2004-2005 ONR Research Teams

Computer Networks
Mentor: Mr. Chris Edwards
Napoleon Paxton, Anthony Anderson, Jerome Mitchell

Oceanography
Mentor: Dr. William Porter
Brandi Brehon Karitsa Williams Jacklyn James

Remote Sensing
Mentor: Dr. Malcolm LeCompte
Danielle Graves Erica Pinkney Demetrus Rorie

Multimedia
Mentor: Mr. Jeff Wood
Joanelle Baptiste Trevelyn Williams Kaiem Frink

Geoscience
Mentor: Dr. Lloyd Mitchell
Asani Brewton Matthew Hockaday

Dates to Remember
http://nia.ecsu.edu/nrts/nrtsevent.html

Internship Roundtable
3:30 pm 116 LH, November 9, 2004

CERSER Distinguished Lecture Series
Dr. Phil Dustan, University of Charleston, SC
November 18, 2004

IEEE Southcon 2005
Orlando, Florida, February 16-17, 2005

IEEE-GRSS Distinguished Lecture Series and Remote Sensing Training
Dr. Scott Hensley, NASA JPL
March 3, 2005

ACM-SIGCSE
February 23-27, 2005 St. Louis, MO

IEEE SoutheastCon 2005
Ft. Lauderdale, FL, April 8-10, 2005

Final ONR Oral Reports
April 3 and 5, 2005

Undergraduate Research Experience in Ocean, Marine, and Space Science: ECSU
May 31 - July 15, 2005

IGARSS Conference
Seoul, Korea, September 25-29, 2005

ADMI Conference
Puerto Rico, September 2005

ONR research student Karitsa Williams gives an oral presentation of her summer research.

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Arlington, Virginia 22217-5660

For more information visit our web site: http://nia.ecsu.edu/onr/onr.html
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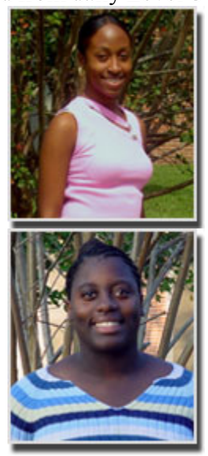
Grant Numbers: N00014-98-1-0749 N00014-99-1-0990 N00014-01-1-1070

NERT
Nurturing ECSU Research Talent

2004–2005 Program Highlights & Summer 2004 Research Abstracts

Danielle Graves - Senior, Applied Mathematics
Erica Pinkney - Junior, Physics
Mentor: Dr. Malcolm LeCompte, Dr. Sonia Gallegos
Internship: Stennis Naval Research Laboratory
Title: The Spatial and Temporal Variability of the NW Gulf of Mexico

A pilot study was undertaken to determine the spatial and temporal variability of chlorophyll concentrations in the northwestern Gulf of Mexico during 2002. The chlorophyll parameter was obtained from daily Level-3 estimations of Sea-Viewing Wide-Field-of–view Sensor (SeaWiFS) data computed by the Naval Research Laboratory. An empirical eigenfunction (EOF) analysis was performed on the data using the Karhunen-Loeve (KL) algorithm. Ten empirical eigenfunctions, temporal coefficients, and variance spectrum were computed. This analysis revealed that 15% of the variance around the mean is accounted by the first empirical eigenfunction, which is identified with chlorophyll fluctuations around the Mississippi Delta, Lakes Pontchartrain and Borgne, the Mississippi Sound, and the Mobile, Pensacola, and Choctawhatchee Bays. The eigenfunction shows that the chlorophyll in near-shore water is changing more rapidly than the rest of the shelf waters. The second EOF which contained 3% of the variance is found to be related to changes in chlorophyll in bays and estuaries to the east of the delta, exclusively. The third EOF (%) was identified with the waters flowing east from the mouth of the Mississippi into bays and estuaries. The fourth EOF (%) is identified with changes in chlorophyll concentrations at the mouth of the Mississippi River proper, propitiated by the river flow. Because this EOF is also identified with waters of Lakes Pontchartrain and Borgne as well as with the Mississippi Sound, it is possible that the changes observed may not be related to chlorophyll but to increases in dissolved and particulate components brought about by an increase in rain fall.



Jerome Mitchell - Sophomore, Computer Science
Mentor: Dr. Prasad Gogineni
Internship: Research Experience for Undergraduates (REU) University of Kansas, School of Engineering
Title: UML Class Diagrams of PRISM Multi-Agent Subsystem Using XML and FIPA

Hurricanes, tornados, thunderstorms, and other natural disasters can have many devastating outcomes. Global warming, the prime investigated natural disaster of the PRISM (Polar Radar for Ice Sheet Measurements) project, has a tremendous effect on the sea level rise. Scientists and researchers have theorized that the excess water is being allocated from the polar ice sheets of Greenland and Antarctica due to the long-term results of global warming; however, there are few resources to confirm the gain or loss ice.

Scientists and researchers of the PRISM project have applied their expertise on teams based on the areas of robotics, communications, intelligent systems, and radar. These areas were essential in measuring the ice thickness an determining the bedrock below the ice sheets in Greenland and Antarctica. In this research, the investigator worked with the Intelligent Systems team by learning the messaging patterns between the data producing agents and the requesting agents. The investigator also created UML class diagrams of a messaging subsystem to represent the collaboration and communication between these two types of agents using XML with FIPA standard code. The class diagram assisted scientists and researchers in planning new features for the multi-agent system.

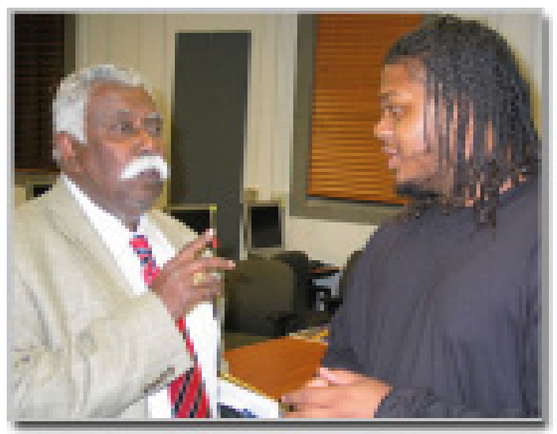
Napoleon C. Paxton - Senior, Computer Science
Mentors: Dr. Jon Hare, Dr. Jud. Kenworthy, Dr. Patrick Biber
Internship: NOAA Educational Partnership Program (EPP) Center for Coastal Fisheries and Habitat Research
Title: Determining the Maximum Depth of Seagrass Beds along the Southern Outer Banks

Interns for the summer of 2004 (May-Aug) will assist in determining the maximum depth of seagrass beds along the Southern Outer Banks. Interns will be responsible for assisting scientists at the NOAA Beaufort Laboratory with this project. The interns will work on geo-referencing existing aerial photography, selecting sampling sites using this imagery placed in a GIS, and then going in the field to assist with ground-truthing activities.

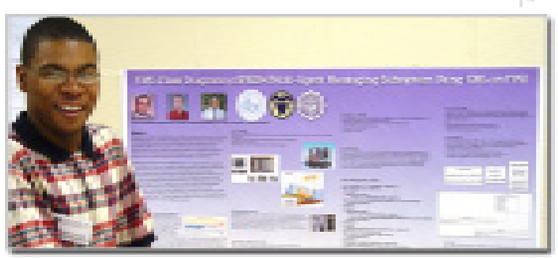
The goals of this project are to develop a long-term record of seagrass bed extent, focusing primarily on the historical changes that have occurred to the deep-edge, and tie this in with historical changes in water-quality. The data gathered from this internship project will be used to calibrate a model of light-attenuation for seagrass habitat requirements. This model is being developed as a tool to assist managers with monitoring water-quality to protect seagrasses, a critical estuarine habitat in North Carolina. Future developments for this model aim to include remote-sensing information in near-real time to enable timely and appropriate management actions to be made.

Karitsa Williams - Junior, Computer Science
Mentor: Dr. Aleta Hohn, Dr. Jon Hare
Internship: NOAA Educational Partnership Program (EPP) Center for Coastal Fisheries and Habitat Research
Title: Relationship Between Sea Surface Temperature and Sea Height on Stranding of Harbor Porpoise along the North Carolina Coast

Interns for the summer of 2004 will assist with determining whether an unusually high number of strandings of harbor porpoise during the winter of 1999 was due to an unusual juxtaposition of oceanographic features in the western the mid-Atlantic. The goals are to investigate whether a narrow band of cold water near shore followed by a strong warm water front results in higher numbers of stranded harbor porpoise than when the front is further offshore. Positive results may allow for development of a model that predicts relative numbers of harbor porpoise strandings. This question has been a concern because an alternative explanation for unusually high numbers of strandings is entanglement of porpoises in gillnets along the mid-Atlantic coast. The interns will work on compiling extracted sea surface temperature (SST) and sea height data, creating graphs and GIS plots, and assisting with analysis of the data. Only one other episode of alarming numbers of strandings of harbor porpoise in North Carolina has occurred in recent times and that was in 1977. Interns will use SST and wind data for years when it was available to ensure that the convergence of oceanographic events seen in 1999 did not occur in other years when high numbers of strandings also did not occur. Although comparable data do not exist for the 1970's, oceanographic sampling cruises did collect data that may be useful. Access to these results will require a literature search.



Dr. Robert George, Marine Ecologist, speaks with Kaiem Frink, ONR freshman researcher.



ONR research student Jerome Mitchell presents his summer internship poster.

Photo Highlights

The Office of Naval Research Nurturing ECSU Research Talent program involves undergraduate mathematics and computer science majors in academic year team research activities. Research and training meetings began in early September and are held every Tuesday and Thursday through mid April. Research meetings start with an announcement period during which time students learn about internship opportunities, hear program announcements, give team reports, discuss travel logistics, and discuss goals of the program. Following the announcement period, students meet with faculty mentors or attend training on tools used for research. In addition, students spend 20 hrs/week in the research computer laboratory completing task sheet requirements and assignments. During the closing program, students make oral presentations of their research activities. The research teams are also required to complete written reports and to maintain a team web page. Shown below are highlights from the 2003-2004 academic year and summer program.

2004-2005 Office of Naval Research
Nurturing ECSU Research Talent (NERT)

Seniors

Joanelle Baptiste
Mathematics

Aswani Brewton
Geology

Danielle Graves
Computer

Jacklyn James
Marine Environ. Science

Napoleon Paxton
Computer Science

Wallace Tsormey
Computer Science

Jeff Wood
Computer Science

Juniors

Anthony Anderson
Computer Science

Erica Pinkney
Physics

Demetrus Rorie
Computer Science

Karitsa Williams
Computer Science

Sophomores

Brandi Brehon
Computer Science

Jerome Mitchell
Computer Science

Freshman

Kaiem Frink
Computer Science

Demetrus Rorie - Junior, Computer Science
Mentor: Dr. Prasad Gogineni
Internship: Research Experience for Undergraduates (REU) University of Kansas, School of Engineering
Title: Sequence Diagram of an Agent Getting Data from a Sensor (RMI System)

Scientists have speculated that due to long-term global climate change there is a surplus of water being released from the polar ice sheets. Although there is much speculation, they have insufficient data to prove this theory. This uncertainty has prompted scientist to explore the interactions between ice sheets, oceans, and atmosphere in an attempt to quantify the role of ice sheets in sea level rise. Scientists and engineers at the University of Kansas are applying their expertise to develop and utilize innovative radar and robotic rovers to measure ice thickness and determine bedrock data conditions below ice sheets in Greenland and Antarctica. This combination of data will help earth scientists determine how quickly the polar ice sheets are melting and to quantify the effects of this melting on sea level rise.

The Polar Radar for Ice Sheet Measurements (PRISM) project aims to design and develop an autonomous mobile radar system to measure polar ice sheets. The PRISM team is divided into four primary areas: Communication, Robotics, Intelligent Systems, and Radar. The communication team is creating technologies that enable communication with the rover, in the field and also from the field to the University of Kansas. The Robotics group created a virtual prototype model that has been a guide to the design and operation of the rover, which includes maneuverability limits, speed limits, and antenna towering capability. The Radar team produced radar systems that are required to execute the scientific measurement of the ice sheets, and the intelligent Systems team has designed the specification for an intelligent agency for radar and vehicle control.

We are currently working with the Intelligent Systems team using the PRISM Intelligent System codebase to get an understanding of the issues involved in the design and implementation of multi-agent systems. The study of multi-agent systems focuses on systems in which many intelligent agents interact with each other. Using the PRISM codebase, we are enhancing our understanding of multi-agent systems and contributing to the PRISM project by creating UML models of key parts of the multi-agent architecture including the MatchMaker, and the underlying RMI system that allows agents to communicate with other agents over networks. Using UML we will develop a class diagram of a messaging subsystem and also a sequence diagram of an agent getting data from a sensor.

Using UML I have developed a sequence diagram of a temperature agent getting data from a remote temperature sensor. With this model the PRISM Intelligent Systems team can plan modifications and addition to the multi-agent system. The diagram will help plan for additional functionality for next years field test.

ONR research students with Dr. George Carruthers at the National Technical Association (NTA) conference.

ONR research student Jerome Mitchell presents his research at the NTA conference.

Brandi Brehon - Sophomore, Mathematics
Mentor: Dr. Paulinus Chigbu
Internship: NOAA Educational Partnership Program (EPP) Center for Coastal Fisheries and Habitat Research
Title: NOAA Fishery Stock Assessment Research and Stock Modeling

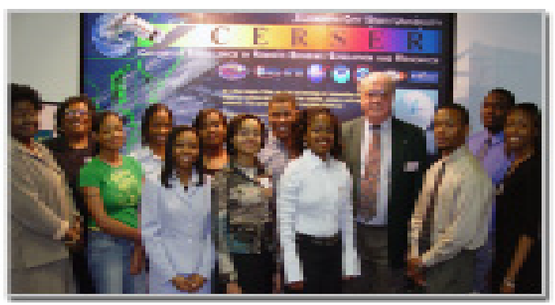
The Fishery Stock Assessment course is a four-week course that is designed to introduce undergraduate and graduate students to fish stock assessment and fisheries management. The course was held at Jackson State University in Jackson, Mississippi. Various students from different institutions with various majors were selected to be in the program. The institutions represented by the various students were Prairie View A&M University, ECSU, Jackson State University, Virginia State University, University of Maryland, Eastern Shore, and Tufts University. The class was not just limited to undergraduate and graduate students; there were two fisheries biologists from the Pascagoula NOAA lab in Mississippi.

The fisheries stock assessment course consisting of thirteen students was held Monday through Friday from nine to five in a computer lab on Jackson State University's campus. The instructors consisted of Dr. Dvorah Hart, Dr. Steve Cadrin, Dr. Stockhauser, Dr. John Brodziak, which were all from the Woods Hole NOAA Lab in Woods Hole, Massachusetts. The staff also consisted of the Principal Investigators for the course Dr. Ambrose Jerald and Dr. Paulinus Chigbu, and Dr. Ralf Riedel, coordinator of the course. Every three days a different instructor would come to JSU to lecture a certain section of the Atlantic States Marine Fisheries Commission: Fisheries Stock Assessment User's Manual. After the lecture, assignments were assigned to the class to complete in a group or individually.

Fishery Stock Assessment is vital in the prevention of extinction of the many species of fish. There is much time and effort spent in the assessment of the fish. The NOAA lab in Beaufort, North Carolina is using stock assessment on the Black Sea Bass. This type of species is interesting because at the stage of maturity, all females change to males. This research involved finding the age that the Black Sea Bass actually change sexes and at what age they should be harvested to ensure that they do not became extinct. If the female fish convert to males before they have a chance to produce than the species may soon become extinct. In order to find this information, such items as total biomass, yield per recruit analyses, spawning stock biomass have to be found. The programming language used for this research project was called "R". R has the capability of making graphs and is used in mathematical research.

Joanelle Baptiste - Senior, Mathematics
Mentor: Dr. Daniel Roman
Internship: EPP, National Ocean Service-National Geodetic Survey-Geosciences Research Division
Title: A Comparison of Continuation Models for Optimal Transformation of Gravimetric Data

The scope of this analysis is to measure the impact of the simplifying assumption that the Earth is flat and not round when upward continuing gravity data. Because of the differences in spatial geometry, assuming a flat plane will cause systematic effects as data are recomputed at a higher elevation. These effects will become more exaggerated with elevation and with distance away from the point of tangency between the assumed plane of the observations and the actual curve of the Earth. The first case means that as you go up, the magnitude of the errors should increase. The second case means that as you move away from the point of tangency at the same elevation, the errors should also increase. Problems arise in both cases, because the observed gravity data are not actually in a flat plane. Hence, the physical relationship has been assumed different than it actually is.



Guest Lecturer, Dr. Keith Raney and research

This year's IEEE International Geoscience and Remote Sensing Symposium entitled "Science for Society: Exploring and Managing a Changing Planet" was held in Anchorage, Alaska. The symposium was based on how advances in remote sensing directly affect life on Earth. This basis reflects today's global economic interdependence where countries are no only tied together environmentally, but economically as well.

ECSU was represented by Dr. Linda Hayden, Karitsa Williams, and Danielle Graves. Dr. Hayden made a presentation entitled "Mentoring Minority Undergraduates through Remote Sensing and Geo-Information Sciences Research". This presentation gave a background of the Center of Excellence in Remote Sensing Education and Research (CERSER) and it's impact on students. Danielle gave a poster presentation entitled "Science, Settlement, and Remote Sensing: Locating the Remains of the Lost Colony of NE North Carolina". This research drew on a wide-range of primary and secondary sources from history, geography, archaeology, and most importantly remote sensing technology. Karitsa's poster presentation, "The Effects of Wind Speed and Direction on both Sea Surface Temperature and Strandings of Harbor Porpoise" dealt with determining whether an unusually high number of strandings of harbor porpoise during the winter of 1999 was due to an unusual juxtaposition of oceanographic features in the western the mid-Atlantic.

Research Student Danielle Graves

IGARSS 2004 Minority Student Program Attendees

The Geoscience and Remote Sensing Society seeks to advance geoscience and remote sensing science and technology through scientific, technical and educational activities. The Society strives to promote a high level of technical excellence among its members by exchange of information through conferences, meetings, workshops, publications, and through its committees to provide for the needs of its members.

The first meeting of the Eastern North Carolina Chapter of the IEEE-GRSS was held on 13 November, 2003 in the Center of Excellence for Remote Sensing Education and Research (CERSER) Lab. IEEE-GRSS has sponsored several lectures and workshops in CERSER's lab including the following:

- **Spring 2003, Dr. Sonia Gallegos**, *"Optical models developed for the Yellow Sea between the coasts of China and the Korean Peninsula"*
- **Fall 2003, Dr. Malcolm LeCompte**, *"Views & Visualization of Earth from Space"*
- **Fall 2003**, **Dr. S. Gogineni**, *"Microwave Remote Sensing and Applications"*
- **Spring 2004, Dr. Keith Raney**, *"Mapping Sea Bottom Topography with Radar Altimetry from Space"*
- **Fall 2004, Dr. Glenn Prescott**, *"Polar Research and Remote Sensing Education and Research Opportunities"*