NATIONAL INSTITUTE
of AEROSPACE

NASA Langley Research Center

STRATEGIC TECHNOLOGY INVESTMENT PLAN AREAS 1-9

NIA MEMBER UNIVERSITIES

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22 October 2013

Introduction

In October, 2012, the NASA Langley Technical Council released the "Langley Strategic Technology Investment Plan" (LSTIP). In order to provide information on the faculty at NIA's member and affiliate universities that have expertise in the nine technology areas, NIA created this document – the "LSTIP Directory."

Key technologies were identified for each of the nine areas in the LSTIP. Then a preliminary list of relevant faculty was created thru a search of the universities' web pages. Version 1 of the "LSTIP Directory" was sent to the chairs of the departments mentioned in the preliminary list[1] for correction, addition, and deletion. This information was compiled to form Version 2 of the Directory. Version 2 also includes excerpts from the LSTIP throughout the Directory. These excerpts are in underlined italics.

I hope that this document leads to further collaboration between LaRC, faculty at NIA's member universities, and NIA. I wish to thank Todd Mathes, 2012 Air Force Education with Industry student, and Jim VanLaak, NIA Director for Commercial Space, for help with the web searches, and special thanks to Bianca Clark for all her help with formatting, corrections, and production of both Version 1 and 2.

Liselotte Schioler, Sc.D.
Director, Government Agency Programs

Summary

The Langley Strategic Technology Investment Plan (LSTIP) documents mid-term and long-term technology challenge goals to stimulate breakthroughs in science and engineering. The LSTIP content enclosed herein will be used to build a "portfolio" of Internal Research and Development (IRAD) projects for Langley. Nine areas were identified that have a significant potential impact on NASA's future missions and for which Langley's historical and future technical expertise/capability can be focused to make major advances. The LSTIP will be periodically updated to capture new knowledge of missions and technology.

This strategic plan specifically supports:

- *Potential solutions to challenges at the frontiers of aeronautics, space, and science*
- *High-payoff technologies or systems that have the potential to greatly exceed current capabilities*

[1] See the complete list of all the university departments and chairs on the next page.

- *Ideation well beyond the scope of current NASA program and projects. Langley's IRAD projects are not risk adverse, but embrace new unproven concepts and approaches with the potential for high impact*

In addition to direct IRAD call for proposals, the Langley Technology Council plans to use the LSTIP to guide center recommendations in other emerging technology and innovative research programs such as the SBIR/STTR and other aeronautics, space, and science early stage investment opportunities. Leveraging and focusing the multiple sources of support for early stage R&T will help the center and agency move towards new technological solutions to the agencies mission challenges. It is believed that this coordination of projects and strategic focus will help the center and agency more rapidly "invent the future".

LSTIP Area 1-9 Key Technologies

LSTIP Area 1: Point-to-Point Civil Aviation
Key Technologies:
- Automation and autonomy
- Scalable NAS (National Airspace System)
- Adaptive vehicle systems
- Machine learning
- Intuitive displays
- Low noise systems
- Lightweight multifunctional structures
- Novel aero-structural concepts
- Self-healing aircraft
- Decision support tools

LSTIP Area 2: Digital Twin (Aeronautical Vehicles)
Key Technologies:
- High fidelity modeling and simulation
- Life prediction and extension tools
- In-situ repair
- Autonomous in-flight mitigation strategies
- Continuous monitoring
- On-board IVHM system
- Data and text mining
- Sensor fusion
- Physics-based models of vehicle systems

LSTIP Area 3: Architecture and Systems for Long Duration Human Exploration
Key Technologies:
- Affordable concepts & technology
- Space environment
- Radiation physics
- Systems concepts
- Radiation protection materials
- Low power active radiation shielding
- Alternative habitat concepts
- Passive shielding countermeasures
- Operational countermeasures
- Nuclear propulsion

LSTIP Area 4: Accurately Landing and Positioning Large Payloads on Mars
Key Technologies:
- Inflatable Atmospheric Decelerators (IADs)
- Supersonic retro-propulsion

LSTIP Area 4, cont'd:

- Physics-based models
- Multiscale models
- Energy harvesting
- Integration of:
- Flight dynamics
- GN&C
- Aerodynamics
- Aerothermodynamics
- Thermal analysis
- Materials
- Structures
- Propulsion
- Atmospheric characterization

LSTIP Area 5: Sensors and Platforms for Scientific Data (Atmospheric Science Knowledge for Global Change)

Key Technologies:

- Improved sensor accuracy, resolution, and responsiveness
- Reduced sensor drift
- Data mining
- Sensor fusion
- Signal processing
- Data synthesis
- Visualization of sensor data

LSTIP Area 6: Autonomy

Key Technologies:

- Adaptation and learning
- Decision making for fault tolerance
- Integration of controls, communications, and computing
- Self-learning
- Improved fidelity of aerodynamic models
- Adaptive flight control algorithms
- Real-time system identification techniques
- Non-linear aerodynamic modeling
- Scalable NAS

LSTIP Area 7: Simulation Based Engineering and Science (SBES) for Invention and Discovery

Key Technologies:

- Physics-based models and simulation
- Multi-scale models and simulation
- Data synthesis
- Data analytics
- Artificial intelligence
- Quantum computers
- Computer science

LSTIP Area 8: Nanomaterial Superstructures / Multifunctional Materials for Structures

Key Technologies:

- Alignment and joining of nanomaterials to form "superstructures"
- Nanomaterial surface physics and chemistry
- Molecular additive manufacturing
- Nanomaterial composite processing
- Nanomaterial/matrix interface control
- Innovative structure designs
- Low cost manufacturing of nano-superstructures
- Tailored near-net-shape manufacturing of structures

LSTIP Area 9: Applications of Quantum Technology

Key Technologies:

- Quantum material design
- Quantum sensors, metrology, and imaging
- Quantum optics
- Quantum computing and algorithms
- Quantum pattern recognition
- Quantum-based energetics
- Quantum electronics and communications

Universities Included in LSTIP with Department Chairs/Heads

Georgia Tech:

Aerospace Engineering: Vigor Yang, Chair

Chemical & Biomolecular Engineering: David Sholl, Chair

Chemistry & Biochemistry: Charles Liotta, Chair

Computational Science & Engineering: Richard Fujimoto, Chair

Computer Science: Lance Fortnow, Chair

Earth & Atmospheric Science: No Current Administrator

Electrical & Computer Engineering: Steve McLaughlin, Chair

Interactive Computing: Annie Anton, Chair

Materials Science & Engineering: Naresh Thadhani, Chair

Mechanical Engineering: William Wepfer, Chair

Physics: Paul Goldber, Chair

Hampton University:

Atmospheric & Planetary Sciences: Robert Laughman, Chair

Chemical Engineering: Adeyinka Adeyiga, Chair

Chemistry: Isai Urasa, Chair

Computer Science: Jean Muhammad, Chair

Electrical & Computer Engineering: Nesim Halyo, Chair

Electrical Engineering: Nesim Halyo, Chair

Physics: Donald Whitney, Interim Chair

North Carolina A&T:

Chemical, Biological & Bioengineering: Stephen Knisley; Chair

Computational Science & Engineering: Marwan Bikdash, Chair

Computer Science: Gerry Dozier, Chair

Computer Technology Systems: Clay Gloster, Chair

Electrical & Computer Engineering: John Kelly, Chair

Nanoengineering: Ajit Kelkar, Chair

Physics: Abdellah Ahmidouch, Chair

North Carolina State University:

Chemical & Biomolecular Engineering: Peter Fredkiw, Chair

Chemistry: Christopher Gorman, Chair

Civil, Construction & Environmental Engineering: Morton Barlaz, Head

Computer Science: Mladen Vouk, Head

Electrical & Computer Engineering: Daniel Stancil, Head

Industrial & Systems Engineering: Paul Cohen, Head

Materials Science & Engineering: Justin Schwartz, Head

Mathematics: Aloysius Helminck, Head

North Carolina State University, cont'd:

Mechanical & Aerospace Engineering: Richard Gould, Head

Nuclear Engineering: Yousry Azmy, Head

Statistics: Montserrat Fuentes, Head

Technology and Management, Textile & Apparel: Karen Leonas, Head

Textile Engineering: Jon Rust, Head

Old Dominion University:

Chemistry & Biochemistry: Peter Bernath, Chair

Computer Science: Desh Ranjan, Chair

Electrical & Computer Engineering: Shrishak Dali, Chair

Engineering Technology: Mileta Tomovic, Chair

Engineering Management & Systems Engineering: Resit Unal, Chair

Mathematics & Statistics: J. Mark Dorrepaal, Chair

Mechanical & Aerospace Engineering: Sebastian Bawab, Chair

Modeling Simulation & Visualization Engineering: Rick Mckenzie, Chair

Physics: Charles Sukenik, Chair

University of Maryland:

Aerospace Engineering: Norman Wereley, Chair

Applied Mathematics & Statistics: David Levermore, Director

Chemical & Biomolecular Engineering: Sheryl Ehrman, Chair

Chemistry & Biochemistry: Janice Reutt-Robey, Chair

Computer Science: Samir Khuller, Chair

Electrical & Computer Engineering: Rama Chellappa, Chair

Materials Science & Engineering: Robert Briber, Chair

Mathematics: Scott Wolpert, Chair

Mechanical Engineering: Balakumar Balachandran, Chair

Physics: Andrew Baden, Chair

University of Virginia:

Chemical Engineering: Roseanne Ford, Chair

Chemistry: W. Dean Harman, Chair

Computer Science: Kevin Skadron, Chair

Electrical & Computer Engineering: John Lach, Chair

Engineering Physics: Jerry Floro, Chair

Materials Science & Engineering: William C. Johnson, Chair

Mechanical & Aerospace Engineering: Hossein Haj-Hariri, Chair

Physics: Joseph Poon, Chair

Statistics: Jeff Holt, Chair

Systems & Information Engineering: Barry Horowitz, Chair

Virginia Tech:

Aerospace & Ocean Engineering: Eric Paterson, Head

Chemical Engineering: David Cox, Head

Chemistry: James Tanko, Chair

Virginia Tech, cont'd:

Computer Science: Barbara Ryder, Head

Electrical & Computer Engineering: Paul Plassman, Head

Engineering Science & Mechanics: Scott Case, Interim Head

Materials Science & Engineering: David Clark, Head

Mechanical Engineering: Robert Parker, Head

Physics: Leo Piilonen, Chair

College of William & Mary:

Applied Sciences: Christopher Del Negro, Chair

Computer Science: Robert Michael Lewis, Chair

Mathematics: Eric Bradley, Chair

Phsyics: David Armstrong, Chair

LSTIP Area 1: Point-to-Point Civil Aviation

"Point-to-point civilian aviation provides for on-demand air mobility, utilizing unmanned and personal aerial vehicles, to allow people and goods to travel wherever, whenever, This technology area is of interest to the entire aviation market, not only large commercial operations. Small GA and point-to-point air taxi carriers have already been enabled by recent cost and regulatory changes. In the future, on-demand air mobility, enabled by a high degree of automation and autonomy, will allow people and goods to travel wherever, whenever, however they choose at speeds only aviation can provide across distributed areas, while avoiding infrastructure burdens. This means orders of magnitude more flying vehicles than today as well as vehicles moving among people and structures. The need to develop a scalable National Airspace System (NAS) beyond NextGen, where vehicle systems can learn and adapt as conditions change is critical. Technologies that have high system impact for point-to-point, on-demand aviation operations, include innovative data and control displays, low noise systems, lightweight multifunctional structures, novel aero-structural concepts.

"Civilian interest in unmanned aerial vehicles (UAV) is growing in areas including commercial photography, aerial mapping, crop monitoring, advertising, communications and broadcasting safety enhancement - perhaps even saving lives. However, it is hindered by questions and concerns around public trust in autonomy/automation and associated safety analyses for vehicle and operational certification. Personal air vehicles (PAV) are inevitable component of future mainstream transportation and will benefit from the advancement and acceptance of UAVs. In both cases, highly automated and autonomous flight vehicles must be highly robust to changes in an aircraft stability or controllability due to damage or malfunctions. "Self-healing" aircraft whose control systems are constantly learning and naturally adapt to a changing environment is one component of the gaining trust in autonomy. Intuitive "flight deck" displays and decision support tools will transition flying from the niche activity that it is today into a mainstream activity where a "drivers" license is all that's' required to operate a PAV. Beyond the vehicle, the airspace system itself must be robust to accommodate increased density, myriad vehicle types and performance characteristics, and ensure safe integration of civil UAS at previously uncontrolled Class G airspace at altitudes 1000' and below where UASs and PAVs may become ubiquitous."

Key Technologies:

- Automation and autonomy
- Scalable NAS (National Airspace System)
- Adaptive vehicle systems
- Machine learning
- Intuitive displays
- Low noise systems
- Lightweight multifunctional structures
- Novel aero-structural concepts
- Self-healing aircraft
- Decision support tools

GEORGIA TECH

Center for Robotics and Intelligent Machines at Georgia Tech

http://robotics.gatech.edu/
Director: Henrik I. Christensen
404-385-7480
hic@cc.gatech.edu

"The Center for Robotics and Intelligent Machines at Georgia Tech (RIM@GT) is helping define the new face of computing through a unique emphasis on education and research in robotics. The Center positions Georgia Tech to become a world leader in these promising, revolutionary new technologies. RIM@GT activities leverage the strengths and resources of Georgia Tech by reaching across traditional boundaries to embrace a multidisciplinary approach.

"Basic and applied research is at the heart of RIM@Georgia Tech. The study of basic engineering problems in robotics is central to our work, but equally important is the integration of innovation and discoveries into real-world systems and applications. The exceptionally high quality of our programs, faculty and research are rapidly positioning RIM@Georgia Tech with an international reputation for excellence and innovation in robotics."

Cognitive Engineering Center

Director: Amy Pritchett
404-894-0199
Amy.Pritchett@aerospace.gatech.edu
Karen.Feigh@gatech.edu

"Researchers in the CEC examine human-system integration in complex work environments from theoretical and methodological viewpoints, in the field and in the laboratory, and make substantive contributions to practice. Their research focuses on the analysis, design, and evaluation of complex socio-technical systems of people and technology such as air/ground transportation and military systems. They combines knowledge and experience from the cognitive and computer sciences, human factors, human-computer interaction, and systems engineering. Human cognitive activities such as planning, decision making, and problem-solving, should be considered early in the systems design process of technology,

procedures, or teams. The goals of the field are 1) to provide better integration between human operators and the system so that human operators conduct more effectively and preserve system safely and productivity if unanticipated situations arise, and 2) to consider capabilities and limitations of human cognitive behaviors in the design processes of the system to reduce potential human errors and maximize human performance."

Model-Based Systems Engineering Center

http://mbsec.gatech.edu
Directors: Chris Paredis, Jonathan Rogers, Brian German
404-894-5613
Chris.Paredis@me.gatech.edu

"The Model-Based Systems Engineering Center (MBSEC) is part of the Georgia Tech Manufacturing Institute (manufacturing.gatech.edu). It focuses on developing a theoretical foundation for systems engineering. The research covers a broad range of theoretical foundations, from economics, decision theory, game theory, and organization theory to ontologies, formal modeling, simulation and optimization. Systems engineering problems are treated from a socio-technical perspective in a global socio-political and environmental context. Applications include, manufacturing, automotive, heavy equipment, aerospace systems, defense systems and energy systems.

Statistical Machine Learning and Visualization Lab

http://smlv.cc.gatech.edu/
Director: Guy Lebanon
404-997-3735
lebanon@cc.gatech.edu
www.cc.gatech.edu/~lebanon

"The Statistical Machine Learning and Visualization Lab is a research group focused on machine learning and visualization of high dimensional data. Our research emphasizes statistics and computation, and includes both basic research and applied studies."

UAV Research Facility

http://controls.ae.gatech.edu/wiki/UAV_Research_Facility
Director: Eric N. Johnson
404-385-2519
Eric.Johnson@ae.gatech.edu

"The UAVRF performs research to enable highly capable Unmanned Aerial Systems (UAS), aerial robots, and autonomous vehicle systems. Current research topics include:

- Vision aided navigation and control
- Highly capable adaptive control methods with robustness and performance guarantees
- Active environmental perception, obstacle avoidance, and agile low altitude flight
- Integrated guidance, navigation, and control of miniature UAS in cluttered GPS denied environments
- Navigation and estimation theory and sensor fusion
- Decentralized control and management of mobile networks
- Human UAS interaction

"The UAVRF places a strong emphasis on control theoretic research. Flight experimentation is often used for validating developed theory, collecting relevant data, and for motivating new areas of research."

K. K. Ahuja

Aerospace Engineering
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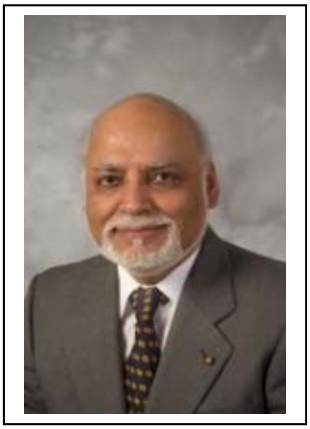


Research Areas:

- Jet and rotor noise
- Flow/acoustic interactions and noise suppression
- Active noise control
- Quiet wind tunnel and engine test facility design
- Infrasonics

LSTIP Area 1 Key Technology: Low noise systems

John-Paul Clarke

Aerospace Engineering
404-385-7206
johnpaul@gatech.edu
http://soliton.ae.gatech.edu/people/jpclarke/

Research Areas:

- Air traffic management, aircraft operations, and airline operations
- Optimal control
- Large-scale optimization
- System analysis, design, and optimization application

LSTIP Area 1 Key Technology: Scalable NAS

Mark Costello

Aerospace Engineering
404-385-4303
mark.costello@aerospace.gatech.edu
http://camm.gatech.edu

Research Areas:

- Dynamic behavior of new air vehicle configurations
- New physical control mechanisms for air vehicles
- New, highly integrated air vehicle sensor systems
- Advanced flight control systems

LSTIP Area 1 Key Technology: Novel aero-structural concepts

Karen Feigh

Aerospace Engineering
404-385-7686
karen.feigh@aerospace.gatech.edu
www.ae.gatech.edu/people/karen.feigh/

Research Areas:

- Decision support system design
- Computational cognitive modeling for engineering design
- Dynamic socio-technical settings
- Adaptive automation design

LSTIP Area 1 Key Technologies: Scalable NAS; Intuitive displays; Decision support tools

Eric Feron

Aerospace Engineering
404-894-3062
eric.feron@aerospace.gatech.edu
http://www.feron.org/Eric/

Research Areas:

- Control systems,
- Multi-agent operations, including air traffic control systems
- Aerospace software system certification
- Flight mechanics and control involving real-time, embedded systems

LSTIP Area 1 Key Technologies: Scalable NAS

Brian German

Aerospace Engineering
404-385-3299
brian.german@aerospace.gatech.edu
http://bgerman.ae.gatech.edu/german.html

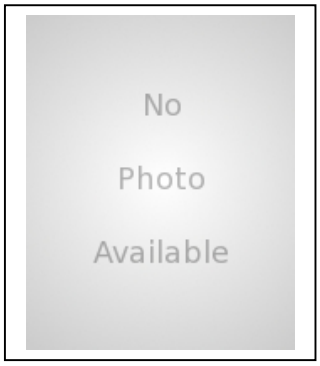
Research Areas:

- Multidisciplinary design optimization (MDO)
- Multi-objective optimization algorithms and applications
- Trade space exploration
- Uncertainty representation and quantification
- Decision sciences in the context of design problems
- Design analysis models for aircraft concept studies
- Configuration aerodynamics
- Synthesis of innovative air vehicle concepts

LSTIP Area 1 Key Technologies: Novel aero-structural concepts; Decision support tools

Sathya V. Hanagud

Aerospace Engineering
404-894-3040
hanagud@aerospace.gatech.edu
http://soliton.ae.gatech.edu/people/shanagud/



Research Areas:

- Smart structures based vibration control
- Induced strain actuators
- Health monitoring of structures
- Active aeroelastic control

LSTIP Area 1 Key Technologies: Adaptive vehicle systems

Eric Johnson

Aerospace Engineering
404-385-2519
eric.johnson@aerospace.gatech.edu
http://www.ae.gatech.edu/~ejohnson/

Research Areas:

- Digital avionics systems, flight control, and navigation
- Adaptive flight control for fault tolerance
- Vision-based guidance and navigation
- Flight testing of guidance, navigation, and control methods on research aircraft

LSTIP Area 1 Key Technologies: Automation and autonomy; Machine learning

George Kardomateas

Aerospace Engineering
404-894-8198
george.kardomateas@aerospace.gatech.edu
http://gkardomateas.gatech.edu/

Research Area:

- Fracture/fatigue/structural behavior in both advanced composite and conventional metallic materials and structures

LSTIP Area 1 Key Technologies: Lightweight multifunctional structures

Amy Pritchett

Aerospace Engineering and Industrial & Systems Engineering
404-894-0199
amy.pritchett@isye.gatech.edu
http://www2.isye.gatech.edu/people/faculty/Amy_Pritchett/

Research Areas:

- Cognitive engineering methods for designing technologies and work processes to support cognitive behaviors
- Applications of cognitive engineering to aerospace engineering, including cockpit operations, air traffic control and management, and UAV operations
- Applications of cognitive engineering to design tools

LSTIP Area 1 Key Technologies: Intuitive displays; Scalable NAS

Massimo Ruzzene

Aerospace Engineering
404-894-3078
massimo.ruzzene@aerospace.gatech.edu
http://www.ae.gatech.edu/people/mruzzene/

Research Areas:

- Structural dynamics and wave mechanics
- Analysis and design of novel cellular structural configurations with multi-functional capabilities
- Analysis and design of acoustic-based sensors and signal processing MEMS devices
- Adaptive passive strategies for vibration isolation and noise control

LSTIP Area 1 Key Technologies: Lightweight multifunctional structures

Panagiotis Tsiotras

Aerospace Engineering
404-894-9526
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http://www.ae.gatech.edu/~ptsiotra/

Research Areas:

- Autonomous systems, nonlinear and optimal control
- Intelligent path planning with application to autonomous on-board navigation and guidance for aerial, space, and ground unmanned vehicles
- Hardware-driven control specifications and algorithms

LSTIP Area 1 Key Technologies: Automation and autonomy

Vitali Volovoi

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404-894-9811
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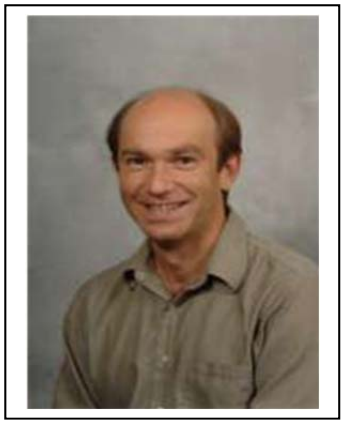
http://www.ae.gatech.edu/people/vvolovoi/



Research Areas:

- System risk, safety and reliability of complex engineering systems
- Assessment of condition-based and other maintenance policies combined with logistics
- Structural design and optimization in the presence of uncertainties
- Air transportation safety

LSTIP Area 1 Key Technologies: Scalable NAS

Ayanna Howard

Electrical and Computer Engineering
404-385-4824
ayanna.howard@ece.gatech.edu
http://users.ece.gatech.edu/ayanna/

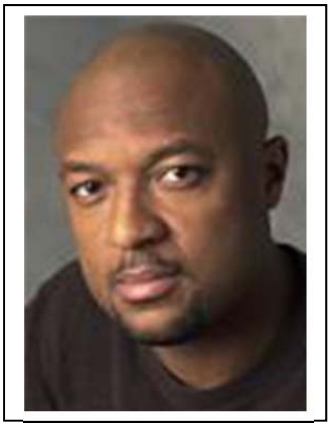
Research Areas:

- Humanized intelligence
- Embedding human cognitive capability into the control path of autonomous systems
- Machine learning

LSTIP Area 1 Key Technologies: Automation and autonomy; Machine learning

Charles Isbell

Interactive Computing
404-385-6491
isbell@cc.gatech.edu
http://www.cc.gatech.edu/~isbell/



Research Areas:

- Artificial intelligence
- Statistical machine learning to building autonomous agents

LSTIP Area 1 Key Technologies: Automation and autonomy; Machine learning

Sundaresan Jayaraman

Materials Science & Engineering and College of Management
404-894-2461
sundaresan.jayaraman@mse.gatech.edu
http://www.mse.gatech.edu/node/1011

Research Areas:

- Engineering design and development of products and processes
- Knowledge-based decision support systems

LSTIP Area 1 Key Technologies: Decision support tools

Seung-Kyum Choi

Mechanical Engineering
404-894-9218
schoi@me.gatech.edu
http://www.me.gatech.edu/faculty/choi

Research Areas:

- Reliability-based systems design
- Probabilistic risk assessment
- Uncertainty representation and quantification
- Decision-based design
- Multiscale modeling under uncertainty
- Optimal design of cellular structures

- LSTIP Area 1 Key Technologies: Decision support tools; Lightweight multifunctional structures

Jonathan S. Colton

Mechanical Engineering
404-894-7407
jcolton@gatech.edu
http://www.me.gatech.edu/faculty/colton

Research Areas:

- Polymer composites processing
- Polymer processing
- Out of autoclave processing
- Integration of sensors and lift modification devices into composite structures

LSTIP Area 1 Key Technologies: Lightweight multifunctional structures

Kenneth A. Cunefare

Mechanical Engineering
404-894-4726
ken.cunefare@me.gatech.edu
http://www-old.me.gatech.edu/ken.cunefare/

Research Areas:

- Controlling and tailoring the sound produced by engineered structures and systems
- Design optimization methods to permit tailoring of the acoustic characteristics of structures
- Investigation of how active control might be used to tailor acoustic responses

LSTIP Area 1 Key Technologies: Low noise systems

Alper Erturk

Mechanical Engineering
404-385-1394
alper.erturk@me.gatech.edu
http://www.alpererturk.com/

Research Areas:

- Acoustics and dynamics
- Mechanics of materials
- Structural dynamics;
- Smart structures
- Structural coupling and modification techniques.

LSTIP Area 1 Key Technologies: Adaptive vehicle systems; Low noise systems

Jonathan Rogers

Mechanical Engineering
404-385-1600
jonathan.rogers@me.gatech.edu
http://me.gatech.edu/faculty/jonrogers

Research Areas:

- Nonlinear estimation and system identification
- Stochastic control and automation
- Modular ground, aerial, and marine robotic systems
- Autonomous vehicle design/optimization

LSTIP Area 1 Key Technologies: Automation and autonomy, Novel aero-structural concepts

Chris Paredis

Mechanical Engineering
404-894-5613
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Research Areas:

- Model-based systems engineering
- Decision theory and game theory
- Theoretical foundations of systems engineering
- Complex systems design
- System architecture
- Modeling and simulation

LSTIP Area 1 Key Technologies: Decision support tools

Erica E. Ryherd

Mechanical Engineering
404-385-3276
erica.ryherd@me.gatech.edu
http://www-old.me.gatech.edu/erica.ryherd/

Research Areas:

- Noise control
- Psychological/physiological response to noise
- Aircraft noise transmission through structures
- Impacts of aircraft noise on humans and wildlife

LSTIP Area 1 Key Technologies: Low noise systems

NORTH CAROLINA A&T

Center for Autonomous Control and Information Technology

http://acitcenter.ncat.edu/

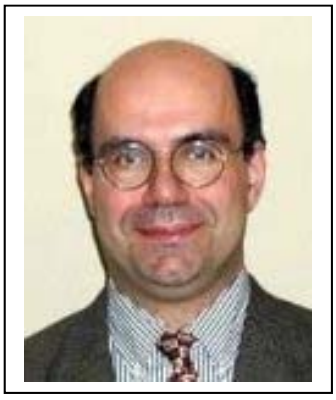
Director: Abdollah Homaifar
336-334-3151
homaifar@ncat.edu

"Advances in autonomous control engineering and its application in many diverse fields require interdisciplinary work and collaboration among departments and institutions. The disciplines include, among others, information, control, and energy technology. The Autonomous Control and Information Technology (ACIT) Center foster interdisciplinary work to carry out research and education in this autonomous control engineering and its application. The technology transfer role of the Center includes workshops, seminars and demonstration projects designed to move the new technologies from the laboratory to industry as well as to educate technical personnel and managers on the opportunities and uses of the new technologies. The culmination of these activities will increase regional economic growth fostered by the development, adoption, and effective use of new information, control, and energy technology."

Center for Cooperative Systems

Director: Marwan U. Bikdash
bikdash@ncat.edu

Marwan Bikdash



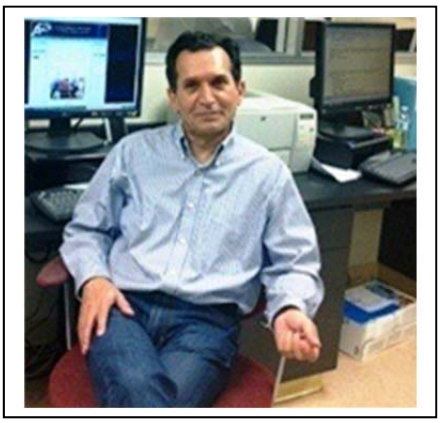
Computational Science and Engineering
336-334-7437
bikdash@ncat.edu

Research Areas:

- Computational modeling of networks of social agents;
- Control, collaboration and decision making via large information systems
- Evolution of behavior in populations under various levels of competition
- Survivable networks

LSTIP Area 1 Key Technology: Automation and autonomy

Abdollah Homaifar
Electrical and Computer Engineering
336-285-3709
homaifar@ncat.edu
http://acitcenter.ncat.edu/Homaifar.html



Research Areas:

- Soft computing
- Multi-agent systems and artificial intelligence
- Image processing and pattern recognition
- Machine learning

LSTIP Area 1 Key Technologies: Automation and autonomy; Machine learning

NORTH CAROLINA STATE UNIVERSITY

Active Robotic Sensing Laboratory

http://research.ece.ncsu.edu/aros/
Director: Edgar Lobaton
909-515-5151
edgar.lobaton@ncsu.edu

"The Active Robotic Sensing laboratory (ARoS), directed by Dr. Edgar Lobaton, is located in the department of Electrical and Computer Engineering (ECE) at NCSU. The lab's research focuses on the design of robust techniques for estimation from imaging data, and techniques for motion planning and control of robotic platforms under uncertainty and minimal sensing. Applications areas include autonomous driving, emergency response in disaster sites, surgical medical robotics, security and surveillance, and wildlife environment monitoring."

Advanced Diagnosis, Automation, and Control Lab

http://www.adac.ncsu.edu/
Director: Mo-Yuen Chow
919-515-5405
adac_lab@ncsu.edu

"The ADAC lab, directed by Dr. Mo-Yuen Chow, is located in the Department of Electrical and Computer Engineering (ECE) at North Carolina State University (NCSU). We develop advanced diagnosis, automation, and control technologies at ADAC lab to provide high performance, cost effective, robust and safe solutions to engineering problems. Currently, we are developing (i) Novel secured cooperative distributed control algorithms to seamlessly integrate massive distributed energy sources into power grids in a plug-and-play environment, and (ii) On-line adaptive algorithms to monitor Li-Ion and Lead-acid batteries to provide precise State-of-Charge and State-of-Health estimations of the batteries."

Center for Robotics and Intelligent Machines

http://www.crim.ncsu.edu/
Director: Edward Grant
919-515-7016
egrant@ncsu.edu

"The Center for Robotics and Intelligent Machines (CRIM) was established in 1992 with the mission of fostering increased interaction in the interdisciplinary technologies of advance robotics and intelligent machines research. The CRIM focuses its research themes to meet its mission within the State as well as nationally and internationally. This is being achieved through various programs of evolution, integration,

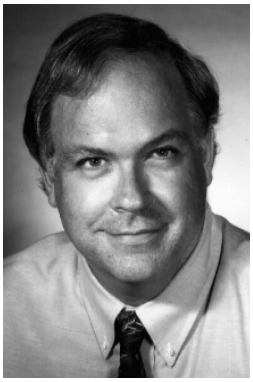
and collaboration. The changing face of the State's hi-tech industries motivates the CRIM to broaden its research base to include biotechnology and information technology themes, since these industries are expanding quickly within the State and the nation."

Vision Information and Statistical Signal Analysis and Applications Lab

http://research.ece.ncsu.edu/vissta
Director: Hamid Krim
919-513-2270
ahk@ncsu.edu

"Our group focuses on applied problems in vision and imaging, as well as smart sensing and intelligent data mining. While we address applied problems, in addition to their visionary and philosophical bend, our approaches are rather formal and are strongly rooted in Analysis, Geometry, Topology and Probability/Statistics."

Dennis R. Bahler



Computer Science
919-515-3369
bahler@csc.ncsu.edu
http://www4.ncsu.edu/~bahler/

Research Areas:

- Machine Learning
- Artificial intelligence and intelligent agents
- Networking and performance evaluation

LSTIP Area 1 Key Technology: Machine learning

Jon Doyle

Computer Science
919-513-0423
doyle@csc.ncsu.edu
http://www.csc.ncsu.edu/faculty/doyle/

Research Areas:

- Algorithms and theory of computation
- Artificial intelligence and intelligent agents
- Information and knowledge management
- Software engineering and programming languages
- Analytics

LSTIP Area 1 Key Technology: Automation and autonomy

James C. Lester

Computer Science
919-515-7534
lester@ncsu.edu
http://www.intellimedia.ncsu.edu/people/jlester/

Research Areas:

- Artificial intelligence
- Graphics and human computer interaction

LSTIP Area 1 Key Technologies: Automation and autonomy; Intuitive displays

Robert St. Amant

Computer Science
919-515-7938
stamant@csc.ncsu.edu
http://www4.ncsu.edu/~stamant/

Research Areas:

- Human-computer interaction
- Artificial intelligence
- Intelligent user interfaces
- Statistical expert systems

LSTIP Area 1 Key Technology: Intuitive displays

Eddie Grant

Electrical & Computer Engineering
919-515-7016
egrant@ncsu.edu
http://www.crim.ncsu.edu/people/director/dr-eddie-grant

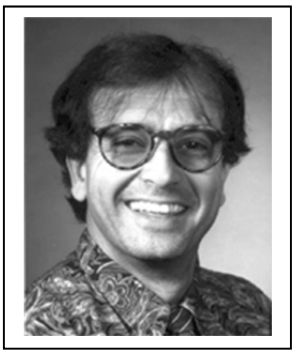
Research Areas:

- Evolutionary control applied to autonomous mobile robot colonies
- Autonomous robot technology
- Self-learning and adaptive robotic colonies using revolutionary computing
- Applied research directed at robot/human relationships

LSTIP Area 1 Key Technologies: Automation and autonomy; Machine learning

Hamid Krim

Electrical & Computer Engineering
919-513-2270
ahk@ncsu.edu
http://www.ece.ncsu.edu/people/ahk/



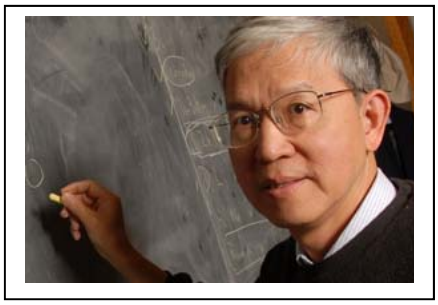
Research Areas:

- Digital signal processing
- Machine learning and data mining and fusion
- Computational intelligence
- Sensor and social networks and topological data analysis

LSTIP Area 1 Key Technology: Machine learning

Shu-Cherng Fang

Industrial & Systems Engineering
919-515-2192
fang@ncsu.edu
http://www.ise.ncsu.edu/fang/www/fangsc.html



Research Areas:

- Linear and nonlinear programming
- Fuzzy optimization and decision making
- Soft computing and heuristic methods

LSTIP Area 1 Key Technology: Decision support tools

David B. Kaber

Industrial & Systems Engineering
919-515-0312
dbkaber@ncsu.edu
http://www.ise.ncsu.edu/ergolab/kaber/

Research Areas:

- Human-automation interaction
- Aviation human factors
- Human-robot interaction
- Multi-modal and intelligent user interface design

LSTIP Area 1 Key Technology: Intuitive displays

Javad Taheri

Industrial & Systems Engineering
919-513-1906
jtaheri@ncsu.edu
http://www.ise.ncsu.edu/taheri/

Research Area:

- Decision support tool development

LSTIP Area 1 Key Technology: Decision support tools

Ashok Gopalarathnam

Mechanical & Aerospace Engineering
919-515-5669
ashok_g@ncsu.edu
http://www.mae.ncsu.edu/faculty-staff/profile/ashok-gopalarathnam/

Research Areas:

- Flight mechanics
- Aircraft design
- Adaptive aircraft
- Design methodologies

LSTIP Area 1 Key Technologies: Adaptive vehicle systems; Novel aero-structural concepts

Charles E. Hall Jr.

Mechanical & Aerospace Engineering
919-515-5299
chall@ncsu.edu
http://www.mae.ncsu.edu/faculty-staff/profile/charles-hall/

Research Areas:

- Dynamics, vibrations, controls, and system design
- Aerodynamics

LSTIP Area 1 Key Technologies: Adaptive structures; Novel aero-structural concepts

Richard Keltie

Mechanical & Aerospace Engineering
919-515-6151
keltie@ncsu.edu
http://www.mae.ncsu.edu/faculty-staff/profile/richard-keltie/

Research Areas:

- Structural mechanics
- Vibration of rib-stiffened structures
- Acoustic radiation
- Mechanical vibrations
- Mechanical design
- System design

LSTIP Area 1 Key Technology: Low noise systems

Robert T. Nagel

Mechanical & Aerospace Engineering
919-515-5283
nagel@ncsu.edu
http://www.mae.ncsu.edu/faculty-staff/profile/robert-nagel/

Research Areas:

- Dynamics, vibrations, controls, and system design
- Aerodynamics

LSTIP Area 1 Key Technology: Adaptive vehicle systems

Alexander Bogdanovich

Textile Engineering, Chemistry, & Science
919-515-6566
aebogdan@ncsu.edu
http://www.ncsu.edu/faculty-and-staff/

Research Areas:

- Multi-scale modeling of hierarchical nano- micro- and macro-composites
- Bridging physics-based models to mechanical property predictions
- Processing multifunctional carbon nanotube - carbon matrix composite superstructures
- Lightweight near-net-shape multifunctional three-dimensional textile composites
- Analysis of composite thin-walled shells and plates

LSTIP Area 1Key Technology: Lightweight multifunctional structures

OLD DOMINION UNIVERSITY

National Centers for System of Systems Engineering

http://www.odu.edu/ncsose

Principal Staff Scientist: Kevin Adams
757-683-5219
kmadams@odu.edu

"NCSOSE is an Old Dominion University enterprise research center with the mission:
To develop, disseminate, and put into practice methodologies and technologies grounded in systems theory and focused on decision making for multidisciplinary problems.

"The Center has six mission areas that serve to focus capability development, funded research efforts, and scholarship. All mission areas have the common thread of Systems Theory as their underlying conceptual and developmental basis. The six mission areas include:

1. *System of Systems Engineering* - developing the formal methodology and tools to effectively address system of systems problems.
2. *Decision Analysis* - development of multi-attribute models and simulation for decision support.
3. *Performance Measurement* -- development and application of measurement systems of value to a wide variety of enterprises and those enterprise's specific problems.
4. *Project Management and Scheduling* -- assisting organizations struggling with the challenges of managing in today's complex project driven environments.
5. *Systems Education and Training* - development and delivery of advanced systems education and training to prepare individuals and organizations to deal with complex problems.
6. *Operational Test and Evaluation* -- developing test plans responsive to the expectations of tested systems' key stakeholders, especially end-users."

Virginia Modeling, Analysis, and Simulation Center

http://www.vmasc.odu.edu/

Director: John Sokolowski
757-686-6215
jsokolow@odu.edu

"The Virginia Modeling, Analysis and Simulation Center (VMASC) is a university-wide multidisciplinary research center that emphasizes modeling, simulation, and visualization (MS&V) research, development and education.

"VMASC concentrates on eight core modeling and simulation applied research areas:
• Transportation
• Homeland Security and Military Defense
• Virtual Environments
• Social Sciences

• Medicine & Health Care
• Game-based Learning
• M&S Interoperability
• System Sciences”

Jiang Li

Electrical & Computer Engineering
(757) 683-6748
JLi@odu.edu
http://www.ece.odu.edu/~jli/

Research Areas:

- Machine learning
- Neural networks
- Modeling and simulation

LSTIP Area 1 Key Technology: Machine Learning

Resit Unal

Engineering & Technology
(757) 683-4554
runal@odu.edu
http://www.resitunal.info/

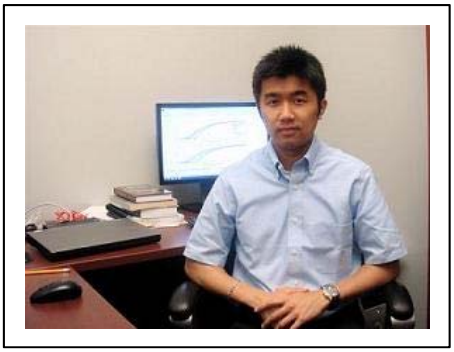
Research Areas;

- Expert judgment methods
- Multidisciplinary design optimization
- Design for reliability
- Genetic algorithms and probabilistic risk analysis

LSTIP Area 1 Key Technology: Decision support tools

ManWo Ng

Modeling, Simulation & Visualization Engineering
757-683-6665
mng@odu.edu
http://www.odu.edu/~mng/



Research Areas:

- Transportation network modeling
- Intelligent transportation systems
- Sensor location problems
- Transportation and the environment
- Infrastructure management and optimization

LSTIP Area 1 Key Technology: Scalable NAS

Onur Bilgen
Mechanical & Aerospace Engineering
757-683-6363
obilgen@odu.edu
http://www.odu.edu/directory/people/o/obilgen

Research Areas:

- Coupled aerodynamic, mechanical and electrical systems
- Smart-material based solid-state morphing airfoils, aircraft, and all necessary electronics

LSTIP Area 1 Key Technology: Adaptive vehicle systems

UNIVERSITY OF MARYLAND

Army MAST Collaborative Technology Alliance Center on Microsystems Mechanics

http://www.microsystems.umd.edu/index.php
Lead PI: Inderjit Chopra
301-405-1122
chopra@umd.edu

"The objective of the MAST CTA is to perform enabling research and technology transition to enhance tactical situational awareness in urban and complex terrain by enabling the autonomous operation of a collaborative ensemble of multifunctional, mobile microsystems. To achieve this objective, the Alliance is expected to advance fundamental science and technology in several key areas including:

- Microsystem Mechanics
- Processing for Autonomous Operation
- Microelectronics, and
- Platform Integration"

Autonomous Vehicles Laboratory

http://www.avl.umd.edu/
Director: J. Sean Humbert
301-405-0328
humbert@umd.edu

"The Autonomous Vehicle Laboratory (AVL) is a facility in the Department of Aerospace Engineering, located in the Jeong H. Kim Engineering Bldg, and conducts research and development in the area of biologically inspired robotics. We seek to distil the fundamental sensing and feedback principles that govern locomotive behavior in small organisms that will enable the next generation of autonomous microsystems. Unique capabilities include rapid-prototyping facilities for microsystem fabrication and development, a VICON marker-based visual tracking system that provides direct measurements of 6-DOF vehicle position and orientation for system identification and real-time feedback, a low speed wind tunnel with a specialized high speed camera system for insect tracking and wing kinematics measurement, and advanced hardware and software tools for visual-based simulation of flight systems."

Center for Automation Research

http://www.cfar.umd.edu/
Director: Rama Chellappa
301-405-3656
rama@cfar.umd.edu

The Center for Automation Research includes several other labs. Some of these are:

Computer Vision Lab
http://www.cfar.umd.edu/cvl/
Director: Yiannis Aloimonos
301-405-4526
yiannis@cs.umd.edu

"The Computer Vision Laboratory at the University of Maryland traces its origin back to 1964. It is now a constituent Laboratory of the University's Center for Automation Research."

Graphics and Visual Informatics Laboratory
http://www.cs.umd.edu/gvil/
301-405-6722

"The University of Maryland's Graphics and Visual Informatics Laboratory (GVIL) was established in 2000 by the Department of Computer Science and the University of Maryland Institute for Advanced Computer Studies to promote research and education in computer graphics, scientific visualization, and virtual environments. "

Laboratory for Language and Media Processing
http://lamp.cfar.umd.edu/index.htm
301-405-6444
lamp@cfar.umd.edu

Center for Scientific Computation and Mathematical Modeling (CSCAMM)

http://www.cscamm.umd.edu/
Director: Eitan Tadmor
301-405-0652
info@cscamm.umd.edu

"The primary goal of the Center for Scientific Computation and Mathematical Modeling (CSCAMM) is to foster research and educational activities that highlight novel computational algorithms and mathematical modeling and their interplay with physical science, biological science, and engineering.

"The rapid growth over the past quarter century in the speed and data handling capability of high performance computers has transformed the methodology of scientific investigation. Combined with the development of novel algorithms, scientific computation has not only joined experiment and theory as one of the fundamental tools of investigation, but it has also altered the kind of experiments performed and expanded the scope of theory. The Center for Scientific Computation and Mathematical Modeling (CSCAMM) was created in 2001 by the University of Maryland, College Park (UMd), as a 'major impact' project which aims to address the challenges offered by these scientific developments. CSCAMM encourages cross-fertilization of research activity that lies at the interface between different scientific fields utilizing scientific computation and mathematical modeling. Recent examples of such fields include weather forecasting based on multi-scale modeling/simulations of atmosphere-ocean-land interactions, nano-structures, protein folding and turbulence and transport in fluids and plasma."

Collective Dynamics and Control Laboratory

http://cdcl.umd.edu
Director: Derek A. Paley
301-405-5757
dpaley@umd.edu

"The Collective Dynamics and Control Laboratory (CDCL) conducts research in multi-vehicle control, autonomous vehicles, and bio-inspired collective behavior. Specific research topics include nonlinear control and dynamics, mobile sensor networks, and biocomplexity. Sample research projects include cooperative control of autonomous vehicles in the air and sea, optimal and adaptive sampling of spatiotemporal processes, and quantitative modeling of animal groups. Robotics is a major theme in CDCL research and to support mobile robotics research we have an eighteen camera indoor motion-capture studio and a twelve-camera underwater motion-capture system."

Institute for Systems Research

http://www.isr.umd.edu/home
Director: Reza Ghodssi
ghodssi@umd.edu
301-405-6615

"The Institute for Systems Research is a permanent, interdisciplinary research unit within the A. James Clark School of Engineering at the University of Maryland. Since its beginnings as one of the National Science Foundation's original Engineering Research Centers in 1985, ISR has been at the international forefront of interdisciplinary research and education in the system sciences and systems engineering. ISR attained permanent institute status at the university in 1992 and graduated from the NSF program in 1996. ISR's founding director was Dr. John Baras.

"Because large-scale science requires systems engineering and, conversely, systems engineering and implementation of modern real-world systems doesn't occur without good systems science, ISR develops both basic solution methodologies and tools for systems problems in a variety of different areas. Our advances in the system sciences have been driven by a wide range of complex applications, which have changed over time. ISR's current main research areas are:

- Communication systems and networks
- Control systems and methodologies
- Neuroscience and biology-based technology
- Micro and nano devices and systems; robotics
- Design, operations and supply chain management
- Systems engineering methodologies
- Computing, speech, artificial intelligence, data mining"

The Institute has many related centers and labs. Some of these are:

Maryland Robotics Center
http://robotics.umd.edu/index.php
Director: Nuno Martins
301-405-9198
nmartins@umd.edu

"An interdisciplinary research center housed in the Institute for Systems Research within the A. James Clark School of Engineering. The mission of the center is to advance robotic systems, underlying component technologies, and applications of robotics through research and educational programs that are interdisciplinary in nature and based on a systems approach."

Micro Robotics Lab
http://terpconnect.umd.edu/~sarahb/
Director: Sarah Bergbreiter
301-405-6506
sarahb@umd.edu

"Our vision is to engineer a new class of networked centimeter and millimeter sized mobile robots. To accomplish this goal, we are working on many important aspects of this problem from microrobotic locomotion to low power and efficient actuators to novel fabrication techniques. We hope to adapt the technologies that go into these tiny robots for use in medicine, consumer electronics, and science."

Simulation-Based System Design Laboratory
http://www.simulation.umd.edu/index.php
Director: Jeffrey Herrmann
301-405-5433
jwh2@umd.edu

"Our research objective is to develop, test, and implement effective and efficient simulation techniques for modeling, evaluating, and optimizing systems in order to improve decision-making throughout the system development life cycle. Simulation is an important tool for modeling and predicting the performance of systems when analytical models do not exist or perform poorly. In addition, simulation provides powerful ways to visualize the behavior of a complex system before it is constructed."

Smart Materials & Structures Research Center

http://www.smsrc.umd.edu/
Director: Amr Baz
301-405-5216
baz@umd.edu

"The Smart Materials and Structures Research Center (SMSRC) was formed in 1994 to catalyze the development of existing and new smart materials and structures technologies, and to educate a new generation of multidisciplinary engineers in the Department of Mechanical Engineering. The SMSRC has since grown to include six faculty members and thirty graduate students, with an annual research budget exceeding $1.5M from a variety of governmental and industrial sponsors."

University of Maryland Institute for Advanced Computer Studies

http://www.umiacs.umd.edu/
Director: Amitabh Varshney
varshney@cs.umd.edu
301-405-6722

"Our mission is to foster and enhance basic and interdisciplinary research programs in computing across the University of Maryland at College Park. The success of UMIACS in catalyzing and excelling in interdisciplinary applications of computing is often attributed to: (1) identification and focus on grand challenge applications of computing with significant societal impact, (2) identifying and incentivizing outstanding faculty to excel in their research through rotating appointments, and (3) mediating interaction amongst interdisciplinary researchers through an outstanding computational infrastructure. We have developed the skill set and culture necessary for building strong interdisciplinary research programs, providing advanced computing research infrastructure, and first-rate technical support, which have greatly facilitated our national and international leadership role in multi-disciplinary computing. Our research programs are led by an outstanding group of distinguished scholars across the UMD College Park campus. Since computing is at the core of all the Institute's activities, UMIACS has a uniquely close relationship with the highly regarded Department of Computer Science."

Jewel Barlow

Aerospace Engineering
240-464-3871
barlow@umd.edu
http://www.windtunnel.umd.edu/

Research Areas:

- Applied aerodynamics
- Experimental aerodynamics
- Flight mechanics and control
- Aerospace vehicle design process

LSTIP Area 1 Key Technology: Novel aero-structural concepts

Inderjit Chopra

Aerospace Engineering
301-405-1122
chopra@umd.edu
http://www.inderjitchopra.umd.edu/index.html

Research Area:

- Smart structures

LSTIP Area 1 Key Technology: Adaptive vehicle systems

James E. Hubbard, Jr.

Aerospace Engineering
757-325-6830
juhubbard@nianet.org or jhubbard@nianet.org
http://www.morpheus.umd.edu/index.php

Research Areas:

- Morphing airframe architecture, airfoils, and missile control surfaces
- Smart materials

LSTIP Area 1 Key Technology: Adaptive vehicle systems

Darryll J. Pines

Aerospace Engineering
301-405-0263
pines@umd.edu
http://www.eng.umd.edu/aboutus/pines-bio

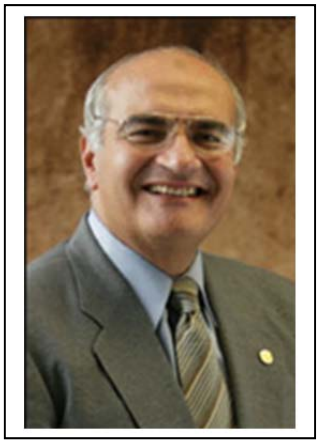
Research Areas:

- Smart structures,
- Structural dynamics and control
- Guidance, navigation, and control of aerospace vehicles

LSTIP Area 1 Key Technology: Adaptive vehicle systems

Amr Baz

Mechanical Engineering
301-405-5216
baz@umd.edu
http://www.baz.umd.edu/
http://www.smsrc.umd.edu/



Research Areas:

- Active and passive control of vibration and noise
- Active constrained layer damping
- Magnetic composites
- Active acoustic metamaterials

LSTIP Area 1 Key Technologies: Adaptive vehicle systems; Low noise systems

Nikhil Chopra

Mechanical Engineering
301-405-7011
nchopra@umd.edu
http://terpconnect.umd.edu/~nchopra/Site/Home.html

Research Areas:

- Control of networked robotic systems
- Synchronization of dynamical systems
- Bilateral tele-operation
- Control of semi-autonomous systems

LSTIP Area 1 Key Technology: Automation and autonomy

Hugh Bruck

Mechanical Engineering
301-405-8711
bruck@umd.edu
http://terpconnect.umd.edu/~bruck/WAM-pub/

Research Areas:

- Smart materials
- Multifunctional materials
- Finite element modeling of functionally graded multifunctional materials
- Mathematical techniques for optimizing the design of functionally graded and multifunctional materials

LSTIP Area 1 Key Technologies: Adaptive vehicle systems; Lightweight multifunctional structures

Abhijit Dasgupta

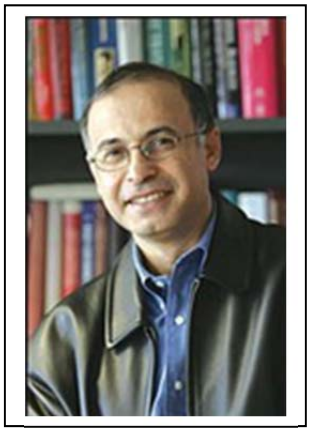
Mechanical Engineering,
301-405-5251
dasgupta@umd.edu
http://www.calce.umd.edu/general/faculty/bios/dasgupta.html

Research Areas:

- Mechanics of “smart” composite materials
- Self-health monitoring in “smart” systems

LSTIP Area 1 Key Technology: Adaptive vehicle systems

Ali Mosleh
Mechanical Engineering
301-405-5215
301-314-9477
mosleh@umd.edu
http://www.enme.umd.edu/facstaff/fac-profiles/mosleh.html



Research Areas:

- Risk and safety assessment
- Reliability analysis
- Decision analysis

LSTIP Area 1 Key Technology: Decision support tools

UNIVERSITY OF VIRGINIA

Center for Risk Management of Engineering Systems

http://www.sys.virginia.edu/risk/about.html
Director: Yacov Y. Haimes
risk@virginia.edu
434-924-0960

"Center for Risk Management of Engineering Systems was founded by the University of Virginia in 1987 by the Council of Higher Education in Virginia as a University-wide resource. It develops theory, methodology and technology to assist in the management of risk for a variety of engineering systems. Working closely with faculty and students at the center, industry and government sponsors of research contribute their unique strengths and interests.

"The mission of UVa's Center for Risk Management of Engineering Systems (the Center) is to develop theory, methodology, and technology to assist in the management of risk for a variety of engineering systems. Industry and government sponsors of research at the Center contribute their unique strengths and interests. They share their experience and work closely with faculty and students on a broad range of ongoing projects. Center areas of expertise include the following:

- Collaborative risk modeling and assessment
- Large-scale and complex hierarchical systems
- Critical infrastructure protection
- Defense and civil infrastructure systems
- Infrastructure interdependencies, including multiregional and cross-regional analysis
- Geographic information system (GIS)-based analyses
- Strategic preparedness and regional resilience
- Multimodal transportation planning and transportation safety
- Business and operations decision making and processes
- Digital identity management in emergency response
- Information assurance and Command, Control, Communications, Computers, Intelligence, Surveillance and Reconnaissance (C4ISR)
- Safety- and mission-critical systems
- Transportation systems
- Computer-based systems, including hardware and software performance and reliability
- Reliability modeling of multiple failure modes in complex systems
- Environmental impacts
- Water resources and technology management

"The Center is unique in many ways, including:

- Its cross-disciplinary range within and beyond engineering.
- It is one of the few in the country to apply risk assessment and management to engineering and technology-based systems.

- Experienced since 1987, the Center is in a strategic position to evaluate and manage risk in a broad scope of technology-based systems."

Yanjun (Jane) Qi

Computer Science
434-243-3089
yq2h@virginia.edu
http://www.cs.virginia.edu/yanjun/

Research Areas:

- Machine learning
- Bioinformatics
- Data mining
- Medical informatics

LSTIP Area 1 Key Technology: Machine learning

Gang Tao

Electrical & Computer Engineering
434-924-4586
gt9s@virginia.edu
http://www.people.virginia.edu/~gt9s

Research Areas:

- Resilient and autonomous flight control
- Adaptive control
- Adaptive fault detection
- Fault tolerant control

LSTIP Area 1 Key Technologies: Automation and autonomy; Adaptive vehicle system

Sean Agnew

Materials Science & Engineering
434-924-0605
sra4p@virginia.edu
http://www.virginia.edu/ms/research/agnew

Research Areas:

- Low symmetry metal deformation
- Magnesium alloy processing-structure-property relationships
- Surface characterization

LSTIP Area 1 Key Technology: Lightweight multifunctional structures

James Burns

Materials Science & Engineering
434-243-1939
jtb5r@virginia.edu
http://www.virginia.edu/cese/

Research Areas:

- Metallurgy
- Solid mechanics
- Chemistry

LSTIP Area 1 Key Technologies: Lightweight multifunctional structures; Novel aero-structural concepts

Richard Gangloff

Materials Science & Engineering
434-982-5782
rpg7y@virginia.edu
http://www.virginia.edu/ms/faculty/gangloff.html

Research Areas:

- Hydrogen embrittlement
- Corrosion fatigue
- Stress corrosion cracking and experimental fracture mechanics of ferrous and aluminum alloys

LSTIP Area 1 Key Technologies: Lightweight multifunctional structures; Novel aero-structural concepts

Robert Kelly

Materials Science & Engineering
434-982-5783
rgkelly@virginia.edu
http://www.virginia.edu/cese/

Research Areas:

- Corrosion in aging aircraft
- Development of embeddable corrosion microinstruments
- Atomistic and continuum modeling of electrochemical processes
- Localized corrosion in alloy systems

LSTIP Area 1 Key Technologies: Lightweight multifunctional structures; Novel aero-structural concepts

Elizabeth Opila

Materials Science & Engineering
434-243-7610
ejo4n@virginia.edu
http://www.virginia.edu/ms/faculty/opila.html

Research Areas:

- Materials durability in extreme environments
- High temperature coating development
- High temperature water vapor interactions with metals and ceramics
- Thermochemistry of gaseous metal hydroxides
- Oxide defect chemistry

LSTIP Area 1 Key Technologies: Lightweight multifunctional structures; Novel aero-structural concepts

John Scully

Materials Science & Engineering
434-982-5786
jrs8d@virginia.edu
http://www.virginia.edu/cese/

Research Areas:

- Hydrogen embrittlement
- Stress corrosion cracking
- Localized corrosion
- Passivity of materials

LSTIP Area 1 Key Technologies: Lightweight multifunctional structures; Novel aero-structural concepts

Haydn N. Wadley

Materials Science & Engineering
434-982-5671
haydn@virginia.edu
http://www.ipm.virginia.edu

Research Area:

- Synthesis, structure, and performance of novel materials

LSTIP Area 1 Key Technology: Lightweight multifunctional structures

Hillary Bart-Smith

Mechanical & Aerospace Engineering
434-924-0701
hb8h@virginia.edu
http://www.bartsmithlabs.com/mms/index.html

Research Areas:

- High authority morphing structures
- Ultra-light multifunctional materials
- Electroactive and electrostrictive polymers
- Nanoporous thin films - nanoporous shape memory alloy films

LSTIP Area 1 Key Technology: Lightweight multifunctional structures

Christopher Goyne

Mechanical & Aerospace Engineering
434-982-5355
cpg3e@virginia.edu
http://www.mae.virginia.edu/arl/

Research Areas:

- Supersonic aerodynamics
- Hypersonic ground and flight test techniques
- Diagnostic and measurement technique development

LSTIP Area 1 Key Technology: Novel aero-structural concepts

James McDaniel

Mechanical & Aerospace Engineering
434-982-5945
jcm@virginia.edu
http://www.mae.virginia.edu/newmae.mae-faculty/james-c-mcdaniel/

Research Areas:

- Hypersonic aerodynamics
- Nonintrusive laser-based flowfield diagnostics

LSTIP Area 1 Key Technology: Novel aero-structural concepts

James H. Lambert

Systems & Information Engineering
434-982-2072
lambert@virginia.edu
http://people.virginia.edu/~jhl6d/

Research Areas:

- Reliability modeling of multiple failure modes in complex systems
- Reliability analysis and critical systems safety
- Multi-stage, multi-objective, decision making for extreme events
- Risk prioritization with risk filtering, ranking, and management method

LSTIP Area 1 Key Technology: Decision support tools

Matthew Gerber

Systems & Information Engineering
434-924-5397
msg8u@virginia.edu
http://web.sys.virginia.edu/matthew-gerber.html

Research Areas:

- Natural language processing
- Dynamic Spectral Clustering

LSTIP Area 1 Key Technology: Machine learning

Gregory J. Gerling

Systems & Information Engineering
434-924-0533
gg7h@virginia.edu
http://www.sys.virginia.edu/ggerling/

Research Areas:

- Haptics
- Computational neuroscience
- Human factors/ergonomics
- Human-machine interaction

LSTIP Area 1 Key Technology: Intuitive displays

Stephanie Guerlain

Systems & Information Engineering
434-924-4438
sag3c@virginia.edu
http://www.sys.virginia.edu/hci/

Research Areas:

- Design of decision support systems
- Cognitive systems engineering
- Human-computer interaction and data visualization

LSTIP Area 1 Key Technologies: Intuitive displays; Decision support tools

Yacov Y. Haimes

Systems & Information Engineering
434-924-3803
yyh4f@virginia.edu

Research Areas:

- Risk-based decision making
- Multiobjective tradeoff analysis
- Hierarchical analysis of large-scale systems

LSTIP Area 1 Key Technology: Decision support tools

Amy LaViers

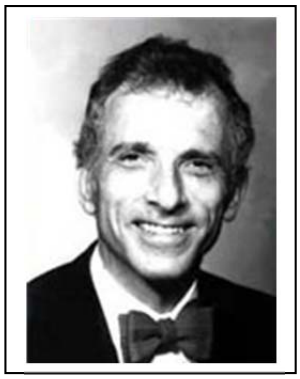
Systems & Information Engineering
434-924-7460
alaviers@virginia.edu
http://people.virginia.edu/~ael8a/

Research Areas:

- Robotics and control
- Dynamic Spectral Clustering

LSTIP Area 1 Key Technologies: Automation and autonomy; Scalable NAS; Adaptive vehicle systems; Machine learning

Roman Krzysztofowicz
Systems & Information Engineering
434-982-2067
rk@virginia.edu
http://www.faculty.virginia.edu/rk/



Research Areas:

- Bayesian decision theory
- Probabilistic modeling
- Decision, risk, and reliability analyses
- Stochastic control with forecasts

LSTIP Area 1 Key Technology: Decision support tools

VIRGINIA TECH

Computational Multi-physics Systems Laboratory

http://www.cmsvt.org/

Director: Tomonari Furukawa
434-766-6632
tomonari@vt.edu

"The Computational Multiphysics Systems Laboratory recently joined the Center for Vehicle Systems & Safety. The laboratory investigates "the analysis and synthesis of computational multiphysics systems which range from deformable bodies studied in computational and experimental mechanics to rigid bodies studied in robotics."

Material Characterization
1. Full-field strain measurements
2. Online stochastic characterization of composites
3. Online damage prediction of composites

Structural Health Monitoring (SHM) and Non-Destructive Evaluation (NDE)
1. Stochastic defect identification under sensor uncertainties
2. Hybrid SHM/NDE method for defect identification
3. Hybrid material/geometry method for micro-crack identification

Bayesian Robotics
1. Simultaneous Localization and Mapping (SLAM)
2. Robotic monitoring of indoor environments
3. Autonomous Bayesian search and tracking (SAT)
4. Cooperative search, tracking, localization and mapping (STLAM)
5. Platform- and hardware-in-the-loop simulator (PHILS)
6. Non-line-of-sight localization

Autonomous Vehicles
1. Autonomous mini ground vehicles
2. Autonomous rotary-wing MAVs (MAVSTAR) Large unmanned ground vehicles
3. Visualization of flapping-wing MAVs"

Robotics & Mechanisms Laboratory (RoMeLa)

http://www.romela.org/main/Robotics_and_Mechanisms_Laboratory

Director: Dennis Hong
540-231-7195
dhong@vt.edu

"RoMeLa is a unique laboratory dedicated to advancing robotics through research and education, where graduate and undergraduate students, post docs and visiting researchers all work closely together as a team."

Virginia Center for Autonomous Systems

http://www.unmanned.vt.edu/

Director: Craig A. Woolsey
540-231-8117
cwoolsey@vt.edu

"The Virginia Center for Autonomous Systems (VaCAS) is an ICTAS/College of Engineering research center which facilitates interdisciplinary research in autonomous systems technology. VaCAS hosts research activities spanning every application domain: water, land, air, and space. VaCAS member research activities range from fundamental control theory to vehicle development to applications for science, security, and commerce.

"The primary purpose of the Virginia Center for Autonomous Systems is to advocate and support a broad range of basic and applied interdisciplinary research activities related to autonomous system technology. VaCAS hosts research activities spanning every application domain: water, land, air, and space. Member research activities range from fundamental control theory to vehicle development to applications for science, security, and commerce. Although VaCAS research activities span a broad range of topics, they are universally characterized by rigorous methodology applied to real-world challenges in autonomous systems.

"Research focus areas include:

- Advanced vehicle guidance and control
- Advanced sensing and navigation
- Advanced mobility and actuation
- Vehicle dynamic modeling and analysis
- Vehicle design"

Mazen H. Farhood

Aerospace & Ocean Engineering
540-231-2983
farhood@vt.edu
http://www.unmanned.vt.edu/news/mazen-farhood.html

Research Areas:

- Cooperative control in complex environments
- Integrate robust feedback control methods into the design and construction of multi-vehicle systems to ensure operational networks despite disturbances, communication latency and packet loss, obstacles in an uncertain environment, and model uncertainties

LSTIP Area 1 Key Technology: Automation and autonomy

Craig Woolsey

Aerospace and Ocean Engineering
540-231-8117
cwoolsey@vt.edu
http://www.dept.aoe.vt.edu/~cwoolsey/

Research Areas:

- Nonlinear control of mechanical systems
- Autonomous vehicle dynamics and control
- Unmanned air vehicles

LSTIP Area 1 Key Technology: Automation and autonomy

Dhruv Batra

Electrical & Computer Engineering
540-231-7561
dbatra@vt.edu
http://filebox.ece.vt.edu/~dbatra/

Research Areas:

- Machine learning and computer vision
- Structured-output prediction
  inference and learning in graphical models like Markov random field
- Interactive 3d modeling

LSTIP Area 1 Key Technology: Machine learning

Scott Case

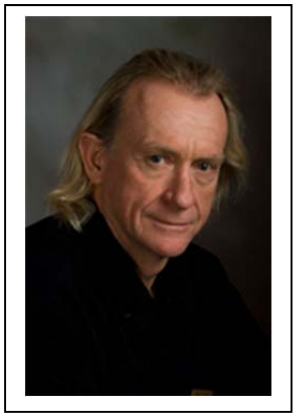
Engineering Science & Mechanics
540-231-3140
scase@vt.edu
http://www.esm.vt.edu/people/active/scase/scase-bio.html

Research Areas:

- Life prediction techniques for composite materials
- Modeling of "smart" material systems

LSTIP Area 1 Key Technologies: Adaptive vehicle systems

Chris Fuller



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540-231-4162
cfuller@vt.edu
or
757-325-6965
chris.fuller@nianet.org
https://www.val.me.vt.edu/content/chris-fuller

Research Areas:

- Interior noise
- Structural acoustics
- Active control of sound and vibration
- Adaptive structures and application of artificial neural networks to problems in acoustics and vibration

LSTIP Area 1 Key Technology: Low noise systems

Kevin Kochersberger

Mechanical Engineering
540-231-5589
kbk@vt.edu
http://www.me.vt.edu/_bios/_primary/kochersberger_bio.html

Research Areas:

- Vibrations/dynamics
- Adaptive air vehicle design
- Low Reynolds number aerodynamics
- Integration of UAV into the national airspace system

LSTIP Area 1 Key Technologies: Scalable NAS; Adaptive vehicle systems

Alexander Leonessa

Mechanical Engineering
540-231-3268
leonessa@vt.edu

Research Areas:

- Adaptive Control
- Autonomous Marine Vehicles

LSTIP Area 1 Key Technologies: Automation and autonomy

Walter O'Brien

Mechanical Engineering
540-231-9104
walto@vt.edu

Research Areas:

- Unsteady stator/rotor interactions in compressors
- Noise control in turbofans
- Combustion instabilities and adaptive controls
- Active flow control for reducing high-cycle fatigue

LSTIP Area 1 Key Technology: Low noise systems

Pablo A. Tarazaga

Mechanical Engineering
540-231-2906
ptarazag@vt.edu
http://p.tarazaga.net/

Research Areas:

- Structural mechanics
- Dynamics and control
- Intelligent material applications
- Structure acoustic interactions
- SHM
- Model validation and modal analysis

LSTIP Area 1 Key Technologies: Adaptive vehicle systems; Low noise systems

LSTIP Area 2: Digital Twin (Aeronautical Vehicles)

"Future generations of aerospace vehicles will be lighter, yet carry higher loads and experience more extreme service conditions over longer time periods than the current generation of vehicles. Yet, existing methodologies for vehicle certification, fleet management and sustainment are largely based on similitude and a heuristic understanding of the effects of operational and anomalous conditions on the structural health, safety and performance of a vehicle.

"The Digital Twin is an integrated, multiphysics, multiscale simulation of an as-built vehicle or system that incorporates high fidelity modeling and simulation and situational awareness to mirror the life of the corresponding flying vehicle or system. The Digital Twin continuously forecasts the health of the vehicle or system, the remaining useful life and the probability of mission success. The extreme requirements of the next generation of vehicles also necessitate a fundamental change in the methods used for their development, thus design and certification methods are another component of the Digital Twin paradigm. Finally, because the vehicles are expected to perform over very long durations, with limited, if any, opportunities for repair, their structures and systems must be more robust than is possible on current vehicles. Thus, the Digital Twin incorporates unprecedented capabilities for life prediction and extension including in-situ repair and autonomous in-flight mitigation strategies that increase the life span of the vehicle and the probability of mission success.

As a virtual instantiation of a flying vehicle, the Digital Twin is expected to be able to experience every event that its flying twin experiences. Because of its ability to mirror the life of a specific vehicle in an as-built state, the Digital Twin will necessarily revolutionize certification, fleet management and sustainment. It will also decrease system weight by reducing reliance on statistical distributions of material properties, heuristic design philosophies, physical testing and assumed similitude between testing and operational conditions. Once the vehicle is launched, the Digital Twin will increase the reliability of the flying vehicle because of its ability to continuously monitor and mitigate degradation and anomalous events. Additionally, it will enable mission managers to make knowledgeable decisions regarding the consequences of possible in-flight changes to a vehicle's mission.

Components of the Digital Twin include:
- *Precise models of the as-built configuration of a vehicle or component, including material microstructure, defects, fabrication anomalies, etc.*
- *An on-board IVHM system to continuously monitor aerodynamic, thermal, inertial and other loading in addition to measures of degradation in vehicle health and performance.*
- *A suite of ultra-high fidelity physical models of the vehicle and its systems and structures of interest. These may include models of one or more important and interdependent vehicle*

systems, including airframe, propulsion and energy storage, life support, avionics, thermal protection, etc.

• Technologies that enable the updating of physics-based models with sensor data, fleet data, maintenance reports and other historical information via data mining and text mining.

Although the paradigm of the Digital Twin can be applied to any aerospace vehicle, this topic is focused on certification and sustainment aeronautical vehicles."

Key Technologies:

- High fidelity modeling and simulation
- Life prediction and extension tools
- In-situ repair
- Autonomous in-flight mitigation strategies
- Continuous monitoring
- On-board IVHM system
- Data and text mining
- Sensor fusion
- Physics-based models of vehicle systems

GEORGIA TECH

Aerospace Systems Design Laboratory

http://www.asdl.gatech.edu/index.html
Director: Dimitri Mavris
404-894-1557
dimitri.mavris@aerospace.gatech.edu

"Formulate, develop, and implement comprehensive approaches to the design of affordable and high quality complex systems, emphasizing

- Disciplinary breadth and depth while accounting for uncertainty and risk
- Multi-disciplinary analysis, optimization and design
- Reduction of analysis & design process cycle time
- Physics-based analysis & design of unconventional vehicles
- Systems of Systems, Architecture-based Systems Engineering
- Interdisciplinary research, both within the Schools at Georgia Tech and through the formation of alliances with other universities, industry, and government"

Model-Based Systems Engineering Center

http://mbsec.gatech.edu

Director: Chris Paredis, Jonathan Rogers, Brian German

404-894-5613

Chris.Paredis@me.gatech.edu

"The Model-Based Systems Engineering Center (MBSEC) is part of the Georgia Tech Manufacturing Institute (manufacturing.gatech.edu). It focuses on developing a theoretical foundation for systems engineering. The research covers a broad range of theoretical foundations, from economics, decision theory, game theory, and organization theory to ontologies, formal modeling, simulation and optimization. Systems engineering problems are treated from a socio-technical perspective in a global socio-political and environmental context. Applications include, manufacturing, automotive, heavy equipment, aerospace systems, defense systems and energy systems.

UAV Research Facilty

http://controls.ae.gatech.edu/wiki/UAV_Research_Facility

Director: Eric N. Johnson

404-385-2519

Eric.Johnson@ae.gatech.edu

"The UAVRF performs research to enable highly capable Unmanned Aerial Systems (UAS), aerial robots, and autonomous vehicle systems. Current research topics include:

- Vision aided navigation and control
- Highly capable adaptive control methods with robustness and performance guarantees
- Active environmental perception, obstacle avoidance, and agile low altitude flight
- Integrated guidance, navigation, and control of miniature UAS in cluttered GPS denied environments
- Navigation and estimation theory and sensor fusion
- Decentralized control and management of mobile networks
- Human UAS interaction

"The UAVRF places a strong emphasis on control theoretic research. Flight experimentation is often used for validating developed theory, collecting relevant data, and for motivating new areas of research."

Structural Dynamics and Smart Structures Laboratory

http://soliton.ae.gatech.edu/labs/sdssl/home.html

Director: Sathya V. Hanagud

404-894-3040

hanagud@aerospace.gatech.edu

"The Structural Dynamics and Smart Structures Laboratory is involved in most of the areas of smart structures. The main project at this time is the application of smart structures in the alleviation of buffet induced vibrations in twin tails high performance aircrafts. Another research area is the online, or real time, detection of structural anomalies such as delaminations and impact damages in composites,

debonding in sandwich structures and cracks. Also, acoustic control was studied with the smart guitar project.

"The equipment available in the laboratory includes:

- many types of sensors ranging from accelerometers to PVDF sensors,
- many types of actuators ranging from 50 lb. Shakers to PZT wafers and stack actuators,
- electronic devices such as signal generators, power amplifiers, filters and oscilloscopes,
- a Genrad computer aided test system with the Modal Plus software from SDRC for modal analysis purposes,
- three IBM PC compatible computers with softwares such as Matlab, Mathematica etc.,
- two Digital Signal Processor systems for control simulation and implementation:
    - a dSPACE DS1102 Board 40 Mflops system, with 2 ADC 16 bits channels, 2 ADC 12 bits channels and 4 DAC 14 bits channels,
    - a dSPACE DS1004 Based System at 600 Mflops, with 5 ADC 16 bits channels, 5 DAC 14 bits channels, expandable

"The Mathworks sofwares Matlab, Simulink, System Identification Toolboxes, Control Toolboxes are used for system identification procedures and for controller design, simulation and implementation. Another Matlab toolbox from Scientific Software, the Structural Dynamic Toolbox, is used for simple Finite Element Computation. Both DSP Systems are programmed using Matlab, Simulink and the Real Time Workshop."

Intelligent Control Systems Laboratory

http://icsl.gatech.edu/icsl/Main_Page
Director: George Vachtsevanos
404-894-6252
gjv@ece.gatech.edu

"The Intelligent Control Systems Laboratory has a long and extensive record of collaborations with academic, industry and government agencies. Our research personnel have worked closely with Honeywell, Siemens and other industrial organizations in the development of the laboratory's infrastructure. Through donations of equipment and joint efforts, laboratory facilities were installed in the MARC building and other campus locations that serve our educational and research objectives. Funding from the Georgia Research Alliance was served and assisted in the development of the sensing, controls, and robotics components of the laboratory.
The underlying philosophy of the laboratory has been driven by a need to serve students and researchers. The laboratory's facilities have been used by other Georgia Tech units for the conduct of laboratory experiments and research. Our collaborators within Georgia Tech include the Schools of Aerospace Engineering, Mechanical Engineering, Textile and Polymer Engineering and the Georgia Tech Research Institute.

"The laboratory's research collaborators include such industrial organizations as Honeywell, Siemens, General Motors, Northrop Grumman Corp., Boeing Aerospace Co., General Dynamics, Fairchild Control Company, Bell Helicopter, among others. Of special mention is our collaboration over many years with small companies in SBIR/STTR programs. Our research team has assisted all these firms in the development of innovative new technologies. A highlight of this activity is our outstanding relationship with Impact Technologies, LLC which has grown over the years into a productive collaboration for the benefit of students, faculty and the firm's personnel."

Mark Costello

Aerospace Engineering
404-385-4303
mark.costello@aerospace.gatech.edu
http://camm.gatech.edu

Research Areas:

- Understanding the dynamic behavior of new air vehicle configurations
- Creating new physical control mechanisms for air vehicles
- Creating new, highly integrated air vehicle sensor systems
- Developing advanced flight control systems

LSTIP Area 2 Key Technologies: Continuous monitoring; Sensor fusion

Brian German

Aerospace Engineering
404-385-3299
brian.german@aerospace.gatech.edu
http://bgerman.ae.gatech.edu/german.html

Research Areas:

- Multidisciplinary design optimization (MDO)
- Multi-objective optimization algorithms and applications
- Trade space exploration
- Uncertainty representation and quantification
- Decision sciences in the context of design problems
- Simulations of the engineering design and development process

LSTIP Area 2 Key Technologies: High-fidelity modeling & simulation; Physics-based models of vehicle systems

Brian C. Gunter

Aerospace Engineering
404-385-2345
brian.gunter@aerospace.gatech.edu
http://bgunter.gatech.edu

Research Areas:

- Earth and planetary observation
- Orbital mechanics and precise orbit determination
- Positioning and navigation using GPS/INS systems
- System theory, parameter estimation, and dense linear algebra
- High-performance computing and software engineering

LSTIP Area 2 Key Technology: Sensor fusion

Sathya V. Hanagud

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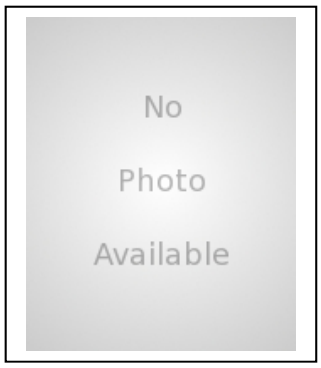
404-894-3040
hanagud@aerospace.gatech.edu
http://soliton.ae.gatech.edu/people/shanagud/



Research Area:

- Health monitoring of structures

LSTIP Area 2 Key technology: On-board IVHM

Marcus J. Holzinger

Aerospace Engineering
404-385-3342
holzinger@gatech.edu
http://ae.gatech.edu/mholzinger

Research Areas:

- Space situational awareness
- Guidance, navigation, & control
- Information theory, optimal estimation, & sensor fusion
- Formation flight, rendezvous, and proximity operations
- Optimal control and reachability

LSTIP Area 2 Key Technology: Sensor fusion

Dimitri Mavris

Aerospace Engineering
404-894-1557
dimitri.mavris@aerospace.gatech.edu
http://www.asdl.gatech.edu/

Research Areas:

- Disciplinary breadth and depth while accounting for uncertainty and risk
- Multi-disciplinary analysis, optimization and design, including requirements definition and analysis
- Reduction of analysis, design process cycle time
- Physics based analysis and design of unconventional vehicles
- System-of-systems, architecture-based systems engineering

LSTIP Area 2 Key technologies: Physics-based models of vehicle systems

Massimo Ruzzene

Aerospace Engineering
404-894-3078
massimo.ruzzene@aerospace.gatech.edu
http://www.ae.gatech.edu/people/mruzzene/

Research Areas:

- Structural dynamics and wave mechanics
- Structural health monitoring and damage detection in composite and metallic aerospace structures
- Analysis and design of novel cellular structural configurations with multi-functional capabilities
- Analysis and design of acoustic-based sensors and signal processing MEMS devices
- Adaptive passive strategies for vibration isolation and noise control

LSTIP Area 2 Key Technology: On-board IVHM system

Vitali Volovoi

Aerospace Engineering
404-894-9811
vitali.volovoi@aerospace.gatech.edu
http://www.ae.gatech.edu/people/vvolovoi/

Research Areas:

- System risk, safety and reliability of complex engineering systems
- Assessment of condition-based and other maintenance policies combined with logistics
- Structural design and optimization in the presence of uncertainties
- Air transportation safety

LSTIP Area 2 Key Technology: Life-prediction and extension tools

Haesun Park

Computational Science & Engineering
404-385-2170
hpark@cc.gatech.edu
http://www.cc.gatech.edu/~hpark/

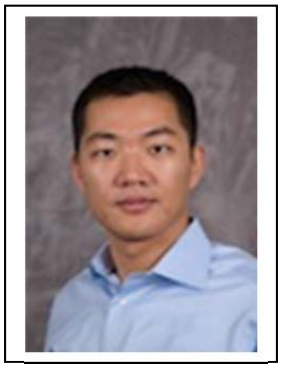
Research Areas:

- Bioinformatics
- Data mining
- Information retrieval
- Numerical algorithms
- Pattern recognition

LSTIP Area 2 Key Technology: Data and text mining

Wenke Lee

Computer Science
404-385-2879
wenke@cc.gatech.edu
http://wenke.gtisc.gatech.edu/



Research Areas:

- Applied cryptography
- Data mining
- Network management
- Systems and network security

LSTIP Area 2 Key Technology: Data and text mining

Santosh Vempala

Computer Science
404-385-0811
vempala@gatech.edu
http://www.cc.gatech.edu/~vempala

Research Areas:

- Algorithms
- Data mining
- Geometry
- Optimization

LSTIP Area 2 Key Technology: Data and Text Mining

Magnus Egerstedt

Electrical and Computer Engineering
404-894-3484
magnus.egerstedt@ece.gatech.edu
http://users.ece.gatech.edu/~magnus/

Research Areas:

- Control theory and robotic
- Control and coordination of complex networks, such as multi-robot systems, mobile sensor networks, and cyber-physical systems.

LSTIP Area 2 Key Technology: Sensor fusion

George Vachtsevanos

Electrical & Computer Engineering
404-894-6252
gjv@ece.gatech.edu
http://www.ece.gatech.edu/faculty-staff/fac_profiles/bio.php?id=107

Research Areas:

- Hierarchical/Intelligent control of large-scale industrial processes
- Fault-tolerant and mode transitioning control of unmanned aerial vehicles
- Vision and IR based inspection technologies for textile, glass and other industrial products
- Analysis of EEG signals for detection and prediction of epileptic seizures
- Sensor fusion techniques for classification and control

LSTIP Area 2 Key Technology: Sensor fusion

Linda Wills

Electrical & Computer Engineering
404-894-4565
linda.wills@ece.gatech.edu
http://www.ece.gatech.edu/~linda

Research Areas:

- Embedded computer vision and surveillance systems
- Parallelizing multimedia applications
- Automated software engineering and retargeting
- Computer systems education

LSTIP Area 2 Key Technology: High fidelity modeling and simulation

Nagi Gebraeel

Industrial & Systems Engineering
404-894-0054
nagi@isye.gatech.edu
http://www.isye.gatech.edu/people/faculty/Nagi_Gebraeel/

Research Areas:

- Sensor-based prognostics and degradation modeling,
- Reliability engineering

LSTIP Area 2 Key Technology: Life prediction and extension tools

Dave Goldsman

Industrial & Systems Engineering
404-894-2365
dave.goldsman@isye.gatech.edu
www.isye.gatech.edu/_sman

Research Areas:

- Computer simulation with emphasis on statistical output analysis
- Applied probability
- Ranking and selection
- Financial engineering
- Reliability and life testing

LSTIP Area 2 Key Technology: High fidelity modeling and simulation

Nicoleta Serban

Industrial & Systems Engineering
404-385-7255
nicoleta.serban@isye.gatech.edu
http://www.isye.gatech.edu/~nserban/

Research Areas:

- Nonparametric statistical methods
- Model-based data mining

LSTIP Area 2 Key Technology: Data and text mining

John Stasko

Interactive Computing
404-894-5617
stasko@cc.gatech.edu
http://www.cc.gatech.edu/~stasko

Research Areas:

- Data mining
- Information visualization
- Visual analytics tools

LSTIP Area 2 Key Technology: Data and text mining

Nico F. Declercq

Mechanical Engineering
404-894-1658
Nico.declercq@me.gatech.edu
http://declercq.gatech.edu

Research Areas:

- Understanding the interaction of ultrasound with complex structures
- Developing sensor control mechanisms for air vehicles

LSTIP Area 2 Key Technology: Continuous monitoring; Sensor fusion

Chris Paredis

Mechanical Engineering
404-894-5613
Chris.Paredis@me.gatech.edu
http://www.mbsec.gatech.edu/users/cparedis

Research Areas:

- Model-based systems engineering
- Decision theory and game theory
- Theoretical foundations of systems engineering
- Complex systems design
- System architecture
- Modeling and simulation

LSTIP Area 2 Key Technologies: High fidelity modeling and simulation; Physics-based models of vehicle systems

Jonathan Rogers

Mechanical Engineering
404-385-1600
jonathan.rogers@me.gatech.edu
http://me.gatech.edu/faculty/jonrogers

Research Areas:

- Nonlinear estimation and system identification
- Stochastic control and automation
- Modular ground, aerial, and marine robotic systems
- Autonomous vehicle design/optimization

LSTIP Area 2 Key Technologies: Sensor fusion, High fidelity modeling and simulation

Karim Sabra
Mechanical Engineering
404-385-6193
karim.sabra@me.gatech.edu

Research Areas:

- Acoustics and Dynamics
- Wave propagation
- Structural health monitoring
- Biomechanical systems evaluation

LSTIP Area 2 Key Technology: On-board IVHM system

HAMPTON UNIVERSITY

Data Conversion and Management Lab (DCML)

757-727-5928
dcml@hamptonu.edu
http://cit.hamptonu.edu/inside_cit/departments/dcml/index.cfm

"Hampton University's Data Conversion and Management Lab is a state-of-the-art digital production center that provides a variety of business management services."

"The DCML office was funded by the U.S. Congress through the Department of Defense in 1999 with a $1 million grant and is an operating unit of Hampton University. The initial commission in the DCML was for a $300,000 CAD conversion program (hardcopy to AutoCAD). The Lab has since been awarded another $8,000,000 in contracts and has expanded to include many other essential business services, such as:

- Data Conversion
- Data Management Research
- IT Security Training and Firewall Operations
- Virtual Parts Engineering/Reverse Engineering
- Business Development
- Technology, Network and Support Services
- Development of a Physical Facilities Database and Access System
- Research project analysis for short-term and long-term strategic planning
- Emergency Operations preparedness training and planning"

Morris Morgan, III

Chemical Engineering
757-727-5063
morris.morgan@hamptonu.edu

Research Areas:

- Nonlinear dynamics
- Robust statistical metrics that accurately and quickly detect a change in the inherent nature of a time series
- Statistical investigation of wavelet methods for analyzing data streams arising from chaotic sources
- Statistical metrics for assessing nonlinear time series features

LSTIP Area 2 Key Technologies: Data and text mining

Robert Willis, Jr.

Computer Science
757-727-5552
Robert.willis@hamptonu.edu

Research Areas:

- Information assurance
- Software engineering

LSTIP Area 2 Key Technologies: Data and text mining

Zhao (Joy) Sun

Electrical Engineering
757-637-2338
zhao.sun@hamptonu.edu

Research Areas:

- Dynamic modeling and simulation for complex systems
- Adaptive and intelligent systems
- Robotics and vision systems
- Sensor data fusion
- Fault tolerant flight control
- Energy efficient autonomous soaring
- Modeling, control and management for energy storage and conversion systems

LSTIP Area 2 Key Technologies: High fidelity modeling and simulation; Sensor fusion

NORTH CAROLINA A&T

Gerry Dozier

Computer Science
336-334-7245
gvdozier@ncat.edu
http://aci2.ncat.edu/gvdozier/

Research Areas:

- Artificial intelligence
- Neural networks
- Data mining
- Sensor fusion

LSTIP Area 2 Key Technologies: Data and text mining, Sensor fusion

Albert C. Esterline

Computer Science
336-285-3694
esterlin@ncat.edu
http://www.ilabsite.org/people/aesterline/

Research Areas:

- Multi-agent systems
- Structural health monitoring
- Knowledge based systems
- Fuzzy sets
- Learning systems
- Genetic algorithms
- Unmanned vehicles
- Acoustic emissions

LSTIP Area 2 Key Technology: On-board IVHM system

Li-Shiag Tsay

Computer Technology Systems
336-285-3146
ltsay@ncat.edu

Research Areas:

- Knowledge discovery and data mining
- Multimedia databases
- Intelligent web search
- Agent-based modeling and complex adaptive systems

LSTIP Area 2 Key Technology: Data and text mining

Dewayne Brown

Electrical & Computer Engineering
336-285-3140
dbrown@ncat.edu

Research Area:

- Data mining

LSTIP Area 2 Key Technology: Data and text mining

Gary L. Lebby

Electrical & Computer Engineering
336-334-7761
lebby@ncat.edu

Research Areas:

- Advanced machine intelligence algorithm development
- Intelligent system design
- Modeling and simulation

LSTIP Area 2 Key Technology: High fidelity modeling and simulation

NORTH CAROLINA STATE UNIVERSITY

NC State High-Performance Computing

http://www.ncsu.edu/itd/hpc/About/About.php
Director: Gary Howell
919-513-7672
Gary_howell@ncsu.edu

"NC State University High-Performance Computing (HPC) is part of the initiative to provide state of the art support for research and academic computing at NC State. HPC group provides NC State students and faculty with entry and medium level high-performance research and education computing facilities, consulting support and scientific workflow support. This service shares infrastructure and staff resources with the Virtual Computing Laboratory (VCL).

"HPC services include shared memory computing, distributed memory computing, data storage, a suite of applications, and consulting and collaboration on computational issues.

"Office of Information Technology (OIT) offers NC State faculty an HPC Partnership Program. Researchers purchase HPC hardware (compute blades and/or storage) and any specialized or discipline-specific software licenses. OIT provides space in an appropriate and secure operating environment, option to combine the purchased computing power and storage with that available by the general HPC program, and the system administration and support. In return for services provided by OIT, when computing resources are not being used by the faculty partner, the server(s) are available to the general NC State HPC cluster user community."

Vision Information and Statistical Signal Analysis and Applications Lab

http://research.ece.ncsu.edu/vissta
Director: Hamid Krim
919-513-2270
ahk@ncsu.edu

"Our group focuses on applied problems in vision and imaging, as well as smart sensing and intelligent data mining. While we address applied problems, in addition to their visionary and philosophical bend, our approaches are rather formal and are strongly rooted in Analysis, Geometry, Topology and Probability/Statistics."

Murthy N. Guddati

Civil, Construction, & Environmental Engineering
919-515-7699
murthy.guddati@ncsu.edu
http://www.ce.ncsu.edu/faculty/murthy-guddati/

Research Areas:

- Multiscale modeling and finite element methods
- Wave propagation and structural dynamics
- Subsurface imaging including nondestructive evaluation
- Solid mechanics: constitutive modeling including fatigue
- Computational science: domain decomposition methods

LSTIP Area 2 Key Technology: High fidelity modeling and simulation

Kemafor Anyanwu

Computer Science
919-513-2850
kogan@ncsu.edu
http://www.csc.ncsu.edu/people/kogan

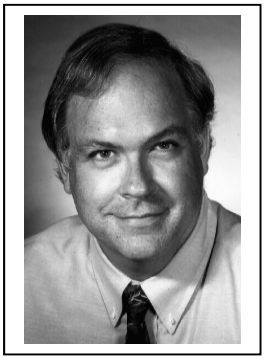
Research Areas:

- Artificial intelligence and intelligent agents
- Information and knowledge management
- Semantic web
- Databases
- Data mining
- Information retrieval and services computing

LSTIP Area 2 Key Technology: Data and text mining

Dennis Bahler

Computer Science
919-515-3369
bahler@csc.ncsu.edu
http://www4.ncsu.edu/~bahler/



Research Areas:

- Artificial Intelligence
- Machine learning
- Data mining
- Pattern recognition

LSTIP Area 2 Key Technologies: Data and text mining; Sensor fusion

Nagiza Samatova

Computer Science
919-513-7575
samatova@csc.ncsu.edu
http://www.csc.ncsu.edu/people/nfsamato

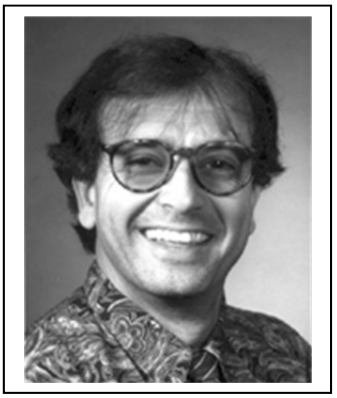
Research Areas:

- Graph theory and algorithms
- High performance data analytics
- Machine learning
- Data mining
- Data management and data integration
- Scientific and high performance computing

LSTIP Area 2 Key Technology: Data and text mining

Hamid Krim

Electrical & Computer Engineering
919-513-2270
ahk@ncsu.edu
http://www.ece.ncsu.edu/people/ahk/



Research Areas:

- Digital signal processing
- Computer vision and image analysis
- Machine learning and data mining and fusion
- Computational Intelligence
- Sensor and social networks and topological data analysis

LSTIP Area 2 Key Technologies: Data and text mining; sensor fusion

Kara Peters

Mechanical and Aerospace Engineering
919-515-5226
kjpeters@ncsu.edu
http://www.mae.ncsu.edu/faculty-staff/profile/kara-peters/

Research Areas:

- Sensor fusion
- Structural health monitoring
- Self-healing composite sandwich structures

LSTIP Area 2 Key Technologies: On-board IVHM system; Sensor fusion

Fuh-Gwo Yuan

Mechanical and Aerospace Engineering
919-515-5947
yuan@ncsu.edu
http://www.mae.ncsu.edu/faculty-staff/profile/fuhgwo-yuan/

Research Areas:

- Structural health monitoring
- Damage tolerance of composite structures
- Smart materials and structures
- Fracture & life prediction of advanced materials and structures
- Multifunctional composite structures

LSTIP Area 2 Key Technologies: Continuous monitoring; On-board IVHM system; Sensor fusion

Lexin Li

Statistics
919-515-1929
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http://www4.stat.ncsu.edu/~li/

Research Areas:

- Dimension reduction
- Bioinformatics
- Machine learning

LSTIP Area 2 Key Technology: Data and text mining

OLD DOMINION UNIVERSITY

Virginia Modeling, Analysis and Simulation Center

http://www.vmasc.odu.edu/
Director: John Sokolowski
757-686-6215
jsokolow@odu.edu

"The Virginia Modeling, Analysis and Simulation Center (VMASC) is a university-wide multidisciplinary research center that emphasizes modeling, simulation, and visualization (MS&V) research, development and education.

"VMASC concentrates on eight core modeling and simulation applied research areas:
• Transportation
• Homeland Security and Military Defense
• Virtual Environments
• Social Sciences
• Medicine & Health Care
• Game-based Learning
• M&S Interoperability
• System Sciences"

Shuiwang Ji

Computer Science
757-683-7717
sji@cs.odu.edu
http://www.cs.odu.edu/~sji/

Research Areas:
- Machine learning
- Data mining
- Computational biology
- Computational neuroscience

LSTIP Area 2 Key Technology: Data and text mining

Yuzhong Shen

Electrical & Computer Engineering
757-683-6366
yshen@odu.edu
http://www.ece.odu.edu/~yshen/index.html

Research Areas:

- Signal and image processing
- Visualization and computer graphics
- Modeling and simulation

LSTIP Area 2 Key Technology: High fidelity modeling and simulation

Charles B. Keating

Engineering Management & Systems Engineering
757-683-5753
ckeating@odu.edu
http://ww2.odu.edu/~ckeating/

Research Areas:

- Complex systems
- System of systems engineering
- Quality systems design

LSTIP Area 2 Key Technology: Life prediction and extension tools

Ghaith Rabadi

Engineering Management & Systems Engineering
757-683-4918
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http://ww2.odu.edu/~grabadi/

Research Areas:

- Operations Research
- Simulation Modeling and Analysis
- Scheduling
- Optimizations Techniques

LSTIP Area 2 Key Technology: High fidelity modeling and simulation

Andreas Tolk

Engineering Management & Systems Engineering
757-683-4500
atolk@odu.edu
http://ww2.eng.odu.edu/enma/directory/atolk.shtml

Research Areas:

- Model-based systems engineering
- Modeling and simulation
- Interoperability challenges

LSTIP Area 2 Key Technology: High fidelity modeling and simulation

Ahmed K. Noor

Modeling, Simulation & Visualization Engineering
(757) 766-5233
aknoor@odu.edu
http://eng.odu.edu/msve/directory/fs/noor.shtml

Research Areas:

- Advanced Visualization
- Finite element Analysis
- Information/ cyber/ meta literacy
- Interactive Immersive Visual Simulations and Virtual Worlds
- Collaborative Distributed Knowledge Discovery and Exploitation
- Intelligent Adaptive Cyber-Physical EcoSystems

LSTIP Area 2 Key Technology: High fidelity modeling and simulation

John Sokolowski

Modeling, Simulation & Visualization Engineering
757-686-6232
jsokolow@odu.edu
http://www.vmasc.odu.edu/sokolowski.html

Research Areas:

- Human behavior modeling
- Decision system modeling
- Multiagent system simulation
- Modeling and simulation representation of social systems

LSTIP Area 2 Key Technology: High fidelity modeling and simulation

Masha Sosonkina, Ph.D.
Modeling, Simulation & Visualization Engineering
757-683-6367
msosonki@odu.edu
http://eng.odu.edu/msve/directory/fs/sosonkina.shtml

Research Areas:

- High-performance computing
- Large-scale simulations
- Parallel numerical algorithms
- Performance analysis
- Adaptive algorithms

LSTIP Area 2 Key Technology: High fidelity modeling and simulation

UNIVERSITY OF MARYLAND

Center for Scientific Computation and Mathematical Modeling (CSCAMM)

http://www.cscamm.umd.edu/
Director: Eitan Tadmor
301-405-0652
info@cscamm.umd.edu

"The primary goal of the Center for Scientific Computation and Mathematical Modeling (CSCAMM) is to foster research and educational activities that highlight novel computational algorithms and mathematical modeling and their interplay with physical science, biological science, and engineering"

University of Maryland Institute for Advanced Computer Studies

http://www.umiacs.umd.edu/
Director: Amitabh Varshney
301-405-6722
varshney@cs.umd.edu

"Our mission is to foster and enhance basic and interdisciplinary research programs in computing across the University of Maryland at College Park. The success of UMIACS in catalyzing and excelling in interdisciplinary applications of computing is often attributed to: (1) identification and focus on grand challenge applications of computing with significant societal impact, (2) identifying and incentivizing outstanding faculty to excel in their research through rotating appointments, and (3) mediating interaction amongst interdisciplinary researchers through an outstanding computational infrastructure. We have developed the skill set and culture necessary for building strong interdisciplinary research programs, providing advanced computing research infrastructure, and first-rate technical support, which have greatly facilitated our national and international leadership role in multi-disciplinary computing. Our research programs are led by an outstanding group of distinguished scholars across the UMD College Park campus. Since computing is at the core of all the Institute's activities, UMIACS has a uniquely close relationship with the highly regarded Department of Computer Science."

Roberto Celi

Aerospace Engineering
301-405-1132
celi@eng.umd.edu
http://celi.umd.edu/

Research Areas:

- Flight dynamic simulation modeling
- Inverse simulation and trajectory optimization
- Fundamental studies of flight in Degraded Visual Environment (DVE)

LSTIP Area 2 Key Technology: High fidelity modeling and simulation

Darryll J. Pines

Aerospace Engineering
301-405-0263
djterp@umd.edu
http://www.eng.umd.edu/aboutus/pines-bio

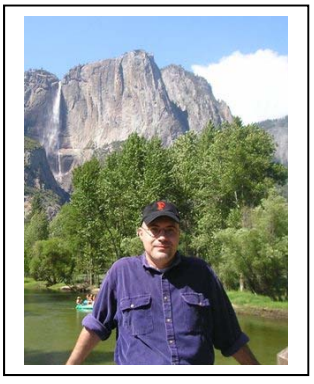
Research Areas:

- Structural health monitoring
- Smart structures
- Micro air vehicle design and development
- Guidance, navigation, and control of aerospace vehicles

LSTIP Area 2 Key Technology: On-board IVHM system

Radu Balan

Mathematics
301-405-5492|
rbalan@math.umd.edu
http://www2.math.umd.edu/~rvbalan/



Research Areas:

- Signal processing
- Applied harmonic analysis
- Machine learning
- Intelligent systems
- Sensor fusion

LSTIP Area 2 Key Technology: Sensor fusion

Michel Cukier

Mechanical Engineering
301-314-2804
mcukier@umd.edu
http://terpconnect.umd.edu/~mcukier/

Research Areas:

- Fault tolerance
- Intrusion tolerance
- Dependability and security evaluation

LSTIP Area 2 Key Technology: Life prediction and extension tools

Abhijit Dasgupta

Mechanical Engineering
301-405-5251
dasgupta@umd.edu
http://www.calce.umd.edu/general/faculty/bios/dasgupta.html

Research Areas:

- Nano and micromechanics
- Damage mechanics and computational mechanics
- Self-health monitoring in 'smart' systems
- Real-time health monitoring

LSTIP Area 2 Key Technology: On-board IVHM system

Ashwani K. Gupta

Mechanical Engineering
301-405-5276
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Research Areas:

- Flowfield modeling
- Nonintrusive diagnostics

LSTIP Area 2 Key Technology: Continuous monitoring

Jin-Oh Hahn

Mechanical Engineering

301-405-7864
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http://terpconnect.umd.edu/~jhahn12/

Research Areas:

- System dynamics and control
- System identification
- Condition monitoring and fault diagnostics
- Multi-sensor fusion and signal processing

LSTIP Area 2 Key Technologies: On-board IVHM system; Sensor fusion

Mohammed Modarres

Mechanical Engineering
301-405-5226
modarres@umd.edu
http://www.modarres.umd.edu/

Research Areas:

- Probabilistic risk assessment
- Uncertainty analysis
- Physics of failure probabilistic modeling of failure mechanisms of mechanical components, systems and structures
- Reliability analysis of complex engineering systems

LSTIP Area 2 Key Technology: Physics-based models of vehicle systems, including materials and structures

UNIVERSITY OF VIRGINIA

MaSTRI

Modeling and Simulation Technology Research Initiative
http://www.cs.virginia.edu/~MaSTRI/

MaSTRI's focus is the solution of critical challenges that have inhibited or prevented the use of modeling and simulation technology in otherwise practical settings. Critical challenges include simulation reuse, multi-resolution modeling, composability, interoperability, visualization, behavioral modeling and integration of modeling and simulation (M&S) into training and education.
Our research is focused on the areas of simulation coercion and simulation coercibility, which we collectively refer to as COERCE. We observe that COERCE has direct application to the challenges of simulation reuse and composability:

- COERCE can minimize problems caused by differences between models of the same phenomenon at different levels of resolution. For example, before replacing a high-resolution model with a more computationally efficient low-resolution model, the low-resolution model can be coerced to reflect the behavior of the high-resolution more closely.
- In the area of simulation composability, COERCE has the potential to increase flexibility of the components comprising a simulation. Using the metaphor of a jigsaw puzzle, COERCE enables the composition of mismatched pieces through flexibility of the pieces, and thus their interfaces. Simulations, carefully designed and annotated by their creators, lend themselves to interactive semi-automated manipulation by experts, for the purpose of making them conform to requirements different from those which they were originally intended to meet.

So far, we have experienced considerable success in coercing individual simulations that were not designed to be coerced, and we are exploring how simulation coercion can become more automated and be facilitated by developing simulations with the specific objective of coercibility.

Kamin Whitehouse

Computer Science
434-982-2211
whitehouse@cs.virginia.edu
http://www.cs.virginia.edu/~whitehouse/

Research Areas:

- Wireless networking
- Wireless sensor networks
- Distributed systems
- Parallel systems

LSTIP Area 2 Key Technology: Sensor fusion

Haibo Dong

Mechanical & Aerospace Engineering
434-243-4098
hd6q@virginia.edu
http://www.mae.virginia.edu/fsrg/

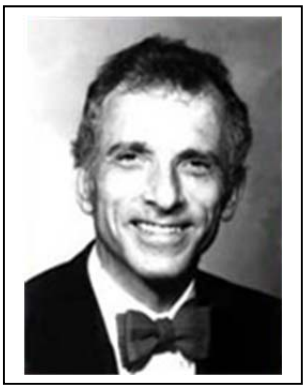
Research Areas:

- Computational fluid dynamics
- Cartesian grids methodology
- Low speed aerodynamics
- Reduced order modeling
- Direct injection and simulation of small engines
- Modeling and design of tDCS electrodes

LSTIP Area 2 Key Technologies: High fidelity modeling and simulation; Physics-based models of vehicle systems

Roman Krzysztofowicz

Systems Engineering, Statistics
434-982-2067
rk@virginia.edu
http://www.faculty.virginia.edu/rk/



Research Areas:

- Bayesian decision theory
- Sensor fusion
- Economic value of information
- Probabilistic modeling
- Decision, risk, and reliability analyses
- Multiobjective decision making
- Decision support systems

LSTIP Area 2 Key Technology: Sensor fusion

Donald E. Brown

Systems & Information Engineering
434-982-2074
brown@virginia.edu
http://web.sys.virginia.edu/donald-e-brown.html

Research Areas:

- Data mining
- Data fusion
- Predictive modeling
- Response surface methods
- Agent based simulation

LSTIP Area 2 Key Technology: Data and text mining

VIRGINIA TECH

Computational Multiphysics Systems Laboratory

http://www.cmsvt.org/

Director: Tomonari Furukawa
434-766-6632
tomonari@vt.edu

"Computational Multiphysics Systems Laboratory recently joined CVeSS. As one of the world's two computational multiphysics systems laboratory, CMS led by Professor Tomonari Furukawa investigate the analysis and synthesis of computational multiphysics systems which range from deformable bodies studied in computational and experimental mechanics to rigid bodies studied in robotics.

- Online damage prediction of composites
- Structural Health Monitoring (SHM) and Non-Destructive Evaluation (NDE)
- Bayesian Robotics
- Autonomous Vehicles"

Center for Intelligent Material Systems and Structures

http://www.cimss.vt.edu/

Director: Dan Inman
540-231-2908
cimss@vt.edu

"The Center for Intelligent Material Systems and Structures (CIMSS) focuses on the use and development of smart materials and structures, starting from material science and working through the chain of research and development, including device design and modeling. Applications span all fields of engineering, including vibration reduction, structural health monitoring, energy harvesting, sensing and sensors, etc. Application disciplines include mechanical engineering, materials engineering, civil engineering, chemical engineering, computer engineering, engineering mechanics, bio-inspired engineering, electrical engineering and applied mathematics. We work with electroactive polymers, MR fluids, piezoelectric materials, dielectric elastomers, and shape memory materials. Investigators at CIMSS perform basic research while at the same time trying to serve the needs of practicing engineers."

Laboratory for Advanced Scientific Computing and Applications

http://research.cs.vt.edu/~lasca/

Director: Layne T. Watson
540-231-7540
ltw@cs.vt.edu

"The goal of the Laboratory for Advanced Scientific Computing and Applications (LASCA) is to provide expertise and leadership in high-end scientific computing research and education at Virginia Tech. Located in the Advanced Computing and Information Technology Center (ACITC), Torgersen Hall, the laboratory is a visible and strategic center of activity in applied high-performance computing on campus. LASCA participants do basic research in high-performance parallel computation and assist scientists and engineers in applying high-end computing resources to their problems. By bringing together experts in scientific computing and its applications, LASCA helps build the kind of multidisciplinary teams needed to address today's most challenging computational science problems.

"LASCA affiliates include faculty and students from two broad groups: those whose primary research interests include high-performance scientific computing, and those whose primary research activities are in another scientific or engineering discipline but who are actively applying high-end computing resources to their problems. Current participants are drawn from seventeen academic departments and ten research centers."

Rakesh Kapania

Aerospace and Ocean Engineering
(540) 231-4881
rkapania@vt.edu
www.aoe.vt.edu/people/faculty/rkapania.html

Research Areas:

- Shape sensitivity analysis of aero-elastic response
- Non-linear structural response
- Neural networks and structural health monitoring

LSTIP Area 2 Key Technology: On-board IVHM system

Mayuresh J. Patil

Aerospace and Ocean Engineering
(540) 231-8722
mpatil@vt.edu
www.dept.aoe.vt.edu/~mpatil/

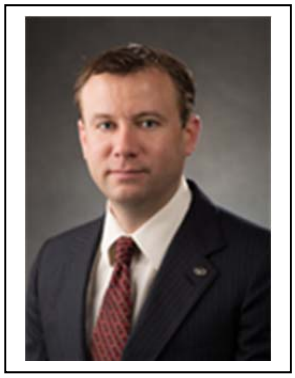
Research Areas:

- Damage modeling: analytical, computational, stochastic damage propagation
- Coupled analysis for life estimation: structures, fracture mechanics, aerodynamics, dynamics

LSTIP Area 2 Key Technology: Life prediction and extension strategies

Michael Keith Philen

Aerospace and Ocean Engineering
540-231-2548
mphilen@vt.edu
www.aoe.vt.edu/people/faculty/philen.html



Research Areas:

- Adaptive structures
- Advanced actuator and sensor technology
- Smart materials for control and sensing of structures

LSTIP Area 2 Key Technology: Continuous monitoring

Pradeep Raj

Aerospace and Ocean Engineering
540-231-4843
praj@vt.edu
www.aoe.vt.edu/people/faculty/raj.html

Research Areas:

- Simulation based design
- High-fidelity physics-based computational methods

LSTIP Area 2 Key Technology: Physics-based models of vehicle systems, including materials and structures

Chang-Tien Lu

Computer Science
703-538-8373
ctlu@vt.edu
http://people.cs.vt.edu/~ctlu

Research Areas:

- Spatial databases
- Data mining
- Data warehousing
- Geographic information systems
- Intelligent transportation systems

LSTIP Area 2 Key Technology: Data and text mining

Naren Ramakrishnan

Computer Science
540-231-8451
naren@vt.edu
http://people.cs.vt.edu/~ramakris/

Research Areas:

- Computational biology and bioinformatics
- Data, information, knowledge, and libraries
- Discovery analytics center
- Knowledge, data and information
- Problem solving environments
- Data mining

LSTIP Area 2 Key Technology: Data and text mining

Scott Case

Engineering Science and Mechanics
(540) 231-3140
scase@vt.edu
www.esm.vt.edu/people/active/scase/scase-bio.html

Research Areas:

- Life prediction techniques for composite materials
- Micromechanical modeling of composite behavior
- Modeling of "smart" material systems.

LSTIP Area 2 Key Technology: Life prediction and extension strategies

Tomonari Furukawa

Mechanical Engineering
434-766-6639
tomonari@vt.edu
www.me.vt.edu/_bios/_primary/furukawa_bio.html

Research Areas:

- Material characterization
- Structural health monitoring and non-destructive evaluation
- Bayesian robotics
- Micro aerial vehicles

LSTIP Area 2 Key Technology: On-board IVHM system

Daniel J. Inman

Mechanical Engineering
540-231-4709
dinman@vt.edu
www.cimss.vt.edu/people/inman.html

Research Areas:

- Morphing aircraft
- Macro-fiber composite actuators
- Energy harvesting
- Structural monitoring

LSTIP Area 2 Key Technology: On-board IVHM system

Pablo A. Tarazaga

Mechanical Engineering
540-231-2906
ptarazag@vt.edu
http://p.tarazaga.net/vitae.html

Research Areas:

- Structural Health Monitoring (SHM and NDE)
- Modal Analysis and Model Validation
- Experimental Modal Testing

LSTIP Area 2 Key Technology: On-board IVHM system

WILLIAM & MARY

Mark Hinders
Applied Science
757-221-1519
hinders@wm.edu
http://www.wm.edu/as/appliedscience/faculty/_olddirectory/hinders_m.php

Research Areas:

- Non- destructive evaluation
- Intelligent Robotics

LSTIP Area 2 Key Technology: On-board IVHM system

LSTIP Area 3: Architecture and Systems for Long Duration Human Exploration

"Beyond LEO human stays for longer than 180 days pose significant health risks from space radiation exposure, microgravity, orbital debris and other environments. This topic requires several technical disciplines to provide systems solutions to provide affordable safety to crew. This topic emphasizes affordable concepts and supporting technology for safe beyond LEO human exploration. Issues/considerations of interest include the simultaneous effects of extreme environments on the space infrastructure and human biology. For example, reduced gravity, radiation, long duration aging, biologic pathogens and corrosives, and micro-meteoroids can individually compromise a long duration mission and the combined effects of these environments is virtually unknown. R&D in radiation physics, systems concepts, and advanced structures and materials, low power active shielding technologies, alternative habitat concepts, and related systems to extend human presence are needed. The largest technological hurdle is how to protect crew from long duration radiation exposure.

"The space radiation problem is a multi-faceted, inter-disciplinary problem of utmost importance to the future human and robotic exploration of space beyond low Earth orbit. There are three major countermeasures which are currently employed to solve the space radiation problem. Firstly, shielding countermeasures reduce the tertiary internal spacecraft environment to a level that is safe for humans, such as a dose equivalent of 150 mSv/year for astronauts. However, standard passive shielding countermeasures add considerable weight to a vehicle and are therefore a major expense. Active (electromagnetic) shield countermeasures are not yet feasible due to power limitations. Secondly, there are operational (ops) countermeasures, such as no spacewalks during traversal of the South Atlantic Anomaly. The use of nuclear propulsion to speed up trips to Mars, thereby reducing exposure, is another example of an operational countermeasure. Operational countermeasures can be very effective, but are of very limited capability for human missions beyond low earth orbit (LEO). Thirdly, there are response countermeasures in which one may alter the response of a particular organ using drugs. Human response countermeasures are in their infancy and are not currently employed. There are many aspects to the radiation problem and a breakthrough in one, or more probably system architecture of countermeasures, may enable safe travel beyond LEO."

Key Technologies:

- Affordable concepts & technology
- Space environment
- Radiation physics
- Systems concepts
- Radiation protection materials
- Low power active radiation shielding
- Alternative habitat concepts
- Passive shielding countermeasures
- Operational countermeasures
- Nuclear propulsion

GEORGIA TECH

Center for Space Systems

http://www.css.gatech.edu/projects.html
Director: David Spencer
david.spencer@ae.gatech.edu

"The Center for Space Systems was founded in 2008 at the Georgia Institute of Technology with the goal of creating a world-class research and educational organization dedicated to the design, development, and operation of advanced space systems. Through involving students in the full lifecycle of space flight projects, the Center addresses an immediate need within the aerospace community for the development of the next generation of space system engineers."

Radiation Science and Engineering Laboratory

http://www.rsel.gatech.edu/
Director: Glenn Sjoden
sjoden@gatech.edu
404-894-573

"The Radiation Science and Engineering Laboratory at Georgia Tech was established to provide a wide variety of nuclear and accelerator-driven research and irradiation services tailored to the needs of faculty, staff, and external customers. The RSEL is an integral part of the Nuclear and Radiological and Medical Physics (NRE/MP) Programs at Georgia Tech."

Robert Braun

Aerospace Engineering
404-385-6171
robert.braun@aerospace.gatech.edu
http://www.ae.gatech.edu/~rbraun

Research areas:

- Advanced flight systems and technologies for planetary exploration
- Entry, descent and landing systems analyses and technology
- Robotic concepts capable of powered flight in planetary atmospheres
- Integrated design and aeroelastic analyses of inflatable aerodynamic decelerators
- Engineering mitigation strategies for planetary defense

LSTIP Area 3 Key Technologies: Affordable concepts & technology; Nuclear propulsion

David Spencer

Aerospace Engineering
404-385-7641
david.spencer@aerospace.gatech.edu
http://ssdl.gatech.edu/spencer.shtml

Research Areas:

- On-orbit relative proximity operations
- Collaborative operations of robotic systems
- Planetary mission concept development
- Small satellite technology advancement and applications

LSTIP Area 3 Key Technologies: Systems concepts

Thom Orlando

Chemistry & Biochemistry
404-894-4012
thomas.orlando@chemistry.gatech.edu
http://www.chemistry.gatech.edu/people/Orlando/Thomas

Research Areas:

- Radiation processing of icy surfaces in the outer solar system
- Minerals on asteroids, moons and inner planets
- Modeling
- Space craft observation and instrumentation

LSTIP Area 3 Key Technology: Space environment

Carol Paty

Earth & Atmospheric Science
404-894-2860
carol.paty@eas.gatech.edu
http://shadow.eas.gatech.edu/~cpaty/

Research Areas:

- Charged particles in electric and magnetic fields
- Planetary magnetospheres
- Icy moon-magnetosphere interactions
- Ion-neutral interaction
- Aurora, plasma dynamic simulations
- Atmospheric electrodynamics

LSTIP Area 3 Key Technology: Space environment

Nolan E. Hertel

Nuclear & Radiological Engineering
404-894-3601
nolan.hertel@me.gatech.edu
http://www.me.gatech.edu/faculty/hertel

Research Areas:

- Neutron dosimetry
- Radiation measurement,
- Transport and shielding.
- External-beam fast neutron therapy
- Neutron capture therapy for treating radio-resistant cancers

LSTIP Area 3 Key Technologies: Radiation physics; Radiation protection materials

Bojan Petrovic

Nuclear & Radiological Engineering
404-894-8173
bojan.petrovic@gatech.edu
http://www.nremp.gatech.edu/faculty/petrovic

Research Areas:

- Radiation physics
- Advanced nuclear systems design
- Design of inherently safe reactors
- Nuclear fuel cycle and waste management
- Radiation transport simulations, shielding and dose assessment

LSTIP Area 3 Key Technologies: Affordable concepts & technology; Passive shielding countermeasures; Nuclear propulsion;

Chris Paredis

Mechanical Engineering
404-894-5613
Chris.Paredis@me.gatech.edu
http://www.mbsec.gatech.edu/users/cparedis

Research Areas:

- Model-based systems engineering
- Decision theory and game theory
- Theoretical foundations of systems engineering
- Complex systems design
- System architecture
- Modeling and simulation

LSTIP Area 3 Key Technology: Systems concepts

C-K Chris Wang

Nuclear & Radiological Engineering
404-894-3727
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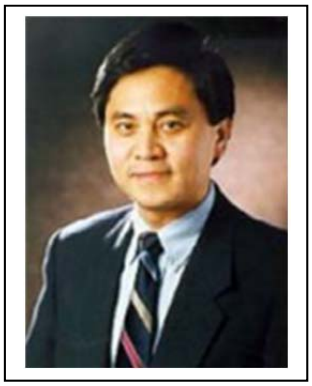


Research Areas:

- Radiation interaction
- Radiation detection
- Dosimetry
- Microdosimetry
- Biophysical modeling of radiation effects
- Neutron capture therapy
- Fast neutron therapy
- Intravascular treatment using beta particles

LSTIP Area 3 Key Technology: Radiation physics

HAMPTON UNIVERSITY

Bill Paterson
Atmospheric & Planetary Sciences
757-728-6401
bill.paterson@hamptonu.edu
http://reu.hamptonu.edu/

Research Areas:

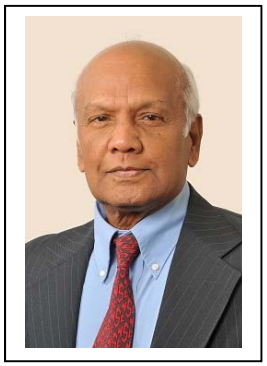
- Astronomy and space science
- Space environment and Sun/Earth connections
- Studies of the northern lights, and the processes in space that drive them
- Space environments of Jupiter and its moons.

LSTIP Area 3 Key Technology: Space environment

NORTH CAROLINA STATE UNIVERSITY

Korukonda L. Murty

Materials Science & Engineering
919-515-3657
murty@ncsu.edu
http://www4.ncsu.edu/~murty/



Research Areas:

- Effects of radiation exposure on the structure-property relationship in materials

LSTIP Area 3 Key Technologies: Radiation protection materials; Passive shielding countermeasures

Andre P. Mazzoleni

Mechanical & Aerospace Engineering
919-515-5667
a_mazzoleni@ncsu.edu
http://www.mae.ncsu.edu/faculty-staff/profile/andre-mazzoleni/

Research Areas:

- Space exploration
- Astronautics
- Spacecraft design
- Power generation
- Energy storage

LSTIP Area 3 Key Technology: Affordable concepts & technology

Afsaneh Rabiei

Mechanical & Aerospace Engineering
919-513-2674
arabiei@ncsu.edu
http://www.mae.ncsu.edu/homepages/rabiei/index.html

Research Areas:

- Processing and characterization of advanced materials
- Metal foams
- Coatings and composites
- Failure analysis
- Microstructural evaluation

LSTIP Area 3 Key Technology: Radiation protection materials

Mohamed Bourham

Nuclear Engineering
919-515-7662
bourham@ncsu.edu
http://www.ne.ncsu.edu/people/faculty/bourham.html

Research Areas:

- Plasma-matter interaction
- Plasma diagnostics
- Plasma-driven launch technology
- Fusion engineering and technology
- Plasma dynamics
- Plasma propulsion and space thrusters
- X-ray sources for medical and screening imaging

LSTIP Area 3 Key Technology: Radiation protection materials

Roger L. Barker

Textile Engineering, Chemistry, & Science
919-515-6577
roger_barker@ncsu.edu
http://www.tx.ncsu.edu/about/find-people/people-detail.cfm?id=5

Research Areas:

- Physical properties of fabrics and clothing systems
- Heat resistant fabrics
- Protective clothing
- Thermal protective performance of textile fabrics and clothing
- Assessment of human sensory and physiological response to clothing comfort

LSTIP Area 3 Key Technology: Radiation protection materials

Warren J. Jasper

Textile Engineering, Chemistry, & Science
919-515-6565
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http://www.tx.ncsu.edu/about/find-people/people-detail.cfm?id=57

Research Areas:

- Radiation protective performance of textile fabrics
- Plasma/corona dynamics in flexible structures
- Physical properties of fabrics and films
- Filtration of liquids and solids, aerosols

LSTIP Area 3 Key Technology: Radiation protection materials

Abdel-Fattah Mohamed Seyam

Textile &Apparel Technology & Management
919-515-6583
a_seyam@ncsu.edu
http://www.tx.ncsu.edu/about/find-people/people-detail.cfm?id=106

Research Areas:

- Nanosciences, surface modification, fibers and polymers
- Technical textiles and textile structures
- Health and safety
- Technical textiles and textile structures

LSTIP Area 3 Key Technology: Radiation protection materials

OLD DOMINION UNIVERSITY

Resit Unal

Engineering Management & Systems Engineering
757-683-4554
runal@odu.edu
http://www.lions.odu.edu/~runal/

Research Areas:

- Multidisciplinary design optimization
- Robust design
- Quality engineering
- Response surface methods
- Space transportation systems

LSTIP Area 3 Key Technology: Affordable concepts & technology

Svetozar Popovic

Physics
757-683-4618
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http://ww2.odu.edu/~spopovic/

Research Areas:

- Nanoscale surface engineering technology
- Plasma aerodynamic validation test development
- Virtual structures
- Low-noise surface physics and engineering
- Space radiation detectors and radiation shielding
- Radiation protection structures and materials
- Magnetohydrodynamic propulsion
- Plasma-assisted fuel reformation
- Energy harvesting

LSTIP Area 3 Key Technology: Radiation protection materials

Leposava Vuskovic
Physics
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http://ww2.odu.edu/~lvuskovi/

Research Areas:

- Nanoscale surface engineering technology
- Plasma aerodynamic validation test development
- Virtual structures
- Low-noise surface physics and engineering
- Space radiation detectors and radiation shielding
- Radiation protection structures and materials
- Magnetohydrodynamic propulsion
- Plasma-assisted fuel reformation
- Energy Harvesting

LSTIP Area 3 Key Technology: Radiation Protection materials

UNIVERSITY OF MARYLAND

Institute for Systems Research

http://www.isr.umd.edu/home
Director: Reza Ghodssi
301-405-6615
pwhite@isr.umd.edu

"The Institute for Systems Research is a permanent, interdisciplinary research unit within the A. James Clark School of Engineering at the University of Maryland. Since its beginnings as one of the National Science Foundation's original Engineering Research Centers in 1985, ISR has been at the international forefront of interdisciplinary research and education in the system sciences and systems engineering. ISR attained permanent institute status at the university in 1992 and graduated from the NSF program in 1996. ISR's founding director was Dr. John Baras.

"ISR is home to about 100 faculty and other researchers from 14 departments and four colleges across the University of Maryland. We believe teams of researchers with diverse backgrounds are needed to address society's most important and challenging problems. Today's frontiers of engineering and biological system development have expanded because engineers have the tools to support analysis and design. ISR was one of the pioneers creating these tools, which address the need to analyze and simulate new types of automated, distributed, adaptable, resilient, extensible and economically competitive systems.

"Our basic research has resulted in many new algorithms and sophisticated models for decision making and control (the sense-decide-actuate lifecycle), communications, and computing needed to model and design engineering systems that are highly automated, autonomous and distributed. New approaches to the planning and multi-objective optimization-based design of engineering systems also have been developed."

Space Systems Laboratory

http://ssl.umd.edu/
Director: David Aiken
301-405-1138
dakin@ssl.umd.edu

"The Space Systems Laboratory (SSL) is part of the Aerospace Engineering Department and A. James Clark School of Engineering at the University of Maryland in College Park, Maryland. A leader in the area of astronautics, the Space Systems Laboratory is centered around the Neutral Buoyancy Research Facility, a 50-foot diameter, 25-foot deep water tank that is used to simulate the microgravity environment of space. The only such facility housed at a university, Maryland's neutral buoyancy tank is used for undergraduate and graduate research at the Space Systems Lab. Research in Space Systems emphasizes space robotics, human factors, applications of artificial intelligence and the underlying fundamentals of space simulation. There are currently five robots being tested, including Ranger, a four-

armed satellite repair robot, and SCAMP, a 6 degree of freedom free-flying underwater camera platform. Launched by NASA in 1996, Ranger and its predecessor robot were both constructed in the Space Systems Lab."

UMD Space Physics Group

http://space.umd.edu/index.html
Director: Douglas Hamilton
301-405-6207
dch@umd.edu

"The plasma and energetic particle observations carried out by the Space Physics Group require novel instrumentation carried on Earth-orbiting satellites and deep-space probes. Instruments are designed and constructed on campus by the group's technical staff, with participation by graduate as well as undergraduate students. The basic instrumentation technique is time-of-flight mass spectrometry, customized for rugged, lightweight systems as required by space missions. The group actively collaborates with other research teams in the United States and Europe.

"Experiments built by the group are currently operating on many spacecraft, including the Voyager deep-space probes, WIND, the Solar and Heliospheric Observatory (SOHO) and the Advanced Composition Explorer (ACE) satellites orbiting L1, and the Cassini probe to Saturn.

"Near-Earth missions included the Interplanetary Monitoring Platform (IMP), Geotail, the Solar Anomalous and Magnetospheric Particle Explorer (SAMPEX), the Imager for Magnetopause to Aurora Global Exploration (IMAGE), and the 2-spacecraft Solar-Terrestrial Relations Observatory (STEREO) mission.

"The work for which the group is internationally recognized includes studies of the composition and ionization states of the solar wind, solar energetic particles, and interstellar neutral atoms which have been "picked up" in the solar wind. This work, carried on at Maryland since the late 1960s, has given key insights into solar energetic particle acceleration and conditions in the solar atmosphere. Other work has provided fundamental information about the energization of particles by traveling interplanetary shocks, and such diverse topics as the origin of oxygen and sulfur ions in Jupiter's magnetosphere from the volcanoes on the moon Io, and the composition and energy content of the Earth's radiation belts."

David L. Akin

Aerospace Engineering
301-405-1138
dakin@ssl.umd.edu
http://spacecraft.ssl.umd.edu/

Research Areas:

- Space systems and operations
- Space human factors
- Space simulation
- Space applications of artificial intelligence

LSTIP Area 3 Key Technology: Affordable concepts & technology

Mary Bowden

Aerospace Engineering
301-405-0011
bowden@umd.edu
http://www.aero.umd.edu/faculty/bowden

Research Areas:

- Space systems and operations
- Structural dynamics

LSTIP Area 3 Key Technologies: Affordable concepts & technology

Ray Sedwick

Aerospace Engineering
301-405-0111
sedwick@umd.edu
http://www.umerc.umd.edu/faculty/sedwick

Research Areas:

- Space power generation and propulsion systems
- Inertial electrostatic confinement fusion for application to space power generation
- Applications of plasmas

LSTIP Area 3 Key Technology: Nuclear propulsion

Douglas Hamilton

Physics
301-405-6207
dch@umd.edu
http://umdphysics.umd.edu/research/experimental/80-spacephysics.html

Research Area:

- Space Physics

LSTIP Area 3 Key Technology: Space environment

UNIVERSITY OF VIRGINIA

Laboratory for Atomic and Surface Physics

http://www.virginia.edu/ep/LASP/index.php
Director: Raul Baragiola
434-924-1059
rb9a@virginia.edu

"We study the interaction of energetic particles (ions, electrons) and photons with surfaces. Our goals are to understand the mechanisms leading to electronic excitations and how these excitations evolve and lead to the emission of light (luminescence), electrons, radiation, atoms and molecules (sputtering and photodesorption), and to radiation damage, chemical changes or heat. We currently study metals, rare gas solids, condensed molecular gases, ultrathin carbon foils, diamond, minerals, oxides and rocks. The studies are driven by interest in fundamental phenomena and by applications to astrophysics, space exploration, semiconductor processing, nuclear fusion, gas discharges and biology. We recently started studying ozone generation by triboelectricity generated by rock fracture, with potential widespread applications in Earth and Environmental Sciences."

Kevin Skadron

Computer Science
434-982-2042
ks7h@virginia.edu
http://www.cs.virginia.edu/~skadron/

Research Areas:

- Multi-core architectures
- Graphics processors (GPUs)
- Massive parallelism
- Thermal modeling
- Fault tolerant architectures

LSTIP Area 3 Key Technology: Systems concepts

Sudhanva Gurumurth

Computer Science
434-982-2211
sg7ff@virginia.edu
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Research Areas:

- Computer architecture
- Storage systems
- Energy-efficient computing
- Graphics processors (GPUs)
- Fault tolerant architectures

LSTIP Area 3 Key Technology: Systems concepts

John Knight

Computer Science
434-982-2216
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http://www.cs.virginia.edu/~jck

Research Areas:

- Software reliability
- Software engineering

LSTIP Area 3 Key Technology: Systems concepts

Alf Weaver

Computer Science
434-982-2201
acw@virginia.edu
http://www.cs.virginia.edu/people/faculty/weaver.html

Research Areas:

- Computer networks and protocols
- Telemedicine
- Electronic commerce
- Medical data privacy and security
- Crowdsourcing

LSTIP Area 3 Key Technology: Systems concepts

Raul Baragiola

Engineering Physics and Materials Science & Engineering
434-982-2907
rb9a@virginia.edu
http://www.virginia.edu/ms/people/faculty/baragiola.html

Research Areas:

- Astrophysics / astrochemistry
- Atomic physics
- Solid state physics
- Space sciences
- Instrumentation for space research

LSTIP Area 3 Key Technology: Space environment

Robert Johnson

Materials Science & Engineering
434-924-3244
rej@virginia.edu
http://people.virginia.edu/~rej/

Research Areas:

- Sputtering, radiolysis, photolysis and atmospheric evolution
- Modeling of radiation-induced physics and chemistry occurring in differing astrophysical environments

LSTIP Area 3 Key Technology: Space environment; Radiation physics

VIRGINIA TECH

Center for Space Science and Engineering

http://www.space.vt.edu/
Director: Wayne Scales
540-231-5622
wscales@vt.edu

"The Center for Space Science and Engineering (Space@VT) comprises a group of faculty, students and staff devoted to the investigation of the space environment. We presently include members from the Bradley Department of Electrical and Computer Engineering and the Department of Aerospace and Ocean Engineering. The Center resides in the College of Engineering.

"Our mission is to provide forefront research, instruction, and educational outreach in the fields of space science and engineering utilizing a holistic approach of theoretical modeling, advanced simulation techniques, space system and instrument design, and experimental data acquisition, analysis and interpretation."

Interdisciplinary Center for Applied Mathematics

http://www.icam.vt.edu/
Director: Terry L. Herdman
540-231-7667
terry.herdman@vt.edu

"Applied mathematics plays a central role in all of modern science and advanced technology. The symbiotic relationship between mathematics and its areas of application is ever growing as more areas of engineering and science become dependent on new mathematical tools and mathematically trained scientists. Applied mathematics is therefore becoming the underpinning of the revolutionary changes taking place in all scientific, engineering and technological fields. These areas are vital to the new industries that will dominate the twenty-first century.

"The Interdisciplinary Center for Applied Mathematics (ICAM) was formed in August 1987 to promote and facilitate interdisciplinary research and education in applied mathematics at Virginia Polytechnic Institute and State University. A major goal of ICAM is the enhancement of the historical links among mathematics, engineering and the sciences. Since its inception, considerable progress has been made toward the establishment of a faculty group within ICAM to secure international prominence. ICAM received its first grant in 1988, for $1,369,560 for research in "An Integrated Research Program for the Modeling, Analysis and Control of Aerospace Systems". This is believed to be the largest grant ever awarded to a Virginia university for research in mathematics."

Scott Bailey

Electrical & Computer Engineering
540-231-0459
baileys@vt.ed
http://www.space.vt.edu/people/baileys.html

Research Areas:

- Aeronomy of the atmosphere
- Remote sensing
- Space mission design

LSTIP Area 3 Key Technology: Space environment

Joseph B. H. Baker

Electrical & Computer Engineering
540-231-3355
jo.baker@vt.edu
http://www.space.vt.edu/people/bakerj.html

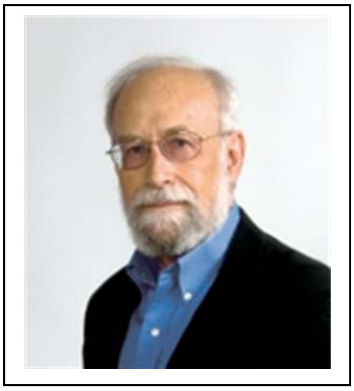
Research Areas:

- HF radar development
- Ionospheric plasma convection
- Aurora
- Magnetosphere-ionosphere coupling
- Space weather

LSTIP Area 3 Key Technology: Space environment

Robert Clauer, Jr.

Electrical & Computer Engineering
757-325-6917
rclauer@vt.edu
http://www.space.vt.edu/people/clauerr.html



Research Areas:

- Magnetospheric physics
- Space weather investigations

LSTIP Area 3 Key Technology: Space environment

John Michael Ruohoniemi

Electrical & Computer Engineering
540-231-1482
mikeruo@vt.edu
http://www.space.vt.edu/people/ruohoniemi.html

Research Areas:

- Ionospheric physics
- HF radar development
- Magnetosphere-ionosphere coupling
- Space weather

LSTIP Area 3 Key Technology: Space environment

Wayne Scales

Electrical & Computer Engineering
540-231-5622
wscales@vt.edu
http://www.space.vt.edu/people/scalesw.html

Research Areas:

- Computational space plasma physics
- Active space experiments
- Dusty plasma physics

LSTIP Area 3 Key Technology: Space environment

Daniel R. Weimer

Research Professor
757-325-6908
dweimer@vt.edu
http://www.space.vt.edu/people/weimerd.html

Research Areas:

- Empirical Models of the space environment

LSTIP Area 3 Key Technology: Space environment

Xia Cai
Research Scientist
757-325-6790
xcai@vt.edu
http://www.space.vt.edu/people/caix.html

Research Areas:

- Magnetospheric Physics
- Space Weather

LSTIP Area 3 Key Technology: Space environment

LSTIP Area 4: Accurately Landing and Positioning Large Payloads on Mars

"Affordable concepts and technologies for repeatedly delivering large (>40 mT) payloads within 20 m accuracy are required to enable human presence on Mars. Technologies that would enable the successful landing of large robotic or human-class payloads to the surface of Mars include Inflatable Atmospheric Decelerators (IADs) to "break the boundary" defined by the launch vehicle fairing. IADs as well as an additional technology development of supersonic retro-propulsion (SRP) enables a reduction in overall entry mass for a constant payload/vehicle mass, significantly reducing mission cost over all-propulsive techniques, enabling an affordable option for human missions to Mars.

"Architectures coupling SRP, IAD, and alternative technologies such as energy harvesting to enable large payload delivery to the surface of Mars require the integration of many disciplines including flight dynamics, GN&C, aerodynamics, aerothermodynamics, thermal analysis, structures, materials, propulsion, and atmospheric characterization. This topic supports system solutions to the challenge of affordable, repeatable, precision landing of large payloads on Mars."

Key Technologies:

- Inflatable Atmospheric Decelerators (IADs)
- Supersonic retro-propulsion
- Physics-based models
- Multiscale models
- Energy harvesting
- Integration of:
  - Flight dynamics
  - GN&C
  - Aerodynamics
  - Aerothermodynamics
  - Thermal analysis
  - Materials
  - Structures
  - Propulsion
  - Atmospheric characterization

GEORGIA TECH

Model-Based Systems Engineering Center

http://mbsec.gatech.edu

Director: Chris Paredis, Jonathan Rogers, Brian German
404-894-5613
Chris.Paredis@me.gatech.edu

"The Model-Based Systems Engineering Center (MBSEC) is part of the Georgia Tech Manufacturing Institute (manufacturing.gatech.edu). It focuses on developing a theoretical foundation for systems engineering. The research covers a broad range of theoretical foundations, from economics, decision theory, game theory, and organization theory to ontologies, formal modeling, simulation and optimization. Systems engineering problems are treated from a socio-technical perspective in a global socio-political and environmental context. Applications include, manufacturing, automotive, heavy equipment, aerospace systems, defense systems and energy systems.

Modeling & Simulation Research & Education Center

http://www.msrec.gatech.edu/

Director: Christos Alexopoulos, Ph.D.
404-894-2361
christos.alexopoulos@isye.gatech.edu

"MSREC's mission is to create and support cross-disciplinary research and development activities, including researchers in core M & S areas, supporting technologies, and innovative applications. It will develop and maintain education programs to train M & S practitioners, educators and researchers."

Space Systems Design Laboratory

http://www.ssdl.gatech.edu/

Directors: Robert Braun and David Spencer
404-894-7783
robert.braun@aerospace.gatech.edu or david.spencer@aerospace.gatech.edu

"The Space Systems Design Laboratory (SSDL) was founded within Georgia Tech's Guggenheim School of Aerospace Engineering in 1995 by Dr. John Olds with the goal of creating a world-class research and educational organization dedicated to the design of advanced space systems. The lab is currently co-directed by Prof. Robert Braun and Prof. David Spencer and consists of undergraduate students, Masters-level graduate students, and PhD-level graduate students with an interest in space systems analysis, design and development.

Research in the lab centers on identification and assessment of new technologies and approaches for human and robotic planetary exploration. Access to space, atmospheric entry and space systems engineering topics are research areas of particular interest and expertise. Our projects rely heavily on computer simulation and analytical prediction techniques to answer "what-if" questions related to next-generation space missions, vehicles, and architecture concepts. Members of the lab have developed new distributed design methods, new disciplinary analysis tools, and multidisciplinary design optimization techniques for robust design in an uncertain environment. The common focus of the lab is the application of these methods and tools to future space systems."

Robert Braun

Aerospace Engineering
404-385-6171
robert.braun@aerospace.gatech.edu
http://www.ae.gatech.edu/people/rbraun/

Research Areas:

- Hypersonic inflatable aerodynamic decelerators
- Entry, descent and landing technology
- Planetary atmospheric flight
- Robotic and human mars exploration
- Space systems engineering
- Multidisciplinary design optimization

LSTIP Area 4 Key Technologies: Inflatable atmospheric decelerators; Supersonic retro-propulsion

Mark Costello

Aerospace Engineering
404-385-4303
mark.costello@aerospace.gatech.edu
http://www.ae.gatech.edu/people/mcostell/

Research Areas:

- Dynamic modeling of physical systems
- Flight mechanics of air vehicle configurations
- Physical control mechanisms for air and ground platforms
- Unconventional highly integrated vehicle sensor systems
- Advanced control systems specialized to applications of interest

LSTIP Area 4 Key Technologies: Physics-based models; Integration of flight dynamics and GN&C

Brian German

Aerospace Engineering
404-385-3299
brian.german@aerospace.gatech.edu
bgerman.ae.gatech.edu/

Research Areas:

- Multidisciplinary design optimization (MDO)
- Multi-objective optimization algorithms and applications
- Trade space exploration
- Uncertainty representation and quantification
- Decision sciences in the context of design problems
- Simulations of the engineering design and development process
- Configuration aerodynamics
- Propulsion system performance

LSTIP Area 4 Key Technology: Physics-based models

Marcus J. Holzinger

Aerospace Engineering
404-385-3342
holzinger@gatech.edu
http://www.ae.gatech.edu/mholzinger/

Research Areas:

- Space situational awareness
- Guidance, navigation, & control
- Information theory, optimal estimation, & sensor fusion
- Formation flight, rendezvous, and proximity operations
- Optimal control and reachability

LSTIP Area 4 Key Technologies: Integration of GN&C and flight dynamics

Dimitri Mavris

Aerospace Engineering
404-894-1557
dimitri.mavris@aerospace.gatech.edu

Research Areas:

- Disciplinary breadth and depth while accounting for uncertainty and risk
- Multi-disciplinary analysis, optimization and design
- Reduction of analysis, design process cycle time
- Physics based analysis and design of unconventional vehicles
- System-of-systems, architecture-based systems engineering

LSTIP Area 4 Key Technology: Physics-based models

Faisal Alamgir

Materials Science & Engineering
404-385-3263
faisal.alamgir@mse.gatech.edu

Research Areas:

- Materials for energy storage conversion and harvesting
- Nanoscopy and nano-scale structure

LSTIP Area 4 Key technology: Energy harvesting

Meilin Liu

Materials Science & Engineering
404-894-6114
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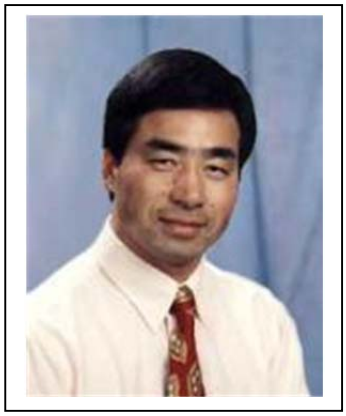
http://fcbt.mse.gatech.edu/liu.htm



Research Areas:

- Energy storage and harvesting
- Functional electronic and optical materials
- Materials and nanoengineered devices

LSTIP Area 4 Key Technology: Energy harvesting

Zhong Lin Wang

Materials Science & Engineering
404-894-8008
zhong.wang@mse.gatech.edu
http://www.nanoscience.gatech.edu

Research Areas:

- Nanogenerators and self-powered nanosystems
- Piezotronics for smart systems
- Piezo-phototronics for energy science and optoelectronics
- Hybrid cells for energy harvesting
- Nanogenerators and self-powered nanosystems

LSTIP Area 4 Key Technology: Energy harvesting

Jonathan Rogers

Mechanical Engineering
404-385-1600
jonathan.rogers@me.gatech.edu
http://me.gatech.edu/faculty/jonrogers

Research Areas:

- Nonlinear estimation and system identification
- Stochastic control and automation
- Modular ground, aerial, and marine robotic systems
- Autonomous vehicle design/optimization

LSTIP Area 4 Key Technology: Integration of Flight Dynamics and GN&C

Chris Paredis

Mechanical Engineering
404-894-5613
Chris.Paredis@me.gatech.edu
http://www.mbsec.gatech.edu/users/cparedis

Research Areas:

- Model-based systems engineering
- Decision theory and game theory
- Theoretical foundations of systems engineering
- Complex systems design
- System architecture
- Modeling and simulation

LSTIP Area 4 Key Technologies: Physics-based models

HAMPTON UNIVERSITY

Aeropropulsion Center

http://set.hamptonu.edu/research/aeropropulsion.cfm

Director: Morris Morgan, III
757-727- 5063
morris.morgan@hamptonu.edu

"The Aeropropulsion Center (APC) was established at Hampton University School of Engineering and Technology (SET) in January, 2003. APC is sponsored by NASA. The mission of the Center is to provide broad-based and cutting edge research and development in aerospace science and technology including aerodynamics, propulsion, aeroacoustics, hypersonic engine and vehicle systems, novel sensors for aerospace applications, and human exploration and development of space. Additionally, APC will become a focal point for the training and encouraging the participation of underrepresented minorities and persons with disabilities in the areas of interest to NASA's Science and Technology Enterprises. APC will also foster interdisciplinary research collaborations among sister HBCUs, major universities, other research institutions and industry."

NORTH CAROLINA A&T

Marwan Bikdash
Computational Science & Engineering
336-334-7437
bikdash@ncat.edu

Research Areas:
- Control system synthesis
- Fuzzy sets
- Computer simulation
- Mathematical models
- Motion planning
- Feedback control
- Approximation theory
- System theory

LSTIP Area 4 Key Technologies: Physics-based models; Multiscale models

John Kizito
Mechanical Engineering Department
336-285-3747
jpkizito@ncat.edu

Research Areas:
- Computational fluid dynamics
- Flow visualization
- Microgravity fluid physics
- Lunar and Martian fluid physics
- Exploration system
- Thermal radiation modeling
- Thermal management and energy conversion systems
- Aerodynamics and propulsion
- Biophysicochemical hydrodynamics

LSTIP Area 4 Key Technology: Integration of thermal analysis and materials

NORTH CAROLINA STATE UNIVERSITY

Engineering Mechanics and Space Systems Laboratory

http://www.mae.ncsu.edu/mazzoleni/emssl
Director: Andre Mazzoleni
919-515-5667
a_mazzoleni@ncsu.edu

"Computational mechanics capabilities for performing dynamics and stress analyses for aerospace and biomechanical systems.

- Expertise in design of innovative planetary rover systems
- Expertise in utilizing high speed video photography for analyzing dynamic systems"

Alex Q. Huang

Electrical & Computer Engineering
919-513-7387
aqhuang@ncsu.edu
http://www.ece.ncsu.edu/people/aqhuang

Research Areas:

- Power management integrated circuit
- Power semiconductor devices
- Advanced power electronics
- Renewable energy integration and smart grid

LSTIP Area 4 Key Technology: Energy harvesting

Xiaoning Jiang

Materials Science & Engineering
919-515-5240
xjiang5@ncsu.edu
http://www.mae.ncsu.edu/jiang

Research Areas:

- Micro/nanofabrications with smart materials and structures incorporation
- Micro/nano-sensors, actuators and transducers
- Sensors and actuators for extreme environment
- Smart material and micro/nanostructures for energy conversion (harvesting, sensing, actuation)

LSTIP Area 4 Key Technologies: Energy harvesting; Integration of materials and atmospheric characterization

Alina Chertock

Mathematics
919-515-3200
chertock@math.ncsu.edu
www.math.ncsu.edu/~acherto

Research Areas:

- Applied nonlinear partial differential equations
- Scientific computing
- Numerical analysis,
- Multiscale models
- Uncertain phenomena
- Experimental asymptotics

LSTIP Area 4 Key Technology: Multiscale models

Andre P. Mazzoleni

Mechanical & Aerospace Engineering
919-515-5667
a_mazzoleni@ncsu.edu
http://www.mae.ncsu.edu/faculty-staff/profile/andre-mazzoleni/

Research Areas:

- Dynamics
- Vibrations
- Nonlinear systems
- Astronautics
- Spacecraft design
- Power generation
- Energy harvesting

LSTIP Area 4Key Technologies: Energy Harvesting; Integration of flight dynamics and structures

Fuh-Gwo Yuan
Mechanical & Aerospace Engineering
919-515-5947
yuan@ncsu.edu
http://www.mae.ncsu.edu/faculty-staff/profile/fuhgwo-yuan/

Research Areas:

- Structural health monitoring
- Damage tolerance of composite structures
- Smart materials and structures
- Fracture & life prediction of advanced materials and structures
- Structural diagnosis and prognosis
- Wireless sensors that monitors structural integrity
- In-situ, mounted/embedded sensors for multi-functional composite structures

LSTIP Area 4 Key Technologies: Physics-based modeling; Energy harvesting

OLD DOMINION UNIVERSITY

Virginia Modeling, Analysis and Simulation Center

http://www.vmasc.odu.edu/
Director: John Sokolowski
757-686-6215
jsokolow@odu.edu

"The Virginia Modeling, Analysis and Simulation Center (VMASC) is a university-wide multidisciplinary research center that emphasizes modeling, simulation, and visualization (MS&V) research, development and education.

"VMASC concentrates on eight core modeling and simulation applied research areas:

- Transportation
- Homeland Security and Military Defense
- Virtual Environments
- Social Sciences
- Medicine & Health Care
- Game-based Learning
- M&S Interoperability
- System Sciences"

Robert L. Ash

Mechanical & Aerospace Engineering
757-683-4914
rash@odu.edu
http://www.odu.edu/directory/people/r/rash

Research Areas:

- Vortical flows
- Non-equilibrium phenomena
- Space systems
- Mars resources

LSTIP Area 4 Key Technology: Inflatable atmospheric decelerator

Svetozar Popovic

Physics
757-683-4618
spopovic@odu.edu
http://ww2.odu.edu/~spopovic/

Research Areas:

- Nanoscale surface engineering technology
- Plasma aerodynamic validation test development
- Virtual structures
- Low-noise surface physics and engineering
- Space radiation detectors and radiation shielding
- Radiation protection structures and materials
- Magnetohydrodynamic propulsion
- Plasma-assisted fuel reformation
- Energy harvesting

LSTIP Area 4 Key Technology: Energy harvesting

Leposava Vuskovic

Physics
757-683-4611
vuskovic@odu.edu
http://ww2.odu.edu/~lvuskovi/

Research Areas:

- Nanoscale surface engineering technology
- Plasma aerodynamic validation test development
- Virtual structures
- Low-noise surface physics and engineering
- Space radiation detectors and radiation shielding
- Radiation protection structures and materials
- Magnetohydrodynamic propulsion
- Plasma-assisted fuel reformation
- Energy harvesting

LSTIP Area 4 Key Technology: Energy harvesting

UNIVERSITY OF MARYLAND

Space Systems Laboratory

http://ssl.umd.edu/

Director: David Aiken
301-405-1138
dakin@ssl.umd.edu

"The Space Systems Laboratory (SSL) is part of the Aerospace Engineering Department and A. James Clark School of Engineering at the University of Maryland in College Park, Maryland. A leader in the area of astronautics, the Space Systems Laboratory is centered around the Neutral Buoyancy Research Facility, a 50-foot diameter, 25-foot deep water tank that is used to simulate the microgravity environment of space. The only such facility housed at a university, Maryland's neutral buoyancy tank is used for undergraduate and graduate research at the Space Systems Lab. Research in Space Systems emphasizes space robotics, human factors, applications of artificial intelligence and the underlying fundamentals of space simulation. There are currently five robots being tested, including Ranger, a four-armed satellite repair robot, and SCAMP, a 6 degree of freedom free-flying underwater camera platform. Launched by NASA in 1996, Ranger and its predecessor robot were both constructed in the Space Systems Lab."

Laboratory for Physical Sciences

http://www.lps.umd.edu

301-935-6400

"Located adjacent to the University of Maryland's College Park Campus, the Laboratory for Physical Sciences is a unique facility where university and federal government personnel collaborate on research in advanced communication and computer technologies. Faculty, post-doctoral scientists, and students from the UMCP Departments of Physics, Electrical and Computer Engineering, and Materials and Nuclear Engineering all conduct research in LPS laboratories in the areas:"

- Advanced computing systems
- Advanced functional materials and devices
- Biometrics
- Magnetics
- Microelectronics integration
- Molecular beam epitaxy
- Optics
- Quantum computing
- Superconducting computing
- RF wireless/RF energy harvesting

David Akin

Aerospace Engineering
301-405-1138
dakin@ssl.umd.edu
http://spacecraft.ssl.umd.edu/

Research Areas:

- Space systems
- Space robotics
- Space human factors
- Extravehicular activity/space suit design

LSTIP Area 4 Key Technology: Inflatable atmospheric decelerators

Norman M. Werely

Aerospace Engineering
301-405-1927
wereley@umd.edu
http://www.core.umd.edu/

Research Areas:

- Active, semi-active and passive vibration control
- Adaptive crashworthiness systems
- Magnetorheological energy absorbers and fluids
- Smart pneumatic systems

LSTIP Area 4 Key Technology: Inflatable atmospheric decelerators

Alireza Khaligh

Electrical & Computer Engineering
301-405-8985
khaligh@umd.edu
http://www.ece.umd.edu/~khaligh/

Research Areas:

- Power electronics
- Renewable energy systems
- Energy harvesting
- Plug-in hybrid electric vehicles
- Electric vehicles

LSTIP Area 4 Key Technology: Energy Harvesting

Reza Ghodssi

Electrical & Computer Engineering
301-405-8158
ghodssi@umd.edu
http://www.ece.umd.edu/~ghodssi/

Research Areas:

- Microball bearing supported micromachines
- Small scale power sources
- Energy harvesting

LSTIP Area 4 Key Technology: Energy harvesting

Sennur Ulukus

Electrical & Computer Engineering
301-405-4909
ulukus@umd.edu
http://www.ece.umd.edu/~ulukus/

Research Areas:

- Wireless communication theory and networking
- Network information theory for wireless networks
- Signal processing for wireless communications
- Information-theoretic physical-layer security
- Energy harvesting communications

LSTIP Area 4 Key Technology: Energy harvesting

Mohammad Modarres

Mechanical Engineering
301-405-5226
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http://www.modarres.umd.edu/

Research Areas:

- Probabilistic risk assessment
- Uncertainty analysis
- Physics of failure probabilistic modeling of failure mechanisms of mechanical components, systems and structures
- Reliability analysis of complex engineering systems
- Nuclear safety analysis

LSTIP Area 4 Key technologies: Physics-based models; Multiscale modeling

UNIVERSITY OF VIRGINIA

Robert Johnson
Materials Science & Engineering
434-924-3244
rej@virginia.edu
http://people.virginia.edu/~rej/

Research Areas:

- Sputtering, radiolysis, photolysis and atmospheric evolution
- Modeling of radiation-induced physics and chemistry occurring in differing astrophysical environments

LSTIP Area 4 Key Technology: Atmospheric characterization

James McDaniel
Mechanical & Aerospace Engineering
434-982-5945
jcm@virginia.edu
http://www.mae.virginia.edu/newmae.mae-faculty/james-c-mcdaniel/

Research Areas:

- Retro-propulsion for entry, descent and landing into Mars
- Hypersonic aerodynamics
- Nonintrusive laser-based flowfield diagnostics

LSTIP Area 4 Key Technology: Supersonic retro-propulsion

Harsha Chelliah
Mechanical & Aerospace Engineering
434-924-6037
harsha@virginia.edu
http://www.mae.virginia.edu/newmae.mae-faculty/harsha-k-chelliah

Research Areas:

- Combined heat and power using renewable biomass
- Combustion of porous graphite and magnesium particles under microgravity
- Development of reduced kinetic models

LSTIP Area 4 Key Technology: Energy harvesting

Hossein Haj-Hariri

Mechanical & Aerospace Engineering
434-982-2037
hh2b@virginia.edu
http://mae.virginia.edu/newmae/mae-faculty/hossein-haj-hariri

Research Areas:

- Thermal management
- Carbon-fiber composites
- Linear and non-linear wave propagation
- Fluid dynamics-computation, modeling

LSTIP Area 4 Key Technologies: Physics-based models; Integration of aerothermodynamics and materials

Patrick Hopkins

Mechanical & Aerospace Engineering
434-982-2037
peh4v@virginia.edu
http://patrickehopkins.com/

Research Areas:

- Thermal transport in nanosystems
- Thermal conductivity of bismuth-doped III-V alloys
- Short-pulsed laser interactions with solids and interfaces

LSTIP Area 4 Key Technology: Integration of aerothermodynamics and materials

Pamela Norris

Mechanical & Aerospace Engineering
434-924-6295
pamela@virginia.edu
http://pamelanorris.wordpress.com/

Research Areas:

- Nanoscale heat transfer
- Aerogel research
- Thermal energy management
- Soft materials

LSTIP Area 4 Key Technology: Integration of aerothermodynamics and materials

VIRGINIA TECH

Modal Analysis Laboratory

Director: Alfred L. Wicks
awicks@vt.edu

"The Modal Analysis Laboratory specializes in research relating to the characterization of dynamic properties of structures."

Center for Intelligent Material Systems and Structures (CIMSS)

http://www.cimss.vt.edu/

Director: Dan Inman
540-231-2908
cimss@vt.edu

"CIMSS is a research center in the Mechanical Engineering Department at Virginia Tech, and is located on the Virginia Tech campus in Blacksburg, Virginia. CIMSS is composed of faculty, staff, postdoctoral researchers, doctoral and masters students, undergraduate students, and visiting scholars.
Dr. Daniel J. Inman has been the Director of CIMSS since 1997. He is also the George R. Goodson Professor of Mechanical Engineering.

"CIMSS currently has many active projects in structural dynamics, structural health monitoring, energy harvesting, and applications of materials science for smart materials and structures."

Troy Henderson

Aerospace & Ocean Engineering
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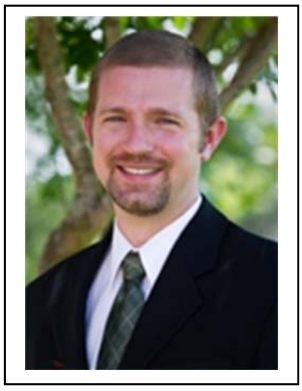
henderson@vt.edu
http://www.space.vt.edu/people/henderson.html

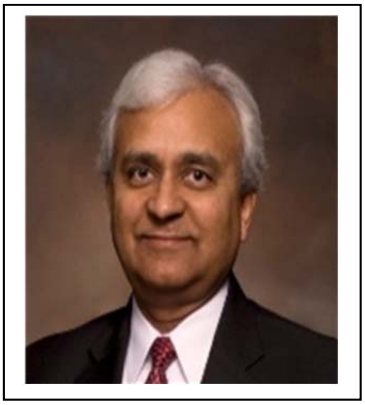


Research Areas:

- Dynamics and control
- Spacecraft design and space mission design
- Precision planetary landing through the use of inflatable aero-shells
- Orbital debris

LSTIP Area 4 Key Technology: Inflatable atmospheric decelerators

Pradeep Raj
Aerospace & Ocean Engineering
540-231-4843
praj@vt.edu
http://www.aoe.vt.edu/people/faculty/raj.html



Research Areas:

- Affordable quality designs
- Simulation based design
- Modeling and simulation technologies
- High-fidelity physics-based computational methods

LSTIP Area 4 Key Technology: Physics-based models

WILLIAM & MARY

Robert Lewis
Computer Science
757-221-2032
rml@cs.wm.edu
http://rmlewi.people.wm.edu/

Research Areas:

- Nonlinear optimization
- Optimization for engineering and scientific application
- P.D.E. Constrained optimization
- Graph embedding

LSTIP Area 4 Key Technology: Multiscale modeling

LSTIP Area 5: Sensors and Platforms for Scientific Data (Atmospheric Science Knowledge for Global Change)

"This topic supports development of new technology and methods for achieving the required atmospheric data accuracy and spatial/temporal resolution needed to resolve issues associated with global changes. Because of the natural variability in the Earth atmosphere system, detecting and quantifying persistent changes involves a trade between the accuracy of the observing instruments and the length of the calibrated record. The more accurate the instrument, the shorter record is needed to detect the change.

"For example, the accuracy of current sensors in the satellite climate observing system is insufficient for detection of decadal scale trends in climate variables during the life cycle of the individual instrument. To achieve this, one approach would be to calibrate the instrument in orbit to improve the accuracy of the individual instrument. Having an absolute calibration will also allow data from individual instruments to be combined to form a longer climate record.

"Developing and implementing the technology for achieving the required accuracy will reduce the observing time needed (currently measured in decades) to resolve climate feedback sensitivity. It will obviate the need for overlapping missions to preserve data continuity. If successful, data needed by decision makers for societal response to climate change will be available sooner, resulting in potential savings of multi-trillion dollar for the nation. The other benefit is for cost reduction of future satellite based sensors that are designed to utilize the capability."

Key Technologies:

- Improved sensor accuracy, resolution, and responsiveness
- Reduced sensor drift
- Data mining
- Sensor fusion
- Signal processing
- Data synthesis
- Visualization of sensor data

GEORGIA TECH

Center of Signal and Information Processing

http://csip.ece.gatech.edu/

"Digital Signal Processing (DSP) is concerned with the theoretical and practical aspects of representing information bearing signals in digital form, and with using computers or special purpose digital hardware either to extract that information or to transform the signals in useful ways.

"Areas where digital signal processing has made a significant impact include: telecommunications, man-machine communications, medical technology, radar and sonar, and seismic data analysis.

"The Center of Signal and Information Processing, part of the Georgia Tech, School of Electrical and Computer Engineering, is at the forefront of research and education in this important field.

"The laboratory boasts an outstanding, internationally known faculty; a large doctoral education program; an extensive selection of up-to-date courses; a wide-ranging research program in speech and information processing, DSP algorithms, hardware architectures, and DSP software; and excellent modern computer facilities for research and education."

Brian C. Gunter

Aerospace Engineering
404-385-2345
brian.gunter@aerospace.gatech.edu
http://bgunter.gatech.edu

Research Areas:

- Earth and planetary observation
- Orbital mechanics and precise orbit determination
- Positioning and navigation using GPS/INS systems
- System theory, parameter estimation, and dense linear algebra
- High-performance computing and software engineering

LSTIP Area 5 Key Technologies: Data synthesis; Sensor fusion

Marcus J. Holzinger

Aerospace Engineering
404-385-3342
holzinger@gatech.edu
http://ae.gatech.edu/mholzinger

Research Areas:

- Space situational awareness
- Guidance, navigation, & control
- Information theory, optimal estimation, & sensor fusion
- Formation flight, rendezvous, and proximity operations
- Optimal control and reachability
-

LSTIP Area 5 Key Technology: Sensor fusion

Haesun Park

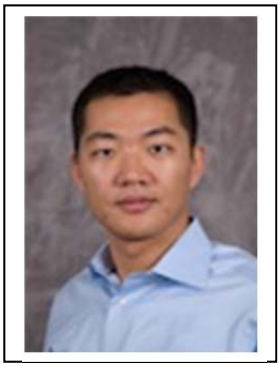
Computational Science and Engineering
404-385-2170
hpark@cc.gatech.edu
http://www.cc.gatech.edu/~hpark/

Research Areas:

- Bioinformatics
- Data mining
- Information retrieval
- Numerical algorithms
- Pattern recognition

LSTIP Area 5 Key Technology: Data mining

Wenke Lee



Computer Science
404-385-2879
wenke@cc.gatech.edu
http://wenke.gtisc.gatech.edu/

Research Areas:

- Applied cryptography
- Data mining
- Network management
- Systems and network security

LSTIP Area 5 Key Technology: Data mining

Umakishore Ramachandran

Computer Science
umakishore.ramachandran@cc.gatech.edu
http://www.cc.gatech.edu/~rama/

Research Areas:

- Software and hardware mechanisms for ubiquitous distributed
- Architectural design, programming, and analysis of parallel and distributed systems

LSTIP Area 5 Key Technology: Sensor fusion

Santosh Vempala

Computer Science
404-385-0811
vempala@gatech.edu
http://www.cc.gatech.edu/~vempala

Research Areas:

- Algorithms
- Data mining
- Geometry
- Optimization

LSTIP Area 5 Key Technology: Data Mining

Judith A. Curry

Earth & Atmospheric Sciences
404-894-3948
curryja@eas.gatech.edu
http://curry.eas.gatech.edu/

Research Areas:

- Remote sensing
- Climate of the polar regions
- Atmospheric modeling
- Air/sea interactions
- Atmospheric chemistry, aerosols & clouds

LSTIP Area 5 Key Technologies: Improved sensor accuracy, resolution, and responsiveness

Magnus Egerstedt

Electrical & Computer Engineering
404-894-3484
magnus.egerstedt@ece.gatech.edu
http://users.ece.gatech.edu/~magnus/

Research Areas:

- Control theory and robotic
- Control and coordination of complex networks, such as multi-robot systems, mobile sensor networks, and cyber-physical systems.

LSTIP Area 5 Key Technology: Sensor fusion

Christopher J. Rozell

Electrical & Computer Engineering
404-385-7671
crozell@gatech.edu
http://users.ece.gatech.edu/~crozell/

Research Areas:

- Constrained sensing systems
- Compressed sensing
- Sparse approximation
- Statistical signal processing
- Theoretical and computational neuroscience
- Biological vision

LSTIP Area 5 Key Technology: Signal processing

George Vachtsevanos

Electrical & Computer Engineering
404-894-6252
gjv@ece.gatech.edu
http://www.ece.gatech.edu/faculty-staff/fac_profiles/bio.php?id=107

Research Areas:

- Hierarchical/Intelligent control of large-scale industrial processes
- Fault-tolerant and mode transitioning control of unmanned aerial vehicles
- Vision and IR based inspection technologies for textile, glass and other industrial products
- Analysis of EEG signals for detection and prediction of epileptic seizures
- Sensor fusion techniques for classification and control

LSTIP Area 5 Key Technology: Sensor fusion

Nicoleta Serban

Industrial & Systems Engineering
404-385-7255
nicoleta.serban@isye.gatech.edu
http://www.isye.gatech.edu/~nserban/

Research Areas:

- Nonparametric statistical methods
- Model-based data mining

LSTIP Area 5 Key Technology: Data mining

Ronald Arkin

Interactive Computing
404-894-8209
arkin@cc.gatech.edu
http://www.cc.gatech.edu/aimosaic/faculty/arkin/

Research Areas:

- Behavior-based reactive control and action-oriented perception for mobile robots and unmanned aerial vehicles
- Hybrid deliberative/reactive software architectures
- Robot survivability
- Multiagent robotic systems
- Human-robot interaction
- Robot ethics
- Learning in autonomous systems

LSTIP Area 5 Key Technology: Sensor fusion

Tucker Balch

Interactive Computing
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http://www.cc.gatech.edu/~tucker/

Research Areas:

- Statistical machine learning
- Data mining algorithms

LSTIP Area 5 Key Technology: Sensor fusion

John Stasko

Interactive Computing
404-894-5617
stasko@cc.gatech.edu
http://www.cc.gatech.edu/~stasko

Research Areas:

- Data mining
- Information visualization
- Visual analytics tools

LSTIP Area 5 Key Technology: Data mining

S. Mostafa Ghiaasiaan

Mechanical Engineering
404-894-3746
mghiaasiaan@gatech.edu
http://gtcryolab.gatech.edu

Research Areas:

- Cryogenics and cryocoolers
- Transport phenomena in multi-phase flow
- Thermal control and management

LSTIP Area 5 Key Technology: Improved sensor accuracy, resolution, and responsiveness

Jonathan Rogers

Mechanical Engineering
404-385-1600
jonathan.rogers@me.gatech.edu
http://me.gatech.edu/faculty/jonrogers

Research Areas:

- Nonlinear estimation and system identification
- Stochastic control and automation
- Modular ground, aerial, and marine robotic systems
- Autonomous vehicle design/optimization

LSTIP Area 5 Key Technology: Improved sensor accuracy, resolution, and responsiveness; Sensor fusion

HAMPTON UNIVERSITY

Center for Atmospheric Sciences

http://cas.hamptonu.edu/
Co-Directors: James M. Russell III & Patrick McCormick
757-727-5108
cas@hamptonu.edu

"The Center for Atmospheric Sciences (CAS) was founded in 1996 with 3 closely related objectives: fundamental research; education at the graduate and undergraduate levels; and outreach to the public, the university, and the K-12 communities. CAS is especially devoted to increasing the participation of minorities in the fields of atmospheric and planetary sciences. These objectives are now the mission of the Department of Atmospheric and Planetary Sciences, which will maintain CAS as its research center.

"The Center for Atmospheric Sciences (CAS), is the research facility for the Department of Atmospheric and Planetary Sciences, has a three-fold focus of closely related objectives: education; fundamental research; and outreach to the public, university, and K-12 communities. The center supports the nation's programs in atmospheric and Earth radiation sciences and related technologies and works closely with the nearby NASA Langley Research Center (LaRC). CAS is housed in its own buildings on campus with supporting laboratory space at HU. Some cooperative programs are conducted at LaRC, as well as at other institutions."

Morris Morgan, III

Chemical Engineering
757-727-5063
morris.morgan@hamptonu.edu

Research Areas:

- Nonlinear dynamics
- Robust statistical metrics that accurately and quickly detect a change in the inherent nature of a time series
- Statistical investigation of wavelet methods for analyzing data streams arising from chaotic sources
- Statistical metrics for assessing nonlinear time series features

LSTIP Area 5 Key Technologies: Data mining

Robert Willis, Jr.

Computer Science
757-727-5552
Robert.willis@hamptonu.edu

Research Areas:

- Information assurance
- Software engineering

LSTIP Area 5 Key Technologies: Data mining

Qiang Le

Electrical Engineering
757-727-5557
qiang.le@hamptonu.edu
http://set.hamptonu.edu/electrical/le_qiang.cfm

Research Areas:

- Sensors' management
- Multiple target tracking
- Data fusion
- Signals' detection and estimation
- Image signal processing
- Parallel computing

LSTIP Area 5 Key Technology: Sensor fusion

Zhao (Joy) Sun

Electrical Engineering
757-637-2338
zhao.sun@hamptonu.edu
http://set.hamptonu.edu/electrical/sun_zhao.cfm

Research Areas:

- Dynamic modeling and simulation for complex systems
- Adaptive and intelligent systems
- Robotics and vision systems
- Sensor data fusion
- Fault tolerant flight control
- Modeling, control and management for energy storage and conversion systems

LSTIP Area 5 Key Technology: Sensor fusion

NORTH CAROLINA A&T

NOAA Interdisciplinary Scientific Environmental Technology Center (NOAA-ISET Center)

http://www.ncat.edu/academics/schools-colleges1/cas/research/noaa-iset.html

Director: Solomon Bililign
336-285-2110
bililign@ncat.edu

"The NOAA was established with initial Funding from the National Oceanic and Atmospheric Administration Educational Partnership Program in 2006 in partnership with five minority serving institutions and two Research I institutions.

"The Center promotes interdisciplinary collaborations involving faculty from eleven academic departments in Engineering, Arts and Sciences, to conduct research in technology development to help understand climate and environmental change and impacts.

"The Center is organized in three thrust areas:

I. Sensor Science and Technology
II. Global Observing Systems
III. Information Technology Applications"

Gerry Vernon Dozier

Computer Science
336-334-7245
gvdozier@ncat.edu
http://aci2.ncat.edu/gvdozier/

Research Areas:

- Artificial intelligence
- Neural networks
- Data mining
- Sensor fusion

LSTIP Area 5 Key Technologies: Data mining, Sensor fusion

Justin Zhan
Computer Science
zzhan@ncat.edu
http://www.ilabsite.org/people/jzhan/

Research Areas:
- Data privacy
- Data mining
- Cryptography
- Security of data

LSTIP Area 5 Key Technology: Data mining

Li-Shiag Tsay
Computer Technology Systems
336-285-3146
ltsay@ncat.edu

Research Areas:
- Knowledge discovery and data mining
- Multimedia databases
- Intelligent web search
- Agent-based modeling and complex adaptive systems

LSTIP Area 5 Key Technology: Data mining

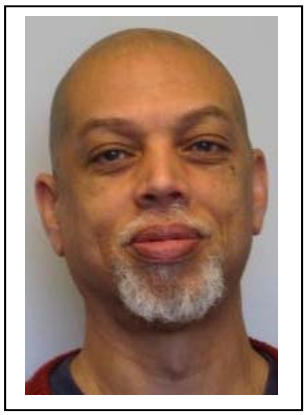
Dewayne Brown
Electrical & Computer Engineering
336-285-3140
dbrown@ncat.edu

Research Area:
- Data mining

LSTIP Area 5 Key Technology: Data mining

William Edmonson

Electrical & Computer Engineering
757-325-6749
wwedmons@ncat.edu



Research Areas:

- Signal processing
- Global optimization
- Mean square error
- Random processes
- Error analysis
- Digital signal processing

LSTIP Area 5 Key Technology: Signal processing

Robert Y. Li

Electrical & Computer Engineering
336-334-7629
eeli@ncat.edu

Research Areas:

- Neural networks
- Vector quantization
- Backpropagation
- Image coding
- Radial basis function networks
- Image compression
- Image reconstruction
- Image quality
- Classifiers
- Pattern recognition

LSTIP Area 5 Key Technology: Signal processing

Solomon Bililign

Physics
336-285-2110
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http://www.noaaiset.org/bililign/

Research Areas:

- Experimental and theoretical atomic, molecular and optical physics
- Chemical physics
- Atmospheric chemistry

LSTIP Area 5 Key Technologies: Improved sensor accuracy, resolution, and responsiveness

Huiming A Yu

Computer Science
336-285-3699
cshmyu@ncat.edu

Research Areas:

- Visualization
- Security of data
- Software engineering
- Network security
- Object oriented programming
- Information science
- Animation
- Computer science
- Mobile robots

LSTIP Area 5 Key Technology: Visualization of sensor data

Xiaohong Yuan

Computer Science
336-285-3700
xhyuan@ncat.edu

Research Areas:

- Software engineering
- Network security
- Visualization
- Security of data
- Computer science
- Computer crime
- Grid computing
- Animation
- Simulators

LSTIP Area 5 Key Technology: Visualization of sensor data

NORTH CAROLINA STATE UNIVERSITY

Advanced Self-Powered Systems of Integrated Sensors and Technology (ASSIST)
NSF Nanotechnology Engineering Research Center

http://assist.ncsu.edu

Director: Veena Misra
919-515-7356
vmisra@ncsu.edu

"The ASSIST Center is leading a paradigm shift in environment and health informatics, enabled by wearable nanotechnologies that monitor individual environmental exposures and health parameters. Long-term sensing will enable direct correlations to be drawn between environmental toxins and health, leading to chronic disease prediction, management and treatment. ASSIST is advancing environmental health research and will inform environmental policy"

"NC State faculty and staff participate in a wide variety enabling technologies.

- Energy Harvesting and Storage
- Ultra-Low Power Electronics
- Environmental and Physiological Sensing
- Device Integration and Clinical Trials
- Nano-materials and Nano-manufacturing"

Image Analysis Lab

http://www.ece.ncsu.edu/imaging/

Director: Wesley Snyder
919-515-5114
wes@ncsu.edu

"This lab hosts a variety of images from different sources and imaging modalities. They have been organized based upon the field in which they are popularly used."

Center for Earth Observation

Director: Hugh A. Devine Jr
919-515-3682
hugh_devine@ncsu.edu

"The Center for Earth Observation has continued to attract extensive external funding with major new grants from the National Interagency Wildfire Research program, the National Park Service, the NC Forest Resources Division, the National Forest Service, the US Fish and Wildlife Service, and the NC Environmental Health Division. In addition, we have been able to work with several PRTM faculty in

developing new proposals to the Rex Health foundation, the Wake County Alliance for Health, and two tourism research studies.

"NC State faculty and staff participate in a wide variety of GIS research and outreach activities - use the following links to obtain more information about some of these projects.

- GeoInformation Science and Environmental Modeling
- Erosion and Sediment Control: Modeling with GIS
- Spatial Characteristics and Simulation of Nearshore Environments
- Watershed Analysis
- National Cooperative Geologic Mapping Program"

Cooperative Institute for Climate and Satellites

http://cicsnc.org/

"The Cooperative Institute for Climate and Satellites (CICS) is a consortium of academic, non-profit and community organizations with leadership from the NC State and University of Maryland-College Park. CICS provides focuses for collaborative research and associated activities in support of NOAA mission goals related to meteorological satellite and climate data and information research and development. The broad CICS consortium constitutes a first step toward the implementation of an academic infrastructure needed to support a national climate service."

Institute for Advanced Analytics

http://analytics.ncsu.edu/
Director: Michael Rappa
919-513-3940
analytics@ncsu.edu

"The goal of analytics is to derive and effectively communicate actionable insights from a vast quantity and variety of data. It covers a broad spectrum of activities, including data management and quality, mathematical and statistical methods for data modeling, and techniques for visualizing data in support of enterprise-wide decision making. Driving analytics is the unprecedented amount of data available today. There is a pressing need for professionals with strong quantitative skills coupled with an understanding of how analytics can be applied with speed and accuracy to the critical challenges facing organizations."

Vision Information and Statistical Signal Analysis and Applications Lab

http://research.ece.ncsu.edu/vissta
Director: Hamid Krim
919-513-2270
ahk@ncsu.edu

"Our group focuses on applied problems in vision and imaging, as well as smart sensing and intelligent data mining. While we address applied problems, in addition to their visionary and philosophical bend, our approaches are rather formal and are strongly rooted in Analysis, Geometry, Topology and Probability/Statistics."

Christopher B. Gorman

Chemistry
919-515-4252
Chris_Gorman@ncsu.edu
http://www.ncsu.edu/chemistry/cbg/cbg.html

Research Areas:

- Design and synthesis of new optical and electronic materials for application in optoelectronic devices, nanoscale electronics, and information systems
- Synthesis of new molecular, macromolecular, supramolecular and fabricated architectures on the nanometer length scale that are designed to display new behaviors.
- Investigation as to how structure controls properties using a variety of analytical characterization techniques

LSTIP Area 5 Key Technology: Improved sensor accuracy, resolution, and responsiveness

Kemafor Anyanwu

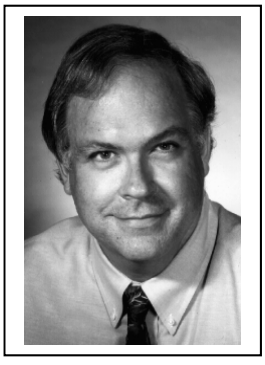
Computer Science
919-513-2850
kogan@ncsu.edu
http://www.csc.ncsu.edu/people/kogan

Research Areas:

- Artificial intelligence and intelligent agents
- Information and knowledge management
- Semantic web
- Databases
- Data mining
- Information retrieval and services computing

LSTIP Area 5 Key Technology: Data mining

Dennis Bahler



Computer Science
919-515-3369
bahler@csc.ncsu.edu
http://www4.ncsu.edu/~bahler/

Research Areas:

- Artificial Intelligence
- Machine learning
- Data mining
- Pattern recognition

LSTIP Area 2 Key Technologies: Data mining; Sensor fusion

Christopher G. Healey

Computer Science
919-513-8112
healey@ncsu.edu
http://www.csc.ncsu.edu/faculty/healey/

Research Areas:

- Graphics and human computer interaction
- Computer and video games
- Information and knowledge management
- Scientific and high performance computing
- Analytics

LSTIP Area 5 Key Technology: Visualization of sensor data

Nagiza Samatova

Computer Science
919-513-7575
samatova@csc.ncsu.edu
http://www.csc.ncsu.edu/people/nfsamato

Research Areas:

- Graph theory and algorithms
- High performance data analytics
- Machine learning
- Data mining
- Data management and data integration
- Scientific and high performance computing

LSTIP Area 5 Key Technology: Data mining

Huaiyu Dai

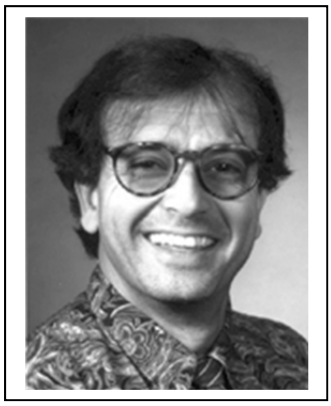
Electrical & Computer Engineering
919-513-0299
hdai@ncsu.edu
http://www4.ncsu.edu/~hdai/

Research Areas:

- Wireless communications and networks
- Networked information processing
- Wireless security

LSTIP Area 5 Key Technologies: Signal processing; sensor fusion

Hamid Krim



Electrical & Computer Engineering
919-513-2270
ahk@ncsu.edu
http://www.ece.ncsu.edu/people/ahk/

Research Areas:

- Digital signal processing
- Computer vision and image analysis
- Machine learning and data mining and fusion
- Computational intelligence
- Sensor and social networks and topological data anlayisis

LSTIP Area 5 Key Technologies: Signal processing; Data Mining; Sensor fusion; Data synthesis and Visualization of sensor data

Wesley E. Snyder

Electrical & Computer Engineering
919-515-5114
wes@ncsu.edu
http://www4.ncsu.edu/~wes/

Research Areas:

- Communications and signal processing
- Image analysis
- Computer vision

LSTIP Area 5 Key Technology: Signal processing

Daniel Stancil

Electrical & Computer Engineering
919-513-3606
ddstancil@ncsu.edu
http://www.ece.ncsu.edu/people/ddstanci

Research Areas:

- Signal processing
- Digital communications
- Electronic circuits and systems
- Electromagnetic fields / antenna analysis
- Microwave devices and circuits
- Nanoelectronics and photonics

LSTIP Area 5 Key Technology: Signal processing

Kara Peters

Mechanical & Aerospace Engineering
919-515-5226
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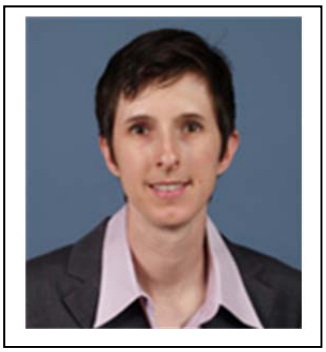
http://www.mae.ncsu.edu/faculty-staff/profile/kara-peters/



Research Areas:

- Sensor fusion
- Structural health monitoring
- Self-healing composite sandwich structures

LSTIP Area 5 Key Technology: Sensor fusion

Fuh-Gwo Yuan

Mechanical & Aerospace Engineering
919-515-5947
yuan@ncsu.edu
http://www.mae.ncsu.edu/faculty-staff/profile/fuhgwo-yuan/

Research Areas:

- Structural health monitoring
- Damage tolerance of composite structures
- Smart materials and structures
- Fracture & life prediction of advanced materials and structures
- Multifunctional composite structures

LSTIP Area 5 Key Technology: Sensor fusion

Lexin Li

Statistics
919-515-1929
lexin_li@ncsu.edu
http://www4.stat.ncsu.edu/~li/

Research Areas:

- Dimension reduction
- Bioinformatics
- Machine learning

LSTIP Area 5 Key Technology: Data mining

OLD DOMINION UNIVERSITY

Virginia Modeling, Analysis and Simulation Center

http://www.vmasc.odu.edu/
Director: John Sokolowski
757-686-6215
jsokolow@odu.edu

"The Virginia Modeling, Analysis and Simulation Center (VMASC) is a university-wide multidisciplinary research center that emphasizes modeling, simulation, and visualization (MS&V) research, development and education.

"VMASC concentrates on eight core modeling and simulation applied research areas:
• Transportation
• Homeland Security and Military Defense
• Virtual Environments
• Social Sciences
• Medicine & Health Care
• Game-based Learning
• M&S Interoperability
• System Sciences"

The Vision Lab

http://www.eng.odu.edu/visionlab/
Director: Khan Iftekharuddin
757) 683-6794
kiftekha@odu.edu

"The Vision Lab aims to develop novel theory, state-of-art algorithms, architectures, and real-time implementations in biomedical, human- and machine-centric recognition, and environment & geoscience applications based on the disciplines of computer vision, signal/image processing and machine learning."

Peter F. Bernath

Chemistry & Biochemistry
757-683-3807
bernath@odu.edu
http://sci.odu.edu/chemistry/directory/bernath.shtml

Research Areas:

- Satellite remote sensing of the Earth's atmosphere
- Infrared trace gas retrievals
- Laboratory spectroscopy of atmospheric and astronomical molecules
- Molecular astronomy of stars, brown dwarfs, planetary atmospheres
- Laser and Fourier transform spectroscopy of materials and gases

LSTIP Area 5 Key Technology: Improved sensor accuracy, resolution, and responsiveness

Shuiwang Ji

Computer Science
757-683-7717
sji@cs.odu.edu
http://www.cs.odu.edu/~sji/

Research Areas:

- Machine learning
- Data mining
- Computational biology
- Computational neuroscience

LSTIP Area 5 Key Technology: Data mining

Min Song

Electrical & Computer
msong@odu.edu

Research Areas:

- Design, analysis, and evaluation of cognitive radio networks
- Wireless sensor networks
- Wireless mesh networks
- WLAN
- Mobile ad-hoc networks

LSTIP Area 5 Key Technologies: Sensor fusion; Signal processing; Visualization of sensor data

Ahmed K. Noor

Modeling, Simulation, and Visualization
757-766-5233
aknoor@odu.edu
http://eng.odu.edu/msve/directory/fs/noor.shtml

Research Areas:

- Interactive immersive visual simulations and virtual worlds;
- Collaborative distributed knowledge discovery and exploitation;
- Learnscapes (advanced learning and training paradigms, technologies and environments)
- Intelligent adaptive cyber-physical ecosystems

LSTIP Area 5 Key Technology: Visualization of sensor data

Yuzhong Shen

Modeling, Simulation, and Visualization
757-683-6366
yshen@odu.edu
http://www.ece.odu.edu/~yshen/research.html

Research Areas:

- Game-based learning
- Visualization and computer graphics
- Modeling and simulation
- Signal and image processing

LSTIP Area 5 Key Technologies: Signal processing; Visualization of sensor data

UNIVERSITY OF MARYLAND

University of Maryland Institute for Advanced Computer Studies

http://www.umiacs.umd.edu/

Director: Amitabh Varshney
varshney@cs.umd.edu
301-405-6722

"Our mission is to foster and enhance basic and interdisciplinary research programs in computing across the University of Maryland at College Park. The success of UMIACS in catalyzing and excelling in interdisciplinary applications of computing is often attributed to: (1) identification and focus on grand challenge applications of computing with significant societal impact, (2) identifying and incentivizing outstanding faculty to excel in their research through rotating appointments, and (3) mediating interaction amongst interdisciplinary researchers through an outstanding computational infrastructure. We have developed the skill set and culture necessary for building strong interdisciplinary research programs, providing advanced computing research infrastructure, and first-rate technical support, which have greatly facilitated our national and international leadership role in multi-disciplinary computing. Our research programs are led by an outstanding group of distinguished scholars across the UMD College Park campus. Since computing is at the core of all the Institute's activities, UMIACS has a uniquely close relationship with the highly regarded Department of Computer Science."

Jin-Oh Hanh

Mechanical Engineering
301-405-7864
jhahn12@umd.edu
http://terpconnect.umd.edu/~jhahn12/

Research Areas:

- System dynamics and control
- System identification
- Condition monitoring and fault diagnostics
- Multi-sensor fusion and signal processing
- Bio-systems and healthcare
- Automotive control systems
- Energy systems

LSTIP Area 5 Key Technologies: Sensor fusion; Signal processing

Radu Balan

Mathematics
301-405-5492
rbalan@math.umd.edu
http://www2.math.umd.edu/~rvbalan/

Research Areas:

- Signal processing
- Sparse signal estimation
- Source separation
- Applied harmonic analysis
- Machine learning
- Intelligent systems
- Sensor fusion

LSTIP Area 5 Key Technologies: Sensor fusion; Signal processing

J. Sean Humbert

Aerospace Engineering
301-405-0328
humbert@umd.edu
http://www.aero.umd.edu/facstaff/fac-profiles/humbert-sean.html

Research Areas:

- Distributed sensing and sensory processing (wide-field integration)
- Low-power, lightweight arrayed MEMS and analog VLSI based avionics
- Flapping, rotary, and fixed wing flight mechanics
- Stability and control
- Insect-inspired mechanisms for gust rejection and compensation
- Autonomous guidance, navigation, and collision avoidance
- Integration of embedded hardware/software systems and communications
- Adaptive learning and control
- Path planning and autonomous decision

LSTIP Area 5 Key Technology: Sensor fusion

Steven Tretter

Electrical & Computer Engineering
301-405-3670
tretter@eng.umd.edu
http://www.ece.umd.edu/meet/faculty/tretter.php3

Research Areas:

- Communication theory
- Coding
- Signal processing

LSTIP Area 5 Key Technology: Signal processing

Sennur Ulukus

Electrical & Computer Engineering
301-405-4909
ulukus@umd.edu
http://www.ece.umd.edu/~ulukus/

Research Areas:

- Wireless communication theory and networking
- Network information theory for wireless networks
- Signal processing for wireless communications
- Information-theoretic physical-layer security
- Energy harvesting communications

LSTIP Area 5 Key Technology: Signal processing

K.J. Ray Liu

Electrical & Computer Engineering
301-405-6619
kjrliu@umd.edu
http://www.cspl.umd.edu/kjrliu/

Research Areas:

- Signal processing algorithms and architectures
- Multimedia communications and signal processing
- Wireless communications and networking
- Information security

LSTIP Area 5 Key Technology: Signal processing

Wolfgang Jank

Applied Mathematics & Statistics, and Scientific Computation
301-405-1118
wjan@rhsmith.umd.edu
http://www.rhsmith.umd.edu/faculty/wjank/

Research Areas:

- Computational statistics
- Functional data analysis
- Nonparametric statistics
- Methods for spatial and temporal data
- Monte Carlo methodology
- Stochastic optimization
- Information visualization

LSTIP Area 5 Key Technology: Visualization of sensor data

UNIVERSITY OF VIRGINIA

SHANTI Interactive Visualizations Application (SHIVA)

http://shiva.virginia.edu/

"SHANTI Interactive Visualizations Application (SHIVA) is an online application that makes it easy to produce interactive visualizations from various media - photographs, videos, texts - or easy to create structured data in the form of rows and columns within Google spreadsheets. Visualizations include charts, maps, images, timelines, video, and networks."

"SHIVA empowers anyone to easily create and share sophisticated visualizations. Create timelines, layered maps, network diagrams, annotated video clips, and charts using simple Google Spreadsheets and other sources on the web. Share them online using tools like WordPress, Collab, and Confluence. Annotate and organize your visualizations in collections for teaching and research."

Sang Hyuk Son

Computer Science
434-982-2205
son@virginia.edu
http://www.cs.virginia.edu/~son/

Research areas:

- Real-time systems
- Databases
- Data and event services
- Wireless sensor networks
- Information security

LSTIP Area 5 Key Technology: Sensor fusion

John Stankovic

Computer Science
434-982-2275
jas9f@virginia.edu
http://www.cs.virginia.edu/people/faculty/stankovic.html

Research areas:

- Real-time computing
- Cyber physical systems
- Ad hoc wireless sensor networks
- Wireless health

LSTIP Area 5 Key Technology: Improved sensor accuracy, resolution, and responsiveness, Reduced sensor drift, Data mining, Sensor fusion

Kamin Whitehouse

Computer Science
434-982-2211
whitehouse@cs.virginia.edu
http://www.cs.virginia.edu/~whitehouse/

Research Areas:

- Wireless networking
- Wireless sensor networks
- Distributed systems
- Parallel systems

LSTIP Area 5 Key Technology: Sensor fusion

Harry Powell

Electrical & Computer Engineering
(434) 924-6107
hcp7ad@virginia.edu
http://www.ece.virginia.edu/faculty/powell.html

Research Areas:

- Energy conversion
- Power electronics
- Signal processing for embedded systems
- Machine learning
- Engineering design

LSTIP Area 5 Key Technology: Signal processing

William C. Keene

Environmental Sciences
434-924-0586
wck@virginia.edu
http://www.evsc.virginia.edu/2008/11/keene-william-c/

Research Areas:

- Fundamental chemical and physical processes in the troposphere
- Multiphase chemistry involving gases, aerosols, cloud droplets, and precipitation
- The impact of aerosols on the earth's radiation balance and climate
- Biogeochemical interactions between ecosystems and the atmosphere
- Development of associated measurement techniques

LSTIP Area 5 Key Technology: Improved sensor accuracy, resolution, and responsiveness

Donald E. Brown

Systems & Information Engineering
434-982-2074
brown@virginia.edu
http://web.sys.virginia.edu/donald-e-brown.html

Research Areas:

- Data mining
- Data fusion
- Predictive modeling
- Response surface methods
- Agent based simulation

LSTIP Area 5 Key Technology: Data mining

Stephanie A. Guerlain

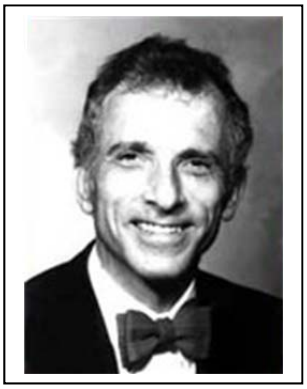
Systems & Information Engineering
434-924-4438
sag3c@virginia.edu
http://www.sys.virginia.edu/hci/

Research Areas:

- Design of decision support systems
- Cognitive systems engineering
- Human-computer interaction
- Data visualization

LSTIP Area 5 Key Technology: Visualization of sensor data

Roman Krzysztofowicz
Systems Engineering and Statistics
434-982-2067
rk@virginia.edu
http://www.faculty.virginia.edu/rk/



Research Areas:

- Bayesian decision theory
- Sensor fusion
- Economic value of information
- Probabilistic modeling
- Decision, risk, and reliability analyses
- Multiobjective decision making
- Decision support systems

LSTIP Area 5 Key Technology: Sensor fusion

VIRGINIA TECH

Spatial Data Management Lab

http://spatial.nvc.cs.vt.edu/

Director: Chang-Tien Lu
703-538-8373
ctlu@vt.edu

"Research on spatial and spatio-temporal data management is to fulfill the emerging requirements for storing, analyzing, exchanging, and disseminating spatial and spatio-temporal data in many GIS applications. Projects range from general spatial and spatio-temporal data management, such as the indexing structure, query processing, and concurrency control, to applications that deal with data analysis and knowledge discovery tasks, such as transportation visualization, watershed monitoring, disease outbreak analysis, geospatial web service, and web usage mining. The outputs of these projects have not only brought out high quality research papers and demos, but also helped the professionals in many fields, such as transportation managers and watershed engineers, to take efficient responses and make effective decisions."

Doug A. Bowman

Computer Science
540-231-2058
dbowman@vt.edu
https://research.cs.vt.edu/3di/user/123

Research Areas:

- 3D-interaction
- Center for human computer interaction
- Human computer interaction
- Immersive environments
- Usability engineering

LSTIP Area 5 Key Technology: Visualization of sensor data

Chang-Tien Lu

Computer Science
703-538-8373
ctlu@vt.edu
http://people.cs.vt.edu/~ctlu

Research Areas:

- Data, information, knowledge, and libraries
- Knowledge, data and information
- Spatial databases

LSTIP Area 5 Key Technology: Visualization of sensor data

Chris North

Computer Science
540-231-2458
north@vt.edu
http://people.cs.vt.edu/~north/

Research Areas:

- Visual analytics
- Information visualization
- Human-computer interaction

LSTIP Area 5 Key Technology: Visualization of sensor data

Naren Ramakrishnan

Computer Science
540-231-8451
naren@vt.edu
http://people.cs.vt.edu/~ramakris/

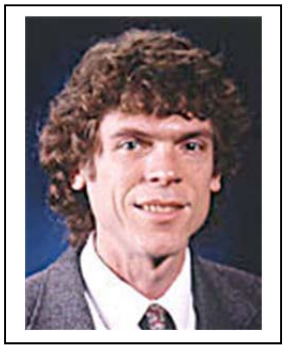
Research Areas:

- Computational biology and bioinformatics
- Data, information, knowledge, and libraries
- Discovery analytics center
- Knowledge, data and information
- Problem solving environments
- Data mining

LSTIP Area 5 Key Technology: Data mining

A. Lynn Abbott

Electrical & computer Engineering
540-231-4472
540-231-3362
abbott@vt.edu
http://www.ece.vt.edu/faculty/abbott.php



Research Areas:

- Computer vision
- Image processing
- Biometrics
- Sensing for autonomous vehicles

LSTIP Area 5 Key Technology: Sensor fusion

Alfred L Wicks

Mechanical Engineering
540-231-4323
awicks@vt.edu
http://www.mechatronic.me.vt.edu/People/DrWicks.html

Research Areas:

- Autonomous Vehicles
- Experimental modal analysis
- Digital signal processing
- Laser-based transducers and instrumentation

LSTIP Area 5 Key Technology: Signal Processing

WILLIAM & MARY

Mark Hinders

Applied Science
757-221-1519
hinders@wm.edu
http://as.wm.edu/Faculty/Hinders.html

Research Areas:

- Non-destructive evaluation
- Intelligent robotics

LSTIP Area 5 Key Technology: Sensor fusion

Gang Zhou

Computer Science
757-221-3458
gzhou@cs.wm.edu

Research Areas:

- Wireless networks
- Sensor networks
- Body networks
- Ubiquitous computing
  smartphone energy saving
- Cyber-physical systems

LSTIP Area 5 Key Technology: Sensor fusion

LSTIP Area 6: Autonomy

"Autonomy in aerospace vehicles, ranging from aircraft, spacecraft, to planetary exploration systems, continues to grow in applications considerable interest. This topic supports autonomous systems with highly integrated functionality and sensor suites that enable robotics at human level intelligence for all missions and functionalities (e.g. real time self-learning, human intelligent assistant, …). Autonomous systems must be able to operate for extended periods of time with no human direction or interaction. The level of autonomy can be low (such as tele-operation to mimic human movements), medium (the machine carries out a task specified by a human), or high (the machine generates as well as completes the task). More autonomy generally needs more cognitive and reasoning capabilities of the machine.

"In spite of considerable progress in the past two decades, the field of autonomous systems is still in early developmental stages. In particular, further development is needed in the areas of adaptation and learning, intelligent decision-making for fault tolerance, and integration of controls, communications, and computing on a rigorous, theoretically sound foundation.
"For aeronautical vehicles, the "Learn-to-Fly" concept that can use advanced adaptive control techniques and real-time system identification to enable self-learning cooperative control of multiple aircraft that can adapt to a changing environment. "Learn-to-Fly" is a concept that uses of real-time system identification techniques that enable self-learning control systems. The analogy is that of a bird being kicked out the nest and learning to fly before it hits the ground. Increased fidelity of aerodynamic models can realized by quickly identifying functional dependence on non-linear parameters that are masked in current linear models, even during flight tests. This topic supports new and emerging technologies (such as adaptive flight control algorithms, real-time system identification techniques, non-linear aerodynamic modeling, etc.) that must be developed and integrated in order to have a systems solution to the problem. In addition, the rapid growth of the global air transportation network, with autonomous unmanned aerial vehicles (UAVs) expected to operate alongside traditional piloted aircraft, has highlighted the urgent need for developing methods for safe operation in a high-traffic density environment. The issues of trusted autonomy (e.g., the behavior of UAS in the NAS) must be solved from the vehicle systems perspective.

"This topic supports autonomy in its broadest sense with applications to aero, space, science, artificial intelligence, and other applications. Individual projects must show substantial embodiments of relevant disciplines and technologies to communicate system level impact."

Key Technologies:

- Adaptation and learning
- Decision making for fault tolerance
- Integration of controls, communications, and computing
- Self-learning
- Improved fidelity of aerodynamic models
- Adaptive flight control algorithms
- Real-time system identification techniques
- Non-linear aerodynamic modeling
- Scalable NAS

GEORGIA TECH

Center for Robotics and Intelligent Machines at Georgia Tech

http://robotics.gatech.edu/
Director: Henrik I. Christensen
404-385-7480
hic@cc.gatech.edu

"The Center for Robotics and Intelligent Machines at Georgia Tech (RIM@GT) is helping define the new face of computing through a unique emphasis on education and research in robotics. The Center positions Georgia Tech to become a world leader in these promising, revolutionary new technologies. RIM@GT activities leverage the strengths and resources of Georgia Tech by reaching across traditional boundaries to embrace a multidisciplinary approach.

"Basic and applied research is at the heart of RIM@Georgia Tech. The study of basic engineering problems in robotics is central to our work, but equally important is the integration of innovation and discoveries into real-world systems and applications. The exceptionally high quality of our programs, faculty and research are rapidly positioning RIM@Georgia Tech with an international reputation for excellence and innovation in robotics."

Cognitive Engineering Center

Director: Amy Pritchett
404-894-0199
Amy.Pritchett@aerospace.gatech.edu
Karen.Feigh@gatech.edu

"Researchers in the CEC examine human-system integration in complex work environments from theoretical and methodological viewpoints, in the field and in the laboratory, and make substantive contributions to practice. Their research focuses on the analysis, design, and evaluation of complex socio-technical systems of people and technology such as air/ground transportation and military systems. They combines knowledge and experience from the cognitive and computer sciences, human factors, human-

computer interaction, and systems engineering. Human cognitive activities such as planning, decision making, and problem-solving, should be considered early in the systems design process of technology, procedures, or teams. The goals of the field are 1) to provide better integration between human operators and the system so that human operators conduct more effectively and preserve system safely and productivity if unanticipated situations arise, and 2) to consider capabilities and limitations of human cognitive behaviors in the design processes of the system to reduce potential human errors and maximize human performance."

Model-Based Systems Engineering Center

http://mbsec.gatech.edu
Director: Chris Paredis, Jonathan Rogers, Brian German
404-894-5613
Chris.Paredis@me.gatech.edu

"The Model-Based Systems Engineering Center (MBSEC) is part of the Georgia Tech Manufacturing Institute (manufacturing.gatech.edu). It focuses on developing a theoretical foundation for systems engineering. The research covers a broad range of theoretical foundations, from economics, decision theory, game theory, and organization theory to ontologies, formal modeling, simulation and optimization. Systems engineering problems are treated from a socio-technical perspective in a global socio-political and environmental context. Applications include, manufacturing, automotive, heavy equipment, aerospace systems, defense systems and energy systems."

Statistical Machine Learning and Visualization Lab

http://smlv.cc.gatech.edu/
Director: Guy Lebanon
404-997-3735
lebanon@cc.gatech.edu
www.cc.gatech.edu/~lebanon

"The Statistical Machine Learning and Visualization Lab is a research group focused on machine learning and visualization of high dimensional data. Our research emphasizes statistics and computation, and includes both basic research and applied studies."

UAV Research Facility

http://controls.ae.gatech.edu/wiki/UAV_Research_Facility
Director: Eric N. Johnson
404-385-2519
Eric.Johnson@ae.gatech.edu

"The UAVRF performs research to enable highly capable Unmanned Aerial Systems (UAS), aerial robots, and autonomous vehicle systems. Current research topics include:

- Vision aided navigation and control
- Highly capable adaptive control methods with robustness and performance guarantees
- Active environmental perception, obstacle avoidance, and agile low altitude flight

- Integrated guidance, navigation, and control of miniature UAS in cluttered GPS denied environments
- Navigation and estimation theory and sensor fusion
- Decentralized control and management of mobile networks
- Human UAS interaction

"The UAVRF places a strong emphasis on control theoretic research. Flight experimentation is often used for validating developed theory, collecting relevant data, and for motivating new areas of research."

John-Paul Clarke

Aerospace Engineering
404-385-7206
johnpaul@gatech.edu
http://soliton.ae.gatech.edu/people/jpclarke/

Research Areas:

- Air traffic management, aircraft operations, and airline operations
- Optimal control
- Large-scale optimization
- System analysis, design, and optimization application

LSTIP Area 6 Key Technology: Scalable NAS

Mark Costello

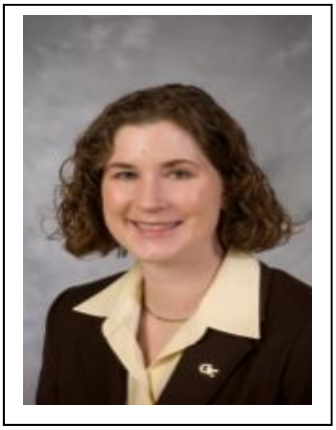
Aerospace Engineering
404-385-4303
mark.costello@aerospace.gatech.edu
http://camm.gatech.edu

Research Areas:

- Dynamic behavior of new air vehicle configurations
- New physical control mechanisms for air vehicles
- New, highly integrated air vehicle sensor systems
- Advanced flight control systems

LSTIP Area 6 Key Technology: Adaptive flight control algorithms

Karen Feigh



Aerospace Engineering
404-385-7686
karen.feigh@aerospace.gatech.edu
www.ae.gatech.edu/people/karen.feigh/

Research Areas:

- Decision support system design
- Computational cognitive modeling for engineering design
- Dynamic socio-technical settings
- Adaptive automation design

LSTIP Area 6 Key Technologies: Scalable NAS; Decision making for fault tolerance

Eric Feron

Aerospace Engineering
404-894-3062
eric.feron@aerospace.gatech.edu
http://www.feron.org/Eric/

Research Areas:

- Control systems,
- Multi-agent operations, including air traffic control systems
- Aerospace software system certification
- Flight mechanics and control involving real-time, embedded systems

LSTIP Area 6 Key Technology: Scalable NAS

Eric N. Johnson

Aerospace Engineering
404-385-2519
eric.johnson@ae.gatech.edu
http://www.ae.gatech.edu/~ejohnson/

Research Areas:

- Adaptive flight control for fault tolerance, including the use of artificial neural networks, with applications for flight safety and reliability
- Vision-based guidance and navigation, including vision-based air-to-air tracking, with applications for small unmanned aircraft
- Digital avionics systems, including hardware and software, for small unmanned aircraft
- Flight testing of guidance, navigation, and control methods on research aircraft

LSTIP Area 6 Technologies: Adaptation and learning; Decision making for fault tolerance; Adaptive flight control algorithms

Panagiotis Tsiotras

Aerospace Engineering
404-894-9526
p.tsiotras@aerospace.gatech.edu
http://www.ae.gatech.edu/~ptsiotra/

Research Areas:

- Autonomous systems, nonlinear and optimal control
- Intelligent path planning with application to autonomous on-board navigation and guidance for aerial, space, and ground unmanned vehicles
- Hardware-driven control specifications and algorithms

LSTIP Area 6 Key Technology: Adaptive flight control algorithms

Vitali Volovoi

Aerospace Engineering
404-894-9811
vitali.volovoi@aerospace.gatech.edu
http://www.ae.gatech.edu/people/vvolovoi/

Research Areas:

- System risk, safety and reliability of complex engineering systems
- Assessment of condition-based and other maintenance policies combined with logistics
- Structural design and optimization in the presence of uncertainties
- Air transportation safety

LSTIP Area 6 Key Technology: Scalable NAS

Frank Dellaert

Computing
404-385-2923
frank.dellaert@cc.gatech.edu
www.cc.gatech.edu/~dellaert/

Research Areas:

- Robotics and computer vision
- Artificial intelligence
- Probabilistic, model-based reasoning paired with randomized approximation

LSTIP Area 6 Key Technologies: Real-time system identification techniques; Decision making for fault tolerance

James Rehg

Computing
404-894-9105
rehg@cc.gatech.edu
http://www.cc.gatech.edu/~rehg/

Research Areas:

- Computer Vision
- Machine learning
- Robotics

LSTIP Area 6 Key Technologies: Adaptation and learning; Self-learning

Polo Chau

Computational Science and Engineering
404-385-7682
polo@gatech.edu
http://www.cs.cmu.edu/~dchau/

Research Areas:

- Machine learning (belief propagation)
- Data mining (anomaly detection)
- Visualization
- User interaction

LSTIP Area 6 Key Technologies: Adaptation and learning; Self-learning

Alexander Gray

Computational Science and Engineering
404-894-6328
agray@cc.gatech.edu
http://www.cc.gatech.edu/~agray/

Research Areas:

- Algorithmic and statistical foundations of machine learning and scientific computing
- New statistical or machine learning methods

LSTIP Area 6 Key Technology: Self-learning

Magnus Egerstedt

Electrical and Computer Engineering
404-894-3484
magnus.egerstedt@ece.gatech.edu
http://users.ece.gatech.edu/~magnus/

Research Areas:

- Optimal Control
- Motion planning and control of (teams of) mobile robots

LSTIP Area 6 Key Technologies: Adaptive flight control algorithms

Ayanna Howard

Electrical and Computer Engineering
404-385-4824
ayanna.howard@ece.gatech.edu
http://users.ece.gatech.edu/ayanna/

Research Areas:

- Humanized Intelligence
- Embedding human cognitive capability into the control path of autonomous systems
- Machine learning

LSTIP Area 6 Key Technologies: Real-time system identification techniques; Self-learning

Patricio Antonio Vela

Electrical and Computer Engineering
404-894-8749
pvela@gatech.edu
http://ivalab.ece.gatech.edu/people/pvela.html

Research Areas:

- Geometric nonlinear control
- Robotics
- Geometric perspectives to control theory and computer vision
- Control of nonlinear systems

LSTIP Area 6 Key Technologies: Adaptive flight control systems; Real-time system identification techniques

Ronald Arkin

Interactive Computing
404-894-8209
arkin@gatech.edu
http://www.cc.gatech.edu/aimosaic/faculty/arkin/

Research Areas:

- Behavior-based reactive control and action-oriented perception for mobile robots and unmanned aerial vehicles
- Hybrid deliberative/reactive software architectures
- Multi-agent robotic systems
- Learning in autonomous systems

LSTIP Area 6 Key Technologies: Adaptation and learning; Machine learning

Aaron Bobick

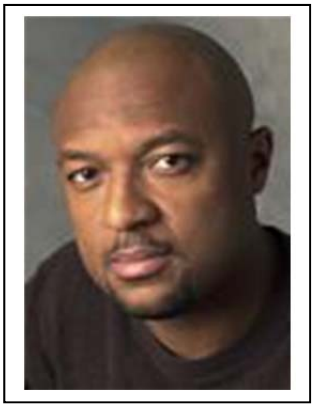
Interactive Computing
404-894-8591
afb@cc.gatech.edu
http://www.cc.gatech.edu/~afb/

Research Areas:

- Computer vision for robots
- Robots understanding how they can interact with objects and people
- Behavior modeling and prediction for collaboration

LSTIP Area 6 Key Technology: Real-time identification techniques

Charles Isbell



Interactive Computing
404-385-6491
isbell@cc.gatech.edu
http://www.cc.gatech.edu/~isbell/

Research Areas:

- Artificial intelligence
- Statistical machine learning to building autonomous agents

LSTIP Area 6 Key Technologies: Adaptation and learning; Self-learning

Mike Stilman

Interactive Computing
650-283-4284
mstilman@cc.gatech.edu
http://www.cc.gatech.edu/~mstilman/

Research Areas:

- Algorithms for planning and control
- Robotic interaction with the physical environment

LSTIP Area 6 Key Technologies: Adaptation and learning; Self-learning

Sundaresan Jayaraman

Materials Science and Engineering
404-894-2461
sundaresan.jayaraman@mse.gatech.edu
http://www.mse.gatech.edu/node/1011

Research Areas:

- Engineering design and development of products and processes
- Knowledge-based decision support systems

LSTIP Area 6 Key Technology: Decision making for fault tolerance

Jonathan Rogers

Mechanical Engineering
404-385-1600
jonathan.rogers@me.gatech.edu
http://me.gatech.edu/faculty/jonrogers

Research Areas:

- Nonlinear estimation and system identification
- Stochastic control and automation
- Modular ground, aerial, and marine robotic systems
- Autonomous vehicle design/optimization

LSTIP Area 6 Key Technologies: Decision making for fault tolerance; Integration of controls, communication, and computing

HAMPTON UNIVERSITY

Chutima Boonthum-Denecke

Computer Science
757-727-5082
Chutima.boonthum@hampton.edu
http://science.hamptonu.edu/compsci/faculty/boonthum.cfm

Research Areas:

- Artificial intelligence (natural language processing, computational logistics)
- Information retrieval
- Web development technology
- Cognitive robotics

LSTIP Area 6 Key Technology: Adaptation and learning

Zhao (Joy) Sun

Electrical and Computer Engineering
757-637-2338
zhao.sun@hamptonu.edu
http://set.hamptonu.edu/electrical/sun_zhao.cfm

Research Areas:

- Dynamic modeling and simulation for complex systems
- Adaptive and intelligent systems
- Robotics and vision systems
- Sensor data fusion
- Fault tolerant flight control
- Energy efficient autonomous soaring
- Modeling, control and management for energy storage and conversion systems

LSTIP Area 6 Key Technologies: Adaptation and learning; Non-linear aerodynamics modeling; Real-time system identification technique

NORTH CAROLINA A&T

Center for Autonomous Control and Information Technology

http://acitcenter.ncat.edu/
Director: Abdollah Homaifar
336-334-3151
homaifar@ncat.edu

"Advances in autonomous control engineering and its application in many diverse fields require interdisciplinary work and collaboration among departments and institutions. The disciplines include, among others, information, control, and energy technology. The Autonomous Control and Information Technology (ACIT) Center foster interdisciplinary work to carry out research and education in this autonomous control engineering and its application. The technology transfer role of the Center includes workshops, seminars and demonstration projects designed to move the new technologies from the laboratory to industry as well as to educate technical personnel and managers on the opportunities and uses of the new technologies. The culmination of these activities will increase regional economic growth fostered by the development, adoption, and effective use of new information, control, and energy technology."

Center for Cooperative Systems

Director: Marwan U. Bikdash
bikdash@ncat.edu

Marwan Bikdash

Computational Science and Engineering
336-334-7437
bikdash@ncat.edu

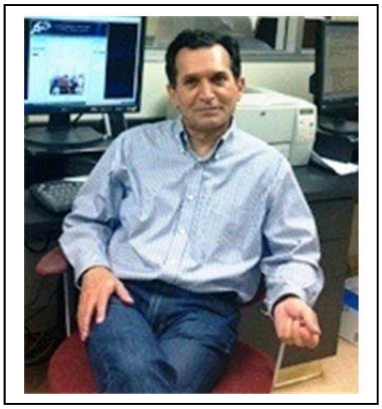
Research Areas:

- Computational modeling of networks of social agents;
- Control, collaboration and decision making via large information systems
- Evolution of behavior in populations under various levels of competition
- Survivable networks

LSTIP Area 6 Key Technology: Decision making for fault tolerance

Abdollah Homaifar

Electrical and Computer Engineering
336-285-3709
homaifar@ncat.edu
http://acitcenter.ncat.edu/Homaifar.html



Research Areas:

- Soft computing
- Multi-agent systems and artificial intelligence
- Image processing and pattern recognition
- Machine learning

LSTIP Area 6 Key Technologies: Adaptation and learning; Self-learning; Real-time system identification techniques

John Kizito

Mechanical Engineering Department
336-285-3747
jpkizito@ncat.edu

Research Areas:

- Computational fluid dynamics
- Flow visualization
- Microgravity fluid physics
- Lunar and Martian fluid physics
- Exploration system
- Thermal radiation modeling
- Thermal management and energy conversion systems
- Aerodynamics and propulsion
- Biophysicochemical hydrodynamics

LSTIP Area 6 Key Technology: Improved fidelity of aerodynamics models

NORTH CAROLINA STATE UNIVERSITY

Active Robotic Sensing Laboratory

http://research.ece.ncsu.edu/aros/
Faculty Advisor: Edgar Lobaton
909-515-5151
edgar.lobaton@ncsu.edu

"The Active Robotic Sensing laboratory (ARoS), directed by Dr. Edgar Lobaton, is located in the department of Electrical and Computer Engineering (ECE) at NCSU. The lab's research focuses on the design of robust techniques for estimation from imaging data, and techniques for motion planning and control of robotic platforms under uncertainty and minimal sensing. Applications areas include autonomous driving, emergency response in disaster sites, surgical medical robotics, security and surveillance, and wildlife environment monitoring."

Advanced Diagnosis, Automation, and Control Lab

http://www.adac.ncsu.edu/
Director: Mo-Yuen Chow
919-515-5405
adac_lab@ncsu.edu

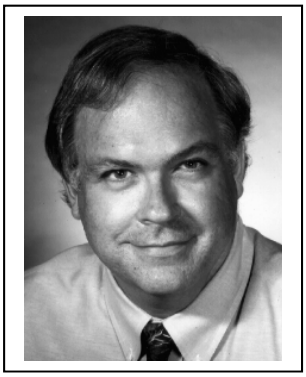
"The ADAC lab, directed by Dr. Mo-Yuen Chow, is located in the Department of Electrical and Computer Engineering (ECE) at North Carolina State University (NCSU). We develop advanced diagnosis, automation, and control technologies at ADAC lab to provide high performance, cost effective, robust and safe solutions to engineering problems. Currently, we are developing (i) Novel secured cooperative distributed control algorithms to seamlessly integrate massive distributed energy sources into power grids in a plug-and-play environment, and (ii) On-line adaptive algorithms to monitor Li-Ion and Lead-acid batteries to provide precise State-of-Charge and State-of-Health estimations of the batteries."

Center for Robotics and Intelligent Machines
http://www.crim.ncsu.edu/
Director: Edward Grant
919-515-7016
egrant@ncsu.edu

"The Center for Robotics and Intelligent Machines (CRIM) was established in 1992 with the mission of fostering increased interaction in the interdisciplinary technologies of advance robotics and intelligent machines research. The CRIM focuses its research themes to meet its mission within the State as well as nationally and internationally. This is being achieved through various programs of evolution, integration,

and collaboration. The changing face of the State's hi-tech industries motivates the CRIM to broaden its research base to include biotechnology and information technology themes, since these industries are expanding quickly within the State and the nation."

Dennis R. Bahler



Computer Science
919-515-3369
bahler@csc.ncsu.edu
http://www4.ncsu.edu/~bahler/

Research Areas:

- Machine learning
- Artifical intelligence and intelligent agents
- Networking and performance evaluation

LSTIP Area 6 Key Technologies: Adaptation and learning, Self-learning

Jon Doyle

Computer Science
919-513-0423
doyle@csc.ncsu.edu
http://www.csc.ncsu.edu/faculty/doyle/

Research Areas:

- Algorithms and theory of computation
- Artifical intelligence and intelligent agents
- Information and knowledge management
- Software engineering and programming languages
- Analytics

LSTIP Area 6 Key Technologies: Adaptation and learning; Self-learning

James C. Lester

Computer Science
919-515-7534
lester@ncsu.edu
http://www.intellimedia.ncsu.edu/people/jlester/

Research Areas:

- Artificial intelligence
- Graphics and human computer interaction

LSTIP Area 6 Key Technology: Self-learning

Mo-Yuen Chow

Electrical and Computer Engineering
919-515-7360
chow@ncsu.edu
http://www4.ncsu.edu/~chow/

Research Areas:

- Network-based distributed control
- Mechatronics and automation
- Computational intelligence
- Mobile robots and unmanned vehicles

LSTIP Area 6 Key Technology: Adaptation and learning

Huaiyu Dai

Electrical & Computer Engineering
919-513-0299
hdai@ncsu.edu
http://www4.ncsu.edu/~hdai/

Research Areas:

- Wireless communications and networks
- Networked information processing
- Wireless security

LSTIP Area 6 Key Technologies: Adaptation and learning; Self-learning

Eddie Grant

Electrical and Computer Engineering
919-515-7016
egrant@ncsu.edu
http://www.crim.ncsu.edu/people/director/dr-eddie-grant

Research Areas:

- Evolutionary control applied to autonomous mobile robot colonies
- Autonomous robot technology
- Self-learning and adaptive robotic colonies using revolutionary computing
- Applied research directed at robot/human relationships

LSTIP Area 6 Key Technologies: Adaptation and learning; Self-learning

Edgar Lobaton

Electrical and Computer Engineering
919-515-5151
edgar.lobaton@ncsu.edu
http://people.engr.ncsu.edu/ejlobato/

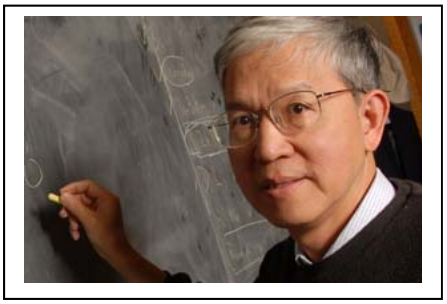
Research Areas:

- Design of robust techniques for estimation from imaging data
- Techniques for motion planning and control of robotic platforms under uncertainty and minimal sensing

LSTIP Area 6 Key Technology: Real-time system identification techniques

Shu-Cherng Fang

Industrial and Systems Engineering
919-515-2192
fang@ncsu.edu
http://www.ise.ncsu.edu/fang/www/fangsc.html



Research Areas:

- Linear and nonlinear programming
- Fuzzy optimization and decision making
- Soft computing and heuristic methods

LSTIP Area 6 Key Technologies: Decision making for fault tolerance

Gregory D. Buckner

Mechanics and Aerospace Engineering
919-515-5270
greg_buckner@ncsu.edu
http://www.pec.ncsu.edu/faculty_staff/buckner/buckner.html

Research Areas:

- Modeling, analysis
- Control of dynamic systems,
- Intelligent control

LSTIP Area 6 Key Technologies: Adaptation and learning

Fen Wu
Mechanics and Aerospace Engineering
919-515-5268
fwu@eos.ncsu.edu
http://www.mae.ncsu.edu/wu/

Research Areas:

- Control theory
- Robust analysis and control
- Structure and control interaction analysis
- Application of advanced control and optimization techniques to aerospace, mechanical and chemical engineering problems

LSTIP Area 6 Key Technology: Adaptive flight control models

OLD DOMINION UNIVERSITY

National Centers for System of Systems Engineering

http://www.odu.edu/ncsose
Principal Staff Scientist: Kevin Adams
757-683-5219
kmadams@odu.edu

"NCSOSE is an Old Dominion University enterprise research center with the mission:
To develop, disseminate, and put into practice methodologies and technologies grounded in systems theory and focused on decision making for multidisciplinary problems.

"The Center has six mission areas that serve to focus capability development, funded research efforts, and scholarship. All mission areas have the common thread of Systems Theory as their underlying conceptual and developmental basis. The six mission areas include:

1. ***System of Systems Engineering*** - developing the formal methodology and tools to effectively address system of systems problems.
2. ***Decision Analysis*** - development of multi-attribute models and simulation for decision support.
3. ***Performance Measurement*** -- development and application of measurement systems of value to a wide variety of enterprises and those enterprise's specific problems.
4. ***Project Management and Scheduling*** -- assisting organizations struggling with the challenges of managing in today's complex project driven environments.
5. ***Systems Education and Training*** - development and delivery of advanced systems education and training to prepare individuals and organizations to deal with complex problems.
6. ***Operational Test and Evaluation*** -- developing test plans responsive to the expectations of tested systems' key stakeholders, especially end-users."

Virginia Modeling, Analysis and Simulation Center

http://www.vmasc.odu.edu/
Director: John Sokolowski
757-686-6215
jsokolow@odu.edu

"The Virginia Modeling, Analysis and Simulation Center (VMASC) is a university-wide multidisciplinary research center that emphasizes modeling, simulation, and visualization (MS&V) research, development and education.

"VMASC concentrates on eight core modeling and simulation applied research areas:

- Transportation
- Homeland Security and Military Defense
- Virtual Environments

- Social Sciences
- Medicine & Health Care
- Game-based Learning
- M&S Interoperability
- System Sciences”

Jiang Li

Electrical and Computer Engineering
757-683-6748
JLi@odu.edu
http://www.ece.odu.edu/~jli/

Research Areas:

- Machine learning
- Neural network
- Modeling and simulation

LSTIP Area 6 Key Technology: Machine learning

Masha Sosonkina

Modeling, Simulation and Visualization Engineering
757-683-6367
msosonki@odu.edu
http://eng.odu.edu/msve/directory/fs/sosonkina.shtml

Research Areas:

- High-performance computing
- Large-scale simulations
- Parallel numerical algorithms
- Performance analysis
- Adaptive algorithms

LSTIP Area 6 Key Technology: Adaptive flight control algorithms

UNIVERSITY OF MARYLAND

Army MAST Collaborative Technology Alliance Center on Microsystems Mechanics

http://www.microsystems.umd.edu/index.php
Lead PI: Inderjit Chopra
301-405-1122
chopra@umd.edu

"The objective of the MAST CTA is to perform enabling research and technology transition to enhance tactical situational awareness in urban and complex terrain by enabling the autonomous operation of a collaborative ensemble of multifunctional, mobile microsystems. To achieve this objective, the Alliance is expected to advance fundamental science and technology in several key areas including:

- Microsystem Mechanics
- Processing for Autonomous Operation
- Microelectronics, and
- Platform Integration"

Autonomous Vehicles Laboratory

http://www.avl.umd.edu/
Director: J. Sean Humbert
301-405-0328
humbert@umd.edu

"The Autonomous Vehicle Laboratory (AVL) is a facility in the Department of Aerospace Engineering, located in the Jeong H. Kim Engineering Bldg, and conducts research and development in the area of biologically inspired robotics. We seek to distil the fundamental sensing and feedback principles that govern locomotive behavior in small organisms that will enable the next generation of autonomous microsystems. Unique capabilities include rapid-prototyping facilities for microsystem fabrication and development, a VICON marker-based visual tracking system that provides direct measurements of 6-DOF vehicle position and orientation for system identification and real-time feedback, a low speed wind tunnel with a specialized high speed camera system for insect tracking and wing kinematics measurement, and advanced hardware and software tools for visual-based simulation of flight systems."

Center for Automation Research

http://www.cfar.umd.edu/
Director: Rama Chellappa
301-405-3656
rama@cfar.umd.edu

The Center for Automation Research includes several other labs. Some of these are:

Computer Vision Lab
http://www.cfar.umd.edu/cvl/
Director: Yiannis Aloimonos
301-405-4526
yiannis@cs.umd.edu

"The Computer Vision Laboratory at the University of Maryland traces its origin back to 1964. It is now a constituent Laboratory of the University's Center for Automation Research."

Graphics and Visual Informatics Laboratory
http://www.cs.umd.edu/gvil/
301-405-6722

"The University of Maryland's Graphics and Visual Informatics Laboratory (GVIL) was established in 2000 by the Department of Computer Science and the University of Maryland Institute for Advanced Computer Studies to promote research and education in computer graphics, scientific visualization, and virtual environments. "

Laboratory for Language and Media Processing
http://lamp.cfar.umd.edu/index.htm
301-405-6444
lamp@cfar.umd.edu

Center for Scientific Computation and Mathematical Modeling (CSCAMM)

http://www.cscamm.umd.edu/
Director: Eitan Tadmor
301-405-0652
info@cscamm.umd.edu

"The primary goal of the Center for Scientific Computation and Mathematical Modeling (CSCAMM) is to foster research and educational activities that highlight novel computational algorithms and mathematical modeling and their interplay with physical science, biological science, and engineering.

"The rapid growth over the past quarter century in the speed and data handling capability of high performance computers has transformed the methodology of scientific investigation. Combined with the development of novel algorithms, scientific computation has not only joined experiment and theory as one of the fundamental tools of investigation, but it has also altered the kind of experiments performed and expanded the scope of theory. The Center for Scientific Computation and Mathematical Modeling (CSCAMM) was created in 2001 by the University of Maryland, College Park (UMd), as a 'major impact' project which aims to address the challenges offered by these scientific developments. CSCAMM encourages cross-fertilization of research activity that lies at the interface between different scientific fields utilizing scientific computation and mathematical modeling. Recent examples of such fields include weather forecasting based on multi-scale modeling/simulations of atmosphere-ocean-land interactions, nano-structures, protein folding and turbulence and transport in fluids and plasma."

Collective Dynamics and Control Laboratory

http://cdcl.umd.edu
Director: Derek A. Paley
301-405-5757
dpaley@umd.edu

"The Collective Dynamics and Control Laboratory (CDCL) conducts research in multi-vehicle control, autonomous vehicles, and bio-inspired collective behavior. Specific research topics include nonlinear control and dynamics, mobile sensor networks, and biocomplexity. Sample research projects include cooperative control of autonomous vehicles in the air and sea, optimal and adaptive sampling of spatiotemporal processes, and quantitative modeling of animal groups. Robotics is a major theme in CDCL research and to support mobile robotics research we have an eighteen camera indoor motion-capture studio and a twelve-camera underwater motion-capture system."

Institute for Systems Research

http://www.isr.umd.edu/home
Director: Reza Ghodssi
ghodssi@umd.edu
301-405-6615

"The Institute for Systems Research is a permanent, interdisciplinary research unit within the A. James Clark School of Engineering at the University of Maryland. Since its beginnings as one of the National Science Foundation's original Engineering Research Centers in 1985, ISR has been at the international forefront of interdisciplinary research and education in the system sciences and systems engineering. ISR attained permanent institute status at the university in 1992 and graduated from the NSF program in 1996. ISR's founding director was Dr. John Baras.

"Because large-scale science requires systems engineering and, conversely, systems engineering and implementation of modern real-world systems doesn't occur without good systems science, ISR develops both basic solution methodologies and tools for systems problems in a variety of different areas. Our advances in the system sciences have been driven by a wide range of complex applications, which have changed over time. ISR's current main research areas are:

- Communication systems and networks
- Control systems and methodologies
- Neuroscience and biology-based technology
- Micro and nano devices and systems; robotics
- Design, operations and supply chain management
- Systems engineering methodologies
- Computing, speech, artificial intelligence, data mining"

The Institute has many related centers and labs. Some of these are:

Maryland Robotics Center
http://robotics.umd.edu/index.php
Director: Nuno Martins
301-405-9198
nmartins@umd.edu

"An interdisciplinary research center housed in the Institute for Systems Research within the A. James Clark School of Engineering. The mission of the center is to advance robotic systems, underlying component technologies, and applications of robotics through research and educational programs that are interdisciplinary in nature and based on a systems approach."

Micro Robotics Lab
http://terpconnect.umd.edu/~sarahb/
Director: Sarah Bergbreiter
301-405-6506
sarahb@umd.edu

"Our vision is to engineer a new class of networked centimeter and millimeter sized mobile robots. To accomplish this goal, we are working on many important aspects of this problem from microrobotic locomotion to low power and efficient actuators to novel fabrication techniques. We hope to adapt the technologies that go into these tiny robots for use in medicine, consumer electronics, and science."

Simulation-Based System Design Laboratory
http://www.simulation.umd.edu/index.php
Director: Jeffrey Herrmann
301-405-5433
jwh2@umd.edu

"Our research objective is to develop, test, and implement effective and efficient simulation techniques for modeling, evaluating, and optimizing systems in order to improve decision-making throughout the system development life cycle. Simulation is an important tool for modeling and predicting the performance of systems when analytical models do not exist or perform poorly. In addition, simulation provides powerful ways to visualize the behavior of a complex system before it is constructed."

Smart Materials & Structures Research Center

http://www.smsrc.umd.edu/
Director: Amr Baz
301-405-5216
baz@umd.edu

"The Smart Materials and Structures Research Center (SMSRC) was formed in 1994 to catalyze the development of existing and new smart materials and structures technologies, and to educate a new generation of multidisciplinary engineers in the Department of Mechanical Engineering. The SMSRC has since grown to include six faculty members and thirty graduate students, with an annual research budget exceeding $1.5M from a variety of governmental and industrial sponsors."

University of Maryland Institute for Advanced Computer Studies

http://www.umiacs.umd.edu/
Director: Amitabh Varshney
varshney@cs.umd.edu
301-405-6722

"Our mission is to foster and enhance basic and interdisciplinary research programs in computing across the University of Maryland at College Park. The success of UMIACS in catalyzing and excelling in interdisciplinary applications of computing is often attributed to: (1) identification and focus on grand challenge applications of computing with significant societal impact, (2) identifying and incentivizing outstanding faculty to excel in their research through rotating appointments, and (3) mediating interaction amongst interdisciplinary researchers through an outstanding computational infrastructure. We have developed the skill set and culture necessary for building strong interdisciplinary research programs, providing advanced computing research infrastructure, and first-rate technical support, which have greatly facilitated our national and international leadership role in multi-disciplinary computing. Our research programs are led by an outstanding group of distinguished scholars across the UMD College Park campus. Since computing is at the core of all the Institute's activities, UMIACS has a uniquely close relationship with the highly regarded Department of Computer Science."

James E. Hubbard, Jr.

Aerospace Engineering
757-325-6830
juhubbard@nianet.org
jhubbar2@umd.edu
http://www.morpheus.umd.edu/index.php

Research Areas:

- Closed loop flow control using conformal sensors and synthetic jets
- Aerodynamic modeling
- Adaptive control

LSTIP Area 6 Key Technologies: Adaptive flight control algorithms; Non-linear aerodynamic modeling

J. Sean Humbert

Aerospace Engineering
301-405-0328
humbert@umd.edu
http://www.aero.umd.edu/facstaff/fac-profiles/humbert-sean.html

Research Areas:

- Distributed sensing and sensory processing (wide-field integration)
- Low-power, lightweight arrayed MEMS and analog VLSI based avionics
- Flapping, rotary, and fixed wing flight mechanics
- Stability and control
- Insect-inspired mechanisms for gust rejection and compensation
- Autonomous guidance, navigation, and collision avoidance
- Integration of embedded hardware/software systems and communications
- Adaptive learning and control
- Path planning and autonomous decision

LSTIP Area 6 Key Technologies: Adaptation and learning; Integration of controls, communications and computing; Self-learning

Darryll J. Pines

Aerospace Engineering
301-405-0263
pines@umd.edu
http://www.aero.umd.edu/facstaff/dean-pines.html

Research Areas:

- Smart structures
- Structural dynamics and control
- Guidance, navigation, and control of aerospace vehicles

LSTIP Area 6 Key Technology: Adaptive flight control algorithms

Derek A. Paley

Aerospace Engineering
301-405-5757
dpaley@umd.edu
http://cdcl.umd.edu/

Research Areas:

- Nonlinear dynamics and controls
- Cooperative control of autonomous vehicles

LSTIP Area 6 Key Technology: Integration of controls, communications and computing

Yiannis Aloimonos

Computer Science
301-405-4526
yiannis@cs.umd.edu
http://www.cfar.umd.edu/~yiannis/

Research Areas:

- Artificial intelligence
- Vision
- Robotics
- Learning
- Neuro-informatics

LSTIP Area 6 Key Technologies: Adaptation and learning; Self-learning

Hector Corrada Bravo

Computer Science
301-405-2481
hcorrada@umiacs.umd.edu
http://www.cbcb.umd.edu/~hcorrada/

Research Areas:

- Computational Genomics
- Bioinformatics
- Machine Learning
- Computational Statistics
- Numerical Optimization

LSTIP Area 6 Key Technologies: Adaptation and learning; Self-learning

Hal Daumé

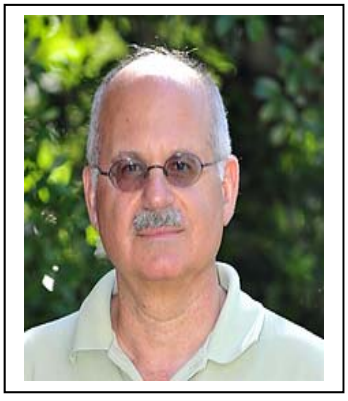
Computer Science
301-405-1073
hal@umiacs.umd.edu
http://www.umiacs.umd.edu/~hal/

Research Areas:

- Natural language processing
- Machine learning
- Bayesian statistics
- Computational linguistics

LSTIP Area 6 Key Technologies: Adaptation and learning; Self-learning

Larry Davis



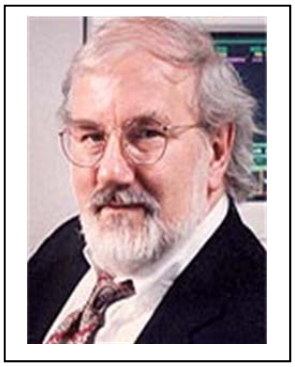
Computer Science
301-405-6718
lsd@umiacs.umd.edu
http://www.umiacs.umd.edu/~lsd/

Research Areas:

- Computer vision
- Artificial intelligence
- High performance computing

LSTIP Area 6 Key Technologies: Adaptation and learning

Gilmer L. Blankenship



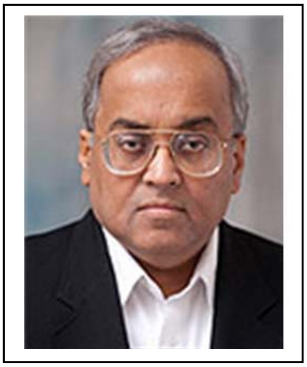
Electrical and Computer Engineering
301-405-3632
gilmer@umd.edu
http://www.ece.umd.edu/faculty/gilmer.html

Research Areas:

- Stochastic and nonlinear control
- Adaptive control
- AI in engineering design

LSTIP Area 6 Key Technology: Adaptation and learning

P.S. Krishnaprasad



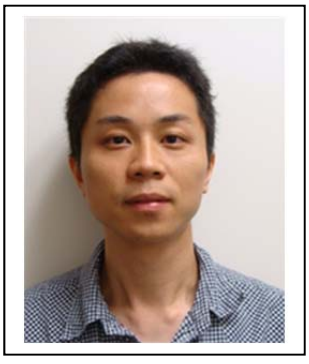
Electrical and Computer Engineering
301-405-6843
Krishna@umd.edu
http://www.isr.umd.edu/~krishna/bio.htm

Research Areas:

- Geometric control theory
- Problems of modeling, design, motion planning, and control arising in mobile robotics
- Geometric methods in nonlinear dynamics
- Intelligent control architectures
- Integration of actuators and sensors in control networks

LSTIP Area 6 Key Technology: Integration of controls, communications, and computing

Chaochao Chen



Mechanical Engineering
301-405-5331
chaochao@umd.edu

Research Areas:

- Fault diagnosis
- Failure prognosis
- Machine learning and statistical methods
- Prediction uncertainty management
- Fault tolerant control and their applications to robotics, power electronics, and various mechanical systems

LSTIP Area 6 Key Technologies: Adaptation and learning; Self-learning; Adaptive flight control algorithms

Nikhil Chopra

Mechanical Engineering
301-405-7011
nchopra@umd.edu
http://terpconnect.umd.edu/~nchopra/Site/Home.html

Research Areas:

- Control theory
- Robotics
- Bilateral tele-operation
- Synchronization theory

LSTIP Area 6 Key Technology: Adaptive flight control algorithms

Jin-Oh Hahn

Mechanical Engineering
301-405-7864
jhahn12@umd.edu
http://terpconnect.umd.edu/~jhahn12/index.htm

Research Areas:

- System dynamics and control
- System identification
- Condition monitoring and fault diagnostics
- Multi-sensor fusion and signal processing

LSTIP Area 6 Key Technology: Adaptive flight control algorithms

UNIVERSITY OF VIRGINIA

Center for Risk Management of Engineering Systems

http://www.sys.virginia.edu/risk/about.html
Director: Yacov Y. Haimes
risk@virginia.edu
434-924-0960

"Center for Risk Management of Engineering Systems was founded by the University of Virginia in 1987 by the Council of Higher Education in Virginia as a University-wide resource. It develops theory, methodology and technology to assist in the management of risk for a variety of engineering systems. Working closely with faculty and students at the center, industry and government sponsors of research contribute their unique strengths and interests.

"The mission of UVa's Center for Risk Management of Engineering Systems (the Center) is to develop theory, methodology, and technology to assist in the management of risk for a variety of engineering systems. Industry and government sponsors of research at the Center contribute their unique strengths and interests. They share their experience and work closely with faculty and students on a broad range of ongoing projects. Center areas of expertise include the following:

- Collaborative risk modeling and assessment
- Large-scale and complex hierarchical systems
- Critical infrastructure protection
- Defense and civil infrastructure systems
- Infrastructure interdependencies, including multiregional and cross-regional analysis
- Geographic information system (GIS)-based analyses
- Strategic preparedness and regional resilience
- Multimodal transportation planning and transportation safety
- Business and operations decision making and processes
- Digital identity management in emergency response
- Information assurance and Command, Control, Communications, Computers, Intelligence, Surveillance and Reconnaissance (C4ISR)
- Safety- and mission-critical systems
- Transportation systems
- Computer-based systems, including hardware and software performance and reliability
- Reliability modeling of multiple failure modes in complex systems
- Environmental impacts
- Water resources and technology management

"The Center is unique in many ways, including:

- Its cross-disciplinary range within and beyond engineering.

- It is one of the few in the country to apply risk assessment and management to engineering and technology-based systems.
- Experienced since 1987, the Center is in a strategic position to evaluate and manage risk in a broad scope of technology-based systems."

Brian Park

Civil & Environmental Engineering
434-924-6347
bp6v@virginia.edu
http://cts.virginia.edu/Park.htm

Research Areas:

- Intelligent transportation systems evaluation using simulation model
- Connection vehicle technology applications
- Stochastic optimization of traffic signal timing plan

LSTIP Area 6 Key Technology: Scalable NAS

Brian Smith

Civil & Environmental Engineering
434-924-8585
briansmith@virginia.edu
http://cts.virginia.edu/Park.htm

Research Areas:

- Intelligent transportation systems
- Advanced transportation management

LSTIP Area 6 Key Technology: Scalable NAS

John Knight

Computer Science Engineering
434-982-2214
knights@cs.virginia.edu
http://cs.virginia.edu/~jck/

Research Areas:

- Dependable computing

LSTIP Area 6 Key Technology: Real-time system identification techniques

Worthy Martin

Computer Science
434-982-2202
martin@virginia.edu
http://www.cs.virginia.edu/people/faculty/martin.html

Research Areas:

- Computer vision
- Robotics
- Image databases
- Artificial intelligence

LSTIP Area 6 Key Technology: Adaptation and learning

Zongli Lin

Electrical & Computer Engineering
434-924-6342
zl5y@virginia.edu
http://people.virginia.edu/~zl5y/

Research Areas:

- Nonlinear control
- Robust control
- Control applications

LSTIP Area 6 Key Technology: Adaptive flight control systems

Gang Tao

Electrical & Computer Engineering
434-924-4586
gt9s@virginia.edu
http://www.people.virginia.edu/~gt9s

Research Areas:

- Intelligent robots
- Adaptive estimation and control
- Adaptive fault detection
- Fault tolerant control

LSTIP Area 6 Key Technology: Adaptation and learning

Laura Barnes

Systems & Information Engineering
434-924-1723
lbarnes@virginia.edu
http://people.virginia.edu/~lb3dp/index.html

Research Areas:

- Decision support systems
- Intelligent systems
- Robotics

LSTIP Area 6 Key Technology: Decision making for fault tolerance

Peter A. Beling

Systems & Information Engineering
434-982-2066
pb3a@virginia.edu
http://people.virginia.edu/~pb3a/homepage.html

Research Areas:

- Multi-instance learning
- Inverse reinforcement learning
- Optimization theory and practice
- Coordination of distributed decision making

LSTIP Area 6 Key Technologies: Adaptation and learning; Decision making for fault tolerance; Self-learning

Randy Cogill

Systems & Information Engineering
434- 924-4488
rlc9s@virginia.edu
people.virginia.edu/~rlc9s/

Research Areas:

- Stochastic control
- Optimization
- Statistical learning
- Networks and communications

LSTIP Area 6 Key Technology: Integration of controls, communications, and computing

Barry Horowitz

Systems & Information Engineering
434-924-0306
bh8e@virginia.edu
http://www.sys.virginia.edu/people.bh.html

Research Areas:

- Systems integration

LSTIP Area 6 Key Technology: Integration of controls, communications, and computing

Amy LaViers

Systems & Information Engineering
434-924-7460
alaviers@virginia.edu
http://people.virginia.edu/~ael8a/

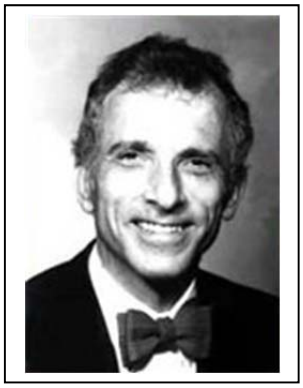
Research Areas:

- Robotics and control
- Dynamic Spectral Clustering

LSTIP Area 6 Key Technology: Scalable NAS

Roman Krzysztofowicz

Systems & Information Engineering
434-982-2067
rk@virginia.edu
http://www.faculty.virginia.edu/rk/



Research Areas:

- Bayesian decision theory
- Decision, risk, and reliability analyses
- Multi-objective decision making
- Decision support systems

LSTIP Area 6 Key Technology: Decision making for fault tolerance

VIRGINIA TECH

Computational Multiphysics Systems Laboratory

http://www.cmsvt.org/

Director: Tomonari Furukawa
434-766-6632
tomonari@vt.edu

"The Computational Multiphysics Systems Laboratory recently joined the Center for Vehicle Systems & Safety. The laboratory investigates "the analysis and synthesis of computational multiphysics systems which range from deformable bodies studied in computational and experimental mechanics to rigid bodies studied in robotics."

Material Characterization

1. Full-field strain measurements
2. Online stochastic characterization of composites
3. Online damage prediction of composites

Structural Health Monitoring (SHM) and Non-Destructive Evaluation (NDE)

1. Stochastic defect identification under sensor uncertainties
2. Hybrid SHM/NDE method for defect identification
3. Hybrid material/geometry method for micro-crack identification

Bayesian Robotics

1. Simultaneous Localization and Mapping (SLAM)
2. Robotic monitoring of indoor environments
3. Autonomous Bayesian search and tracking (SAT)
4. Cooperative search, tracking, localization and mapping (STLAM)
5. Platform- and hardware-in-the-loop simulator (PHILS)
6. Non-line-of-sight localization

Autonomous Vehicles

1. Autonomous mini ground vehicles
2. Autonomous rotary-wing MAVs (MAVSTAR) Large unmanned ground vehicles
3. Visualization of flapping-wing MAVs"

Robotics & Mechanisms Laboratory (RoMeLa)

http://www.romela.org/main/Robotics_and_Mechanisms_Laboratory

Director: Dennis Hong
540-231-7195
dhong@vt.edu

"RoMeLa is a unique laboratory dedicated to advancing robotics through research and education, where graduate and undergraduate students, post docs and visiting researchers all work closely together as a team."

Virginia Center for Autonomous Systems

http://www.unmanned.vt.edu/

Director: Craig A. Woolsey
540-231-8117
cwoolsey@vt.edu

"The Virginia Center for Autonomous Systems (VaCAS) is an ICTAS/College of Engineering research center which facilitates interdisciplinary research in autonomous systems technology. VaCAS hosts research activities spanning every application domain: water, land, air, and space. VaCAS member research activities range from fundamental control theory to vehicle development to applications for science, security, and commerce.

"The primary purpose of the Virginia Center for Autonomous Systems is to advocate and support a broad range of basic and applied interdisciplinary research activities related to autonomous system technology. VaCAS hosts research activities spanning every application domain: water, land, air, and space. Member research activities range from fundamental control theory to vehicle development to applications for science, security, and commerce. Although VaCAS research activities span a broad range of topics, they are universally characterized by rigorous methodology applied to real-world challenges in autonomous systems.

"Research focus areas include:

- Advanced vehicle guidance and control
- Advanced sensing and navigation
- Advanced mobility and actuation
- Vehicle dynamic modeling and analysis
- Vehicle design"

Mazen H. Farhood

Aerospace & Ocean Engineering
540-231-2983
farhood@vt.edu
http://www.dept.aoe.vt.edu/~farhood/Main.html

Research Areas:

- Cooperative control in complex environments
- Integrate robust feedback control methods into the design and construction of multi-vehicle systems to ensure operational networks despite disturbances, communication latency and packet loss, obstacles in an uncertain environment, and model uncertainties

LSTIP Area 6 Key Technology: Integration of controls, communications, and computing

Craig Woolsey

Aerospace & Ocean Engineering
540-231-8117
cwoolsey@vt.edu
http://www.dept.aoe.vt.edu/~cwoolsey/

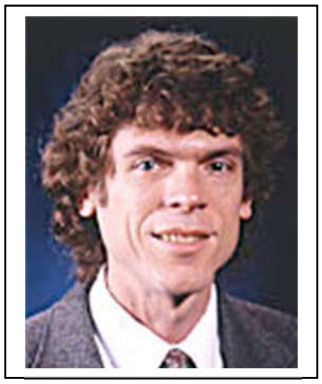
Research Areas:

- Dynamics and control
- Nonlinear control of mechanical systems
- Autonomous vehicle dynamics and control

LSTIP Area 6 Key Technology: Adaptive flight control systems

A. Lynn Abbott

Electrical & Computer Engineering
540-231-4472
abbott@vt.edu
www.ece.vt.edu/faculty/abbott.php



Research Areas:

- Computer vision
- Image processing
- Sensing for autonomous vehicles

LSTIP Area 6 Key Technology: Real-time system identification

Dhruv Batra

Electrical & Computer Engineering
540-231-7561
dbatra@vt.edu
http://filebox.ece.vt.edu/~dbatra/

Research Areas:

- Machine learning
- Computer vision

LSTIP Area 6 Key Technologies: Self-learning; Real-time system identification

Devi Parikh

Electrical & Computer Engineering
540-231-6714
parikh@vt.edu
http://filebox.ece.vt.edu/~parikh/

Research Areas:

- Computer vision
- Machine learning
- Pattern recognition
- Artificial intelligence

LSTIP Area 6 Key Technologies: Adaptation and learning; Self-learning; Real-time system identification

Yue Wang (Joseph)

Electrical & Computer Engineering
571-858-3150
yuewang@vt.edu
http://www.ece.vt.edu/faculty/ywang.php

Research Areas:

- Machine learning
- Pattern recognition
- Signal/image processing

LSTIP Area 6 Key Technology: Self-learning

Guoqiang Yu

Electrical & Computer Engineering
571-858-3153
yug@vt.edu
http://www.ece.vt.edu/faculty/gyu.php

Research Areas:

- Machine learning
- Pattern recognition
- Signal and image processing

LSTIP Area 6 Key Technologies: Adaptation and learning; Self-learning; Real-time system identification

Kevin Kochersberger
Mechanical Engineering
540-231-5589
kbk@vt.edu
http://www.me.vt.edu/_bios/_primary/kochersberger_bio.html

Research Areas:

- Dynamics and control
- Autonomous aerial systems
- Applied aerodynamics
- Unmanned aerial sensing and sampling
- Morphing wing aircraft design

LSTIP Area 6 Key Technology: Non-linear aerodynamic models

WILLIAM & MARY

Mark Hinders

Applied Sciences
757-221-1519
hinders@wm.edu
http://as.wm.edu/Faculty/Hinders.html

Research Areas:

- Intelligent robotics
- Remote sensing
- Non-destructive evaluation

LSTIP Area 6 Key Technologies: Adaptation and learning; Real-time system identification techniques

LSTIP Area 7: Simulation Based Engineering and Science (SBES) for Invention and Discovery

"The massive improvements in cyber capabilities will enable solution of today's grand challenges in science and engineering and allow rapid evaluation of new concepts to realize tomorrow's technical capabilities. The broad application of physics based simulation, big data synthesis, data analytics, and artificial intelligence technologies can reduce the cost and accelerate development of agency missions from concept to flight. The Digital Twin topic is an early instantiation of simulation based engineering over the life cycle of a vehicle. This topic, SBES, is the application of advanced cyber capabilities to all science and technology R&D. For example, SBES will reduce and in some cases eliminate physical experimentation in R&D.

"SBES enables more rapid advancements in discipline and system level design and can drastically lower the cost and increase the pace of NASA missions. Work to build computers operating at exaflops (quintillion [10^{18}] floating point operations per second) is already underway. Solving the power and memory challenges for the hardware is not the subject of this topic. Instead, SBES focuses on the computational environment, e. g., the computational models and computer science issues to fully harness the power of these and faster computers (e.g. quantum computers) that require different methods than used heretofore in aerospace simulations. Discipline and multi-disciplinary challenges in flow physics simulation including direct computation of turbulence, computational synthesized materials and climate modeling including positive feedbacks are a few of the aerospace applications.

"Global SBES infrastructure coupled with cyber technology experts can increase the pace of invention and discovery. Massive data collection and synthesis (data analytics) and computers now approaching human intelligence are transforming engineering paradigms. Utilization of these artificial intelligence tools has the potential to drastically change the way information is stored and retrieved. This topic supports early-stage concepts and technology to begin harnessing advanced cyber capabilities to transform the R&D environment."

Key Technologies:

- Physics-based models and simulation
- Multi-scale models and simulation
- Data synthesis
- Data analytics
- Artificial intelligence
- Quantum computers
- Computer science

GEORGIA TECH

Foundations of Data and Visual Analytics

http://fodava.gatech.edu/
Director: Haesun Park
404-385-2170
hpark@cc.gatech.edu

"FODAVA emphasizes foundational research in data and visual analytics. It collaborates with NVAC in research and educational opportunities. The FODAVA initiative also helps build a community for data and visual analytics that integrates researchers from disparate fields while broadening the field of research."

Model-Based Systems Engineering Center

http://mbsec.gatech.edu
Director: Chris Paredis, Jonathan Rogers, Brian German
404-894-5613
Chris.Paredis@me.gatech.edu

"The Model-Based Systems Engineering Center (MBSEC) is part of the Georgia Tech Manufacturing Institute (manufacturing.gatech.edu). It focuses on developing a theoretical foundation for systems engineering. The research covers a broad range of theoretical foundations, from economics, decision theory, game theory, and organization theory to ontologies, formal modeling, simulation and optimization. Systems engineering problems are treated from a socio-technical perspective in a global socio-political and environmental context. Applications include, manufacturing, automotive, heavy equipment, aerospace systems, defense systems and energy systems."

P. K. Yeung

Aerospace Engineering
404-894-9341
pk.yeung@aerospace.gatech.edu
http://www.ae.gatech.edu/people/pyeung/

Research Areas:
- Turbulence: structure, mixing, and dispersion
- Advanced computing and cyberinfrastructure
- Highly scalable and massively parallel computational algorithms

LSTIP Area 7 Key Technologies: Physics-based models and simulation; Multi-scale models and simulation

David S. Citrin

Electrical & Computer Engineering
404-385-1579
citrin@ece.gatech.edu
http://www.ece.gatech.edu/faculty-staff/fac_profiles/bio.php?id=22

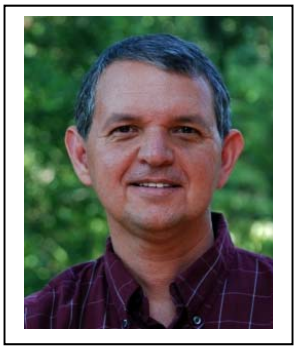
Research Areas:

- Quantum optics
- Nonlinear optical properties of semiconductor materials and devices
- Quantum computing
- Ultrahigh speed all-optical switching
- Terahertz technology

LSTIP Area 7 Key Technology: Quantum computers

Greg Turk

Interactive Computing
404-894-7508
gregory.turk@cc.gatech.edu
http://www.cc.gatech.edu/~turk/



Research Areas:

- Computer graphics related to 3D model creation and rendering
- Image-driven model simplification method
- Vector field visualization
- Texture synthesis

LSTIP Area 7 Key Technology: Visualization of sensor data

Seung-Kyum Choi

Mechanical Engineering
404-894-9218
schoi@me.gatech.edu
http://www.me.gatech.edu/faculty/choi

Research Areas:

- Reliability-based systems design
- Probabilistic risk assessment
- Uncertainty representation and quantification
- Decision-based design
- Multiscale modeling under uncertainty
- Optimal design of cellular structures

LSTIP Area 1 Key Technologies: Decision support tools; Lightweight multifunctional structures

Surya Kalidindi

Mechanical Engineering
404-385-2886
surya.kalidindi@me.gatech.edu
http://www.me.gatech.edu/faculty/kalidindi

Research Areas:

- Physics-based multi-scale models
- Computational mechanics and materials science
- Microstructure sensitive design
- Data analytics
- Materials knowledge systems
- Cyberinfrastructure for materials innovation

LSTIP Area 7 Key Technologies: Physics-based models and simulation; Multi-scale models and simulation; Data analytics

Chris Paredis

Mechanical Engineering
404-894-5613
Chris.Paredis@me.gatech.edu
http://www.mbsec.gatech.edu/users/cparedis

Research Areas:

- Model-based systems engineering
- Decision theory and game theory
- Theoretical foundations of systems engineering
- Complex systems design
- System architecture
- Modeling and simulation

LSTIP Area 7 Key Technology: Physics-based models and simulation

Yan Wang

Mechanical Engineering
404-894-4714
yan.wang@me.gatech.edu
http://www.me.gatech.edu/~ywang

Research Areas:

- Multiscale modeling & simulation
- Multiscale product-materials design
- Cyber infrastructure and design informatics
- Uncertainty quantification and decision making
- Quantum scientific computing

LSTIP Area 7 Key Technologies: Physics-based models and simulation; Multi-scale models and simulation

Michael Chapman
Physics
404-894-5223
michael.chapman@physics.gatech.edu
http://chapmanlabs.gatech.edu/

Research areas:

- Nonlinear optics
- Quantum optics
- Contemporary quantum mechanics
- Fundamental atom-photon interactions
- Atom optics and interferometry

LSTIP Area 7 Key Technology: Quantum computers

HAMPTON UNIVERSITY

Chutima Boonthum-Denecke
Computer Science
757-727-5082
chutima.boonthum@hamptonu.edu
http://science.hamptonu.edu/compsci/faculty/index.cfm?bio=chutima.boonthum

Research Areas:

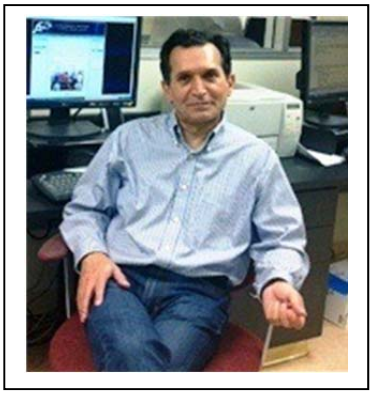
- Natural language processing
- Intelligent tutoring system
- Information retrieval
- Cognitive robotics

LSTIP Area 7 Key Technology: Artificial intelligence

NORTH CAROLINA A&T

Abdollah Homaifar

Electrical & Computer Engineering
336-285-3709
Homaifar@ncat.edu
http://www.ncat.edu/academics/schools-colleges1/coe/caee/people/abdollah-homaifar.html



Research Areas:

- Machine learning
- Expert systems
- Stochastic control and estimation
- Signal processing
- Microprocessor applications
- Robotics
- Computer simulations

LSTIP Area 7 Key Technologies: Physics-based models and simulation; Multi-scale models and simulation

Gary L. Lebby

Electrical & Computer Engineering
336-334-7761
lebby@ncat.edu

Research Areas:

- Neural networks
- Radial basis function networks
- Electric loads
- Electric power generation
- Backpropagation
- Heuristic methods
- Computer simulation
- Pattern recognition
- Learning systems

LSTIP Area 7 Key Technologies: Physics-based models and simulation; Multi-scale models and simulation

Gerry Vernon Dozier

Computer Science
336-334-7245 ext. 467
gvdozier@ncat.edu
http://aci2.ncat.edu/gvdozier/

Research Areas:

- Artificial & computational intelligence
- Genetic & evolutionary computing
- Security anomaly detection systems

LSTIP Area 7 Key Technology: Artificial intelligence

Ram V. Mohan

Nanoengineering
336-285-2867
rvmohan@ncat.edu
http://jsnn.ncat.uncg.edu/faculty/ram-v-mohan-ph-d/

Research Areas:

- Computational multi-physics/multi-scale modeling and simulation
- Computational mechanics, nanomechanics, and material sciences
- Processing, mechanics, characterization, and computational modeling of multi-scale composite and nanoengineered material systems
- Computational modeling of bio and nano systems, interfaces, and interactions
- Flow and thermal behavior during composite material processing
- High performance, scalable scientific computing and engineering product visualization

LSTIP Area 7 Key Technologies: Physics-based models and simulation; Multi-scale models and simulation

John Kizito

Mechanical Engineering Department
336-285-3747
jpkizito@ncat.edu

Research Areas:

- Computational fluid dynamics
- Flow visualization
- Lunar and Martian fluid physics
- Exploration system
- Thermal radiation modeling
- Thermal management and energy conversion systems
- Aerodynamics and propulsion
- Biophysicochemical hydrodynamics

LSTIP Area 7 Key Technology: Physics-based models and simulation; Multi-scale models and simulation

NORTH CAROLINA STATE UNIVERSITY

Center for Research in Scientific Computation

http://www.ncsu.edu/crsc/
Director: H.T. Banks
919-515-5289
contactcrsc@lists.ncsu.edu

"The Center for Research in Scientific Computation (CRSC) is a formally recognized, multidisciplinary center administered by North Carolina State University. Its purpose is to foster research in scientific computing and provide a focal point for research in computational science, engineering and applied mathematics."

Institute for Advanced Analytics

http://analytics.ncsu.edu/
Director: Michael Rappa
919-513-3940
analytics @ ncsu.edu

"The Institute for Advanced Analytics has been preparing data savvy professionals for leadership in a digital world since 2007. Our mission is to produce the world's finest practitioners of analytics — individuals who have mastered complex methods and tools for large-scale data modeling, who have a passion for solving challenging problems through teamwork, who are guided by intellectual curiosity, honesty and integrity, and who strive to attain the highest level of professionalism through continuous self-improvement.

'The goal of analytics is to derive and effectively communicate actionable insights from a vast quantity and variety of data. It covers a broad spectrum of activities, including data management and quality, mathematical and statistical methods for data modeling, and techniques for visualizing data in support of enterprise-wide decision making. Driving analytics is the unprecedented amount of data available today. There is a pressing need for professionals with strong quantitative skills coupled with an understanding of how analytics can be applied with speed and accuracy to the critical challenges facing organizations."

Murthy N. Guddati

Civil, Construction, & Environmental Engineering
919-515-7699
murthy.guddati@ncsu.edu
http://www.ce.ncsu.edu/faculty/murthy-guddati/

Research Areas:

- Multiscale modeling and finite element methods
- Wave propagation and structural dynamics
- Subsurface imaging including nondestructive evaluation
- Solid mechanics: constitutive modeling including fatigue
- Computational science: domain decomposition methods

LSTIP Area 7 Key Technology: Multi-scale models and simulation

William Rasdorf

Civil, Construction, & Environmental Engineering
919-515-7637
no-email@noreply.edu
http://www.ce.ncsu.edu/faculty/william-rasdorf/

Research Areas:

- Computer-aided engineering
- Engineering databases and information processing and technology
- Modeling of engineering objects, processes, assemblies, and phenomena
- Integration among engineering processes and information systems
- Computer-aided design and geometric and spatial modeling and analysis in engineering

LSTIP Area 7 Key Technology: Physics-based models and simulation

Jon Doyle

Computer Science
919-513-0423
doyle@csc.ncsu.edu

Research Areas:

- Algorithms and Theory of Computation
- Artificial Intelligence and Intelligent Agents
- Advanced Learning Technologies
- Electronic Commerce
- Information and Knowledge Management

LSTIP Area 7 Key Technology: Artificial intelligence

James C. Lester

Computer Science
919-515-7534
lester@ncsu.edu
http://www.intellimedia.ncsu.edu/people/jlester/

Research Areas:

- Artificial Intelligence and Intelligent Agents
- Advanced Learning Technologies
- Graphics and Human Computer Interaction

LSTIP Area 7 Key Technology: Artificial intelligence

Michael Rappa

Computer Science
919-513-0480
mrappa@ncsu.edu
http://www.csc.ncsu.edu/people/mrappa

Research Areas:

- Advanced learning technologies
- Electronic commerce
- Information and knowledge management
- Analytics

LSTIP Area 7 Key Technology: Data analytics

David L. Roberts

Computer Science
919-513-7182
robertsd@csc.ncsu.edu
http://www.csc.ncsu.edu/faculty/robertsd/

Research Areas:

- Artificial Intelligence and Intelligent Agents
- Advanced Learning Technologies
- Graphics and Human Computer Interaction
- Computer and Video Games
- Analytics

LSTIP Area 7 Key Technologies: Data analytics; Artificial intelligence

Robert St. Amant

Computer Science
919-515-7938
stamant@csc.ncsu.edu
http://www4.ncsu.edu/~stamant/

Research Areas:

- Human-computer interaction
- Artificial intelligence
- Intelligent user interfaces
- Statistical expert systems

LSTIP Area 7 Key Technology: Artificial intelligence

James R. Wilson

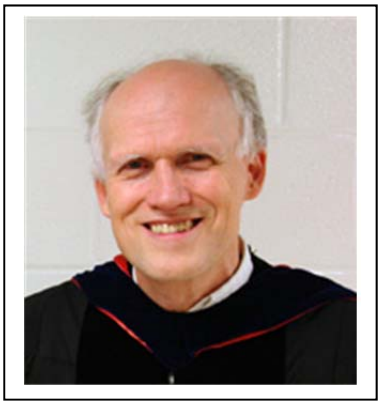
Industrial & Systems Engineering
(919) 515-6415
jwilson@ncsu.edu
http://www.ise.ncsu.edu/jwilson/

Research Areas:

- Probabilistic and statistical issues in the design and analysis of large-scale simulation experiments
- Modeling, estimation, and generation of stochastic input processes
- Analysis of output processes
- Improving simulation efficiency using variance reduction techniques
- Optimization using multiple-comparison and search procedures

LSTIP Area 7 Key Technology: Physics-based models and simulation

Aloysius G. Helminck



Mathematics
919-515-7720
loek@math.ncsu.edu
http://www4.ncsu.edu/~loek/

Research Areas:

- Development of an algebraic and combinatorial generalization of symmetric spaces
- Algebraic groups
- Representation theory
- Harmonic analysis
- Integrable systems
- Invariant theory
- Geometry
- Quantum computing

LSTIP Area 7 Key Technology: Quantum computing

Alexander Bogdanovich

Textile Engineering, Chemistry and Science
919-515-6566
aebogdan@ncsu.edu
http://www.ncsu.edu/faculty-and-staff/

Research Areas:

- Multi-scale modeling of hierarchical nano- micro- and macro-composites
- Bridging physics-based models to mechanical property predictions
- Processing multifunctional carbon nanotube - carbon matrix composite superstructures
- Lightweight near-net-shape multifunctional three-dimensional textile composites
- Analysis of composite thin-walled shells and plates

LSTIP Area 7 Key Technologies: Multi-scale models and simulations; Physics-based models and simulations

OLD DOMINION UNIVERSITY

Computational Engineering Research Cluster

http://eng.odu.edu/computational/members.shtml

"The computer facilities at Old Dominion University includes a wide set of capabilities that range from workstations to high performance parallel computers to state-of-the-art 3-D visualization environments. These facilities are coupled by a high-speed (100 Mb/sec) network. Many of these facilities are housed in the recently built Engineering & Computational Sciences Building (ECSB). Many of the faculty that work in the area of computational science have offices and laboratories in this building which creates a synergetic research environment."

Center for Advanced Engineering Environments

www.aee.odu.edu

Director: Ahmed Noor

757-766-5233

aknoor@odu.edu

"Created in January 2001, the Center for Advanced Engineering Environments (AEE) serves as a focal point for the diverse research activities pertaining to Collaborative distributed Engineering Knowledge/Information management, intelligent synthesis, and advanced learning technologies, and their application to complex aerospace systems. These activities include the synergistic coupling of modeling, visual simulations, intelligent agents, multimedia and synthetic environments, human-computer interactions, computational intelligence, computational, information and collaboration technologies in the multidisciplinary analysis, sensitivity studies, optimization, design and operation of complex aerospace systems. The Center is located at the Old Dominion University Peninsula Higher Education Center in Hampton, Virginia and is an Enterprise Center of the Frank Batten College of Engineering and Technology of Old Dominion University. The Center has the following five specific objectives:

1. Conduct innovative research on applications of collaborative distributed engineering Knowledge/Information management, and intelligent synthesis to complex aerospace systems.
2. Develop innovative technologies, strategies and approaches for advanced learning environments/networks.
3. Act as pathfinder, by demonstrating to the research community what can be done (high-potential, high-risk research).
4. Help identify future directions of research in support of the aeronautical and space missions in the next decades.
5. Help in the rapid transfer of research results to industry and in broadening awareness among researchers and engineers of the state-of-the-art in collaborative distributed engineering Knowledge/Information management, intelligent synthesis, and advanced learning, as well as in other technology areas which can impact these activities."

Virginia Modeling, Analysis and Simulation Center

http://www.vmasc.odu.edu/
Director: John Sokolowski
757-686-6215
jsokolow@odu.edu

"The Virginia Modeling, Analysis and Simulation Center (VMASC) is a university-wide multidisciplinary research center that emphasizes modeling, simulation, and visualization (MS&V) research, development and education.

"VMASC concentrates on eight core modeling and simulation applied research areas:
• Transportation
• Homeland Security and Military Defense
• Virtual Environments
• Social Sciences
• Medicine & Health Care
• Game-based Learning
• M&S Interoperability
• System Sciences"

Michele Weigle

Computer Science
757-683-7729
mweigle@cs.odu.edu
http://www.cs.odu.edu/~mweigle

Research Areas:
- Vehicular networks
- Wireless and mobile networks
- Network protocol evaluation
- Network simulation
- Internet congestion control

LSTIP Area 7 Key Technology: Data analytics

Ruhai Zhou

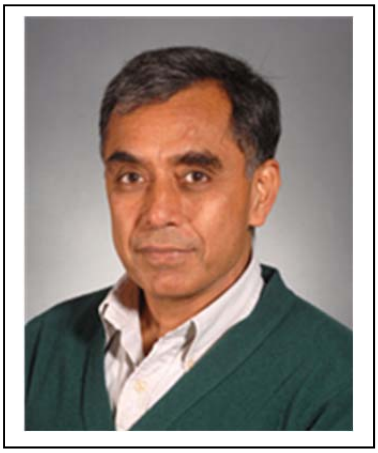
Mathematics and Statistics
757-683-4378
rzhou@odu.edu
http://www.lions.odu.edu/~rzhou/

Research Areas:
- Numerical analysis
- Scientific computation,
- Applied and computational mathematics
- Multiscale modeling

LSTIP Area 7 Key Technology: Multi-scale models and simulation

Bharat Madan

Modeling, Simulation & Visualization Engineering
757-683-6163
bmadan@odu.edu
http://eng.odu.edu/msve/directory/fs/madan.shtml



Research Areas:

- Cyber security and attack tolerant cyber systems
- Elliptic curve cryptography
- Stochastic modeling and analysis
- Information fusion
- Big data analytics for cyber situation awareness

LSTIP Area 7 Key Technology: Data analytics

Ahmed K. Noor

Modeling, Simulation & Visualization
757-766-5233
aknoor@odu.edu
http://eng.odu.edu/msve/directory/fs/noor.shtml

Research Areas:

- Interactive immersive visual simulations and virtual worlds
- Collaborative distributed knowledge discovery and exploitation
- Learnscapes (advanced learning and training paradigms, technologies and environments)
- Intelligent adaptive cyber-physical ecosystems

LSTIP Area 7 Key Technologies: Physics-based models and simulation; Multi-scale models and simulation

Yuzhong Shen

Modeling, Simulation & Visualization
757-683-6366
yshen@odu.edu
http://www.ece.odu.edu/~yshen/research.html

Research Areas:

- Game-based learning
- Visualization and computer graphics
- Modeling and simulation
- Signal and image processing

LSTIP Area 7 Key Technology: Physics-based models and simulation

John Sokolowski

Modeling, Simulation & Visualization Engineering
757-686-6232
jsokolow@odu.edu
http://www.odu.edu/directory/people/j/jsokolow

Research Areas:

- Human behavior modeling
- Decision system modeling
- Multiagent system simulation
- Modeling and simulation representation of social systems

LSTIP Area 7 Key Technology: High fidelity modeling and simulation

Svetozar Popovic

Physics
757-683-4618

Research Areas:

- Nanoscale surface engineering technology
- Plasma aerodynamic validation test development
- Virtual structures
- Low-noise surface physics and engineering
- Space radiation detectors and radiation shielding
- Radiation protection structures and materials
- Magnetohydrodynamic propulsion
- Plasma-assisted fuel reformation
- Energy Harvesting

LSTIP Area 7 Key Technology: Physics-based models and simulation

Leposava Vuskovic

Physics
757-683-4611

Research Areas:

- Nanoscale surface engineering technology
- Plasma aerodynamic validation test development
- Virtual structures
- Low-noise surface physics and engineering
- Space radiation detectors and radiation shielding
- Radiation protection structures and materials
- Magnetohydrodynamic propulsion
- Plasma-assisted fuel reformation
- Energy Harvesting

LSTIP Area 7 Key Technology: Physics-based models and simulation

UNIVERSITY OF MARYLAND

University of Maryland Institute for Advanced Computer Studies

http://www.umiacs.umd.edu/

Director: Amitabh Varshney
(301) 405-6722
edna@umiacs.umd.edu

"Our mission is to foster and enhance basic and interdisciplinary research programs in computing across the University of Maryland at College Park. The success of UMIACS in catalyzing and excelling in interdisciplinary applications of computing is often attributed to: (1) identification and focus on grand challenge applications of computing with significant societal impact, (2) identifying and incentivizing outstanding faculty to excel in their research through rotating appointments, and (3) mediating interaction amongst interdisciplinary researchers through an outstanding computational infrastructure. We have developed the skill set and culture necessary for building strong interdisciplinary research programs, providing advanced computing research infrastructure, and first-rate technical support, which have greatly facilitated our national and international leadership role in multi-disciplinary computing. Our research programs are led by an outstanding group of distinguished scholars across the UMD College Park campus. Since computing is at the core of all the Institute's activities, UMIACS has a uniquely close relationship with the highly regarded Department of Computer Science. The synergistic environment provided by UMIACS is currently enabling innovative collaborations between faculty from Computer Science, Electrical and Computer Engineering, Linguistics, Biology, Chemistry and Biochemistry, Cell Biology and Molecular Genetics, Aerospace Engineering, the Smith School of Business, and the iSchool."

Laboratory for Physical Sciences

http://www.lps.umd.edu

301-935-6400

"Located adjacent to the University of Maryland's College Park Campus, the Laboratory for Physical Sciences is a unique facility where university and federal government personnel collaborate on research in advanced communication and computer technologies. Faculty, post-doctoral scientists, and students from the UMCP Departments of Physics, Electrical and Computer Engineering, and Materials and Nuclear Engineering all conduct research in LPS laboratories in the areas:

- Advanced computing systems
- Advanced functional materials and devices
- Biometrics
- Magnetics
- Microelectronics integration
- Molecular beam epitaxy
- Optics
- Quantum computing
- Superconducting computing
- RF wireless"

Center for Scientific Computation and Mathematical Modeling

http://www.cscamm.umd.edu/
Director: Eitan Tadmor
301-405-0652
info@cscamm.umd.edu

"The primary goal of the Center for Scientific Computation and Mathematical Modeling (CSCAMM) is to foster research and educational activities that highlight novel computational algorithms and mathematical modeling and their interplay with physical science, biological science, and engineering."

Simulation-Based System Design Laboratory

http://www.simulation.umd.edu/index.php
Director: Jeffrey Herrmann
(301) 405-6572
jwh2@umd.edu

"Our research objective is to develop, test, and implement effective and efficient simulation techniques for modeling, evaluating, and optimizing systems in order to improve decision-making throughout the system development life cycle. Simulation is an important tool for modeling and predicting the performance of systems when analytical models do not exist or perform poorly. In addition, simulation provides powerful ways to visualize the behavior of a complex system before it is constructed."

Inderjit Chopra

Aerospace Engineering
301-405-1122
chopra@umd.edu
http://www.inderjitchopra.umd.edu/index.html

Research Area:
- Smart structures

LSTIP Area 7 Key Technology: Physics-based models and simulation

Raymond A. Adomaitis

Chemical & Biomolecular Engineering
301-405-2969
adomaiti@umd.edu
http://www.thinfilm.umd.edu

Research Area:
- Simulation-based design, optimization, and experimental evaluation of advanced materials manufacturing processes

LSTIP Area 7 Key Technology: Multi-scale models and simulation

Yiannis Aloimonos

Computer Science
301-405-4526
yiannis@cs.umd.edu
http://www.cfar.umd.edu/~yiannis/

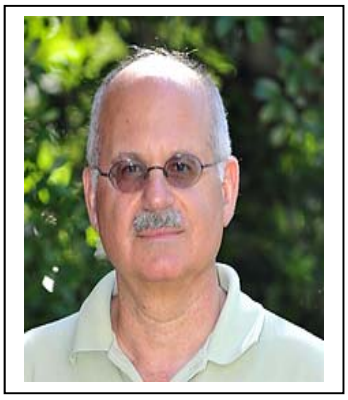
Research Areas:

- Artificial intelligence
- Vision
- Robotics
- Learning
- Neuro-informatics

LSTIP Area 7 Key Technology: Artificial intelligence

Larry Davis

Computer Science
301-405-6718
lsd@umiacs.umd.edu
http://www.umiacs.umd.edu/~lsd/



Research Areas:

- Computer vision
- Artificial intelligence
- High performance computing

LSTIP Area 7 Key Technology: Artificial intelligence

Lise Getoor

Computer Science
301-405-2691
getoor@cs.umd.edu
http://www.cs.umd.edu/~getoor/

Research Areas:

- Artificial intelligence
- Machine learning
- Reasoning under uncertainty
- Databases
- Link mining
- Social network analysis

LSTIP Area 7 Key Technology: Artificial intelligence

Samir Khuller

Computer Science
301-405-6765
samir@cs.umd.edu
http://www.cs.umd.edu/~samir/

Research Areas:

- Theoretical computer science
- Algorithm design
- Graph theory
- Parallel computation
- Combinatorial optimization

LSTIP Area 7 Key Technology: Computer science

V.S. Subrahmanian

Computer Science
301-405-6724
vs@cs.umd.edu
http://www.cs.umd.edu/~vs/

Research Areas:

- Artificial intelligence
- Computer systems
- Databases
- Opinion mining from text
- Ontology management and extraction from text

LSTIP Area 7 Key Technology: Artificial intelligence

Christopher Lobb

Physics
301-405-6130
lobb@squid.umd.edu
http://sqcg.jqi.umd.edu/

Research Areas:

- Experimental condensed matter physics
- Quantum computing using superconducting device
- Phase transitions in superconductors

LSTIP Area 7 Key Technology: Quantum computing

UNIVERSITY OF VIRGINIA

Modeling and Simulation Technology Research Initiative (MaSTRI)

http://www.cs.virginia.edu/~MaSTRI/
Director: Paul F. Reynolds, Jr.
mrm@cs.virginia.edu

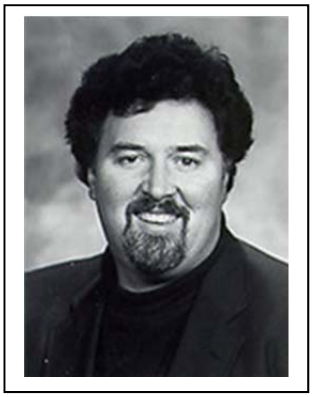
"MaSTRI's focus is the solution of critical challenges that have inhibited or prevented the use of modeling and simulation technology in otherwise practical settings. Critical challenges include simulation reuse, multi-resolution modeling, composability, interoperability, visualization, behavioral modeling and integration of modeling and simulation (M&S) into training and education.

Our research is focused on the areas of simulation coercion and simulation coercibility, which we collectively refer to as COERCE. We observe that COERCE has direct application to the challenges of simulation reuse and composability:

- COERCE can minimize problems caused by differences between models of the same phenomenon at different levels of resolution. For example, before replacing a high-resolution model with a more computationally efficient low-resolution model, the low-resolution model can be coerced to reflect the behavior of the high-resolution more closely.
- In the area of simulation composability, COERCE has the potential to increase flexibility of the components comprising a simulation. Using the metaphor of a jigsaw puzzle, COERCE enables the composition of mismatched pieces through flexibility of the pieces, and thus their interfaces. Simulations, carefully designed and annotated by their creators, lend themselves to interactive semi-automated manipulation by experts, for the purpose of making them conform to requirements different from those which they were originally intended to meet.

So far, we have experienced considerable success in coercing individual simulations that were not designed to be coerced, and we are exploring how simulation coercion can become more automated and be facilitated by developing simulations with the specific objective of coercibility."

James Cohoon



Computer Science
434-982-2210
jpc@virginia.edu
http://www.cs.virginia.edu/~cohoon/

Research Areas:

- Algorithms
- Computer science education
- Diversity and education
- Swarms
- Physical design
- Computational geometry

LSTIP Area 7 Key Technology: Computer science

Sudhanva Gurumurth

Computer Science
434-982-2211
sg7ff@virginia.edu
http://www.cs.virginia.edu/~gurumurthi/

Research Areas:

- Computer architecture
- Storage systems
- Energy-efficient computing
- Graphics processors (GPUs)
- Fault tolerant architectures

LSTIP Area 7 Key Technology: Computer science

Worthy Martin

Computer Science
434-982-2202
martin@virginia.edu
http://www.cs.virginia.edu/people/faculty/martin.html

Research Areas:

- Computer vision
- Human vision
- Robotics
- Genetic algorithms
- Image databases
- Artificial intelligence

LSTIP Area 7 Key Technology: Artificial intelligence

Gabriel Robins

Computer Science
434-982-2214
gr3e@virginia.edu
http://www.cs.virginia.edu/~robins/

Research Areas:

- VLSI CAD
- Algorithms
- Computational geometry
- Optimization
- Bioinformatics
- RFID

LSTIP Area 7 Key Technology: Quantum computing

Kevin Skadron

Computer Science
434-982-2200
skadron@cs.virginia.edu
http://www.cs.virginia.edu/~skadron/

Research Areas:

- Multi-core and multi-threaded chip architectures
- CPU/GPU convergence
- Novel processor organizations
- Architectures for managing power, temperature, and reliability
- Applications of control theory to computer architecture

LSTIP Area 7 Key Technology: Computer science

Yanjun (Jane) Qi

Computer Science
434-243-3089
yq2h@virginia.edu
http://www.cs.virginia.edu/yanjun/

Research Areas:

- Machine learning
- Bioinformatics
- Data Mining
- Medical informatics

LSTIP Area 7 Key Technology: Data synthesis and data analytics

Leonid V. Zhigilei

Materials Science & Engineering
434-243-3582
lz2n@virginia.edu
http://www.faculty.virginia.edu/CompMat/

Research Areas:

- Computational materials science
- Multiple length and time-scale computational methods for materials modeling
- Theoretical and numerical analysis of the dynamic non-equilibrium processes in materials
- Properties of nanostructured and non-crystalline materials

LSTIP Area 7 Key Technologies: Physics-based models and simulation; Multi-scale models and simulation

Haibo Dong

Mechanical & Aerospace Engineering
434-243-4098
hd6q@virginia.edu
http://www.mae.virginia.edu/fsrg/

Research Areas:

- Computational fluid dynamics
- Cartesian grids methodology
- Low speed aerodynamics
- Reduced order modeling
- Direct injection and simulation of small engines
- Modeling and design of tDCS electrodes

LSTIP Area 7 Key Technology: Physics-based models and simulation; Multi-scale models and simulation

Olivier Pfister

Physics
434-924-7956
op6n@Virginia.EDU
http://www.phys.virginia.edu/People/personal.asp?UID=op6n

Research Areas:

- Experimental quantum optics and quantum information
- Highly scalable experimental paradigm for the implementation of quantum computing

LSTIP Area 7 Key Technology: Quantum computers

VIRGINIA TECH

Computational Multiphysics Systems Laboratory

http://www.cmsvt.org/

Director: Tomonari Furuka
tomonari@vt.edu
434-766-6632

"Computational Multiphysics Systems Laboratory recently joined CVeSS. As one of the world's two computational multiphysics systems laboratory, CMS led by Professor Tomonari Furukawa investigate the analysis and synthesis of computational multiphysics systems which range from deformable bodies studied in computational and experimental mechanics to rigid bodies studied in robotics.

- Material Characterization
- Structural Health Monitoring (SHM) and Non-Destructive Evaluation (NDE)
- Bayesian Robotics
- Autonomous Vehicles"

Laboratory for Advanced Scientific Computing and Applications (LASCA)

http://research.cs.vt.edu/lasca/

Director: Adrian Sandu
asandu7@vt.edu
540-231-2193

"The goal of the Laboratory for Advanced Scientific Computing and Applications (LASCA) is to provide expertise and leadership in high-end scientific computing research and education at Virginia Tech. LASCA participants do basic research in numerical algorithms and software for high-performance parallel computation and assist scientists and engineers in applying high-end computing resources to their problems. By bringing together experts in scientific computing and its applications, LASCA helps build the kind of multidisciplinary teams needed to address today's most challenging computational science problems."

Network Dynamics and Simulation Science Laboratory

http://ndssl.vbi.vt.edu/index.php

Director: Christopher Barrett
540-231-8252
cbarrett@vbi.vt.edu

"The NDSSL is pursuing an advanced research and development program for interaction-based modeling, simulation, and associated analysis, experimental design, and decision support tools for understanding large biological, information, social, and technological systems. Extremely detailed, multi-scale computer simulations allow formal and experimental investigation of these systems. The need for such simulations

is derived from questions posed by scientists, policy makers, and planners involved with very large complex systems. The simulation applications are underwritten by a theoretical program in discrete mathematics and theoretical computer science that is sustained by more than a decade of experience with the interplay of research and application. Laboratory members are currently pursuing active projects in Wireless Networks, Computational Epidemiology and Algorithms, Complex Networks and High Performance Computing."

Pradeep Raj

Aerospace & Ocean Engineering
540-231-4843
praj@vt.edu
http://www.aoe.vt.edu/people/faculty/raj.html

Research Areas:

- Affordable quality designs
- Simulation based design
- Modeling and simulation technologies
- High-fidelity physics-based computational methods

LSTIP Area 7 Key Technology: Physics-based models and simulation

Christopher John Roy

Aerospace & Ocean Engineering
540-231-0080
cjroy@vt.edu
http://www.aoe.vt.edu/people/webpages/cjroy/index-cjroy.html

Research Areas:

- Computational fluid dynamics
- Verification and validation
- Assessing mathematical & physical correctness of simulations
- Simulation of chemically reacting flows
- Compressible flows & thermochemistry simulation
- Modeling the flow of gases through microscale devices

LSTIP Area 7 Key Technologies: Physics-based models and simulation; Multi-scale models and simulation

Cornel Sultan

Aerospace & Ocean Engineering
540-231-0047
csultan@vt.edu
http://www.aoe.vt.edu/people/webpages/csultan/index-csultan.html

Research Areas:

- Complex, physics based, control oriented models
- Tensegrity structures
- Path planning and trajectory generation algorithms for large scale, multi-agent networks
- Numerically robust and fast algorithm development
- Energy harvesting

LSTIP Area 7 Key Technology: Physics-based models and simulation

Naren Ramakrishnan

Computer Science
540-231-8451
naren@vt.edu
http://people.cs.vt.edu/~ramakris/

Research Areas:

- Computational biology and bioinformatics
- Data, information, knowledge, and libraries
- Discovery analytics center
- Knowledge, data and information
- Problem solving environments
- Data mining

LSTIP Area 7 Key Technologies: Data analytics; Artificial intelligence

Adrian Sandu

Computer Science
540-231-2193
asandu7@vt.edu
http://www.cs.vt.edu/~asandu

Research Areas:

- High end computing and computational science
- Mathematical foundations of computer science
- Scientific computing

LSTIP Area 7 Key Technology: Computer science

WILLIAM & MARY

Mark Hinders

Applied Science
757-221-1519
hinders@wm.edu
http://as.wm.edu/Faculty/Hinders.html

Research Areas:

- Non-invasive medical diagnostics
- Structural health monitoring and nondestructive testing
- On-line manufacturing process control
- Mobile robotics sensor fusion
- Standoff security screening
- Signal processing and artificial intelligence
- Wave propagation and scattering modeling

LSTIP Area 7 Key Technology: Artificial intelligence

LSTIP Area 8: Nanomaterial Superstructures / Multifunctional Materials for Structures

"The aerospace industry must reduce vehicle weight dramatically in order to achieve affordable space exploration and green aviation. The material system with the most potential to effect major reductions in aerospace vehicle mass is based on nanomaterials. These materials have the potential to yield extraordinary mechanical properties (superstructures), but to date these properties have only been realized at the nano- and micro-scale. Carbon nanotube yarns/sheets and advanced carbon fibers are now available in useful quantities, but bulk properties are far below theoretical potential. The goal of this technology is to achieve a 3- to 5-fold increase in specific stiffness and strength as compared to state-of-the-art carbon fiber reinforced composites at the macro-scale (10s of meters). Implicitly involved with this challenge is the manufacturing (processing) at large scales and structural design with these new super materials (e.g. stability may dominate instead of strength).

"Possible approaches and challenges to achieve the goals of this activity may include:

- *Alignment and joining of nanomaterials to form engineered superstructures to maximize load transfer among nanomaterials, and yield properties undiluted by significant resin binder content. (e.g. wet chemistries that lead to carbon-carbon bond formation between CNTs or irradiation to induce carbon-carbon bond formation)*
- *Extremely high degrees of alignment, dense packing and tailored connectivity among CNTs and matrix to create optimized superstructures are required to achieve necessary structural property goals.*
- *Molecular (fully consolidated) additive manufacturing*
- *Structures (innovative thin wall design/analysis/smart building block approach)*
- *Manufacturing (consistent quality, affordability) (tailored net-shape fabrication)*

"Structures built of advanced multifunctional and self-healing, damage tolerant materials also support this topic to the extent they support structural applications (strength and stiffness) and provide significant system improvements to the application".

Key Technologies:

- Alignment and joining of nanomaterials to form "superstructures"
- Nanomaterial surface physics and chemistry
- Molecular additive manufacturing
- Nanomaterial composite processing
- Nanomaterial/matrix interface control
- Innovative structure designs
- Low cost manufacturing of nano-superstructures
- Tailored near-net-shape manufacturing of structures

GEORGIA TECH

Nanotechnology Research Center

http://nrc.ien.gatech.edu/

Director: James D. Meindl
404-894-5101
james.meindl@mirc.gatech.edu

"The NRC is a research enabler, providing the high technology equipment resources, staff expertise, and training necessary for productive nanoscale science and engineering research.

"The Nanotechnology Research Center provides expertise, facilities, infrastructure, and teaming environments to enable and facilitate interdisciplinary research in microelectronics, integrated optoelectronics, and microsensors and actuators."

The NRC is one node of the National Nanotechnology Infrastructure Network (http://nnin.org/), a multi-institution "integrated partnership of fourteen user facilities, supported by NSF, providing unparalleled opportunities for nanoscience and nanotechnology research. The network provides extensive support in nanoscale fabrication, synthesis, characterization, modeling, design, computation, and hands-on training in an open hands-on environment available to all qualified users."

NanoTECH @ Georgia Tech

http://www.nano.gatech.edu/index.php

"Like many future areas of scientific exploration, nanoscience and nanotechnology exist on the borders between disciplines. No longer is research conducted in a neat, compartmentalized fashion that closely parallels the structure of academic departments. Nanoscience and nanotechnology bring together students, researchers, and industrial partners from a host of different specialized fields.

"At Georgia Tech, the Schools of Chemistry, Chemical & Biomolecular Engineering, Electrical and Computer Engineering, Materials Science and Engineering, and Physics, and the Georgia Tech Research Institute are collectively involved in interdisciplinary research in nanoscience and nanotechnology that encompass five major areas:

- Synthesis and Characteristics of Nanomaterials
- Properties of Nanomaterials
- Nanoscale Modeling and Simulation
- Nanodevices, Nanophotonics, and Nanosystems
- Nanomedicine and Nano-biotechnology"

Min-Feng Yu

Aerospace Engineering
404-894-8166
minfeng.yu@ae.gatech.edu
http://yu.gatech.edu/

Research Areas:

- Mechanics and electromechanics of materials and systems at the micro/nanoscale
- Nanomanufacturing and the mesoscale integration of nanoscale systems
- Functional smart materials with tunable mechanical and electronic properties
- Nanoscale nonlinear mechanical dynamic systems for high sensitivity sensing and high resolution microscopy
- Methods and tools for nanobiotechnology

LSTIP Area 8 Key Technology: Molecular additive manufacturing

Michael A. Filler

Chemical & Biomolecular Engineering
404-894-0430
michael.filler@chbe.gatech.edu
http://fillergroup.gatech.edu/

Research Areas:

- *In-situ* spectroscopic techniques to elucidate the atomic-level chemical bonding synthesis of nanoscale materials
- Nanowire superstructures
- "Bottom-up" nanoscale materials synthesis

LSTIP Area 8 Key Technologies: Alignment and joining of nanomaterials to form "superstructures;" Molecular additive manufacturing

Nazanin Bassiri-Gharb

Materials Science & Engineering
404-385-0667
nazanin.bassirigharb@me.gatech.edu

Research Areas:

- Integrate micro and nanofabrication techniques and processes
- Science of ferroelectric materials.
- Electron beam lithography
- Nano-imprint

LSTIP Area 8 Key Technology: Alignment and joining of nanomaterials to form "superstructures"

Satish Kumar

Materials Science & Engineering
404-894-7550
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http://kumar.mse.gatech.edu/

Research Areas:

- Biologically enabled and bioinspired materials
- Polymers and macromolecules
- Nanomaterials and nanoengineered devices
- Functional electronic and optical materials
- Fibers and composites
- Energy storage and harvesting
- Multi-scale structural & chemical characterization

LSTIP Area 8 Key Technologies: Nanomaterial surface physics and chemistry; Nanomaterial composite processing; Nanomaterial/matrix interface control

Zhiqun Lin

Materials Science & Engineering
404-385-4404
zhiqun.lin@mse.gatech.edu
http://nanofm.mse.gatech.edu/

Research Areas:

- Multifunctional nanocrystals
- Block copolymers
- Hierarchical structure formation and assembly
- Surface and interfacial properties

LSTIP Area 8 Key Technology: Nanomaterial surface physics and chemistry; Molecular additive manufacturing; Nanomaterial/matrix interface control

Meilin Liu

Materials Science & Engineering
404-894-6114
meilin.liu@mse.gatech.edu
http://fcbt.mse.gatech.edu/liu.htm

Research Areas:

- Functional electronic and optical materials
- Materials and nanoengineered devices

LSTIP Area 8 Key Technology: Nanomaterial composite processing

Kenneth Sandhage

Materials Science & Engineering
404-894-6882
ken.sandhage@mse.gatech.edu
http://www.mse.gatech.edu/faculty-staff/faculty/kenneth-sandhage

Research Areas:

- Novel reaction processing of advanced materials for electromagnetic, chemical, optical, sensor, refractory, and structural applications
- Processes for fabricating near net-shaped ceramics and composites

LSTIP Area 8 Key Technology: Tailored near-net-shape manufacturing of structures

Dong Qin

Materials Science & Engineering
404-385-2182
dong.qin@mse.gatech.edu
http://www.nanodq.com

Research Areas:

- Nanomaterials
- Surface-enhanced Raman spectroscopy
- Soft lithography
- Self-assembly
- Colloidal physics and chemistry

LSTIP Area 8 Key Technologies: Molecular additive manufacturing; Nanomaterial surface physics and chemistry

Zhong Lin Wang

Materials Science & Engineering
404-894-8008
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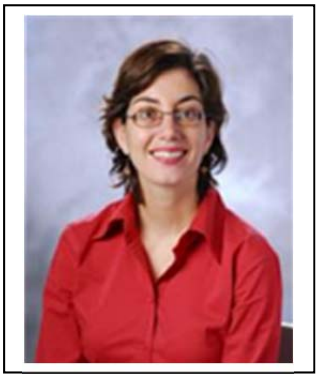
http://www.nanoscience.gatech.edu

Research Areas:

- Nanogenerators and self-powered nanosystems
- Piezotronics for smart systems
- Piezo-phototronics for energy science and optoelectronics
- Hybrid cells for energy harvesting

LSTIP Area 8 Key Technologies: Alignment and joining of nanomaterials to form "superstructures;" Nano materials surface physics and chemistry; Nanomaterial composite processing

Antonia Antoniou
Mechanical Engineering
404-894-6871
antonia.antoniou@me.gatech.edu



Research Areas:

- Synthesis and characterization of nanoporous metals and alloys for applications as sensors, actuators, electrochemical devices and radiation tolerant structural components
- Mechanical behavior of nanomaterials
- Experimental mechanics of materials (in-situ testing and characterization)

LSTIP Area 8 Key Technology: Alignment and joining of nanomaterials to form "superstructures", Innovative structure designs

NORTH CAROLINA A&T

Joint School of Nanoscience and Nanoengineering

http://jsnn.ncat.uncg.edu/
Dean: James G. Ryan
336-285-2800

"The Joint School of Nanoscience and Nanoengineering (JSNN) was formed as a collaborative project of North Carolina A&T State University and The University of North Carolina at Greensboro. The JSNN's research and educational programs focus on Nanoscience and Nanoengineering. The strengths of the two universities in the basic sciences and in engineering make them ideal partners for this new interdisciplinary school. The JSNN is located at the South Campus of Gateway University Research Park, another major joint collaboration between the two universities. The JSNN is housed in a state of the art 105,000 square foot facility, which features extensive labs and clean rooms. Gateway University Research Park and JSNN have partnered with leading manufacturers of tools that are critical to exploring the frontiers of Nanoscience and Nanoengineering. JSNN faculty and students have access to a sophisticated suite of tools including the only Carl Zeiss Helium Ion Microscope in the southeast. The intent of the Chancellors is to create a school focused on developing leading edge applications in the hottest emerging technologies. They housed the JSNN in Gateway University Research Park with the intent of providing an environment conducive to commercialization of university developed intellectual properties and to create a space where industry/academic collaborations will happen."

Yeo Heung Yun

Chemical, Biological, & Bioengineering
336-256-1151 ext. 2010
yyun@ncat.edu
http://www.ncat.edu/academics/schools-colleges1/coe/cbbe/faculty-staff/yeoheung%20yun.html

Research Areas:

- Biosensors
- Nanomedicine
- Drug delivery
- Electrochemistry
- Photocatalyst.
- Carbon nanotubes
- Intelligent materials

LSTIP Area 8 Key Technology: Nanomaterial surface physics and chemistry

Albert M. Hung

Nanoengineering
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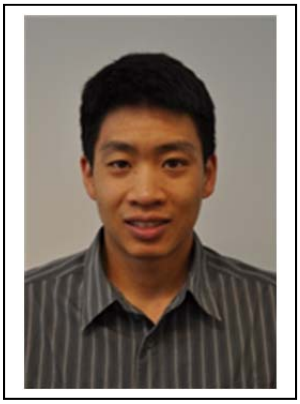
http://jsnn.ncat.uncg.edu/faculty/albert-hung-ph-d/



Research Areas:

- Colloidal and molecular self-assembly
- Non-conventional
- Synthesize and/or organize nanostructures by simple, inexpensive processes under mild conditions

LSTIP Area 8 Key Technologies: Molecular additive manufacturing; Low-cost manufacturing of nano-superstructures

Ajit Kelkar

Nanoengineering
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http://jsnn.ncat.uncg.edu/faculty/ajit-kelkar-ph-d/

Research Areas:

- Atomistic modeling
- Nano engineered materials
- Eletrospinning
- Molecular dynamic simulations
- Nanotechnology
- Multifunctional materials
- Computer aided design and modeling
- Numerical analysis

LSTIP Area 8 Key Technology: Nanomaterial composite processing

Ram V. Mohan

Nanoengineering
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http://jsnn.ncat.uncg.edu/faculty/ram-v-mohan-ph-d/

Research Areas:

- Computational multi-physics/multi-scale modeling and simulation
- Computational mechanics, nanomechanics, and material sciences
- Processing, mechanics, characterization, and computational modeling of multi-scale composite and nanoengineered material systems

LSTIP Area 8 Key Technology: Nanomaterial surface physics and chemistry; Nanomaterial composite processing

NORTH CAROLINA STATE UNIVERSITY

Nano@NC State

http://ncsu.edu/nano/about/
Director: Gregory Parsons
nanotechnology@ncsu.edu

"NC State is an emerging leader in the field of nanotechnology. Dozens of faculty members in departments across campus actively engage in cutting-edge nanotechnology research. Inter-disciplinary efforts among faculty in the fields of chemistry, physics, biology, engineering, textiles, and veterinary medicine are producing new and exciting discoveries at the nanometer level. The university has many research centers and labs dedicated to nanotechnology, including the Analytical Instrumentation Facility and the Nonwovens Cooperative Research Center."

"At NC State, faculty across campus are investigating the unique properties of materials at the nanometer—a minute scale that is one-billionth of a meter. These cutting-edge research efforts, crossing the boundaries of traditional disciplines, engage faculty in departments throughout the university—chemistry, physics, engineering, textiles, education, agriculture, management, veterinary medicine, and social sciences."

Gregory Parsons

Chemical & Biomolecular Engineering
919-515-7553
gnp@ncsu.edu
http://www.che.ncsu.edu/people/faculty-pages/parsons.html

Research Areas:

- Atomic-scale control of growth and interface formation
- Molecular electronics
- Nanotube structures
- Low temperature processing
- Bio-mimetic molecular photovoltaics

LSTIP Area 8 Key Technologies: Molecular additive manufacturing; Low cost manufacturing of nano-structures

Michael Dickey

Chemical & Biomolecular Engineering
919-513-0273
mddickey@ncsu.edu
http://www.che.ncsu.edu/dickeygroup/

Research Areas:

- Alternative micro- and nano-fabrication techniques
- Soft materials
- Nanoelectronics
- Photovoltaics
- Directed assembly

LSTIP Area 8 Key Technology: Molecular additive manufacturing

Christopher Gorman

Chemistry
919-515-4252
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http://www.ncsu.edu/chemistry/cbg/cbg.html

Research Areas:

- Nano-characterization
- Nano-electronics
- Nano-materials & engineering

LSTIP Area 8 Key Technology: Nano-material composite processing

Orlin Velev

Chemistry
919-513-4318
odvelev@ncsu.edu
http://www.che.ncsu.edu/velevgroup/

Research Areas:

- Colloidal nanoscience and nanoengineering
- Biosensors and on-chip devices
- Colloidal interactions
- Self-assembly and directed assembly of nano- and microstructures with photonic, optical, biological and electrical functionality
- Self-propelling particles

LSTIP Area 8 Key Technology: Molecular additive manufacturing

Yuntian Zhu

Materials Science & Engineering
919-513-0559
ytzhu@ncsu.edu
http://www.mse.ncsu.edu/research/zhu/

Research Areas:

- Synthesis of long carbon nanotubes (CNTs) and CNT arrays
- CNT fibers and CNT composites for aerospace applications
- Deformation physics of nano metals and alloys
- Design and development of nano metals and alloys with high strength and high ductility

LSTIP Area 8 Key Technology: Alignment and joining of nanomaterials to form "superstructures"

Xiangwu Zhang

Textile Engineering, Chemistry and Science
919-515-6547
Xiangwu_zhang@ncsu.edu
http://www.tx.ncsu.edu/xzhang

Research Areas:

- Nanostructured and multifunctional polymer, fiber, and textile materials
- Energy storage and conversion of textile materials
- Chemical and biological protection of textile materials
- Composites
- Fundamental materials studies synthesis
- Physical characterization, system design and fabrication

LSTIP Area 8 Key Technology: Alignment and joining of nanomaterials to form "superstructures"

Alexander Bogdanovich

Textile Engineering, Chemistry and Science
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http://www.ncsu.edu/faculty-and-staff/

Research Areas:

- Multi-scale modeling of hierarchical nano- micro- and macro-composites
- Bridging physics-based models to mechanical property predictions
- Processing multifunctional carbon nanotube - carbon matrix composite superstructures
- Lightweight near-net-shape multifunctional three-dimensional textile composites
- Analysis of composite thin-walled shells and plates

LSTIP Area 8 Key Technologies: Alignment and joining of nanomaterials to form "superstructures"; Nanomaterial composite processing; Innovative structure designs; Tailored near-net-shape manufacturing of structures

OLD DOMINION UNIVERSITY

Bala Ramjee
Chemistry & Biochemistry
757-683-3039
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http://ww2.odu.edu/~bramjee/

Research Areas:

- Synthesis and functionalization of polymeric nanostructures, in particular nanocapsules
- Ligand effects in the synthesis and dynamics of metallic and bimetallic nanoparticles
- Synthesis and functionalization of anisotropic nanoparticles
- Nanocatalysis

LSTIP Area 8 Key Technology: Nanomaterial surface physics and chemistry

UNIVERSITY OF MARYLAND

Maryland NanoCenter

http://www.nanocenter.umd.edu/
Director: Gary W. Rubloff
301-405-3011
rubloff@umd.edu

"The Maryland NanoCenter is the hub of a network of interdisciplinary researchers, faculty, labs, and organizations with the goal of advancing the knowledge and understanding of all things nano.

"The mission of Maryland NanoCenter is to enhance the coherence and effectiveness of the University of Maryland nano community through a strategy based on:

- coordinating shared state-of-art experimental facilities;
- developing best practices for administrative infrastructure supports;
- providing coherent, broad visibility at state, national, and international levels;
- encouraging and facilitating nano program growth and fund-raising;
- guiding the evolution of coordinated educational programs for the nano workforce of the future; and
- promoting the development and transfer of nanotechnology and related intellectual property to the marketplace."

Materials Research Science and Engineering Center

http://mrsec.umd.edu/
Director: Janice Reutt-Robey
mrsec@umd.edu

"The Maryland MRSEC carries out nationally recognized fundamental research on surfaces and interfaces of materials with potential impact on the next generation of opto- and nano-electronic devices, and on complex oxides with potential applications in memory, switches and sensors."

Materials and Interface NanoTechnology Laboratory

http://www.ireap.umd.edu/materials/
Director: Oded Rabin
301-405-3382
oded@umd.edu

"The Materials and Interface NanoTechnology Laboratory conducts research in a wide variety of topics related to nanoscience and nanotechnology. Our central goal is to explore the new physics that emerges from shrinking the dimensions of materials to the nanoscale, and to identify the significance of the new

science for an array of applied fields such as sensing, energy, and biomedicine. Below are some current and proposed research projects:

- Directed self-assembly of silver nanocubes for SERS (Raman) sensing.
- Bulk nanostructures as improved thermoelectric materials.
- Eutectic nanowires - structure and transport
- Nanoparticle formulations for x-ray tomography (medical imaging)
- Nanofluidic channels"

Center for Nanophysics and Advanced Materials (CNAM)

http://www.csr.umd.edu/index.html
Director: Richard L. Greene
301.405.8285
rgreene@squid.umd.edu

"The Center for Nanophysics and Advanced Materials supports cutting-edge theoretical and experimental research in Condensed Matter Physics at the University of Maryland. CNAM researchers are working on topics ranging from the search for new materials with new physical properties to the design of new electronic devices that work on new physical principles. The research done today in CNAM will have an impact on the technological challenges of tomorrow, from high-speed computing to energy generation, storage, and transfer. CNAM provides an exciting, collaborative environment for undergraduate and graduate students and postdoctoral researchers to receive excellent training for careers in science and technology.

"The objectives of the Center are to:

- Establish a unique, interdisciplinary center for the interchange of ideas and skills among scientists working in all aspects of condensed matter, nano physics, and advanced materials;
- Lay the foundations for future high technologies based on electronic properties of condensed and nano systems; and
- Develop talented scientists to become future leaders in the field."

Janice Reutt-Robey

Chemistry & Biochemisty
301-405-1788
rrobey@umd.edu
http://www2.chem.umd.edu/groups/reutt-robey/robey.html

Research Areas:

- Surface chemistry and nanoscale science
- Supramolecular chemistry
- Energy storage & production in nanostructured materials
- Directed assembly and molecular engineering
- Supported nanostructures
- Mass transport processes & interface evolution

LSTIP Area 8 Key Technolgies: Nanomaterial surface physics and chemistry; Molecular additive manufacturing

Ray Phaneuf

Materials Science & Engineering
301-405-6566
phaneuf@lps.umd.edu
http://mse.umd.edu/~phaneuf/Welcome.html

Research Areas:

- Nanotechnology
- Surface physics
- Low energy electron microscopy
- Photoemission electron microscopy
- Scanned probe microscopies
- Templating for directed self-assembly

LSTIP Area 8 Key Technologies: Nanomaterial surface physics and chemistry; Molecular additive manufacturing

Oded Rabin

Materials Science & Engineering
301-405-3382
oded@umd.edu
http://www.ireap.umd.edu/materials/

Research Areas:

- Synthesis and physical properties of nanowires and porous thin films
- Electrical and thermal transport in low dimensional systems
- Nanoporous membranes
- Interfacial nanoscience (including organic-inorganic systems
- Controlled assembly

LSTIP Area 8 Key Technologies: Nanomaterial surface physics and chemistry; Molecular additive manufacturing

UNIVERSITY OF VIRGINIA

Institute for Nanoscale and Quantum Scientific and Technological Advanced Research

http://www.nanostar.virginia.edu/
Director: Stuart A. Wolf
434-982-5892
nanostar@virginia.edu

"The Institute for Nanoscale and Quantum Scientific and Technological Advanced Research (nanoSTAR) is an interdisciplinary institute at the University of Virginia involving faculty from engineering, science, medicine, education and business who work together to provide a very competitive environment for the advancement of the science and technology of nanoscale and quantum systems. Approximately 80 faculty members from departments across Grounds are actively engaged in the institute. Outreach and education are also major functions of nanoSTAR. Students can get involved through related coursework and research opportunities, as well as by participating in meetings and events. Our vision is to encourage, facilitate and support collaborative research, development and commercialization in the key areas of nanoelectronics, medicine, and energy and the environment through partnerships with academia, industry and national laboratories."

David Green

Chemical Engineering
434-924-1302
dlgreen@virginia.edu
http://www.faculty.virginia.edu/green/

Research Areas:

- Synthesis of nanoparticles
- Nanoparticle dispersion into polymer solutions and melts
- Nanoparticle suspension rheology
- Nanoparticle-polymer interfaces

LSTIP Area 8 Key Technology: Nanomaterial surface physics and chemistry; Nanomaterial/matrix interface control

Mool Gupta

Electrical & Computer Engineering
757-766-4608
mgupta@virginia.edu
http://www.faculty.virginia.edu/laser/

Research Areas:

- Laser micromachining
- Laser crystallization for solar cell & other applications
- Carbon nanotubes-based nanocomposites
- Ti tubing damage limits
- Finite element modeling
- Organic solar cells

LSTIP Area 8 Key Technology: Nanomaterial composite processing

Jerry Floro

Materials Science & Engineering
434-243-1730
floro@virginia.edu
http://www.virginia.edu/ms/faculty/floro.html

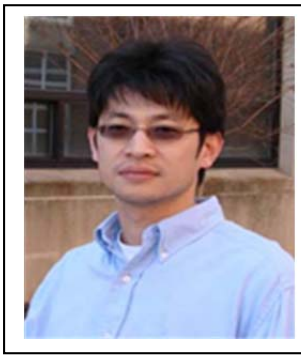
Research Areas:

- Directed self-assembly of semiconductor nanostructures
- Magnetic nanocomposites

LSTIP Area 8 Key Technology: Alignment and joining of nanomaterials to form "superstructures"; Nanomaterial/matrix interface control

Jiwei Lu

Materials Science & Engineering
434-243-2172
jl5tk@virginia.edu
http://virginia.edu/ms/faculty/lu.html



Research Areas:

- Metal-insulator transition of VO2
- Multiferroic materials

LSTIP Area 8 Key Technology: Alignment and joining of nanomaterials to form "superstructures"; Nanomaterial/matrix interface control

Petra Reinke

Materials Science & Engineering
434-924 7203
pr6e@virginia.edu
http://www.virginia.edu/ms/people/faculty/reinke.html

Research Areas:

- Surface science of nanostructures
- Relationship between nanostructure formation and geometric and electronic structure and properties
- Assembly of nanometer sized functional subunits

LSTIP Area 8 Key Technology: Alignment and joining of nanomaterials to form "superstructures;" Molecular additive manufacturing

Haydn N. Wadley

Materials Science & Engineering
434 982-5671
haydn@virginia.edu

Research Areas:

- Synthesis, structure and performance of novel materials
- Multifunctional cellular materials for thermal management
- Adaptive/deployable structures
- Ultralight materials/structures and crushable structures for localized impulse mitigation
- Relationships between composition, structure, and properties
- Modeling of vapor transport and atomic/molecular assembly using kinetic Monte Carlo, molecular dynamics and density functional methods

LSTIP Area 8 Key Technology: Molecular additive manufacturing; Nanomaterial composite processing

Leonid V. Zhigilei

Materials Science & Engineering
434-243-3582
lz2n@virginia.edu
http://www.faculty.virginia.edu/CompMat/

Research Areas:

- Computational materials science
- Development of multiple length and time-scale computational methods for materials modeling
- Theoretical and numerical analysis of the dynamic non-equilibrium processes in materials undergoing processing by short laser pulse
- Investigation of the microscopic mechanisms of phase transformations
- Properties of nanostructured and non-crystalline materials

LSTIP Area 8 Key Technology: Nanomaterial surface physics and chemistry

Pamela Norris

Mechanical & Aerospace Engineering
434-925-6295
Pamela@virginia.edu
http://pamelanorris.wordpress.com/

Research Areas:

- Nanoscale heat transfer
- Aerogel research
- Thermal energy management
- Heat pipe technology

LSTIP Area 8 Key Technologies: Nanomaterial surface physics and chemistry; Nanomaterial/matrix interface control

VIRGINIA TECH

Institute for Critical Technology and Applied Science

http://www.ictas.vt.edu/
Nanoscale Science and Engineering Research Area
http://www.ictas.vt.edu/research/nanoscale.php
Thrust Leader: Michael Hochella
540-231-6227
hochella@vt.edu

"ICTAS research in this thrust focuses on developing the understanding and control of matter at the nanometer scale, with an eye on developing new materials, devices, and systems for a wide spectrum of applications including those in electronics and computers, medicine and health, aeronautics and space, environment and energy, biotechnology and agriculture, and materials and manufacturing.
An example of a targeted area is ICTAS research in environmental nanoscience and technology. This research will provide new approaches for the characterization and understanding of anthropogenic-manufactured nanomaterials and their natural counterparts, and may result in methods for fast, real-time detection of both man-made and natural nanomaterials. This, in turn, will help understand their environmental fate and health impacts and will lead to safer protocols for manufacturing processes and utilization.
Other areas of research include nanosensors, carbonaceous nanomaterials such as carbon nanotubes and nanohorns, nanodevices such as nanoknives and nanoforce transducers, and novel nanocomposites for a range of applications.

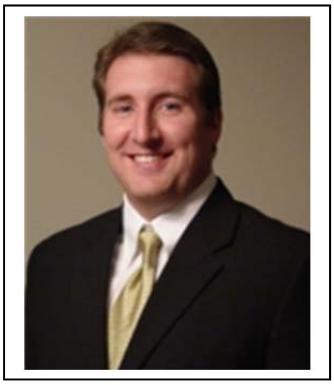
- Environmental Nanoscience and Technology (ENT): relates a vast array of nanomaterial properties to their potential environmental exposures, biological effects, and ecological consequences.
- Nanomaterials including Carbonaceous Materials: pairs molecular building blocks of nanocarbon materials with the creation of carbon nanotubes and devices for technology such as photovoltaic energy cells.
- Virginia Tech Center for Sustainable Nanotechnology (VTSuN): Globally advances sustainable nanotechnology."

Center for Innovation-based Manufacturing (CIbM)

http://www.cibm.ise.vt.edu/
Director: Jaime Camelio
540-231-8976
jcamelio@vt.edu

"The CIbM is a multi-disciplinary center formed to solve current manufacturing issues and help the university commercialize new technologies. The innovation based manufacturing goal is to boost the commercialization potential of basic research that is currently constrained by the lack of adequate processes and systems and provide new tools to improve current processes. In order to achieve this goal,

new pedagogical research in innovation principles related specifically to manufacturing is needed. The proposed center will focus on the development of new innovation methodologies and their application to challenging manufacturability problems across multiple areas such as renewable energies, micro- and nano-manufacturing, medical devices, etc. CIbM is actively working on the definition of the manufacturing of the future and the future of manufacturing."



Gary D. Seidel

Aerospace & Ocean Engineering
540-231-9897
gary.seidel@vt.edu
http://www.dept.aoe.vt.edu/~gdseidel/

Research Areas:

- Multiscale modeling of multifunctional nanocomposites
- Interface of the nanotubes with the surrounding polymer
- Modeling of progressive damage in nanocomposites

LSTIP Area 8 Key Technology: Nanomaterials/matrix interface control

Brian M. Tissue

Chemistry
540-231-3786
tissue@vt.edu
http://www.files.chem.vt.edu/chem-dept/tissue/

Research Areas:

- Nucleation and growth mechanisms in gas-phase condensation of nanoparticles.
- Preparation, surface modification, and luminescence of nanoparticles.
- Catalytic activity of gold/metal oxide nanocomposites

LSTIP Area 8 Key Technologies: Nanomaterials surface physics and chemistry; Nanomaterial/matrix interface control

Donald G. Baird

Chemical Engineering
540-231-5998
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http://www.che.vt.edu/Faculty/Baird/home.html

Research Areas:

- Polymer processing (design and simulation and rheology)
- Composite materials and processing
- Polymeric materials and properties

LSTIP Area 8 Key Technology: Nanomaterials composite processing

Kathy Lu

Materials Science & Engineering
540-231-3225
klu@vt.edu
http://www.lu.mse.vt.edu/

Research Areas:

- Nanomaterial, microsize material synthesis and processing
- Composites, functionally/structurally graded materials, porous materials
- Material design using ceramics, metal powders, polymers
- Shaping of nano-units into large ensembles

LSTIP Area 8 Key Technology: Molecular additive manufacturing; Nanomaterials composite processing

Hans Robinson

Physics
540-231-8732
hansr@vt.edu
http://www.phys.vt.edu/~hansr/

Research Areas:

- Plasmonically directed assembly of colloidal molecules
- Plasmonic contrast agents for nonlinear optical imaging
- Thermoelectric nanostructures on macroporous silicon scaffolding
- Aluminum-based plasmonic enhancement of organic photovoltaic cells

LSTIP Area 8 Key Technologies: Alignment and joining of nanomaterials to form "superstructures;" Molecular additive manufacturing

WILLIAM & MARY

Hannes Schniepp
Applied Science
757-221-2559
schniepp@wm.edu
http://as.wm.edu/schniepp/

Research Areas:

- Nanomaterials
- Scanning probe microscopy
- Nanocomposites

LSTIP Area 8 Key Technology: Nanomaterial composite processing

LSTIP Area 9: Applications of Quantum Technology

"Quantum technology may in enable orders of magnitude improvements in sensor capabilities, computing, atomistic scale design of brilliant multi-functional materials, high density energetics and a multitude of other aerospace applications of quantum embodiments.

"Quantum sensors exploit quantum correlations, such as quantum entanglement, to achieve a sensitivity or resolution that is better than can achieved using only classical systems. Quantum optics exploit quantum correlations such as quantum entanglement of the electromagnetic field in order to image objects with a resolution or other imaging criteria that is beyond what is possible in classical optics. Quantum computing makes direct use of quantum mechanical phenomena, such as superposition and entanglement, to perform operations on data. Whereas digital computers require data to be encoded into binary digits (bits), quantum computation uses quantum properties to represent data and perform operations on these data.

"This topic supports R&D for sensors, devices, and other constructs in aerospace applications."

Key Technologies:

- Quantum material design
- Quantum sensors, metrology, and imaging
- Quantum optics
- Quantum computing and algorithms
- Quantum pattern recognition
- Quantum-based energetics
- Quantum electronics and communications

GEORGIA TECH

Georgia Tech Quantum Institute

http://www.gtqi.gatech.edu/about.shtml
404-407-7409
quantum@gtri.gatech.edu

"The Georgia Tech Quantum Institute (GTQI) is a multi-disciplinary effort to explore and develop quantum information science and technology. The GTQI mission is to combine the strengths in engineering and technology at Georgia Tech with the emerging field of quantum information science in order to advance both fundamental science and emerging quantum information technologies."

"Research at GTQI is guided primarily by the interests and expertise of the affiliate members. Projects may involve small groups within GTQI or they may involve nearly the entire Institute. The close proximity of multiple disciplines will enhance the breadth of ideas that can be explored.

"Three examples of project goals for the first five years at GTQI are (1) a quantum analog simulator that can simulate a physical system in a manner that can not be achieved classically, for example, simulating a condensed matter system of 100 interaction fermions with an trapped ion array, (2) a quantum repeater that could facilitate a quantum secure Internet, for example, using atomic ensembles and (3) an insight or defining experiment that sheds new light on the fundamental nature of quantum processes, for example, the dynamics of entanglement during the interaction of an atom with a molecule."

Ken Brown

Chemistry & Biochemistry
404-385-3124
ken.brown@chemistry.gatech.edu
http://ww2.chemistry.gatech.edu/brownlab/

Research Areas:

- Quantum simulations of molecules and materials
- Quantum mechanics
- Quantum computing
- Quantum information
- Molecular ions
- Quantum control
- Quantum error correction

LSTIP Area 9 Key Technologies: Quantum computing and algorithms; Quantum pattern recognition

David S. Citrin

Electrical & Computer Engineering
404-385-1579
citrin@ece.gatech.edu
http://www.ece.gatech.edu/faculty-staff/fac_profiles/bio.php?id=22

Research Areas:

- Optoelectronics and nanophotonics
- Quantum optics
- Nonlinear optical properties of semiconductor materials and devices
- High-speed electronic, photonic, and optoelectronic devices quantum computing
- Ultrahigh speed all-optical switching

LSTIP Area 9 Key Technologies: Quantum optics; Quantum computing and algorithms

P. Douglas Yoder

Electrical & Computer Engineering
404 385 2652
doug.yoder@gatech.edu
http://users.ece.gatech.edu/dyoder/

Research Areas:

- Optical communication systems
- Optoelectronics and nanophotonics
- Physics of semiconductor opto-, micro- and nanoelectronic devices and structures
- Quantum charge transport simulation

LSTIP Area 9 Key Technology: Quantum electronics and communications

Zhiqun Lin

Materials Science & Engineering
404-385-4404
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http://nanofm.mse.gatech.edu/

Research Areas:

- Multifunctional nanocrystals
- Block copolymers
- Hierarchical structure formation and assembly
- Surface and interfacial properties

LSTIP Area 9 Key Technology: Quantum material design

Yan Wang

Mechanical Engineering
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yan.wang@me.gatech.edu
http://www.me.gatech.edu/~ywang

Research Areas:

- Multiscale modeling & simulation
- Nanoscale CAD/CAM/CAE
- Multiscale product-materials design
- Cyber infrastructure and design informatics
- Uncertainty quantification and decision making
- Quantum scientific computing

LSTIP Area 9 Key Technology: Quantum computing and algorithms

Michael Chapman

Physics
404-894-5223
michael.chapman@physics.gatech.edu
http://chapmanlabs.gatech.edu/

Research Areas:

- Nonlinear optics
- Quantum optics
- Contemporary quantum mechanics
- Fundamental atom-photon interactions
- Atom optics and interferometry

LSTIP Area 9 Key Technologies: Quantum optics; Quantum computing and algorithms

Brian Kennedy

Physics
404-894-5221
brian.kennedy@physics.gatech.edu
https://www.physics.gatech.edu/user/brian-kennedy

Research Areas:

- Nonlinear optics
- Quantum optics
- Ultra-low temperature atomic physics
- Optical parametric processes

LSTIP Area 9 Key Technology: Quantum optics

Alex M. Kuzmich

Physics
404-894-4507
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http://kuzmichlab.gatech.edu/

Research Areas:

- Atomic physics
- Quantum metrology
- Quantum information

LSTIP Area 9 Key Technologies: Quantum sensors, metrology and imaging; Quantum computing & algorithms; Quantum electronics and communications

Chandra Raman
Physics
404-894-9062
craman@gatech.edu
http://ramanlab.gatech.edu/Welcome.html

Research Areas:

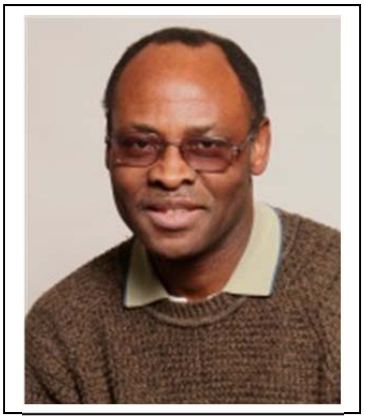
- Macroscopic quantum mechanics using ultralow temperature gases superfluidity in Bose-Einstein condensates
- Quantum antiferromagnetism in a spinor condensate
- Correlated quantum systems

LSTIP Area 9 Key Technologies: Quantum sensors, metrology, and imaging; Quantum computing and algorithms

HAMPTON UNIVERSITY

Edmund Ndip

Chemistry
757-727-5043
edmund.ndip@hamptonu.edu
http://science.hamptonu.edu/chem/faculty/ndip.cfm



Research Areas:

- Design, synthesis, and laser spectroscopic characterization of azo-, imine-, and vinylene-bridged arylstyryl heterocyclic organic semiconductors
- Matrix isolation spectroscopy
- Calculations of nonlinear optical properties of supra-molecular donor-acceptor systems

LSTIP Area 9 Key Technologies: Quantum optics; Quantum computing and algorithms

Jae Tae Seo

Physics
757-727-5149
jaetae.seo@hamptonu.edu
http://science.hamptonu.edu/physics/faculty/seo.cfm

Research Areas:

- Optical dynamics by coupling of exciton to surface plasmon polariton
- Surface-enhanced Raman scattering
- Ultrafast and nonlinear optical and electronic dynamics
- Temporal, spectral, and spatial energy transitions and dynamics of organic and inorganic nanoscale materials and systems

LSTIP Area 9 Key Technology: Quantum optics

NORTH CAROLINA STATE UNIVERSITY

Quantum Optoelectronic Laboratory

http://www.quantum.ncsu.edu/

Director: Robert M. Kolbas
kolbas@eos.ncsu.edu

"The Quantum Optoelectronics Laboratory is under the direction of Dr. Robert M. Kolbas in Electrical and Computer Engineering Department of North Carolina State University located at Raleigh, North Carolina. We are located in the Monteith Research Center (MRC) on the centennial campus of NC State University.

"The focus of our experimental research group is the application of the physics of ultra small semiconductor structures (quantum wells, quantum dots) to attain new and improved device functionality of optical light emitters (lasers, LEDs), dielectric waveguides, and detectors.

"Our current research is focused on the laser properties of wide band gap semiconductors (AlGaN-GaN-InGaN) and the interaction of photons/electron-hole pairs in quantum well semiconductor lasers."

Michael Escuti

Electrical & Computer Engineering
919-513-7363
mjescuti@ncsu.edu
http://www.ece.ncsu.edu/oleg/wiki/Main_Page

Research Areas:

- Liquid crystal displays
- Spectral and polarimetric imaging
- Opto-electronics
- Photonics
- Opto-fluidics
- Quantum optics

LSTIP Area 9 Key Technology: Quantum optics

Ki Wook Kim

Electrical & Computer Engineering
919-515-5229
kwk@ncsu.edu
http://www.ece.ncsu.edu/nano/

Research Areas:

- Semiconductor physics
- Modeling of electronic and optoelectronic devices in the nanoscale
- Carrier transport in heterostructures
- Low dimensional effects
- Quantum transport

LSTIP Area 9 Key Technologies: Quantum optics; Quantum computing and algorithms; Quantum electronics and communications

Robert M. Kolbas

Electrical & Computer Engineering
919-515-5257
kolbas@ncsu.edu

Research Areas:

- III-V semiconductor heterostructures and quantum wells
- Optoelectronic integrated circuits
- Quantum well lasers
- Optical detectors
- Quantum wells and nanostructures
- Optical communication
- Nanoelectronics

LSTIP Area 9 Key Technologies: Quantum optics; Quantum electronics and communications

Daniel Stancil

Electrical & Computer Engineering
919-513-3606
ddstancil@ncsu.edu
http://www.ece.ncsu.edu/people/ddstanci

Research Areas:

- Communications and signal processing including digital communications
- Electronic circuits and systems
- Nanoelectronics and photonics including optical materials and photonic devices
- Applied electromagnetism, solid state physics, and communications

LSTIP Area 9 Key Technologies: Quantum optics; Quantum electronics and communications

Donald W. Brenner
Materials Science & Engineering
919-515-1338
brenner@ncsu.edu
http://www.mse.ncsu.edu/research/brenner/

Research Areas:

- Nano-electronics
- Nano-materials & engineering
- Atomic-scale computer simulations
- Nanometer-scale structure and mechanical properties of grain boundaries in covalent materials new strategies for engineering nanometer-scale structures and devices

LSTIP Area 9 Key Technologies: Quantum material design; Quantum-based energetics

OLD DOMINION UNIVERSITY

Helmut Baumgart

Electrical & Computer Engineering
757-269-7710
hbaumgar@odu.edu
http://eng.odu.edu/ece/directory/baumgart.shtml

Research Areas:

- Nanotechnology
- Microelectronics fabrication
- High-k dielectrics for advanced gate stack engineering
- Atomic layer deposition technology of electronic thin film materials semiconductor device processing
- Thin film growth

LSTIP Area 9 Key Technology: Quantum material design

Amin N. Dharamsi

Electrical & Computer Engineering
757-683-4467
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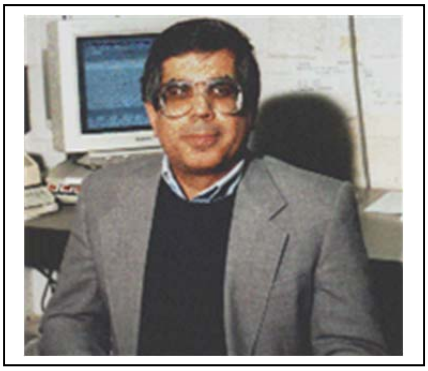
http://www.ece.odu.edu/~adharams/



Research Areas:

- Quantum electronics
- Laser development
- Molecular spectroscopy

LSTIP Area 9 Key Technology: Quantum electronics and communications

Linda L. Vahala

Electrical & Computer Engineering
757-683-4968
lvahala@odu.edu
http://www.ece.odu.edu/vahala.htm

Research Areas:

- Plasma fusion
- Electromagnetic propagation in random media
- Quantum computing
- Plasma physics and atomic physics with an emphasis on laser interactions with plasma

LSTIP Area 9 Key Technology: Quantum computing

Mark Havey

Physics
757-683-4612
mhavey@odu.edu
http://www.lions.odu.edu/~mhavey/Havey_Research_Group/home.html

Research Areas:

- Optical memories for quantum communications and quantum computing
- Quantum phase transitions
- Squeezing the electromagnetic vacuum for precision measurements applications

LSTIP Area 9 Key Technologies: Quantum optics; Quantum computing and algorithms; Quantum electronics and communications

UNIVERSITY OF MARYLAND

Laboratory for Physical Sciences

http://www.lps.umd.edu
301-935-6400

"Located adjacent to the University of Maryland's College Park Campus, the Laboratory for Physical Sciences is a unique facility where university and federal government personnel collaborate on research in advanced communication and computer technologies. Faculty, post-doctoral scientists, and students from the UMCP Departments of Physics, Electrical and Computer Engineering, and Materials and Nuclear Engineering all conduct research in LPS laboratories in the areas:"

- Advanced computing systems
- Advanced functional materials and devices
- Biometrics
- Magnetics
- Microelectronics integration
- Molecular beam epitaxy
- Optics
- Quantum computing
- Superconducting computing
- RF wireless"

Joint Quantum Institute

http://jqi.umd.edu/
Co-Directors: Steve Rolston and Charles Clark
301-405-1300
jqi-info@umd.edu

"The Joint Quantum Institute (JQI) is pursuing that goal through the work of leading quantum scientists from the Department of Physics of the University of Maryland (UMD), the National Institute of Standards and Technology (NIST) and the Laboratory for Physical Sciences (LPS). Each institution brings to JQI major experimental and theoretical research programs that are dedicated to the goals of controlling and exploiting quantum systems.

"JQI's Objectives

1. serve as a world-class research institute, conducting fundamental investigations of coherent quantum phenomena and thereby laying the foundation for engineering and controlling complex quantum systems capable of using the coherence and entanglement of quantum mechanics;
2. maintain and enhance the nation's leading role in high technology through a powerful collaboration among NIST, UMD and LPS; and
3. provide a unique, interdisciplinary center for the interchange of ideas among atomic physics, condensed matter and quantum information scientists.

In pursuing these objectives, the JQI is expected to train scientists and engineers for future industrial opportunities and provide U.S. industry with cutting-edge research results."

Center for Nanophysics and Advanced Materials (CNAM)

http://www.csr.umd.edu/index.html
Director: Richard L. Greene
301-405-8285
rgreene@squid.umd.edu

"The Center for Nanophysics and Advanced Materials supports cutting-edge theoretical and experimental research in Condensed Matter Physics at the University of Maryland. CNAM researchers are working on topics ranging from the search for new materials with new physical properties to the design of new electronic devices that work on new physical principles. The research done today in CNAM will have an impact on the technological challenges of tomorrow, from high-speed computing to energy generation, storage, and transfer. CNAM provides an exciting, collaborative environment for undergraduate and graduate students and postdoctoral researchers to receive excellent training for careers in science and technology.

"The objectives of the Center are to:

- Establish a unique, interdisciplinary center for the interchange of ideas and skills among scientists working in all aspects of condensed matter, nano physics, and advanced materials;
- Lay the foundations for future high technologies based on electronic properties of condensed and nano systems; and
- Develop talented scientists to become future leaders in the field."

John S. Baras

Electrical & Computer Engineering
301-405-6606
baras@umd.edu
http://www.isr.umd.edu/~baras/

Research Areas:

- Integrated management of hybrid communication networks
- Modeling and performance evaluation of large broadband hybrid networks
- Fast internet over heterogeneous (wireless-wireline) networks
- Intelligent control
- Image processing and understanding
- Distributed control (or decision) systems
- Stochastic control and scheduling
- Quantum communications
- Nonlinear systems

LSTIP Area 9 Key Technology: Quantum electronics and communications

Edo Waks

Electrical & Computer Engineering
301-405-5022
edowaks@umd.edu
http://www.ireap.umd.edu/NanoPhotonics/

Research Areas:

- Application of photonic crystals to quantum information processing
- Optical telecommunication and sensing

LSTIP Area 9 Key Technologies: Quantum optics; Quantum computing and algorithms

Gary Rubloff

Materials Science & Engineering
301-405-3011
rubloff@umd.edu
http://rubloffgroup.umd.edu/

Research Areas:

- Multifunctional nanostructures for energy storage and capture
- Biofabrication in mems microsystems
- Biomedical and sensor applications
- Atomic layer deposition process, mechanisms, and technology
- Nanoscale devices for quantum computing

LSTIP Area 9 Key Technologies: Quantum materials design; Quantum computing and algorithms

Christopher Monroe

Physics
301-405-8631
monroe@umd.edu
http://www.iontrap.umd.edu/

Research Areas:

- Experimental quantum information science
- Quantum computing and quantum simulations with trapped atomic ions
- Quantum networks with atoms and photons
- Microfabricated atom trap structures

LSTIP Area 9 Key Technologies: Quantum sensors, metrology, and imaging; Quantum optics; Quantum computing and algorithms; Quantum electronics and communications

UNIVERSITY OF VIRGINIA

Institute for Nanoscale and Quantum Scientific and Technological Advanced Research

http://www.nanostar.virginia.edu/
Director: Stuart A. Wolf
434-982-5892
nanostar@virginia.edu

"The Institute for Nanoscale and Quantum Scientific and Technological Advanced Research (nanoSTAR) is an interdisciplinary institute at the University of Virginia involving faculty from engineering, science, medicine, education and business who work together to provide a very competitive environment for the advancement of the science and technology of nanoscale and quantum systems. Approximately 80 faculty members from departments across Grounds are actively engaged in the institute. Outreach and education are also major functions of nanoSTAR. Students can get involved through related coursework and research opportunities, as well as by participating in meetings and events. Our vision is to encourage, facilitate and support collaborative research, development and commercialization in the key areas of nanoelectronics, medicine, and energy and the environment through partnerships with academia, industry and national laboratories."

Kevin K. Lehmann

Chemistry
434-243-2130
kl6c@virginia.edu
http://www.faculty.virginia.edu/lehmannlab/

Research Areas:

- High resolution laser spectroscopy
- Spectroscopy and dynamics of atoms and molecules in helium and molecular hydrogen nanoclusters
- Determination of the magnitude of intermode coupling constants or intramolecular relaxation rates
- Development of new spectroscopic methods of extreme sensitivity development of new sources of tunable, high spectral brightness light
- Spectroscopic applications to environmental monitoring

LSTIP Area 9 Key Technology: Quantum electronics and communications

Gabriel Robins

Computer Science
434-982-2207
robins@cs.virginia.edu
http://www.cs.virginia.edu/~robins/

Research Areas:

- Near-optimal algorithms for computationally-difficult problems
- Computational geometry
- Pattern detection
- Bioinformatics
- Radio-frequency identification

LSTIP Area 9 Key Technology: Quantum computing and algorithms; Quantum pattern recognition

Patrick Hopkins

Mechanical & Aerospace Engineering
434-982-2037
peh4v@virginia.edu
http://patrickehopkins.com/

Research Areas:

- Thermal transport in nanosystems
- Thermal conductivity of bismuth-doped III-V alloys
- Short-pulsed laser interactions with solids and interfaces

LSTIP Area 9 Key Technology: Quantum material design

Seunghun Lee

Physics
434-924-7959
sl5eb@Virginia.EDU
http://faculty.virginia.edu/sl5eb/top.html

Research Areas:

- Strongly correlated materials such as non-conventional high temperature superconductors, quantum magnets, frustrated spin systems, magnetic molecules, and multiferroics
- Elastic and inelastic neutron scattering
- Growth high quality single crystals of transition metal oxides

LSTIP Area 9 Key Technology: Quantum materials design

Olivier Pfister

Physics
434 924-7956
op6n@virginia.edu
http://faculty.virginia.edu/quantum/

Research Areas:

- Experimental quantum optics and quantum information
- Quantum registers built of a multitude of resonant fields ("Qmodes") of a single optical cavity
- Photon-number-resolved detector system
- Fundamental studies of quantum information theory and their experimental applications to quantum imaging

LSTIP Area 9 Key Technologies: Quantum sensors, metrology, and imaging; Quantum optics, Quantum computing and algorithms; Quantum electronics and communications

Jongsoo Yoon

Physics
434-982-2197
jy2b@Virginia.edu
http://www.phys.virginia.edu/People/Personal.asp?UID=jy2b

Research Areas:

- Phases and phase transitions in two dimensional electronic systems
- Electron crystallization.
- Develop, design, and fabricate the most advanced devices to probe properties of 2d electronic systems
- Produce state-of-the-art devices, such as kinetic inductance bolometers, superconducting transition-edge-sensors, and superconducting quantum interference devices

LSTIP Area 9 Key Technologies: Quantum materials design; Quantum sensors, metrology, and imaging

VIRGINIA TECH

Vicky Choi
Computer Science
703-538-3774
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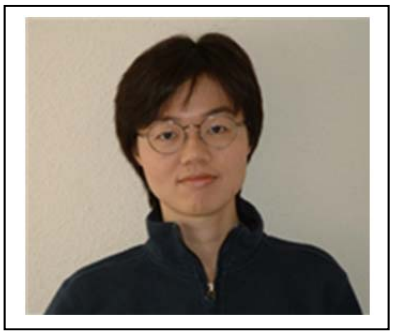
http://people.cs.vt.edu/~vchoi/

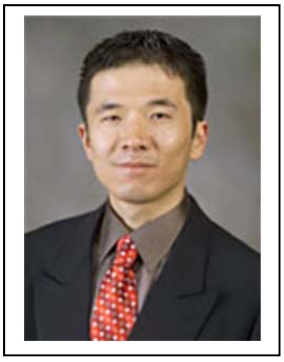


Research Areas:

- Quantum Computation
- Design, analysis and implementation of algorithms in bioinformatics, computational chemistry, computational geometry, and discrete mathematics

LSTIP Area 9 Key Technology: Quantum computing and algorithms

Yong Xu
Electrical & Computer Engineering
540-231-2464
yong@vt.edu
http://www.ece.vt.edu/faculty/xu.php



Research areas:

- Optical sensors
- Integrated optics
- Quantum optics
- Nonlinear optics
- Computational electrodynamics
- Plasmon sensing

LSTIP Area 9 Key Technology: Quantum optics

Levon Asryan

Materials Science & Engineering
540-231-7033
asryan@vt.edu
http://www2.mse.vt.edu/Default.aspx?tabid=521

Research Areas:

- Physics of semiconductor materials and devices
- Low-dimensional heterostructures, nanostructures, quantum dots and quantum wells
- Theory of semiconductor lasers with a quantum-confined active region, quantum dot lasers and quantum well lasers
- Computational materials science

LSTIP Area 9 Key Technology: Quantum materials design

Jean Joseph Heremans

Physics
540-231-4604
heremans@vt.edu
http://www.phys.vt.edu/~heremans/

Research Areas:

- Quantum nanoscience with spins: spintronics and quantum information processing in low-dimensional semiconductor systems under strong spin-orbit coupling
- Electronic transport in molecular systems and organic semiconductors
- Magnetic sensor geometries on high-mobility semiconductors
- Nanoscale fabrication techniques

LSTIP Area 9 Key Technologies: Quantum computing and algorithms; Quantum electronics and communications

Vito Scarola

Physics
540-231-8757
scarola@vt.edu
http://www.phys.vt.edu/~scarola/

Research Areas:

- Experimental and theoretical studies of quantum condensed matter
- Graphene
- Composite fermions
- Quantum dots
- Quantum computing
- Optical lattices

LSTIP Area 9 Key Technology: Quantum computing and algorithms

WILLIAM & MARY

Chi-Kwong Li

Mathematics
757-221-2042
ckli@math.wm.edu
http://cklixx.people.wm.edu/

Research Areas:

- Matrix analysis
- Operator theory
- Combinatorial theory
- Quantum computing
- Quantum information science

LSTIP Area 9 Key Technology: Quantum computing and algorithms

Irina Novikova

Physics
757-221-3693
inovikova@physics.wm.edu
http://physics.wm.edu/~inovikova/group.html

Research Area:

- Coherent interaction of light with atoms to control and manipulate optical properties of atomic ensembles

LSTIP Area 9 Key Technology: Quantum sensors, metrology, and imaging; Quantum optics