



Undergraduate Research Experience

Center of Excellence in Remote Sensing Education and Research

Summer 2009 Research Abstracts :: 2009-2010 Program Highlights

Jean Bevins - Sophomore, CS, ECSU

Joyce Bevins - Sophomore, CS, ECSU

Mentor: Marlon Pierce

2009 STEM Summer Scholars Institute at Indiana University, Bloomington Campus

Creating Social Networking Applications for PolarGrid Facebook, by Applying Facebook Application Programming Interface

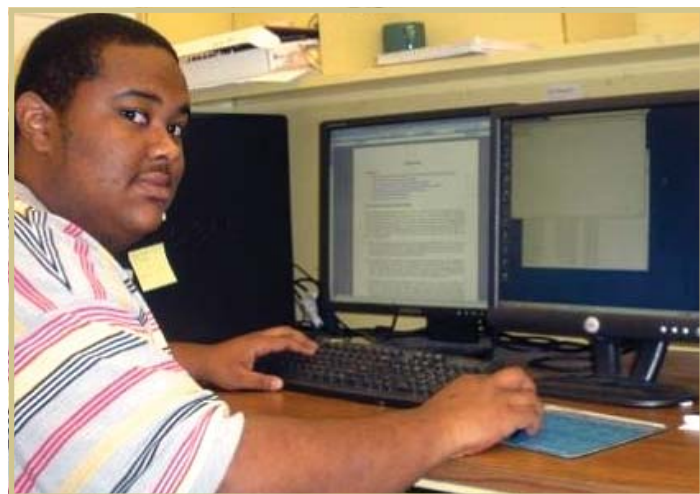


One primary focus of this study was to create a social networking application for PolarGrid by using Facebook Application Programming Interface (API). In completing such, our involvement consisted of a research project to learn the usage of web technologies to provide a way for collaborators to access PolarGrid data and apply simple filters.



PolarGrid, a research project and partnership that seek into the depths of computing infrastructure used to study that of glacial melting, and CReSIS (The Center for Remote Sensing of Ice Sheets), a Science and Technology Center, work hand to hand together. CReSIS does the physical work by going out to the fields collecting ice sheet radar data through remote sensing. PolarGrid provides computer support for the field operations and also supports large-scale analysis of the data after it is returned from the field.

Facebook API is the foundation for building applications on a Facebook platform. Found on the Facebook Developers community page, users have the option of creating or altering an application.



This Social Networking Application also contained data such ice sheet data taken from Greenland from the PolarGrid project. The subglacial terrain images give out ice sheet thickness and the details of internal ice layers over vast areas from both the surface and the air. The purpose of filtering the images is to remove disfigure noise, which usually appears as random grainy patterns. Applying proper filters will enhance the image quality and improve the understanding of subglacial structures.

MyAsia Reid - Junior, CS, ECSU

Michael Jefferson, Jr. - Junior, CS, ECSU

Mentor: Christopher Gifford

CReSIS, University of Kansas

Automatic Ice Thickness Estimation from Polar Subsurface Radar Imagery



This work focuses on automating the tedious task of estimating ice thickness from airborne radar data acquired over Greenland and Antarctica. This process involves the identification and accurate selection of the ice sheet's surface location and interface between the ice sheet and underlying bedrock for each measurement. Knowing the surface and bedrock locations in the radar imagery allows us to compute ice sheet thickness, which is very important for the study of ice sheets, their volume, and how they may contribute to climate change issues. The previous time-consuming manual approach required sparse hand-selection of surface and bedrock interfaces by several human experts, and interpolating between selections to save time. Two primary methods have been studied: edge-based, and active contour. Results are compared and presented in terms of time requirements, error, and advantages which each method offers. Automatic ice thickness estimation results from 2006 and 2007 Greenland field campaigns show that the edge-based approach offers faster processing (seconds compared to minutes), but suffers from a lack of continuity and smoothness aspects that active contours provide. The active contour approach is more accurate when compared to ground truth selections from human experts, and has proven to be more robust to image artifacts.

Justin Deloatch - Junior, CS, ECSU

Mentor: Dr. Jamiiru Luttamaguzi

Ronald E. McNair Post baccalaureate Achievement Program

Artificial Intelligence: Navigating Polygonal Obstacles Using Searching Techniques

The project used artificial intelligence searching techniques to find a path around polygonal obstacles on a plane. The solution was based on both non-informed and informed algorithms. The algorithms are compared and contrasted. Each of these algorithms will work on the problem represented in terms of states and transitions between them. The algorithms then find a path to a goal state by choosing one segment at a time. Java programming was used to implement the algorithms and present the solution in a graphical user interface.



Thaddeus T. Fairley - Sophomore, CS, MVSU

Kadarice J. Joyce - Sophomore, CS, MVSU

Candy M. Graves - Senior, BIO, FSU

Mentor: Dr. Jinchun Yuan

Undergraduate Research Experience in Ocean, Marine, and Polar Science, ECSU

Estimating the distribution of CO2 parameters in surface water of the Indian Ocean from temperature and salinity



The distribution of CO₂ parameters in the ocean is important for understanding the fate of anthropogenic carbon emission and its effects on global climate change. Among the four essential parameters, pH, alkalinity (TA), pCO₂, and total inorganic carbon (Tco₂), any two of them are sufficient to fully define the aquatic CO₂ system. Traditionally, each CO₂ parameters has to be determined using either field sampling or in situ sensors which are inefficient. As a result, temporal and spatial variations of CO₂ system are poorly understood. Recently, linear correlations between CO₂ parameters and temperature, salinity, and concentrations of dissolved organic carbon (DOC) and particulate organic carbon (POC) of various surface waters have been developed (Lohronze and Cai 2006, Berryman et al. 2007, Small and Reid 2007, Yuan 2009). Since sea surface temperature (SST) can be determined from satellite sensors, concentrations of DOC and POC can be estimated from satellite data, and the satellite sensor for sea surface salinity will be launched soon, these correlations will enable estimation of global distribution of CO₂ parameters from satellite data. We have tested these linear equations by predicting CO₂ parameters from sea surface temperature

and salinity along cruise transects in the Indian Ocean. We have compared our prediction with field measurements of CO₂ parameters and evaluated the potential of these linear equations for estimating CO₂ parameters. The final research paper presents our final results, which shows which formula could possibly be future ways of estimating the distribution of CO₂.



Patrina Bly - Sophomore, MATH, ECSU

Mentor: Michael A. Edwards

The Applicability of Geographic Information Systems and Remote Sensing in Identifying Polybrominated Diphenyl Ethers Sources using NOAA National Status & Trends Mussel Watch Program Data



With an ongoing assessment of more than two decades, the Mussel Watch Program is one of the longest running contaminant monitoring programs in the coastal ocean with more than twenty years of data. Mussel Watch uses bivalves (Mussels, Oysters, and Zebra Mussels) as a means to assess water quality. The purpose of the program is geared towards assessing contaminants nationally. Utilizing formats such as Geographic Information Systems (GIS) and Remote Sensing data assessment, an attempt will be made within this project to identify possible releasers of effluent waste into the major coastal watershed regions pertaining to ongoing research conducted within monitored mussel watch sites. The categorization of possible contaminating locations will be made available through the development of a large dataset. This dataset will utilize those derived from agencies such as the United States Environmental Protection Agency (U.S. EPA) and other state government databases such as the National Oceanic and Atmospheric Administration (NOAA), and the United States Geological Survey (USGS).

Utilizing platforms such as ESRI® ArcMap™ software, spatially referenced locations, via point data, vector data, line data, and polygons depicting points and sites of interest will be created using latitude and longitude information. Points and areas of interest (AOI) will be verified using Remote Sensing imagery. As such, Polybrominated Diphenyl Ethers (PBDEs) within observable mussel watch sites will be assessed by NOAA's Center for Coastal Monitoring and Assessment (CCMA). Using this data, researchers will be able to identify possible sources of contributors to the present contaminant.

Tiwana Walton - Senior, MATH, ECSU

Mentor: Sharon Monica Jones

NASA Cooperative Education Program

High Level Aviation Safety Risk Assessment



Prior methods for calculating aviation safety risk assessments were labor intensive. The purpose of this research is to find an alternative method for conducting aviation safety risk analysis in support of the portfolio assessment for Integrated Resilient Aircraft

Control (IRAC) Project within the NASA Aviation Safety (AvSafe) Program. A literature search is being conducted to find high level technology aviation risk assessment methodologies and structured data collection methods for use with subject matter experts. As a result of the literature search, strong consideration has been placed on applying the Delphi Method to conduct future aviation safety analysis using risk matrices and decision support software.

Robyn Evans - Sophomore, CS, ECSU

JerNettie Burney- Sophomore, CS, ECSU

Mentor: Je'aime Powell

Undergraduate Research Experience in Ocean, Marine, and Polar Science, ECSU

A Comparative Analysis of Localized Command Line Execution, Remote Execution through Command Line, and Torque Submissions of Matlab(R) Scripts for the Charting of CReSIS Flight Path Data



The Polar Grid team was tasked with providing the Center for the Remote Sensing of Ice Sheets (CReSIS) with data that would allow signal processing through the CReSIS Synthetic Aperture RADAR Processor (CSARP) to utilize clustered computing resources without the need of MATLAB's® proprietary Distributed Computing Environment. This research centered on the use of MATLAB® through command line, and scripted distribution through TORQUE high performance computing scheduling.



The team used flight path information from the Greenland 2007 field deployment. This data was imported into MATLAB® so that they could be converted from text files into actual MATLAB® script files. With these MEX files, the team was able to create a script within MATLAB® that could plot the flight path data into a graph with the axes of the graph being labeled latitude for the x-axis and longitude for the y-axis.

The team took the master script for the creation of the chart and ran jobs through the command line of MATLAB® to Madogo [Elizabeth City State University's Cluster] and Quarry [Indiana University's Cluster]. The team was then able to compare execution times from the jobs of Madogo versus Quarry. A second comparison was then tested with TORQUE job submission versus MATLAB® submission to see which performed with greater efficiency. Lastly the average execution times of all three data sets were statistically compared with a 5% significance level to determine if there was a statistically significant difference between the use of command line jobs verses TORQUE submission. The paper focuses upon the procedure used in order to complete the research along with the conclusion reached.

2009 TeraGrid Conference

On June 24, 2009, ECSU students JerNettie Burney and Robyn Evans, along with Polar Grid Manager Je'aime Powell, attended the fourth annual TeraGrid Conference held in Arlington, Virginia. The conference lasted a total of five days and brought together students—from high school on up to graduate school—and professionals from different regions. TeraGrid '09 showcased the “capabilities, achievements, and impact of the TeraGrid in research and education” and provided attendees with “hands-on training to enable users of TeraGrid resources to achieve maximum impact.”

This year's conference included a program devoted to students made possible due to funding provided by the National Science Foundation (NSF). This program was added to the conference this year in hopes of exciting students about the potential of computational science and to prepare them to take full advantage of the national cyber infrastructure. The program to introduced students to TeraGrid along with the resources it provides to the computational science and engineering fields.



LaEsha Barnes - Sophomore, Math, CS, MVSU

Cedric Hall - Sophomore, CS, ECSU

Mentors: Dr. Dewayne Branch, Dr. Malcolm LeCompte
Undergraduate Research Experience in Ocean, Marine,
and Polar Science, ECSU

The Carolina Bays: An Investigation of North America's Post Last-Glacial Maximum Environment



Buried beneath the East Antarctic Ice Sheet is a mountain range similar to the European Alps whose age estimates range from 35 to 500 million years. Expeditions during the International Polar Year are seeking to reveal the sub-glacial topography of the range and obtain hints to solve the mystery of their formation. The tools they are using include a combination of ice-core samples and ice penetrating RADAR.



During the Last Glacial Maximum, North America's Laurentide Ice Sheet, reached its maximum extent approximately 20,000 years ago. Its south-easternmost margin penetrated deeply into Pennsylvania. There is no evidence that this or other glaciations went further, but it is believed that evidence for the harsh climatic conditions that prevailed during each glacial episode can be seen in topographical features that remain visible far to the South. Prominent among the features often attributed to glacial climate are numerous elliptically shaped, shallow depressions called collectively Carolina Bays, hypothesized to have been formed by "blow outs" of loose sediment by the strong, sustained winds characteristic of glacial epochs.

Approximately 13,000 years ago, the Laurentide Ice Sheet's retreat was interrupted by a return to glacial climatic conditions that persisted for over 1,000 years. The events precipitating the dramatic, millennial long climatic cooling, known as the Younger Dryas, remain both a mystery and the subject of debate. It has recently been hypothesized that a fragmented comet or asteroid might have simultaneously initiated the YD and formed the Carolina Bays. However, Carbon 14 dating and pollen analysis indicates an earlier genesis. While this research does indicate the bays were



formed during prior glacial epochs, the bays also appear to be repositories of a significant amount of material considered evidence of an extraterrestrial impact including carbon and magnetic spherules and nanodiamonds.

If created during or before the LGM, the bays would have experienced episodic post-formation modification due to cold, dry, windy periods alternating with warm, moist and calmer climatic conditions. In this event, Carolina Bays would episodically fill with wind-blown or water-borne sediment or water.

To understand the processes that created the bays, it is helpful to probe their interior structure. Analogous to the Gamburtsev mountain research, sedimentary core samples and a ground penetrating RADAR survey were used to probe the interior of the bay to collect evidence consistent with either the terrestrial or extraterrestrial formation theory.

Michael Austin - Sophomore, CS, ECSU

Shaketia L. McCoy - Freshman, CS-MATH, MVSU

Frensha Slaughter - Freshman, GIS, MVSU

Mentor: Jeff Wood

Undergraduate Research Experience in Ocean, Marine, and Polar Science, ECSU

Visualization of the CReSIS Greenland Data Sets for the Polar Grid High Performance Computing System



The Center for Remote Sensing of Ice Sheets (CReSIS) has been compiling Greenland ice sheet thickness data since 1993. The airborne program utilizes a 150 MHz radar echo sounder to measure the ice thickness. The data is currently available on the CReSIS web site in various formats including PDF, Matlab, and plain text files. These formats are not readily usable in the classroom environment as a visual representation of the ice depth is not available for each expedition.

During the Undergraduate Research Experience in Ocean, Marine and Polar Science 2009 program, the Greenland Data Visualization Team took the CReSIS data and created a 4-D visualization consisting of depth, time, latitude, and longitude. This visualization was created utilizing HTML,

JavaScript, and PHP. Microsoft Excel was used to filter the raw data downloaded from the CReSIS site. The team then statistically analyzed the Greenland ice sheet thickness data for calculated, missing, and actual depth readings. The goal of this project was to present the CReSIS data via the web in a visual format to elementary, undergraduate, and graduate students for research and education. This visualization package and corresponding data will eventually be migrated to the Elizabeth City State University Polar Grid High Performance Computing System.

2009 National Black Engineer of the Year Awards

As part of the NSF CI-TEAM contributions to Human Resource Development Component, students from Elizabeth City State University recently attended The National Black Engineer of the Year Awards (BEYA) STEM Global Competitiveness Conference which took place in Baltimore, Maryland, February 20-22, 2009. This conference gathers professionals and students from across the U.S. that take part in every field of science, engineering, and technology. ECSU graduate Warren Judge was a conference workshop leader for two sessions.

During the conference seminars and workshops were offered that presented new information on a variety of topics affecting Black technology professionals such as career advancement and diversity programs. A Career Fair brought engineers, scientists, business professionals and students together with employers.



ECSU Research Week 2009

Research Week 2009 at Elizabeth City State University was held on February 2-6, 2009. The theme was "ECSU Tomorrow: Leading, Connecting, Transforming" and was meant to promote research and learning through partnerships with academic alliances, state and federal agencies, private industry, and the community. The overall aim of this week was to increase the number of underrepresented minorities in Science, Technology, Engineering, and Math (STEM).

The Annual Research Fair brought over 15 graduate programs and organizations to share information about graduate study, research opportunities and summer internships spanning the state, region and nation. Research Week 2009 demonstrated the collaborations and partnerships that the ECSU School of Mathematics, Science & Technology has developed and nurtured. ECSU's Chancellor, Dr. Willie Gilchrist, was on hand to welcome guest speakers to the event.

As February was Black History Month, Research Week 2009 represented the school's celebration of the accomplishments of African Americans and HBCU scientists who have made contributions in math, science and technology. The goal was to enhance excitement and enthusiasm about science to the students, faculty, partners, and to the local community and future students at Elizabeth City State University and to create new knowledge to improve the lives of the residents through academic excellence, economic development and collaborative research partnerships.



IEEE-GRSS Spring 2009 Distinguished Lecture Series

On March 3, 2009, The Center of Excellence in Remote Sensing Education and Research (CERSER) continued its IEEE-GRSS Distinguished Lecture Series by welcoming Dr. Yaw A Twumasi, a Research Assistant Professor of Remote Sensing and Geographic Information systems (GIS) at Alcorn State University. Dr. Twumasi research interest concern the use of GIS technology and remote sensing. His research focuses on the use of Geo-spatial. The Distinguished Lecture, co-sponsored by the NSF CI-TEAM project titled “Cyberinfrastructure for Remote Sensing of Ice Sheets” was web cast to all CReSIS and ADMI Partners.

Dr. Twumasi gave a presentation on titled “Application of Remote Sensing Technology to Natural and Built Environments: Some Illustrations.” Special guests were welcomed by Dr. Linda B. Hayden, GRSS Chapter President and Dr. Twumasi was introduced by Dr. Erik Akers, a computer science professor at Elizabeth City State University. Dr. Twumasi’s talk centered around the developments that took place in remote sensing both in the continent of Africa and other countries.



Dr. Linda Hayden with guests and undergraduate students



Mr. Tom Jepsen, President of IEEE-ENCS, Dr. Twumasi, and Dr. William Porter, GRSS Chapter Vice-President



CReSIS Fall 2009 Distinguished Lecture Series

On October 29, 2009, The Center of Excellence in Remote Sensing Education and Research presented the CReSIS Distinguished Lecture Series with Dr. Sam Nwaneri, a Research Assistant Professor of Remote Sensing and Geographic Information Systems at Alcorn State University.

The Distinguished Lecture sponsored by the Center for the Remote Sensing of Ice Sheets was titled “Dynamics of Water Depletion and Global Warming” was webcast to all CReSIS and ADMI Partners. The event was opened by Dr. Harry Bass, Dean of the ECSU School of Math, Science and Technology and guests were welcomed by Dr. Linda B. Hayden, GRSS Chapter President. Dr. Nwaneri was introduced by Dr. Eric Akers, a computer science professor at Elizabeth City State University.



2009 IEEE Geoscience and Remote Sensing Symposium

On July 12-17, 2009 representatives from Elizabeth City State University attended the 2009 IEEE Geoscience and Remote Sensing Symposium in Cape Town, South Africa.

This was the 29th annual symposium for GRSS which brought together world-class scientists, engineers and educators engaged in the fields of geoscience and remote sensing. The 2009 Symposium theme was “Earth Observations - Origins to Applications.”

The IGARSS’09 technical program contained traditional IGARSS topics and a broader program to reflect the theme. In addition to making oral and poster technical presentations, ECSU representatives managed the Education and Outreach section of the conference. This portion of the conference was attended by math and science students from disadvantaged communities in the Cape Town area who were part of the University of Cape Town SHAWCO Science Enrichment Program. Representatives associated with ECSU who made presentations included:

- **Dr. Dewayne Branch**, Center of Excellence in Remote Sensing Education and Research, ECSU
Hands-On Global Positioning Systems and Remote Sensing Training for High School Learners: SHAWCO and MSEN in Cape Town, South Africa
- **Je’aime Powell**, Polar Grid Manager, ECSU
Establishing a Base Camp Server for Remote Sensing of Ice Sheets in Illulissat, Greenland
- **Jerome Mitchell**, Center for Remote Sensing of Ice Sheets, University of Kansas
Geopebbles: Wireless Sensors Nodes for Seismic Monitoring of Ice Sheets
- **Brittany Maybin**, Undergraduate Research Experience in Ocean, Marine, and Polar Science, Spelman College
Temporal and Spatial Variations of Sea Surface Temperature and Chlorophyll a in Coastal Waters of North Carolina
- **Randy Justin**, Pennsylvania State University
East Antarctic Ice Sheets: Characterizing Ice Sheet Thickness and Hydrologic Potential of Sub-Glacial Lake Environments



IGARSS 2009



(l to r above)
 Omotilewa Oluwatoba and Amojo Isaac of the University of Lagos, Nigeria, and Prosper Yaw Adiku of the University of Ghana, Ghana



2009-2010 URE Academic Year Research Teams

Gambit, Mentor: Dr. Dewayne Branch
 Michael Jefferson, Jr. Chelsea Vick
 Vernon Brown Patrina Bly

CRISM, Mentor: Dr. Eric Akers
 Joyce Bevins MyAsia Reid
 Justin Deloatch

Oceanography, Mentor: Dr. Jinchun Yuan
 Nicholas Tabron Cedric Hall
 Jean Bevins

Polar Grid, Mentor: Mr. Je'aime Powell
 Michael Austin JerNettie Burney
 Robyn Evans

Multimedia, Mentor: Mr. Jeff Wood
 Kieshiah Holloway Nadirah Cogbill
 Latricia Dancy Britney Jones
 Matravia Seymore



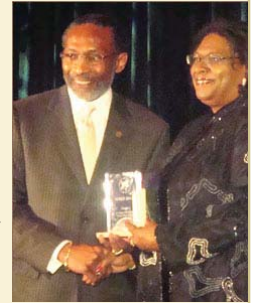
Dr. Benjamin Branch and Undergraduate Research Students



Undergraduate research students present internship opportunities and experiences at the 2009 ECSU Internship Roundtable

NAFEO NOBLE Laureate Award

Dr. Linda Hayden was awarded the 2009 National Association for Equal Opportunity in Higher Education (NAFEO) NOBLE Prize award on April 4, 2009 at the 2009 NAFEO Conference in Atlanta, GA. Dr. Hayden received this award for her work in education and research as Director of the Center of Excellence in Remote Sensing Education and Research at Elizabeth City State University.



This award went to faculty members of Historically Black Colleges and Universities and Predominantly Black Institutions who were distinguished as teachers or researchers in at least ten high need or growth disciplines: the sciences; technology; engineering; mathematics; health professions; law; economics; foreign languages or foreign affairs; teacher education; "peace, justice, equity or ecumenism."

Shown (l to r)

Dr. Edgar Dillard

Navy Career Transition Center

Mr. Charles Luther

Past President of IEEE-GRSS

Dr. Anthony Junior

Office of Naval Research



IEEE-GRSS Student Branch #66221 Meeting

The fourth meeting of the IEEE Student Branch #66221 was held on April 14, 2009 in Room 229, Dixon Hall on the campus of Elizabeth City State University. Mr. Je'aime Powell, president of the Student Branch, called the meeting to order. The meeting centered around the Student Branch guest lecturer, Dr. Benjamin Branch, a Ph.D. Student at North Carolina State University delivered a presentation on his research entitled "A Theory of Educational Change from a Spatial Thinking Culture".

IEEE-GRSS Student Branch officers were also elected during this meeting. The following positions were filled:

President - Je'aime Powell

Vice President - Michael Jefferson

Secretary - MyAsia Reid

Treasurer - Patrina Bly

Branch Representatives - Ryan Winder, Robyn Evans



For more information visit <http://nia.ecsu.edu/ur.html>

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