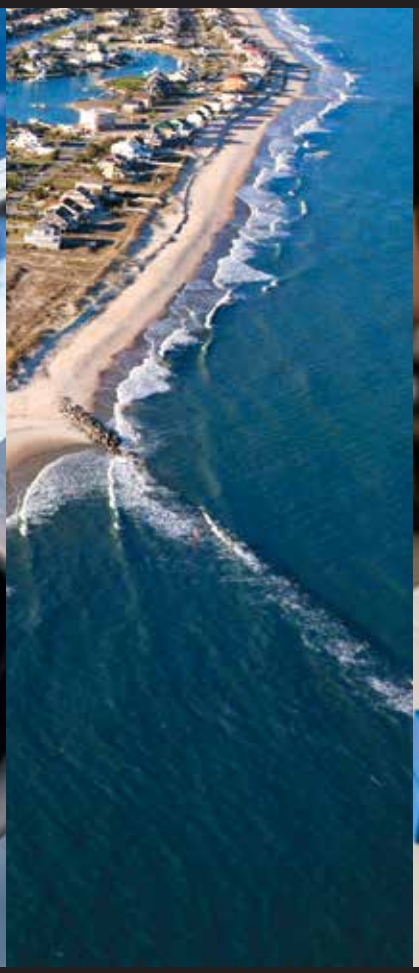
Advancing Innovations and Competitive-Edge Opportunities

UCF COLLEGE OF ENGINEERING AND COMPUTER SCIENCE

Center for Research in Computer Vision

Center for Advanced Turbomachinery and Energy Research



Coastal Dynamics of Sea Level Rise Research Cluster of Excellence

Interactive Systems and User Experience Research Cluster of Excellence

UCF COLLEGE OF ENGINEERING AND COMPUTER SCIENCE

"Real partnerships involve mutual benefits at the core."
–Dr. John C. Hitt, UCF President

At UCF, our efforts to create knowledge through pioneering scholarship and research are bolstered by clustered research efforts, which bring together experts from a variety of disciplines and fields, and provide industry with:

- A streamlined research process, from proposal to completion
- Opportunities to collaborate with renowned researchers
- Higher national and international visibility
- Increased funding potential
- An avenue to train the future science and tech workforce with industry-relevant skills

Featured here are four research clusters of excellence, directed by UCF engineering and computer science faculty who have each made significant contributions in their respective fields.

Below, a sample of four frames from a video sequence. Based on the interaction forces between individuals, the algorithm learns the normal behavior in the scene, in this case, pedestrians walking in multiple directions. Then abnormal behavior, which is pedestrians running from the scene in panic, is detected based on sudden change in the velocities and interaction forces.

This wide-area surveillance video demonstrates vehicle tracking in a high-density traffic scene.

Power of Partnerships

The center partners with local and national high tech companies, including LSI Logic, BBN, SRI, Harris Corporation, Kitware, Intel, SAIC and Kodak. For more than a decade, Dr. Shah's partnership with Lockheed Martin Fire & Missile Systems has resulted in multiple grants from federal agencies, including the DARPA VIRAT program and the U.S. Army Future Combat Systems program.

Using computer vision to track people's movements assists with urban planning.

CENTER FOR RESEARCH IN COMPUTER VISION

What We Do:

The center advances the science of processing and analyzing images and videos, using complex computational methods. Computer vision is used in crowd surveillance, visual tracking, human behavior analysis, geo-spatial location determination of an image or video, unmanned aerial video analysis and biomedical image analysis. Our technology can be used in scanning crowd scenes, analyzing brain scans for tumors, environmental monitoring, indexing and searching massive databases of images and videos, and more.

The UCF Difference:

Professor Mubarak Shah is the world's sixth highest-cited author in computer vision for the past five years, with more than 17,000 citations. This level of expertise ensures state-of-the-art solutions applied to challenging computer vision problems.

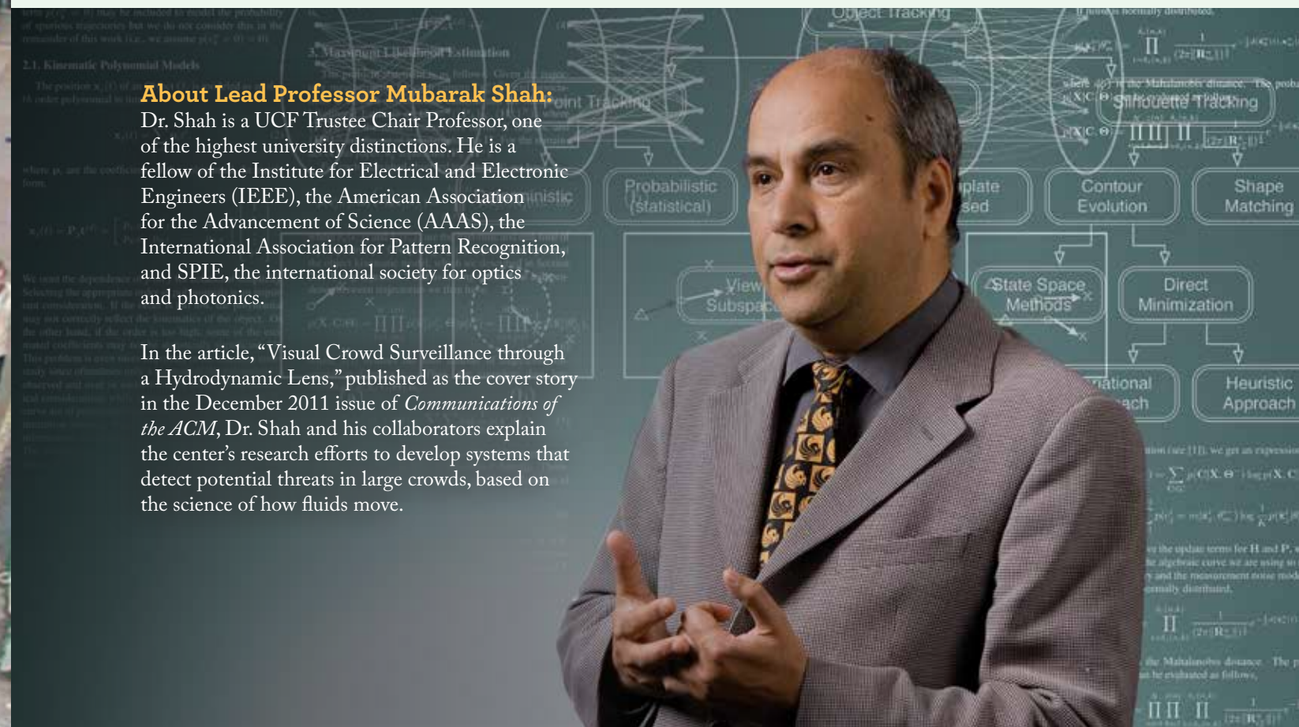
Connect:

Call: (407) 823-1119
Email: info@crcv.ucf.edu
Website: http://crcv.ucf.edu

Our Expertise:

- Video surveillance and monitoring
- Wide area surveillance
- Human behavior recognition
- Visual tracking
- UAV video analysis
- Visual crowd analysis
- Bio-medical image analysis

"Computer vision has changed how we investigate the world and solve problems. Every day we are reminded that investment in this technology is of significant benefit to society."
— Professor Mubarak Shah



About Lead Professor Mubarak Shah:

Dr. Shah is a UCF Trustee Chair Professor, one of the highest university distinctions. He is a fellow of the Institute for Electrical and Electronic Engineers (IEEE), the American Association for the Advancement of Science (AAAS), the International Association for Pattern Recognition, and SPIE, the international society for optics and photonics.

In the article, "Visual Crowd Surveillance through a Hydrodynamic Lens," published as the cover story in the December 2011 issue of *Communications of the ACM*, Dr. Shah and his collaborators explain the center's research efforts to develop systems that detect potential threats in large crowds, based on the science of how fluids move.

Power of Partnerships
Dr. Kapat and his team have received more than $20 million in research funding from the U.S. Department of Energy, the U.S. Army, Air Force Research Laboratory, Air Force Office of Scientific Research, National Science Foundation, NASA, Siemens, Lockheed Martin, Rini Technologies and more.

The Siemens Energy Center that Dr. Kapat established at UCF is the only university building in the nation that carries the name "Siemens Energy." The well-equipped laboratory facility provides a dynamic opportunity of academia-industry interaction and collaboration.

CENTER FOR ADVANCED TURBOMACHINERY AND ENERGY RESEARCH

What We Do:
The center intersects 10 core technical areas that advance scientific knowledge and innovation in turbo-machineries and associated technologies to bring higher reliability, higher efficiency and lower emissions in power generation, aviation and space.

The UCF Difference:
Central Florida is a world hub for turbine, energy and space technology development, with a unique concentration of global large utility turbine manufacturers. Our location provides a clear advantage for pursuing collaborative opportunities in the center's 10 core technical areas, and it provides access to a highly trained, specialized workforce.

Connect:
Call: 407-823-6072

Email: CATER@ucf.edu

Website: http://cater.cecs.ucf.edu

Our Expertise:
Fuels, Flow and Combustion
- AeroThermal
- Combustion
- Fuel and carbon

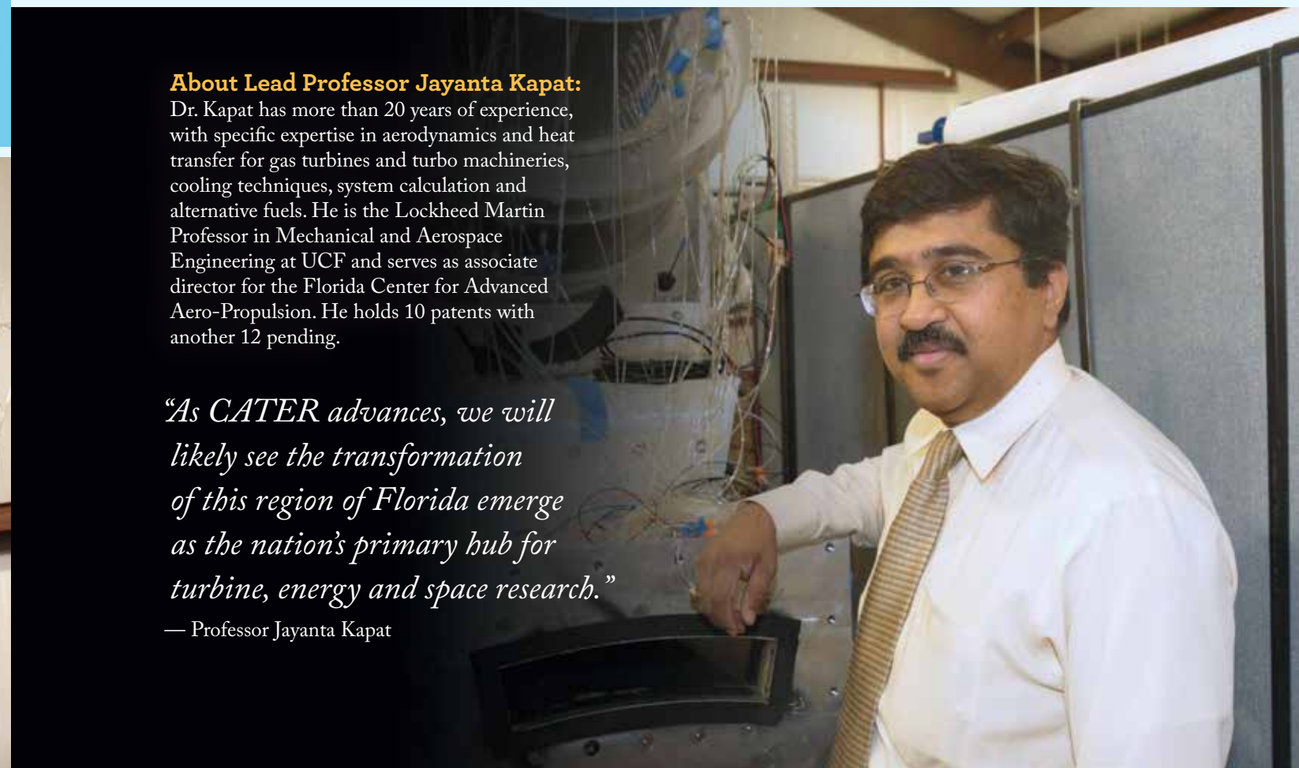
Materials, Properties and Manufacturing
- High temperature materials and coatings
- Mechanical properties and integrity
- Design for manufacturing
- Cycles and plant integration
- Composites

Dynamic Systems and Control
- Vibrations and dynamic integrity
- Transients in power conversion

About Lead Professor Jayanta Kapat:
Dr. Kapat has more than 20 years of experience, with specific expertise in aerodynamics and heat transfer for gas turbines and turbo machineries, cooling techniques, system calculation and alternative fuels. He is the Lockheed Martin Professor in Mechanical and Aerospace Engineering at UCF and serves as associate director for the Florida Center for Advanced Aero-Propulsion. He holds 10 patents with another 12 pending.

"As CATER advances, we will likely see the transformation of this region of Florida emerge as the nation's primary hub for turbine, energy and space research."

— Professor Jayanta Kapat



COASTAL DYNAMICS OF SEA LEVEL RISE RESEARCH CLUSTER OF EXCELLENCE

What We Do:

The cluster advances the science of physics-based, predictive computer modeling to understand coastal hydroscience and engineer solutions that address the impacts of sea level rise (SLR). We predict SLR's impact on shorelines, biological ecosystems and human-built infrastructure; and we extend our research inland to assess SLR's impact on critical resources such as drinking water supply, saltwater and freshwater marshes, and more.

The UCF Difference:

Our interdisciplinary approach to research involves civil and environmental engineers, biologists, climatologists, geomorphologists, social scientists, coastal resource managers and other stakeholders.

Our unique focus is on dynamics: the multiple, interrelated processes at play with SLR and its effect on waves, tides and surges; how these processes are influenced by climate change; and how they influence other coastal and inland processes.

Our Expertise:

- High-performance hydrodynamic and transport models
- Large-scale digital elevation model construction and assessment
- Unstructured finite element mesh generation
- Field/laboratory experiments, data gathering and analysis
- Ecological modeling
- Remote sensing data analysis and application
- Geospatial data fusion and analysis

Connect:

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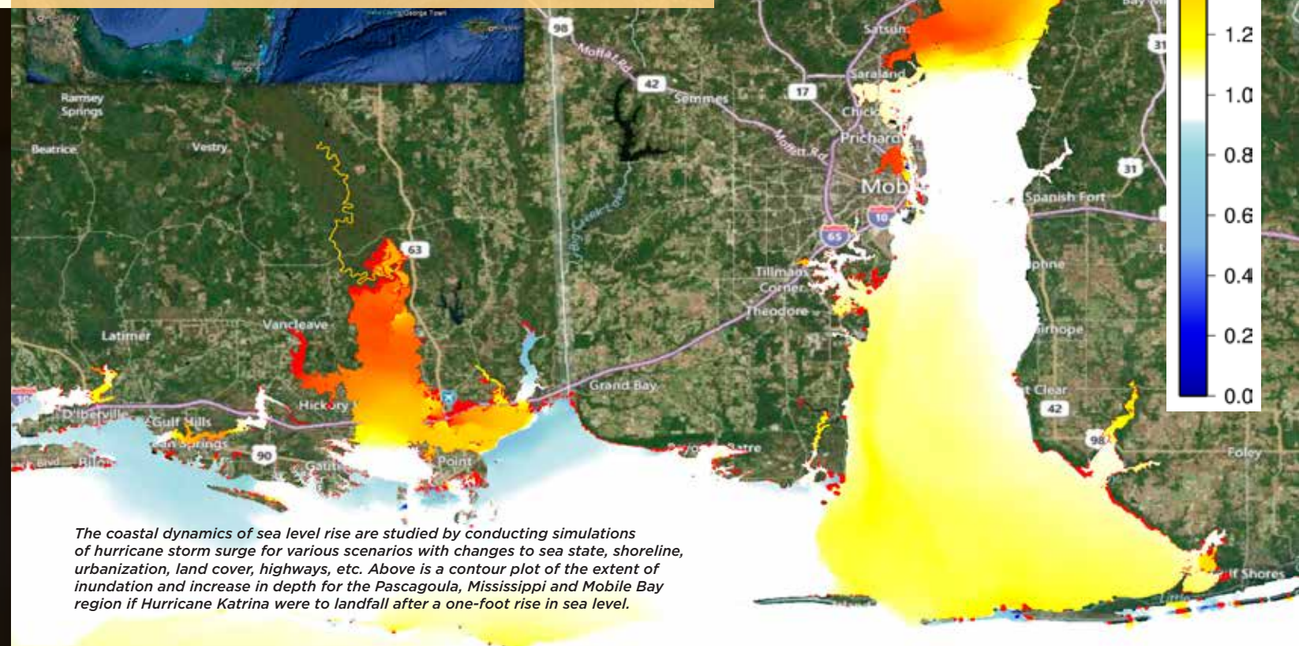
Website: http://champs.cecs.ucf.edu

"The sea level is rising. The best we can do now is to manage the unavoidable and avoid the unmanageable." — Professor Scott Hagen

UCF's STOKES Advanced Research Computing Center empowers Dr. Hagen's work.

Power of Partnerships

The cluster's partners include FEMA, NASA, NOAA, NSF, U.S. Army Corps of Engineers, consulting engineering firms and the Water Management Districts of Florida. Projects include predicting and assessing hydrodynamic, hydrologic and ecologic impacts of sea level rise; applications of remote sensing data; FEMA flood insurance studies; and salinity and oil transport modeling. Studies span the thousands of miles of coastline around Florida and throughout the northern Gulf of Mexico.



The coastal dynamics of sea level rise are studied by conducting simulations of hurricane storm surge for various scenarios with changes to sea state, shoreline, urbanization, land cover, highways, etc. Above is a contour plot of the extent of inundation and increase in depth for the Pascagoula, Mississippi and Mobile Bay region if Hurricane Katrina were to landfall after a one-foot rise in sea level.

About Lead Professor Scott Hagen:

Dr. Hagen, a professor in Civil, Environmental and Construction Engineering, created and directs the internationally recognized Coastal Hydroscience Analysis, Modeling and Predictive Simulations (CHAMPS) Laboratory. He has authored more than 100 peer-reviewed journal articles and conference papers and has edited seven books.

Dr. Hagen is a member of the governing board of the American Society of Civil Engineers' Coasts, Oceans, Ports & Rivers Institute; and was a member of the external review panel, Mississippi Coastal Improvements Program Comprehensive Plan (U.S. Army Corps of Engineers).

INTERACTIVE SYSTEMS AND USER EXPERIENCE (ISUE) RESEARCH CLUSTER OF EXCELLENCE

What We Do:

The cluster develops innovative technologies related to all forms of computer-based interactive experiences that benefit human society. We seek to understand how these technologies affect the user experience. Specifically, the cluster pursues projects and research that supports better learning, physical and mental rehabilitation, entertainment, relaxation and enjoyment.

The UCF Difference:

A variety of disciplines have come together under the cluster to benefit from UCF's expertise in computer science, engineering, psychology, education, digital media and game design, and medicine.

"Computers are engrained in the fabric of our lives. Interacting with them with ease, comfort and efficiency is paramount to the progression of society."

— Associate Professor Joseph LaViola, Jr.

Our Expertise:

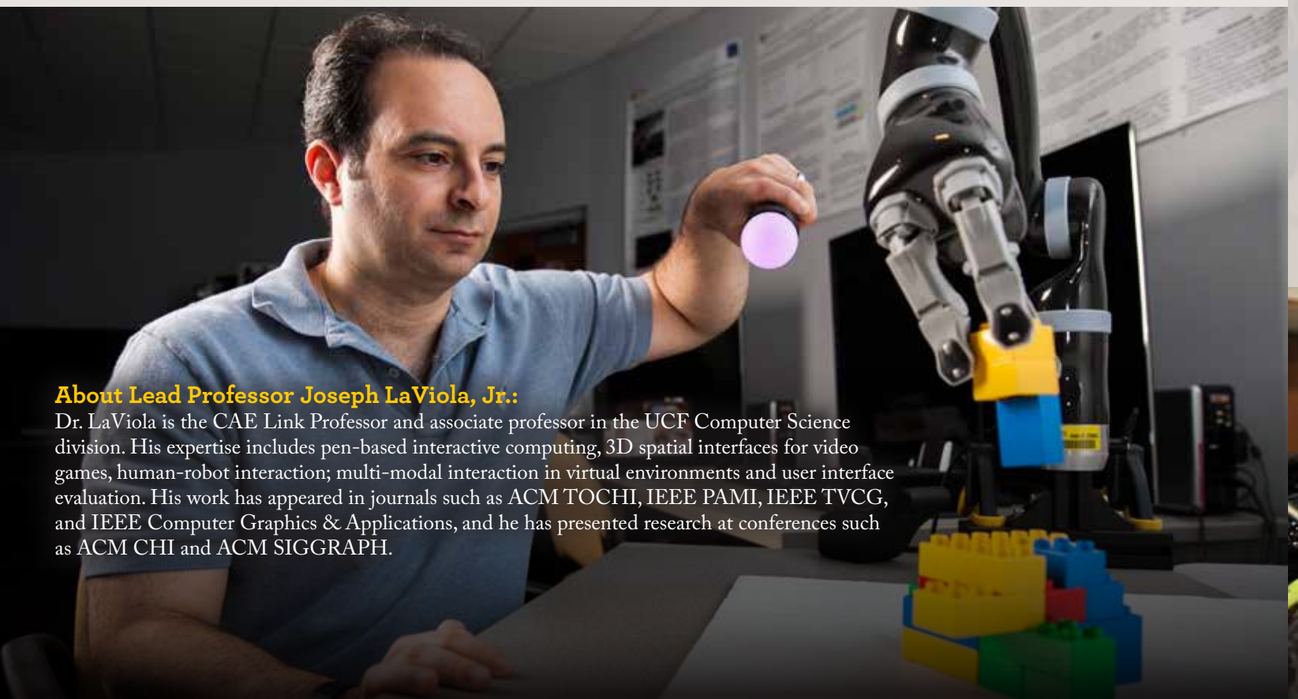
- Interactive technology user experiences and effectiveness
- 3D user interfaces
- Simulation and training
- Video games
- Human-robot interaction
- Virtual and augmented reality environments
- Motion capture technology
- Interfaces for STEM learning tools
- Pen and touch computing
- Training skilled graduates to partake in high-tech interactive technology jobs

Connect:

Call: 407-882-2285

Email: jjl@eecs.ucf.edu

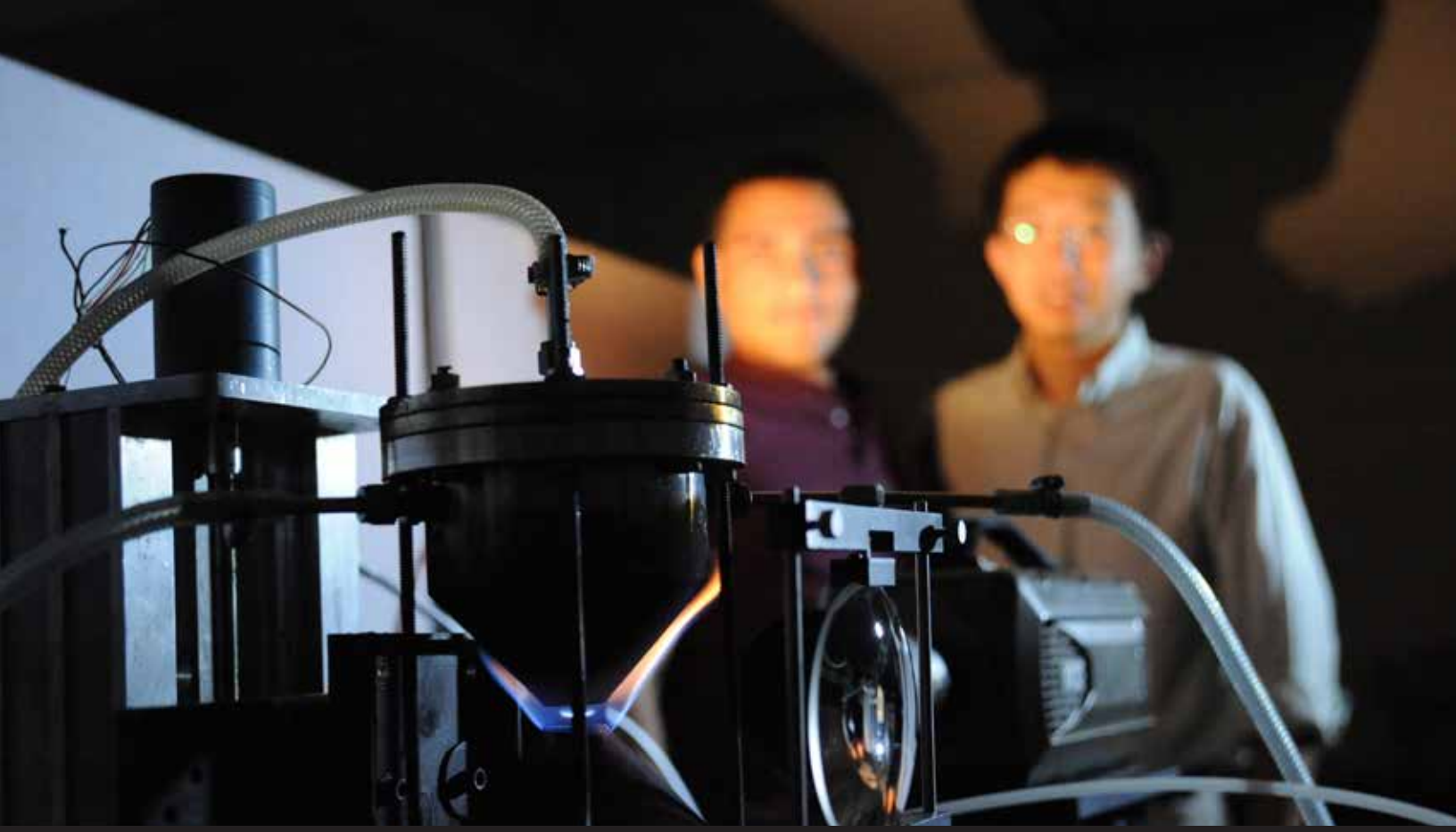
Website: http://www.eecs.ucf.edu/isuerce



About Lead Professor Joseph LaViola, Jr.:
Dr. LaViola is the CAE Link Professor and associate professor in the UCF Computer Science division. His expertise includes pen-based interactive computing, 3D spatial interfaces for video games, human-robot interaction; multi-modal interaction in virtual environments and user interface evaluation. His work has appeared in journals such as ACM TOCHI, IEEE PAMI, IEEE TVCG, and IEEE Computer Graphics & Applications, and he has presented research at conferences such as ACM CHI and ACM SIGGRAPH.

Power of Partnerships
Through its associate director Dr. Gregory Welch, ISUE is aligned with UCF's nationally renowned Institute for Simulation and Training.

ISUE has also partnered with major technology companies, including Intel, Sony, and Microsoft Research, and has been funded by the National Science Foundation, US Army RDECOM, and IARPA as well as several companies including JHT, Inc., Design Interactive, and Intelligent Automation through SBIR programs.



- UCF is designated a "very high research activity" institution by the Carnegie Foundation, the highest rating. With this designation, UCF joins some of the nation's most prestigious universities, including Harvard, MIT, Johns Hopkins and Stanford.
- UCF ranks number 16 among U.S. universities for the impact of its patents, according to IEEE, the world's leading association for the advancement of technology.
- UCF external funding topped $100 million for the ninth straight year. UCF researchers have generated $1.4 billion in external research grants since 2000.
- With UCF as a founding partner, the Florida High Tech Corridor Council has, since 1996, generated more than $1.3 billion in downstream impact to the Florida economy and 4,000 new jobs.

We're Ready to Work with You

The UCF College of Engineering and Computer Science is committed to building win-win partnerships. Our readily accessible intellectual property spans the technology spectrum from software to electronics to power generation. Contact us today to find your next innovative opportunity.

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