

Undergraduate Research Opportunities

March 1, 2010



Dr. Michael Gaines

Assistant Provost of
Undergraduate Research and
Community Outreach

http://www6.miami.edu/UMH/CDA/UMH_Main/0,1770,51877-1;65035-2,00.html



Opportunities within the CoE Departments

- BME
- CAE
- ECE
- IEN
- MAE

BME, Biomedical Engineering

Coral Gables Campus

Biomedical Atomic Force Microscopy Laboratory,

Director: [Dr. Ziebarth](#)
McArthur Engineering Annex, Room MEA 170A

Stem Cell and Mechanobiology Laboratory,

Director: [Dr. Huang](#),
McArthur Engineering Annex, Room MEA 168

Tissue Biomechanics Laboratory,

Director: [Dr. Gu](#)
McArthur Engineering Building, Room MEB 149

Neurosensory Engineering Laboratory,

Director: [Dr. Ozdamar](#), Co-director: [Dr. Bohorquez](#)
McArthur Engineering Building, Room MEB 153

Biomedical Imaging Laboratory,

Director: [Dr. Zhao](#)
McArthur Engineering Annex, Room MEA 201A

UNIVERSITY OF MIAMI

COLLEGE of ENGINEERING



Educating Tomorrow's Technology Leaders for Career Success

Medical School Campus

Biomaterials Laboratory,

Director: [Dr. Andreopoulos](#)
Rosenstiel Room RSMB-8075A, Medical Campus

Joint Bioengineering and Endourology Laboratory,

Co-Director: [Dr. Salas](#), Co-director: [Dr. Leveillee](#)
Miller School of Medicine, 1400 NW 10th Ave, Suite 509

Tissue Engineering Laboratory,

Director: [Dr. Stabler](#)
Miller School of Medicine, Diabetes Research institute

Dual Laboratories (Coral Gables and Medical Campuses) Cartilage Tissue Engineering and Mesenchymal Stem Cells Laboratory,

Director: [Dr. Cheung](#)
McArthur Engineering Building, Room MEA 168
VA Hospital, Miami

Biomedical Optics Laboratory,

Director: [Dr. Manns](#), Co-director: [Dr. Parel](#)
McArthur Engineering Annex, Room MEA 170B
Baskin-Palmer Eye Institute, Miller Medical School

CAE, Civil, Architectural, and Environmental Engineering

Topic/Faculty

Unfunded

- Characterization of Hysteretic Heating in Hybrid Bolted Joints / Giancaspro and Yang (MAE)
- Fire-Resistant Phosphorescent Polymers for Nightclubs / Giancaspro
- High Performance Biocomposites / Giancaspro
- Multiphysics Phenomena of Dry Ice Bombardment of Infrastructure Materials / Giancaspro
- Thermal Damage Characterization in Aerospace Composite Structures / Giancaspro and Yang (MAE)
- Multimedia as a Pedagogical Approach to Advance Engineering Education / Giancaspro
- Advanced composites for new construction and repair / Nanni
- Environmentally compatible construction materials & systems (Mora) Sustainable affordable housing construction (Mora)
- High-Rate Testing and Videography Research in Materials Engineering / Giancaspro and Yang (MAE)

Funded

- Health monitoring of bridge structures / Nanni and Metrovich
- Experimental Assessment of Concrete Surface Preparation Using Dry Ice Bombardment / Giancaspro
- Feasibility of using recycled aggregate replacements in concrete (James/Mora)
- Marine water quality in the context of Oceans and Human Health / Solo-Gabriele



ECE, Electrical and Computer Engineering

Supervisor	Project Title and Description
Dr. Mohamed Abdel-Mottaleb	Biometrics research
Dr. Xiaodong Cai	<ol style="list-style-type: none"> 1. Dynamic Modeling and Simulation of Gene Networks 2. Identification of Gene Regulatory Elements
Dr. Miroslav Kubat	<ol style="list-style-type: none"> 1. Climatological Research 2. Machine Learning
Dr. Shahriar Negahdaripour	GUI for Human-Assisted Control of a Commercial Submersible Robotics Platform
Dr. Kamal Premaratne Dr. Manohar Murthi	Multi-modal data fusion (MM and KP)
Dr. Manohar Murthi	Quantization of signals for robustness to packet loss. (MM)
Dr. Michael Scordilis	<ol style="list-style-type: none"> 1. Miniature, low-power hydrophones 2. New techniques for monitoring and enhancement of very low level acoustic pressure signals
Dr. Mei-Ling Shyu	<ol style="list-style-type: none"> 1. Multimedia Content Analysis and Data Mining 2. Network Security/Network Intrusion Detection
Dr. Akmal Younis	<ol style="list-style-type: none"> 1. Biomedical Image Analysis 2. Information Integration in a Grid Environment Research





DEVELOPMENT OPPORTUNITY FOR SCIENCE AND ENGINEERING STUDENTS

The FIU School of Computing and Information Sciences, with partners FAU and UNCC, is pleased to announce an exciting international research and career development opportunity for students from FIU, FAU, UNCC, UM, and UPRM.

This opportunity is brought to you with funding through a highly competitive, 5-year, \$2.3 million, grant received from the National Science Foundation Partnership for International Research and Education (PIRE) program. The program builds on the LA Grid research collaboration network that was established by FIU and IBM.

Students selected by the PIRE program will become part of a prestigious international research network focusing on using cyberinfrastructure to solve challenging societal problems while training a generation of globally-oriented IT professionals who will become leaders in industry and academia.

PIRE is looking for highly qualified undergraduate, graduate, and post-doctoral students in Science and Engineering disciplines who are interested in:

- Working on critical real-world applications that use or extend cyberinfrastructure as part of an international R&D team
- Experiencing unique technology research and development at top academic and industry laboratories around the world
- Gaining experience in international collaboration and the global economy, which will expand your career opportunities.

The PIRE program includes:

- Collaboration-driven trips (6 weeks to full semesters in length) to research sites in Argentina, Brazil, China, France, India, Italy, Mexico, and Spain
- PIRE Fellowships, up to \$10,000 per semester, which will be awarded to superbly-qualified PhD students
- Monetary awards for winners of its annual poster session
- Cutting-edge research co-supervised by SCIS faculty and international research partners: Cyberinfrastructure Enablement, Cluster/Grid and Supercomputing, Hurricane Mitigation, Bioinformatics, and Health Informatics.

For more information and to apply to become a participant, visit <http://pire.fiu.edu>

"PIRE... will enable the next generation of students participants to become fully engaged as members of the globally-aware IT workforce."
Dr. Nicholas Bowen, Vice President of Strategy and Worldwide Operations, IBM Research

"I was able to develop quite a bit as a person, researcher, and professional."
Marlon Bright, FIU student

"Being able to learn elements directly related to my project, the likes and dislikes of another's culture, and be able to communicate in a different language are all aspects related to the PIRE program for which I will always be grateful."
Simone Pasmore, FAU student

"It helps you build confidence that the degree you hold will enable you to tackle any problem, and, more importantly, it lets you experience the job before committing your life to it."
Allison Lanager, FIU student



IEN, Industrial Engineering

- **University of Miami Industrial Assessment Center (MIIAC)**
Director: Dr. Shihab Asfour
- **Anthony Burns Center for Advanced Supply Chain Management (CASCM)**
Director: Dr. Murat Erkok
- **Biomechanics Research Group (BRG)**
Director: Dr. Shihab Asfour
- **Manufacturing Research Institute (MRI)**
Faculty: Mr. Moataz Eltoukhy
- **Healthcare Systems**
Faculty: Dr. Vincent Omachonu and Dr. Nina Miville
- **Human Factors and Aging**
Faculty: Dr. Joseph Sharit and Dr. Sara Czaja

MAE, Mechanical and Aerospace Engineering

- *Dr. Xiangyang Zhou (General Research Area: Fuel Cells, Materials, Energy):*

Possible topics for Summer and Fall 2010:

- Effect of cleanliness of bonding surface on bonded composite structures for aerospace application.
- Online monitoring of corrosion and cracking in concrete structures.
- All solid state lithium batteries and supercapacitors.

- *Dr. Kau-Fui Wong (General Research Area: Fluids, Renewable Energy):*

Possible topics for Summer and Fall 2010:

- Renewable energy sources (several topics related to sun, wind and water).

- *Dr. Hongtan Liu (General Research Area: Fuel Cells, Renewable Energy):*

Possible topics for Summer and Fall 2010:

- Development of novel flow fields for fuel cells for improved performance.
- Design of fuel cell stacks with super high power densities.
- Practical carbon capture technology (or generating fuels from carbon dioxide).

Topics with other faculty are available:

- Dr. Michael Swain (Research Area: I.C. Engines, Automobile Engineering, Alternate Fuels).
- Dr. Gecheng Zha: (Research Area: Aircraft Design for Improved Efficiency; Bidirectional Airplane, Coflow Jets).
- Dr. Singiresu Rao: (Research Area: System Design and Optimization of Solar Energy and Wind Energy Systems).
- Dr. Jizhou Song: (Research Area: Stretchable/Flexible Electronics).
- Dr. Na Li: (Research area: Micro-Electro-Mechanical-Systems, Nano-Biomechanics).



**Undergraduate Research Activities and Opportunities
In the Department of Electrical and Computer Engineering**

March 1, 2010

Supervisor	Project Title and Description
Dr. Mohamed Abdel-Mottaleb	<p style="text-align: center;">Biometrics research</p> <p>Recognizing people from facial and ear images. Student who will participate in this project will work closely with Ph.D. students who are performing their research in these topics. Students will learn basics of image processing and will get involved in some interesting topics including face and ear modeling and matching. ECE senior Pat O’Keefe is working on this project.</p>
Dr. Xiaodong Cai	<p>1. Dynamic Modeling and Simulation of Gene Networks</p> <p>Apply dynamic systems and control theory as well as signal processing methods to model and simulate the dynamics of gene networks. Possible collaboration with professors in the medical school. The project is particularly suitable for engineering students who are interested in biological or biomedical research.</p> <p>2. Identification of Gene Regulatory Elements</p> <p>Use computational methods to analyze genome sequences and gene expression data and to identify possible gene regulatory elements in the genome. Possible collaboration with professors in the biology department. Good programming skills are required.</p>
Dr. Miroslav Kubat	<p>1. Climatological Research</p> <p>The use of advanced data analysis in climatological research. Application of regression trees to the problem of correcting remote-sensing data.</p> <p>2. Machine Learning</p> <p>The use of machine learning techniques in domains with highly unreliable data.</p>

<p>Dr. Shahriar Negahdaripour</p>	<p>GUI for Human-Assisted Control of a Commercial Submersible Robotics Platform</p> <p>There are a number of projects involving the development of graphical User Interface with Visual C++, or comparable environments (e.g., Python language interface) for sensor output display, control and interaction of the submersible robotics platform owned by the Underwater Vision and Imaging Lab. Recently, one undergraduate student was hired for the project and there are opportunities for more students to be involved. The lab also provides internship supervision to a 10th grader from Gulliver Academy, who is developing various GUI in Matlab for ongoing projects.</p>
<p>Dr. Kamal Premaratne Dr. Manohar Murthi</p>	<p>Multi-modal data fusion (MM and KP)</p> <p>In many applications, one is confronted with massive amounts of various forms of data (e.g., text data, sensor data). For example, doctors are confronted with transcriptions of patient statements, blood pressure readings, and so forth. This project involves investigations into fundamental methods for making sense of and fusing various forms of data (e.g., text and sensor data). ECE seniors Matthew LaPan and Alex Ensminger are working on this project.</p>
<p>Dr. Manohar Murthi</p>	<p>Quantization of signals for robustness to packet loss. (MM)</p> <p>This project involves fundamental work on signal/data compression for transmission of networks that feature packet loss. In particular, we are investigating distributed source coding principles (commonly known as Wyner-Ziv principles) to code speech with robustness to packet loss while featuring efficiencies closer to predictive coding models. This has applications to audio/video coding and transmission. ECE senior James Gibson is working on this project.</p>
<p>Dr. Michael Scordilis</p>	<p>1. Miniature, low-power hydrophones</p> <p>Low level acoustic signals such as those related to physiological processes are very difficult to detect with existing methods. This project research investigates new materials and new design geometries suitable for such applications and it is a collaboration with the UM Medical School.</p> <p>2. New techniques for monitoring and enhancement of very low level acoustic pressure signals</p> <p>Faint, airborne acoustic signals are typically buried in noise and are further distorted by the transducer response and reverberation. In this project we will use our Brüel & Kjær tools to characterize acoustic sources and receivers in our anechoic booth and will investigate signal processing techniques for signal enhancement.</p>

<p>Dr. Mei-Ling Shyu</p>	<p>1. Multimedia Content Analysis and Data Mining</p> <p>To extract information about the content conveyed by the data, using more than one media (audio, video, text, etc.).</p> <ul style="list-style-type: none"> ▪ Image, video, and audio processing ▪ Feature evaluation & selection ▪ Video segmentation and data preprocessing ▪ Multimedia databases ▪ Event detection using multi-modal content analysis and data mining <ul style="list-style-type: none"> ▪ Sports highlights - touchdown, corner kick, dunks, and more ▪ Surveillance – people entering and exiting room under security surveillance ▪ Concept identification and detection <ul style="list-style-type: none"> ▪ Classify broadcast video segments to sports, whether, and other ▪ Evaluation and/or development of feature combination methods using different data mining techniques <ul style="list-style-type: none"> ▪ Decision tree ▪ Association Rule Mining <p>2. Network Security/Network Intrusion Detection</p> <p>To develop effective and efficient frameworks for network intrusion detection.</p> <ul style="list-style-type: none"> ▪ Network traffic generator/simulator ▪ Network programming/multi-threaded programming ▪ (Near) Real-time intrusion detection systems ▪ Distributed multi-agent based intrusion detection systems ▪ Data mining-assisted network intrusion detection systems
<p>Dr. Akmal Younis</p>	<p>1. Biomedical Image Analysis</p> <p>This research project is focused on techniques for processing magnetic resonance imaging studies of the brain for the purpose of quantifying the onset and progression of neuro-degenerative diseases, such as Multiple Sclerosis.</p> <p>2. Information Integration in a Grid Environment Research</p> <p>This project targets the development of information integration approaches in a grid environment for the aggregation of data from multiple data sources.</p>

Department of Mechanical and Aerospace Engineering

Topics for Undergraduate Research

Dr. Xiangyang Zhou (General Research Area: Fuel Cells, Materials, Energy):

Current student:

Evan Asher: Working on: "Development and study of self-sustained electrochemical promotion catalysts for hydrocarbon reforming"

Possible topics for Summer and Fall 2010:

1. Effect of cleanliness of bonding surface on bonded composite structures for aerospace application.
2. Online monitoring of corrosion and cracking in concrete structures.
3. All solid state lithium batteries and supercapacitors.

Dr. Kau-Fui Wong (General Research Area: Fluids, Renewable Energy):

Current students:

Guillermo Amador: Working on: "Power generation for the near future".

Brandon Antoine: Working on: "Turbulence in placement of vertical wind turbines".

Possible topics for Summer and Fall 2010:

Renewable energy sources (several topics related to sun, wind and water).

Dr. Hongtan Liu (General Research Area: Fuel Cells, Renewable Energy):

Current students:

Patricia Custals and Jorge Angel: Working on "Spherical fuel cells".

Possible topics for Summer and Fall 2010:

1. Development of novel flow fields for fuel cells for improved performance.
2. Design of fuel cell stacks with super high power densities.
3. Practical carbon capture technology (or generating fuels from carbon dioxide).

Topics with other faculty are available:

Dr. Michael Swain (Research Area: I.C. Engines, Automobile Engineering, Alternate Fuels).

Dr. Gecheng Zha: (Research Area: Aircraft Design for Improved Efficiency; Bidirectional Airplane, Coflow Jets).

Dr. Singiresu Rao: (Research Area: System Design and Optimization of Solar Energy and Wind Energy Systems).

Dr. Jizhou Song: (Research Area: Stretchable/Flexible Electronics).

Dr. Na Li: (Research area: Micro-Electro-Mechanical-Systems, Nano-Biomechanics).