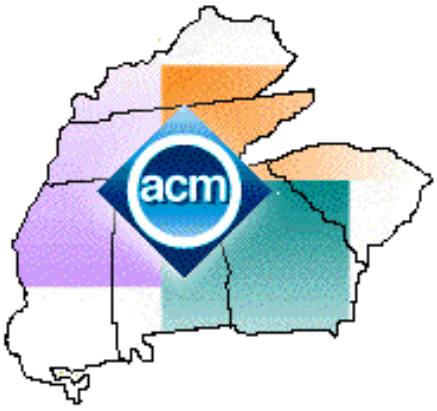
Fall Conference Proceedings

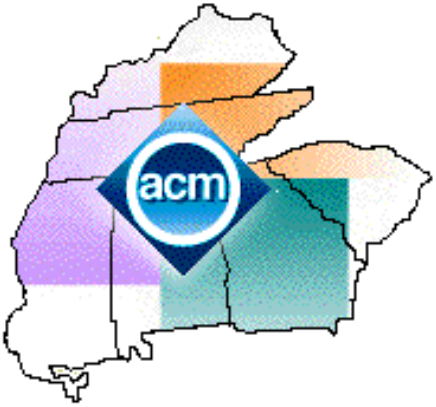
Mid-Southeast Chapter



of the ACM

Gatlinburg, Tennessee
Nov. 15-16, 2012

Mid-Southeast Chapter



of the ACM

For information on the 2013 Fall Conference, select the conference link from the official chapter website: www.acmmidsoutheast.org

A special "thank you" goes to Cengage Learning for lending financial support to this year's conference.

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Message from the Chapter Chair

Welcome to the 2012 Fall Conference of the Mid-Southeast Chapter of the Association for Computing Machinery. On behalf of the officers and members of the ACM Mid-Southeast Chapter, I welcome you to our annual gathering in scenic Gatlinburg, Tennessee.

This year's conference features a full day of technical sessions. We received over 80 abstract submissions including over 30 abstracts from undergraduate students and over 20 abstracts from Master's degree students. Presenters at the conference represent institutions throughout the Southeast and beyond.

The hallmark of the ACM Mid-Southeast Conference is its dedication to, and appreciation of student participation. I especially welcome our students and encourage you to enjoy the camaraderie and fellowship offered by your fellow students and our faculty/industry participates. Accompanying the student emphasis is a special "Thank You" to our student presentation judges. A difficult task always addressed earnestly and enthusiastically by our judges. Your effort is truly appreciated.

The orderly presentation of 80-plus abstracts requires the dedicated effort of our Session Chairs in maintaining the schedule. We thank you for serving the Chapter and keeping the conference on track.

An enormous amount of effort is required throughout the year to bring this conference to fruition. The Chapter extends its gratitude and heartfelt thanks to our conference committee: Conference Chair, Greg Kawell, Program Chair, Kathy Winters, Chapter Treasurer, Bob Bradley, and Judges Coordinator, Brian Toone. Please make a point to stop by the Registration Desk some time during the conference to thank these folks for the effort.

Thank you for attending and participating. Have a great conference. Get out and enjoy the beauty of Eastern Tennessee. Make you plans now to participate in the 2013 conference.

To all, welcome and enjoy.

Randy K. Smith - University of Alabama

Chapter Officers

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Chair

Brian Toone, Samford University

Undergraduate 2-year

Amber Wagner, University of Alabama
Srinivasarao Krishnaprasad, Jacksonville State University

Undergraduate 4-year

Edward Bosworth, Columbus State University
Sylvia Colvin, Tennessee Valley Authority
Gabriel Loewen, University of Alabama
John Nicholson, Austin Peay State University
Randy Smith, University of Alabama
Wayne Summers, Columbus State University
Amber Wagner, University of Alabama
June West, Spartanburg Community College
Melissa Wiggins, Mississippi College

Masters

Sylvia Colvin, Tennessee Valley Authority
Srinivasarao Krishnaprasad, Jacksonville State University
Xuejun Liang, Jackson State University
John Nicholson, Austin Peay State University

Doctoral

Nancy Smithfield, Austin Peay State University
Glenn Wiggins, Mississippi College

Session Chairs

Azalea

Session I:	Ken Adcock, Cleveland State Community College
Session II:	Ken Adcock, Cleveland State Community College
Session III:	Radhouane Chouchane, Columbus State University
Session IV:	Radhouane Chouchane, Columbus State University
Session V:	Amber Wagner, Austin Peay State University

Dogwood I

Session I:	William Johnson, Georgia Perimeter College
Session II:	Kathy Winters, University of Tennessee – Chattanooga
Session III:	William Johnson, Georgia Perimeter College
Session IV:	James Jerkins, University of North Alabama

Dogwood II

Session I:	Randy Smith, University of Alabama
Session II:	Radhouane Chouchane, Columbus State University
Session III:	Ken Adcock, Cleveland State Community College
Session IV:	William Johnson, Georgia Perimeter College

Highlander I

Session I:	James Jerkins, University of North Alabama
Session II:	James Jerkins, University of North Alabama
Session III:	Kathy Winters, University of Tennessee – Chattanooga
Session IV:	Kathy Winters, University of Tennessee – Chattanooga

Highlander II

Session I:	Gabriel Loewen, University of Alabama
Session II:	William Johnson, Georgia Perimeter College
Session III:	James Jerkins, University of North Alabama
Session IV:	Randy Smith, University of Alabama

Notes

ACM Mid-Southeast Chapter
2012 Fall Conference
Gatlinburg, Tennessee
Glenstone Lodge

Thursday, November 15, 2012

4:00 – 6:00 p.m.	**Registration**
6:00 – 7:30 p.m.	**Social Meeting, Hospitality Suite**
7:30 – 9:00 p.m.	**Dinner — (Individual Arrangements)**
9:00 – 11:00 p.m.	**Social Gathering, Hospitality Suite**

Friday, November 16, 2012

7:30 – 9:00 a.m.	**Registration**
7:30 – 8:00 a.m.	**Morning Coffee Sponsored by Cengage Learning**
8:00 – 8:10 a.m.	**Welcome/Announcements — Azalea**
	Welcome Chapter Chair
	Conference Announcements Conference Chair
	Program Announcements Program Chair
8:10 – 9:00 a.m.	**Keynote Address**
9:00 – 9:15 a.m.	**Coffee Break Sponsored by Cengage Learning**

Session I: 9:15 – 10:35 a.m.

Azalea:	**Master's Degree Presentations - Artificial Intelligence** Session Chair: Ken Adock
9:15 – 9:35	*Agent Based Modeling for Social Behavior*, Hugh Kwon - Columbus State University
9:35 – 9:55	*Identifying Student Dropouts using Fuzzy Inferencing*, Shahriar Ibne Husainy - Columbus State University
9:55 – 10:15	*Evolutionary Computation for Optimization using Simulation-based Fitness Evaluation*, Touhid Ahmed - Columbus State University
10:15 –10:35	*Smartphone-based Fall Detection*, Kevin Ringstaff - University of Tennessee - Chattanooga
Dogwood I:	**Undergraduate 4-year Presentations - Artificial Intelligence** Session Chair: William Johnson
9:15 – 9:35	*Computer-aided Diagnoses for Acute Coronary Syndrome with Data-Mining Techniques*, Albert Thornton and Dr. Yu Cao - Troy University
9:35 – 9:55	*Medical Image Indexing, Search, and Retrieval System using Canonical Correlation Analysis with Explicit Semantic Analysis*, Chyeeka Brown - University of Tennessee - Chattanooga
9:55 – 10:15	*An Alternative Approach for Dynamic Spatial Decomposition Applied to Virtually Represented Worlds*, Robert Myers - University of Tennessee - Chattanooga
10:15 –10:35	*Smart Vision for Managed Home Care*, Jackson Goodwin - University of Tennessee - Chattanooga

Dogwood II:	**Doctoral Degree Presentations** Session Chair: Randy Smith
9:15 – 9:35	*Community Survey on Claims and Beliefs about Code Clones.*, Debarshi Chatterji - University of Alabama
9:35 – 9:55	*Domain-Specific Languages for Developing and Deploying Signature Discovery Workflows*, Ferosh Jacob - University of Alabama
9:55 – 10:15	*OpenFortran: Extending Fortran with Meta-Programming*, Songqing Yue - University of Alabama
10:15 –10:35	*Managing Complexity In Cyber-Physical Systems With Design Patterns*, Jerry A. Higgs – Univ of Alabama-Birmingham
Highlander I:	**Professional Presentations – Computer Education** Session Chair: James Jerkins
9:15 – 9:35	*Lessons Learned in Piloting a CS Principles Course*, Amber Wagner - University of Alabama
9:35 – 9:55	*Teaching a New Web User Interface Design Course to Computer Science - Web Technology Undergraduates*, Leong Lee - Austin Peay State University
9:55 – 10:15	*Javascript as a First Language*, Nicholas Coleman - Austin Peay State University
10:15 –10:35	*Implementation of Software Engineering Techniques in System Analysis and Design Courses*, Masoud Naghedolfeizi - Fort Valley State University
Highlander II:	**Professional Presentations** Session Chair: Gabriel Loewen
9:15 – 9:35	*Observations from the Bunker: BYOD Usage in Computer Science Education*, Eric L. Brown and Jeremy Ey - Tennessee Tech University
9:35 – 9:55	*Incorporating Declarative Programming in a Discrete Mathematics Curriculum*, Joshua T. Guerin - University of Tennessee - Martin
9:55 – 10:15	*Detecting Machine-Morphed Malware Variants Via Authorship Attribution*, Radhouane Chouchane - Columbus State University
10:15 –10:35	*Security for Mobile Devices*, Katherine H. Winters - University of Tennessee - Chattanooga

Session II: 10:40 – 12:00 p.m.

Azalea:	**Master's Degree Presentations - Artificial Intelligence / Security** Session Chair: Ken Adcock
10:40 – 11:00	*Feature Extraction Methods for Activity Classification*, Travis Ringstaff - University of Tennessee - Chattanooga
11:00 – 11:20	*Secure Software Design and Development Incorporating Role-based Access Control, Cryptographic Storage and Validation, and Parameterized SQL Statements*, Sandeep Thumma - Jackson State University
11:20 – 11:40	*Design and Implementation of Parallel Approximate Search Algorithm*, Krerkchai Kusolchu - Columbus State University
11:20 – 11:40	*Keeping Up With Modern Day Malware*, Rodrigo Sardinas - Columbus State University
Dogwood I:	**Undergraduate 4-year Presentations- Computer Science Education** Session Chair: Kathy Winters
10:40 – 11:00	*Electronic Brains for Student Success: Using Artificial Neural Networks to Predict Retention, Progression, and Graduation Rates*, Mark Plagge - Columbus State University
11:00 – 11:20	*Bringing Theory and Reality Together in Computer Science Curriculum*, Andrew Overton - Jackson State University
11:20 – 11:40	*The Life and Times of DES*, Elizabeth Wright - Tusculum College
11:40 – 12:00	*Using Undergraduates to Build an Animated Flash Tutorial for CS1*, Michael Orsega, Toni Carlson, David Siver - University of West Georgia

Dogwood II:	**Doctoral Degree Presentations** Session Chair: Radhouane Chouchane
10:40 – 11:00	*A Comparison of Parallel Machine Learning Algorithms in a Cloud versus a Cluster*, Jeffrey A. Robinson - University of Alabama
11:00 – 11:20	*Transaction Management of Cloud Databases*, Md. Ashfakul Islam - University of Alabama
11:20 – 11:40	*Creating a VUI for Initial Programming Environments*, Amber Wagner - University of Alabama
11:40 – 12:00	*Model Transformation Design Patterns*, Huseyin Ergin - University of Alabama
Highlander I:	**Professional Presentations** Session Chair: James Jerkins
10:40 – 11:00	*Unifying Object Model and Data Model with a Verb/Verb Phrase-Driven Approach*, Tzusheng Pei - Jackson State University
11:00 – 11:20	*Online, Offline, and Out of Line: Plagiarism and the Demise of Academic Integrity*, Robert A. Fleck, Jr., Ph.D. - Northcentral University
11:20 – 11:40	*A Void-Cluster Technique For Half-Tone Visual Cryptography*, Tzusheng Pei - Jackson State University
11:40 – 12:00	*Will Spam 4 Work*, Kurt Wesner and Bob Bradley - University of Tennessee - Martin
Highlander II:	**Professional Presentations** Session Chair: William Johnson
10:40 – 11:00	*Alternative Techniques and Tools for Mobile Cross-Platform Development*, John Nicholson - Austin Peay State University
11:00 – 11:20	*Application of Computing Neural Networks to Forecasting Service Life Estimation of Plant Components*, Ramana M. Gosukonda and Nabil Yousif - Fort Valley State University
11:20 – 11:40	*Experiences with Virtual Desktop Infrastructure (VDI)*, Jeremy Ey - Tennessee Tech University
11:40 – 12:00	*Pros and Cons of Blocking and Non-blocking Techniques in Concurrent Programming*, Srinivasarao Krishnaprasad - Jacksonville State University

Lunch **Patio Restaurant 12:00 – 1:00 p.m.**

Session III 1:00 – 2:20 p.m.

Azalea: **Master's Degree Presentations & Professional Presentation**
Session Chair: Radhouane Chouchane

1:00 - 1:20 *Knowledge Base Framework for Building Personal Health Information System.*, Pramukh Reddy Karla - Texas A&M University - Commerce

1:20 - 1:40 *Efficiently Annotating a Genome*, Nathaniel Perry and Thomas Richards - Middle TN State University

1:40 - 2:00 *Improving the odds of success in Computer Science 1*, Wayne Summers - Columbus State University

Dogwood I: **Undergraduate 4-year Presentations- Robotics / Artificial Intelligence**
Session Chair: William Johnson

1:00 - 1:20 *Students Reporting to Students: A Collaboration Between Two Software Engineering Classes*, Jessica Kennemore - Columbus State University

1:20 - 1:40 *Understanding Artificial Intelligence and Real Time Systems with Lego and LeJOS*, Patrick Poirson and Ellis Hicks - University of South Alabama

1:40 - 2:00 *Experiment with SunSpot Technology for Building Smart Environment (ESSE)*, Geoffrey Platta - Columbus State University

Dogwood II:	**Undergraduate 4-year Presentations** Session Chair: Ken Adcock
1:00 - 1:20	*A Pilot Study To Determine The Effects Of A Web-Based - Animated Pedagogy In Two Basic Science Courses*, Dion Jackson - Talladega College
1:20 - 1:40	*A Model Designed To Increase The Number Of African American Women In STEM Fields At Small And Medium Size Historically Black Colleges And Universities*, Deirdre Childress - Talladega College
1:40 - 2:00	*Usage Of Mobile Technology To Improve Unspoken Interaction Between Faculty And Student In Classroom Settings: A Study Of The Literature*, Kierra Jackson - Talladega College
2:00 - 2:20	*An Investigation Of Low Graduation Rates In Small And Medium Size Historically Black Colleges And Universities (HBCUs) In Science, Technology, Engineering And Mathematics (STEM) Fields*, Justin Tyner - Talladega College
Highlander I:	**Doctoral Degree Presentations** Session Chair: Kathy Winters
1:00 - 1:20	*On The Performance of Apache Hadoop in a Tiny Private IaaS Cloud*, Gabriel Loewen - University of Alabama
1:20 - 1:40	*Accountable Cloud with B+ Tree*, Kazi Zunnurhain - University of Alabama
1:40 - 2:00	*Pay Attention to Your Data*, Sui Gong - University of Alabama - Huntsville
Highlander II:	**Professional Presentations** Session Chair: James Jerkins
1:00 - 1:20	*Modeling and simulation of distributed computing workflows in heterogeneous network environments*, Yi Gu - University of Tennessee - Martin
1:20 - 1:40	*Teaching Robotics Vision Applications Using Tekkotsu*, Xuejun Liang - Jackson State University
1:40 - 2:00	*Exploring CASE Tool Impacts on Software Project Success*, Denise Williams - University of Tennessee - Martin
2:00 - 2:20	*CS Student Engagement Through Physical Computing*, David Brown, Richard Barber - Pellissippi State Community College

Break **Poolside 2:20 – 2:35 p.m.**
Sponsored by Cengage Learning

Session IV 2:35 – 3:55 p.m.

Azalea: **Master's Degree Presentations - Networking / Neural Networks / Software Eng.**
Session Chair: Radhouane Chouchane

2:35 - 2:55 *Visually Trace back Stepping-Stone Intrusion*, Malika L. Harris - Columbus State University

2:55 - 3:15 *Implementation of a Virtual Network for Cloud Computing*, Markus Bailey - Jackson State University

3:15 - 3:35 *Learning Math With NeuralPlay Using Mobile Technologies*, Gyanchand Pankaj Jain - Texas A&M University - Commerce

Dogwood I: **Undergraduate 4-year - Seemed Like a Good Idea / Nifty Proofs**
Session Chair: James Jerkins

2:35 - 2:55 *A Study On The Need For An Improved STEM Student Retention Strategy In Small And Medium Size Historically Black Colleges And Universities*, Tevon Bond - Talladega College

2:55 - 3:15 *New Family Observation Method*, Nicholas Dzugan - Samford University

3:15 - 3:35 *The Uses of Coopr in Mathematics and Computer Science Education*, Tyler Bright - Tusculum College

3:35 - 3:55 *Social Network Analysis & Modeling*, Todd Ervin, Chad Howard, Zach Michener, Ben Rosen, Danielle Betke, Asa Jone, Semmy Purewal, and Janine Haugh - University of North Carolina Asheville

Dogwood II:	**Undergraduate 2-year Presentations** Session Chair: William Johnson
2:35 - 2:55	*Autonomous Irrigator*, Johnson Boswell and Brendan Mack - Georgia Perimeter College
2:55 - 3:15	*Framework for Autonomous Control of Interacting Vehicles*, Mariam Mathew and Vincent Hughes - Georgia Perimeter College
3:15 - 3:35	*Submarine Exploration Robot*, Gedeon Nyengele and Sean Stubbs - Georgia Perimeter College
Highlander I:	**Undergraduate 4-year Presentations** Session Chair: Kathy Winters
2:35 - 2:55	*Improving Socialization and Emotion Recognition for Autistic Children Using a Smartphone App*, Cassidy Lamm and Joshua Wolfe - University of Alabama
2:55 - 3:15	*Using Mobile Applications to Aid Students in Higher Education*, Chelsea Rath - Middle TN State University
3:15 - 3:35	*Windows 8 App Development - Grid Views and Lucky Charms - Don't Call It Metro*, Andrew P. Berry, Dustin Damesworth, Michael J. Hayes, Daniel R. Miller, and Jeffrey N. Stubblefield - University of Tennessee - Martin
3:35 - 3:55	*Developing Cloud Hosted Database Driven Applications for Both Web Browsers and Clients*, Joshua C. Hart, Joseph D. Myers, Kinjalkumar G. Patel, Mark Harris, and Cody Watkins - University of Tennessee - Martin
Highlander II:	**Undergraduate 4-year Presentations** Session Chair: Randy Smith
2:35 - 2:55	*Web based teaching through real-time collaboration with ghcLiVE*, Shae Erisson - University of North Alabama
2:55 - 3:15	*Utilizing the Xbox Kinect to Facilitate At-Home Stroke Rehabilitation*, Joshua L Skelton - University of Tennessee - Chattanooga
3:15 - 3:35	*A Binary Code-based Finite State Machine Model to Determine Ancestor-Descendant Relationships in Directed Acyclic Graphs*, Andrew Overton - Jackson State University
3:35 - 3:55	*A Study On Privacy Risks Associated With Radio Frequency Identification*, Jonathan Newman - Talladega College

4:30 – 5:00 p.m. **Business Meeting, Highlander I**

5:00 – 7:00 p.m. **Social Gathering, Hospitality Suite**

7:00 – 8:30 p.m. **Awards Banquet, Azalea**

8:30 – 11:00 p.m. **Social Gathering, Hospitality Suite**

Keynote Address

Dr. Teresa Abi-Nader Dahlberg

Professor of Computer Science and Associate Dean of Undergraduate Programs and Administration for the College of Computing and Informatics

University of North Carolina - Charlotte

Shaping the 21st Century Technology Workforce with the STARS Computing Corps

Abstract

There has never been a more exciting time for computing! In this century, the role of the computing professional has expanded well beyond tech support and software development to that of game-changer, as technology continues to drive innovation in almost every business sector. The 21st century technology workforce needs professionals with deep technical skills paired with broad interdisciplinary and soft skills – what some call T-shaped professionals. In this talk, I'll share our vision for the new computing workforce and highlight how the STARS Computing Corps is helping computing departments reach this vision through student engagement with technology, research, and outreach. Forty-nine colleges and universities have participated in the STARS Computing Corps, producing notable impact on student achievements as well as on the size and diversity of computing enrollments.

About the Speaker

Teresa Abi-Nader Dahlberg is Professor of Computer Science and Associate Dean of Undergraduate Programs and Administration for the College of Computing and Informatics at UNC Charlotte. Teresa has over 25 years of experience in computer science and engineering - as an academic researcher, educator and administrator; research center director; industry developer, and intellectual property consultant. Teresa is founding Director of the Diversity in Information Technology Institute, a research center that has created a set of pipeline programs for student recruitment, education and broadening participation from K-12 through graduate school. She is co-founder and director of the STARS Alliance, a national community of practice for student-led regional engagement. Teresa leads the STARS Alliance efforts to scale from 20 to 50 colleges and universities by 2016. Teresa created the Socially Relevant Computing Research Experiences for Undergraduates program; the Pathways from Community College to Graduate School scholarship program; and the Computing Scholarships for Ph.D. Students program. Teresa leads the national formation committee for the Association of Computing Machinery Special Interest Group on Broadening Participation (ACM SIGBP). She has served as an expert consultant with the National Science Foundation CISE Education and Workforce Programs and now serves on the NSF CISE Advisory Committee. As a Computer Science professor, Teresa's research and teaching focus on areas of communications networking, computing education, and broadening participation. Teresa received the B.S. degree in Electrical Engineering from the University of Pittsburgh and the M.S. and Ph.D. degrees in Computer Engineering from North Carolina State University. She worked as a hardware and software development engineer for the IBM Corporation for ten years, before joining the faculty at the University of North Carolina at Charlotte.

Student Abstracts
Undergraduate Two-Year Programs

Autonomous Irrigator

Johnson Boswell, Daniel Busby, Miriam Castillo, Brendon Mack, Al-Malick Knox, Anthony Nguyen, Cynthia Belinga, Melvin Garrett, Russell Davis, Van Vu, and Shivam Patel
Georgia Perimeter College

Automated irrigation assists agricultural systems by assuring the dispersion of water to crops, thus, reducing the probability that drought will affect the growth of the plants. Automated irrigation systems pledge that irrigation will begin and end at assigned times with little need for human assistance.

These automated systems do not account for real-time factors such as rate of permeability, field capacity, current volumetric soil moisture level, and ideal soil moisture conditions. Consequently, uninformed automated irrigation systems can lead to the flooding of the roots of the plants and ultimately killing the crop. The saturation of a plant?s root system can be avoided by detecting when the soil is ready to be watered and deciding how much water to add to its soil.

The Autonomous Irrigator, AI, is a self-governing water-supply for soil based plant growth. AI is distinct from other automated irrigation systems because it is truly aware of when an area of ground needs water (volumetric soil moisture discrepancy), how much water is needed to solve the discrepancy, and how to extract that amount of water from its water supply. The purpose of developing the AI is to test the efficacy of autonomous irrigation systems as an alternative to conventional automated (timed) irrigation systems and to contrast these systems with natural irrigation.

AI receives input from a soil-moisture sensor, which is planted in a small box-garden. The AI receives data about the volumetric water content of the box-garden. This data is evaluated against the ideal soil moisture conditions to yield information about how to solve the discrepancy. Once the instructions are produced, the AI communicates to a motor which opens and closes the valve withholding the water supply. Environmental conditions will be predicted using a controlled plant in a similar environment to contrast our results against, in addition to determining which types of environments would benefit most from this type of system.

Framework for Autonomous Control of Interacting Vehicles

Vince Hugues, Mariam Mathew, Mariam Castillo, Colin Castillo, Valerie Flynn, and Eduardo Juan Diez
Georgia Perimeter College

The goal of our project is to create a communications framework for autonomously controlled vehicles that will enable them to interact and travel efficiently and safely with each other. This will have many benefits that include increased road safety, more efficient traffic flow patterns, increased fuel efficiency, and even reductions in required parking space.

There are several challenges to creating such a system:

- The system must accurately and reliably monitor the relative positions of multiple vehicles.
- The vehicles must have systems that can be controlled autonomously by sophisticated algorithms.
- The framework of interaction between vehicles must be familiar enough to humans to ensure navigation safety.
- The infrastructure must be kept to a minimum but have a large expandable capacity.

In our project we plan to establish a foundation for such a system. Our objective is to create a framework capable of handling these requirements and to eventually physically implement it on a small scale as a proof of concept. We will create a robust virtual model of this framework and expand the framework to a physical model.
Our immediate goal is a comprehensive virtualization capable of handling common traffic patterns and scenarios efficiently, such as intersections, rush hour traffic, and urban driving. The expected short term outcome of this project is the presentation of this virtual model and demonstration of its abilities to handle the stated challenges effectively.
Further work of the project will be a physical implementation of autonomous vehicles on a small scale as a demonstration of the concept at the interface level. However we expect this to take several months before completion.

Submarine Exploration Robot

Gedeon Nyengele, Joshua Ebin, Shravani Yelakanti, Daniel Busby, Sean Stubbs, Devang Patel, Dereck Graham, Asnake Afework, Chris Silvestre, and Van Vu
Georgia Perimeter College

The submarine robot project is intended to offer an alternative method of submarine exploration. The robot will help determine whether an unexplored submarine site justifies sending down a live crew to identify the situation. For the purposes of this project, the robot will be able to autonomously identify objects in a submarine environment and take appropriate action. Building off of a previous robot of different intent, our team will also be working towards improving the capabilities of the previous design to suit our needs.

To achieve our goal, the robot will be outfitted with a camera and programmed to respond to different situations based on input from the camera and user-input devices via a wireless communications relay. In order to ensure the ability to travel to appropriate depths, the robot will be modified to contain an internal power source. Intense programming will be required to let the robot act autonomously in the identification of objects of interest.

The implementation of these methods will take the form of an independent unit that is untethered to any computer that works in conjunction with a user PC to receive and give input. Cameras, sensors, and an onboard chip of some sort are the essential components around which the robot is built, with other components simply augmenting the ability of the robot to perform its task.

The robot should be able to predictably and reliably identify objects of interest in a submarine environment and relay all information gathered to a user above. By applying all of these new components, the Submarine Exploration Robot will have the ability travel a further distance, navigate underwater with a synthetic vision system, communicate with the surface untethered, and take pictures of objects of interest without direct user interaction.

Student Abstracts
Undergraduate Four-Year Programs

Computer-aided Diagnoses for Acute Coronary Syndrome with Data-Mining Techniques

Albert Thornton and Dr. Yu Cao, Professor, Computer Science and Engineering, UTC, (Yu-Cao@utc.edu)

Troy University

Of the different symptoms for adults in the emergency center, one of the most prevalent complaints is chest pain. Over 850, 000 patients each year are diagnosed with Acute Coronary Syndrome (a spectrum of heart conditions that results in a reduction of blood flow). While doctors may be able to detect if a patient is at high risk for ACS, there is difficulty in deducing who may be at low to intermediate risk of such a disease. For this paper, data-mining techniques such as decision trees, neural networks, and logistic regression attempts to correct this problem by determining the potential risk of having Acute Coronary Syndrome. All the techniques are compared to one another, as well as to other forms of data-mining methods. The paper further discusses a relatively new method of predictive modeling called boosted regression trees and how it may benefit in the medical field. Other information is supplied including software used and a base study of which the author is conducting his research. Ending, the author discusses further plans with his research and what he may wish to find.

Medical Image Indexing, Search, and Retrieval System using Canonical Correlation Analysis with Explicit Semantic Analysis

Chyeeka Brown and Dr. Yu Cao

University of Tennessee - Chattanooga

In today's society a boost in the use of technology has caused an overload of data flooding our systems. This has become a major issue in the medical field where doctors and physicians are constantly taking medical images and sorting through libraries of medical images to help with diagnosing patients and for learning purposes. When it comes to indexing and searching a database of images there are a lot of technicalities that have to first be addressed, such as the multiple modalities (ie, text representation and image representation) and also the question of what an image really means.

There is a big difference between searching for an image by entering keywords and searching for an image with another image. What many have realized is that what is really needed is an accurate and efficient way to analyze the actual context of the images, this is known as content-based image retrieval (CBIR). Our research proposes using canonical correlation analysis (CCA) to determine the strength of the relationship between both the textual and visual features of each specific image then taking the features with the highest correlations and using them to determine what concepts represent each image in a process known as explicit semantic analysis (ESA). We believe that this will help us to optimize the accuracy and relevance of the search results.

Our program is being written in Java using the Eclipse IDE. We are using Terrier (a text search, index, and retrieval system) and ImageTerrier (an image search, index, and retrieval system) to extract the textual and visual features, Matlab to write our CCA code, and implementing a Wikipedia based ESA approach. Our final steps are to integrate these components and then test and compare our system to others that use different feature extraction methods and search and retrieval algorithms.

An Alternative Approach for Dynamic Spatial Decomposition Applied to Virtually Represented Worlds

Robert Myers

University of Tennessee - Chattanooga

The common problem of allowing for agents to navigate a virtual world or perform other similar functions is typically solved by the decomposition of the world into pre-arranged sectors. This approach has a more demanding memory requirement and the static arrangement of sectors enforces limitations on agents attempting to navigate the world. These approaches lack the ability to decompose the world on an as-needed as basis. The research presented here considers an alternative approach which decomposes the world dynamically around an agent of variable size into appropriately sized sectors. This decomposition is based in part on navigable neighboring points. These sectors are created dynamically, allowing for a potentially decreased memory footprint as compared to requiring an entire world to be sectored and loaded into memory at once. The sectors are created according to a variable for sectoring size which allows a path to be fitted to the form of the world as it is relative to the agent. This approach is conducive to potentially receive influence from a variety of qualitative factors present in the world. These factors can be perceived to the degree at which sensors for the desired factors are available. The sizing and influence perception allow an agent to create a notion of 'perspective' through which it can plan navigation. This ability to adjust path planning based on various factors as needed could allow for more dynamic and versatile paths to be devised. These benefits combine to form a naturally propagative approach which requires further investigation to determine if theoretical alterations could be used to actually propagate desired factor(s) throughout the world or some subsection of it.

Smart Vision for Managed Home Care

Jackson Goodwin and Dr. Yu Cao

University of Tennessee - Chattanooga

The purpose of this study was to investigate a new software system for pervasive home monitoring using smart vision techniques. With an increasing number of elderly living alone, it becomes a challenge to ensure their safety and quality of life while maintaining their independence. In-home activity monitoring can provide useful information to doctors in areas such as behavior profiling and preventive care. It can also facilitate in emergency detection and remote assistance. The proposed solution uses an inexpensive webcam and a computer program to analyze posture, using techniques such as foreground detection and ellipse fitting. This paper describes the merits and challenges of using computer vision as a solution to monitoring and evaluating daily activities of the elderly and suggests further research in this area.

Electronic Brains for Student Success: Using Artificial Neural Networks to Predict Retention, Progression, and Graduation Rates

Mark Plagge and Dr. Shamim Khan

Columbus State University

A major goal of higher education institutions is to increase student retention, progression, and graduation rates. There is a great deal of literature that indicates that data mining and machine learning computational techniques can provide a good degree of prediction of students' retention rate (Imbrie, P. K., Lin, J. J., & Malyscheff, A. 2008). These methods concentrate on the student as a component of factors. This research aims to improve the results of previous work by clustering students using artificial neural networks into related groups. By clustering the students before analyzing retention rates, this research will allow universities to find groups of students that have a high probability of leaving the university. This project will also train an artificial neural network to predict the likelihood of individual students dropping out. Another major aspect of accuracy of predictive models is the quantity of data available to the algorithm, for testing and for verification. This research uses the complete data set from Columbus State Universityersity's demographics, from 1998 through 2011, providing a very large dataset to work with. Previous attempts to develop algorithms have used large student data sets, but not this large, and not over such a long time span. This extended time span will give a higher degree of accuracy, and the ability to have a larger test base for the predictions.

The combination of the large data set, segmentation of students, and neural network prediction will provide a significantly more accurate and meaningful predictive factor than has been achieved in the past with previous work.

Bringing Theory and Reality Together in Computer Science Curriculum

Andrew Overton

Jackson State University

This paper describes a proposed effort to incorporate tangible applications into otherwise theory-heavy curricula in Computer Science programs. By incorporating work for a non-profit organization that could benefit from volunteer technology support, students can learn the theories involved with different aspects of the services provided, in the context of their use in real world applications that are being used in the community. While senior students improve their skills by actually working on various projects for the non-profit, lower level students can have access to real-world code that is appropriate to the theory that is being taught at various points in their matriculation. By being exposed to the practical application of theory from an early point in the curriculum cycle, students can gain an appreciation for the theories presented in lectures. By seeing the value and usage of the otherwise abstract theories in practice, retention of the lessons are more likely to be retained. This combination of education and practical application should also benefit the local non-profit that may not, under normal circumstances, be able to afford the services of computer specialists. Such involvement will also likely increase
students' involvement with the community and begin a trend of volunteerism in graduates.

The Life and Times of DES

Elizabeth Wright

Tusculum College

The Data Encryption Standard is a previously predominant algorithm for the encryption of electronic data. It was highly influential in the advancement of modern cryptography in the academic world. It was developed in the early 1970s at IBM and based on an earlier design by Horst Feistel. It has received academic scrutiny over time, which has led to the modern understanding of block ciphers and their cryptanalysis. DES is now considered to be insecure for many applications because a 56-bit key size is now considered to be too small. In January, 1999, distributed.net and the Electronic Frontier Foundation collaborated to publicly break a DES key in 22 hours and 15 minutes.

DES can be used as a classroom teaching tool when talking about data encryption and decryption because it can show how data encryption standards develop and evolve and also how they eventually become obsolete as computers become more complex and harder to maintain and secure.

Using Undergraduates to Build an Animated Flash Tutorial for CS1

Michael Orsega, Toni Carlson, and David Siver

University of West Georgia

This presentation describes a recent research study and includes student experiences and tips for the future. The faculty member received a small, internal grant which helped to pay two undergraduate students as they developed a Flash tutorial for our CS1 course. The undergraduate research students spent Fall semester learning Flash programming (something not taught in our curriculum) and building an animated tutorial.

The next semester an exercise was developed to measure the effectiveness of the tool. CS1 students served as research participants and were presented with a pre-test over material that had not yet been covered in class. Half of the students then worked with the animated tutorial and the other half read the same content (a transcript of the animation's material). Finally a post-test was given.

A within-subjects, pre- / post-test design was used to measure improvements for those using the video tutorial (experimental condition) and those reading a textual description (control condition). The dependent variable was improvement from pre- to post-test. Additionally, a between-subjects, post-test only design was used to test for differences in exercise completion time. Results showed that participants using the animated tutorial were able to answer more post-test questions correctly and completed the exercise faster than those viewing the text-based information.

The undergraduate researchers noted they enjoyed the invitation to create a learning tool to be used by students. They felt that seeing the complete process - learning the technology, developing the tutorial, running the experiment, and analyzing the results - gave them both research experience and also showed them of the many uses for computer science. They also noted that the role reversal from student to teacher was one in which they gained a better appreciation of the CS content and the learning process.

Students Reporting to Students: A Collaboration Between Two Software Engineering Classes

Edward Bosworth (CS Faculty), Jessica Kennemore (CS Student)

Columbus State University

This paper presents a collaboration between two courses: CPSC 4176 (Senior Software Engineering Project, taught by Dr. Rogers) and CPSC 6179 (Software Project Planning and Management, taught by Dr. Bosworth). CPSC 4176, an undergraduate course, focuses on systematic production of software, including the requirements and design documents. CPSC 6179, a graduate course, focuses on tracking the progress of the development of a software system, including reading of the requirements and design documents. This collaboration gave the undergraduate students a target audience for their documentation and the graduate students a set of documents to read and critique. The paper has been expanded a bit to include comments by Ms. Kennemore, who was a student in the CPSC 4176 class. As opposed to what the professors hoped would happen, a student who took the course might say what actually happened.

Understanding Artificial Intelligence and Real Time Systems with Lego and LeJOS

Patrick Poirson and Ellis Hicks

University of South Alabama

This past summer a project was initiated to consider several aspects of Real-Time Systems (RTS) and Artificial Intelligence (AI) using programmable Lego Mindstorms bricks. While this is not unique, the associated aspects of this project make it an innovative activity. Having only taken two introductory Computer Science (CS) courses in Java, we were able to construct a collision avoidance system for a slot car racetrack using legos and leJOS. LeJOS is a version of Java which can be used to program Lego Mindstorms bricks. The advantage of using leJOS over the prepackaged Lego programming environment is the opportunity to develop more complex algorithms, have multiple threads running, and the ability to handle exceptions. The first step of the summer project was to construct a gripper (hand) out of legos to control the speed of the car on the racetrack. Once this gripper was completed we then programmed this gripper in leJOS to autonomously detect when a collision was going to occur on the racetrack, and avoid the collision. To accomplish this the software makes use of multiple classes, Lego light sensors, multiple Lego Mindstorms RCX bricks communicating through infrared, and multithreading. The plan for the near future is to add a second gripper to the project so that the two cars can race one another. One improvement that is currently being considered is a switch from an analog solution to control the speed of the car, the gripper, to a digital solution. This switch would allow for more dynamic control of the cars, which could further improve our results. Through this project we were able to successfully gain first hand experience with programming AI and RTS without having taken any courses on the subject matter.

Experiment with SunSpot Technology for Building Smart Environment (ESSE)

Geoffrey Platta and Lydia Ray

Columbus State University

The Internet is envisioned to be transformed into network of things instead of network of computers in the coming decades. Significant research work is being done to overcome the challenges of embedding tiny wireless sensing computers into all commodities of daily life and thus creating a smart environment. Recently SUN Microsystems has launched a new product named SunSpot Development Kit to enhance the development of smart things that can be embedded into the Internet and will be able to communicate with other web entities. We have designed a research project ESSE to explore the potential of this Java-programmable sensor network technology for building smart things and embedding these into the Internet, and also explore some of the main challenges of implementing a network of wireless sensors. We are currently working in the first phase, where we are building a smart flashlight that automatically lights up when it is dark and automatically switches itself off when there is enough light. The platform used is Linux. We are in the process of writing an application program (based on an original program provided by SunSpot) in NetBeans that enables the light sensor in the flashlight to sense the amount of light in its surroundings. The flashlight switches on or off depending on whether the amount of light sensed goes beyond a certain threshold or not. Our next goal is to write a program to connect this flashlight to the Internet over HTTP connections. In our presentation, we will demonstrate our programs and display the results we obtained. Our final goal is to explore the following problems:

- How to maximize the lifetime of this flashlight by using energy-conserving communication techniques.
- Explore security threats that exist for such smart things connected to web.
- Implement a few energy-conserving security mechanisms in the product and compare consumption of energy by each security mechanism.

A Pilot Study To Determine The Effects Of A Web-Based - Animated Pedagogy In Two Basic Science Courses

Dion Jackson

Talladega College

An effective education practice utilizes successfully integrated knowledge in classroom teaching strategies. The progressive evolution of technology has become the driving force behind innovative social media demands in classrooms. Active learning techniques have a great potential in being the medium which captivates students minds in the learning environment. This pilot research project proposes to determine the need to integrate two basic web-based STEM courses, Biology-101 and Computer Science-150, to retain students' interest in STEM careers. Forty percent (40%) of the entering college students choose STEM fields as a major. This study identified related factors in STEM enrollment and course retention which influences learning in traditional and web-based courses. An assessment procedure will be used to collect students' opinions after applying this model in the Fall 2012 and Spring 2013 semesters.

A Model Designed To Increase The Number Of African American Women In STEM Fields At Small And Medium Size Historically Black Colleges And Universities

Deirdre Childress

Talladega College

Science, Technology, Engineering and Mathematics (STEM) are widely regarded as critical to the national economy. Expanding and developing the STEM workforce is a critical issue for government, industry leaders, and educators. Workforce projections stated by the U.S. Department of Labor for 2018 showed that nine of the ten fastest-growing occupations require at least a bachelor's degree in a STEM field. Many science and engineering occupations are predicted to grow faster than the average rate for all occupations, and women currently hold one-quarter or fewer positions in those fields. Various studies identified a pipeline problem in STEM fields. Those studies indicated a shortage of women and minorities for engineering, information technology, physics, biology, and other natural science fields.

Despite the tremendous gains and progress that women have made in education and the workforce during the past fifty years; still many scientific and engineering disciplines remain male dominated. Extensive literature searches identified factors contributing to minimal diversity in STEM fields. In this study, a model is proposed that can be used to increase the number of women in STEM disciplines at small and medium size Historically Black Colleges and Universities (HBCUs). The study identified an assessment procedure to validate the model, while also showing the results based on the factors used to create awareness concerning this problem at small and medium HBCU's (SMHBCUs). As progress continues for minority (African-American) women in STEM fields through increased mentoring programs between faculty and students, research opportunities, and graduate school support will help alleviate the disproportionate number of male and female minorities in STEM fields.

Usage Of Mobile Technology To Improve Unspoken Interaction Between Faculty And Student In Classroom Settings: A Study Of The Literature

Kierra Jackson

Talladega College

Educational technology can broaden and enhance the use of active learning in classrooms. Students are using technology as a tool for communicating with others and engage in an active role rather than the passive role of recipient of information transmitted by a teacher. This active engagement is an important tool in improving student learning outcomes.

This study examined the possible benefits of using mobile phones to increase interaction and promote active learning in large and small classroom settings. Today's students are part of the electronic generation and meeting face-to-face with a professor may not happen often. The student might prefer to have a discussion via e-mail or text messaging. Research indicates that many students prefer to use their mobile phone to interact with their professor in the classroom setting. Use of the cell phone in the classroom gradually increased to ninety nine percent (99%) in 2006 as compared to ninety six and four tenth percent (96.4 %) in 2005.

The acceptance of mobile phone technology as a learning aid is an obvious step toward college progression. Scornavacca, Huff, & Marshall (2009) indicated that in classroom settings only ten percent (10%) of the students raised their hand to ask a question whereas, thirty eight percent (38%) used Short Messaging and Services (SMS). Therefore, it was indicated that students hesitate to ask question in classroom for fear of embarrassment and humiliation.

This study resulted in the development of a model Text-2-Text-2-Learn (T-2-T-2-L) to ask a question during the class lecture or beyond to increase the interaction between Faculty and Student using SMS techniques. Using this model, the professor receives the message and responds after class or at a later time. This process reduces the feeling of being humiliated by classmates.

This study also developed an assessment procedure to apply the model in two Fall 2012 and Spring 2013 classes. The students' opinions will be collected from the classes and will be evaluated later for the possibility of integrating the model in more than two courses. Text-2-Text-2-Learn could be used to determine the use of SMS to reduce barriers between faculty and students in order to enhance students' learning outcomes and reduce attrition in courses.

An Investigation Of Low Graduation Rates In Small And Medium Size Historically Black Colleges And Universities (HBCUs) In Science, Technology, Engineering And Mathematics (STEM) Fields

Justin Tyner

Talladega College

The African American college graduation rate nationwide is forty one percent (41%). For Historically Black Colleges and Universities (HBCUs), the graduation rate drops to thirty seven percent (37%). This research project was designed to identify some of the factors that contribute to low graduation rates in HBCUs in Science, Technology, Engineering and Mathematics (STEM) disciplines. Some factors that were identified during the research showed that HBCUs, although underfunded, educate a high number of low-income students with lower levels of K-12 academic preparation. There are few books in the homes of low income families and neither parents or grandparents went to college. HBCUs address those challenges with limited resources. Many minority students attempt to major in STEM fields, but do not complete the STEM courses. Minority STEM majors who complete the courses are finishing at a lower graduation rate than their non-STEM counterparts.

This research has identified some factors responsible for low graduation rates in (HBCUs) in the STEM area by literature review.
The literature review provided information and data on factors that contribute to low STEM graduation rates at HBCUs. Using the information and data, a graphic model was developed which identified factors such as low ACT scores, lack of role models and inadequate funding that negatively affect STEM graduation rates.
An assessment procedure was developed to validate the model and provide a mechanism to make more underrepresented minorities aware of the problem. Data was collected through literature reviews and charts were developed for posting to draw attention to this challenge.

A Study On The Need For An Improved STEM Student Retention Strategy In Small And Medium Size Historically Black Colleges And Universities

Tevon Bond

Talladega College

The U.S economy is based on effective professionals in Science, Technology, Engineering and Mathematics (STEM) fields. The U.S. possesses one of the most innovative and technologically advanced economies in the world. STEM degrees are vital to America's competitiveness. The United States degree attainment in STEM fields is plummeting. America's low production of effective and efficient leaders in STEM disciplines jeopardizes its economic and global competitiveness. According to Lee (2012), the overall U.S. graduation rates are stagnant at fifty (50%). The average 6-year college completion rate for African American students nationwide is significantly lower at forty two percent (42%) compared to sixty two percent (62%) for their white peers. Small and medium size HBCUs continues to suffer from decreasing retention rates among black students.

There are one hundred three (103) Historically Black Colleges and Universities (HBCUs) in the nation. Only twenty two percent (22%) of them exceed the national average for African American degree attainment. Published articles in the literature have identified factors that contribute to low retention rates at small and medium sized HBCUs. This project focused on retention at Fisk University, Philander Smith College and Talladega College. It closely examines the factors responsible for increased attrition rates. As a result, a strategy was developed to increase retention at Talladega College. It will be applied during the 2012-2013 academic year. Data collected will be assessed at the end of the 2013 Spring semester.

New Family Observation Method

Nicholas Dzugan

Samford University

Traditionally, methods for gathering observational data in social sciences have relied upon video and audio recording, live observers, or instrumentation attached to individuals (e.g., biometric sensors). These methods are limited in terms of the volume of data collectable, the resources required to process the data, and privacy concerns. To address these concerns, we began developing an observation system involving Microsoft Kinect sensors. This presentation will describe functioning of the Kinect sensor, technological challenges of combining data from multiple sources, and progress made toward these goals during a summer 2012 research project.

The Uses of Coopr in Mathematics and Computer Science Education

Tyler Bright

Tusculum College

The Uses of Coopr in Mathematics and Computer Science Education

Coopr, A Common Optimization Python Repository, can be used beneficially in teaching mathematics and computer science courses. Coopr is a collection of Python libraries that allows its users to work with a diverse set of optimization capabilities for formulating and analyzing optimization models. A key driver for Coopr development is Pyomo, an open source tool used to model optimization applications in Python. Pyomo can define symbolic problems, create instances of concrete problems, and finally solve these created instances with standard solvers. Pyomo provides a capability that is associated with algebraic modeling languages like AMPL and GAMS. Coopr has also proven effective for developing high-level optimization and analysis tools. For example, the PySP package provides generic solvers for stochastic programming. Pyomo and PySP are both able to model realistic mathematical situations concisely and intuitively. Users can interact with the models as well within an interactive Python shell.

I will show different programming codes from the Pyomo and PySP libraries, and then explain how each would be helpful in a classroom situation. Along with the algebraic and optimization models given by Pyomo and PySP, there will be examples on how both libraries have the ability to also solve the problems which they generate and write.

Social Network Analysis & Modeling

Todd Ervin, Chad Howard, Zach Michener, Ben Rosen, Danielle Betke, Asa Jones, Semmy Purewal, and Janine Haugh

University of North Carolina Asheville

In recent years, data collected from social media has been used to make predictions about real-world events. For example, a group at HP Labs classified sentiment from tweets and, in doing so, was able to predict the box-office outcomes of new movie releases in theaters. While informative, the process of analyzing the language in these tweets is complicated and resource-intensive. We explored a potential simplification of this process.

Specifically, the goal of this project was to extract the emotional keywords "love" and "hate" from all tweets about Barack Obama and Mitt Romney in order to predict the outcome of the 2012 presidential election. We used relatively new technologies such as Node.js, Express, and Redis to extract and route the data in real time, which we have made accessible on a user-friendly website deployed on CloudFoundry.

The data is still in the process of being analyzed (since the election is still 4 weeks away at the time of this writing), but we have spent the last several months analyzing the data and making it more usable. In the weeks leading up to the election, we will be further analyzing this data and comparing it to polls and other prediction sources. We will present these results at the conference.

Improving Socialization and Emotion Recognition for Autistic Children Using a Smartphone App

Cassidy Lamm and Joshua Wolfe

University of Alabama

Smartphone apps are used with increased frequency to train children. In this presentation, we present our work that investigates how children with autism may benefit from applications suited to help them overcome social challenges. In our research, we investigated and compiled a list of existing apps to see where gaps exist in topic coverage. From this survey of existing smartphone apps for children with autism, we developed a new app that challenges children to interact in a social setting through three separate phases. The first phase is an identification and learning phase that displays six pictures with a corresponding caption for each emotion.
Our design of the first phase began with initializing a list of pictures that represent an emotion. As the child cycles through the pictures of emotions, the caption below each picture changes to the corresponding emotion. After the child cycles through all of the emotions, he or she can tap on the quiz button to begin the second phase. This will create a game that will prompt the child with a picture and allow him or her to choose one of six emotions that corresponds to the image. As the child progresses through the quiz, his or her score will be recorded. At the end of the quiz, the score will be displayed. The third phase will also provide a new context to help children learn about their emotions through peer interaction. Though the third phase is still conceptual, it will allow one child in the group to act out a particular emotion while the other children use the app to vote for which emotion they think he or she is acting out. In addition to providing the motivation and needs for this app, our presentation will cover some of the details of implementation.

Using Mobile Applications to Aid Students in Higher Education

Chelsea Rath

Middle TN State University

The nation's high school graduates are currently in a generation that is born into the age of technology. Students are growing more dependent on devices such as calculators, computers and mobile phones. Several universities, including Middle Tennessee State University (MTSU), have acknowledged this change and have begun to delve into the realm of mobile applications. At MTSU, we have a student driven mobile development team that is dedicated to developing smartphone applications for both Android and iOS platforms.

With the average college graduation rate in the United States being just over 50%, nearly half of the entire nation's student population in higher education either fail or drop out of college before obtaining a degree. Keeping this in mind, our student development team has taken the initiative to develop applications designed to aid the university's students by providing them with tools to help make their college experience successful and increase their overall performance. Among these applications is MTSU Mobile; a university application that specializes in features to help students in general areas of interest on campus such as an interactive campus map, dining, parking and bus routes, schedule and course look up features. Some other applications currently under development are designed more towards individual classes and study tools, with the intention to help students develop better time management skills and study habits. These include department-specific applications as well as a study aid and homework application. In this presentation, I will be discussing team experiences as well as the applications and results we have collected so far concerning the progress of the mobile development team at MTSU.

Windows 8 App Development - Grid Views and Lucky Charms - Don't Call It Metro

Andrew P. Berry, Dustin Damesworth, Michael J. Hayes, Daniel R. Miller, Jeffrey N. Stubblefield, Bob Bradley (Advisor)

University of Tennessee - Martin

This talk will introduce the process of developing apps for Microsoft's new Windows 8 Operating System. Windows 8 has a radically new user interface that was designed for the new touch-based tablet computers. In addition, Windows 8 has a totally new model for writing these Metro style apps. This presentation will introduce many of the new features including the grid views, charms (share, settings, search), contracts, live tiles and the Metro (Window's Store) style programming interface. We will give a live demonstration of these features and show example code to illustrate how to program those features in your code. We will also show examples of how to retrieve data from a web site using JSON and/or OData. The talk will focus mainly on developing Metro style apps using C# and XAML, but it will also show examples using the new Java Script/HTML5 method. This talk will give you many pointers and will give you a head start for writing your own Windows 8 Metro/Store apps. Lastly, we will talk about the process of sending your app to the app store including using the Windows App Certification Kit (WACK) tool.

Developing Cloud Hosted Database Driven Applications for Both Web Browsers and Clients

Joshua C. Hart, Joseph D. Myers, Kinjalkumar G. Patel, Mark Harris, Cody Watkins, Bob Bradley (Advisor)

University of Tennessee - Martin

This talk will discuss the process of developing database-powered systems that can be accessed from both a standard web browser and a specialized client written for an OS such as Windows 8. The presentation will cover the process of creating the database in MySQL. It will also cover the process of writing code that can access that database from a web site, using both php and ASP.NET methods. The talk will show how to streamline the web side of the process using JQuery. We will also talk about using standard data protocols such as JSON or XML to allow clients (such as Windows 8 or iOS) to easily access the same data.

Finally, we will present information about several of the new Amazon cloud based services such as the new Elastic Beanstalk and the new RDS database systems. These new services are widely used by popular sites and apps (such as Instagram). We will talk about the service's ease of use and the expected monthly costs for using these services once the "free tier" program expires.

Web based teaching through real-time collaboration with ghcLiVE

Shae Erisson

University of North Alabama

Internet Relay Chat (IRC) is an effective conversational medium but not an efficient tool for collaborating on Haskell code. When I started the #haskell IRC channel in 2001, my goal was to create a dynamic community. Haskell is a general purpose purely functional programming language with non-strict semantics and strong static typing. The channel has since become a vibrant online community where people learning Haskell can interact with experienced developers.

Some of the current teaching tools popular in the #haskell channel are a one line read-eval-print-loop (REPL), a web-based clipboard at hpaste.org and real-time IRC interaction.

But, switching among these three tools is often error-prone and time consuming. Even when all these tools are correctly coordinated, users must manually relay any error messages and source changes to the helpful experts in the #haskell IRC channel.

I propose a new teaching tool for the #haskell IRC channel to fuse the functionality of these three popular collaborative tools into a single user interface. The ghcLiVE project integrates editing, compiling, and evaluating Haskell code in a single browser based interface.

The interface consists of three panes, a multi-user collaborative editor, program output and a REPL. This integrates the real-time multi-user aspect of IRC with a REPL that can load entire files. Thus, all users will be able to see both the source and the errors and interact in real time.

This project was sponsored by Google Summer of Code 2012, during which a working prototype was created. Document synchronization, Haskell compilation and a webserver are built into the ghcLiVE project. This presentation will describe the ghcLiVE design and implementation.

Utilizing the Xbox Kinect to Facilitate At-Home Stroke Rehabilitation

Joshua L Skelton

University of Tennessee - Chattanooga

The first 90 days after a stroke can cost patients thousands of dollars, with much of this money going to payment for rehabilitation. The home environment is the most convenient place for the rehabilitation process, allowing the most cost effective way to help patients recover through conducting intensive, repetitive practice of functional movement. Recent developments in the gaming industry and with gaming motion tracking devices, such as Microsoft Xbox 360 and Kinect, have great potential to transform in-home rehabilitation. This research project looks at how to facilitate at-home rehabilitation for stroke patients utilizing this technology. A system of this type can vastly improve rehabilitation healthcare by helping the stroke patient in the following areas: lowering rehabilitation costs, utilizing more efficient time management, and addressing patient comfort. Further motivation for this research is the advancement of similar technology in motion capturing for rehabilitation purposes. This system uses the Microsoft Kinect and XNA Framework to capture, track, analyze, and interpret the 3D motion images to further enhance in-home rehabilitation. This research shows the exercises performed. And the differences in the collected rehabilitation exercise data. There is a compelling need for a system of this nature, and this research provides some of the groundwork from which future research will benefit.

A Binary Code-based Finite State Machine Model to Determine Ancestor-Descendant Relationships in Directed Acyclic Graphs

Andrew Overton, Natarajan Meghanathan, and Raphael Isokpehi

Jackson State University

We propose the use of a binary code-based finite state machine (FSM) model to efficiently represent and verify ancestor-descendant relationships between any two nodes in a directed acyclic graph (DAG) in polynomial time, in comparison to the exponential time incurred with the previous work on this problem (applicable for analyzing node relationships in diverse fields, ranging from compiler design to bio informatics). The binary code for a node is the concatenation of the code for its parent node and the unique binary representation of the immediate children of the parent node. In the context of a DAG, where each node can inherit from multiple parents, the number of binary codes needed to uniquely represent a node increases exponentially. Moreover, a direct extension of the previous algorithm to determine ancestor-descendant relationships for two nodes I and J (in trees) to a DAG would primarily result in a brute-force verification of every pair of binary codes of I and J, leading to an exponential worst-case time complexity. The FSM model captures multiple inheritance of the binary codes in a more compact form with fewer states and state transitions (abstracted by finding common matching bits across the codes) without any loss of information. The polynomial time-efficiency of the proposed FSM model stems from the fact that only one binary code of a prospective ancestor node I need to be verified through a traversal of the finite state machine of a prospective descendant node J. If the traversal path, determined based on the binary code of I, is through a sequence of state transitions that indeed exist in the FSM of J, one can conclude node I to be an ancestor of node J; otherwise not. There is no need to examine all pairs of the binary codes of nodes I and J.

A Study On Privacy Risks Associated With Radio Frequency Identification

Jonathan Newman

Talladega College

Radio Frequency Identification (RFID) is a technology involving a silicon chip called a tag. Radio waves are transmitted from a reader to a tag to obtain information. RFID technology has been used in the supply chain industry to verify products on a supply chain as well as in U.S. passports. The radio waves transmitted by a reader can be intercepted by an unexpected third party; therefore, creating a privacy concern. This research project developed an awareness model which identified the threats associated with RFID tags along with a level of risk (Low, Medium, High) associated with the threat of identity theft. The study also identified countermeasures to these threats such as data encryption and track and trace.

Student Abstracts
Master's Degree Programs

Agent Based Modeling for Social Behavior

Hugh Kwon and Dr. Charles Turnitsa

Columbus State University

In today's world, we are faced with thousands of information competing for our attention. That information may be vital to our survival or it may simply be which smart phone brand is better. How do we, as a community, select which information best suits our needs? Thomas Seeley describes in Honeybee Democracy how bees choose a new nest sites. It is a thoroughly a democratic process in which scout bees inspect potential nest sites, each advertising the site she deems ideal, and eventually coming to an agreement on a single and, more often than not, the best available site. In this project, the nest site hunting is represented by agent-based model and its validity is checked against available data from Seeley's observations. We argue that this model can be generalized to simulate how our community works to resolve the conflicting information at disposal.

Identifying Student Dropouts using Fuzzy Inferencing

Shahriar Ibne Husainy

Columbus State University

Fuzzy logic provides a methodology for reasoning using imprecise rules and assertions. Whereas a statement can only be true or false in classical logic, statements in fuzzy logic may be true or false to varying degrees. This enables fuzzy logic to deal with data and rules that are expressed in an imprecise manner using inexact linguistic expressions. Fuzzy inference is the process of formulating the mapping from a given input to an output using fuzzy logic. The mapping then provides a basis from which decisions can be made, or patterns discerned. Fuzzy expert systems are proving to be a powerful tool in business knowledge decision support.

According to a report released by the National Center for Public Policy and Higher Education, low rates of college completion have long been a key concern in American higher education. Colleges and universities across the country, including Columbus State Universityersity, are investigating this problem of student retention, progression and graduation (RPG) in order to address it more effectively. The main aim of this research project is to build a fuzzy inference based model capable of predicting the likelihood of a student dropping out of his or her program of study. It will be a fuzzy rule-based system, where rules will be derived from the domain experts. As a possible extension to this project, the extraction of fuzzy rules from an Artificial Neural Network (ANN) trained using student data will also be investigated.

Evolutionary Computation for Optimization using Simulation-based Fitness Evaluation

Touhid Ahmed

Columbus State University

Optimization is a process of making a system more effective in terms of utilization, throughput and efficiency. Genetic Algorithm (GA), a branch of evolutionary computation, is one such technique for optimization. GA starts with a set of random solutions called chromosomes. It requires a fitness function that assigns a figure of merit to each solution. Based upon fitness values, solutions are selected probabilistically and then evolved using crossover and mutation. The process continues until a best fit is achieved.

Application of GA in combinatorial optimization is a challenge. When designing any new service facility, e.g. a drivers license office, the management has to decide on numerous issues: level of customer satisfaction, waiting time in the queue, processing time, budget, employee utilization and many more. Management goal is to maximize throughput with the least amount of resources used. One challenge in solving such problems using GA involves devising a single fitness function involving multiple criteria explained above. Another challenge would be determining the reliability of a solution, which takes into account randomness of inputs such as customer inter-arrival time, system breakdowns, etc.
This project aims to explore the use of computer simulation as an alternative to the use of fitness functions in GA. It will attempt to validate the following hypothesis: "It is possible to generate a satisfactory solution for optimization problems involving a service facility by using simulation as an alternative to fitness functions"
A GA generated solution will be fitted into a simulation model and tested using relevant performance standards. The simulation result will be sent back as feedback to the GA algorithm to produce the next generation of solutions. These solutions will be evaluated further through simulation, and this cycle of solution generation and evaluation using simulation will continue until a satisfactory solution is derived.

Smartphone-based Fall Detection

Kevin Ringstaff

University of Tennessee - Chattanooga

Falls affect over one in every three elderly people and it causes injury, leading to extended and expensive hospital stays, and even death. An automated fall detection system that is accurate, cheap, and easy to use is in such high demand. Although there are a number of appropriate devices that are able to be used in fall detection, mobile phones were chosen in this study for a variety of reasons. They are relatively inexpensive, programmable, and widely available which greatly aids in testing purposes. Another feature is their ability to call for help in the event that anything should happen, even if the user is unconscious and unable to do so themselves. Additionally, mobile phones are extremely portable, in contrast to other detection devices, most people are comfortable "wearing" their phone and they usually have it on them at all times. The objective of this research is to investigate, develop, and validate effective fall detection algorithms that can be efficiently implemented on a smartphone platform (i.e., Andriod or iPhone). Detection of a fall is performed by analyzing and classifying Activities of Daily Living (ADL). ADLs are normal activities that are frequently performed throughout the day, such as standing, sitting, walking, and running. We define a fall as a sequence of ADLs and we capture them by calculating the root-sum-of-squares (RSS) signal from the accelerometer data. We also employ new features, such as calculating average acceleration and average free fall acceleration, in order to reduce the frequency of misclassifying regular ADLs as real falls. We have validated our implementation with real fall scenarios performed by people or by using a dummy and the experiments show that our proposed approach is a promising solution for smartphone-based fall detection.

Feature Extraction Methods for Activity Classification

Travis Ringstaff

University of Tennessee - Chattanooga

Devices which have the ability to read and store data from sensors such as accelerometers and gyroscopes are more prevalent today than at any other time. There has been, therefore, substantial interest in using these devices for healthcare applications, such as activity detection or predicting the likelihood of certain events. With the growing abundance of these devices and the constant increase in their sophistication, smarter and more efficient methods are required to perform data mining operations on the retrieved data. The purpose of this research is to show that feature extraction can be a useful, lightweight tool for representing data in a more efficient way, and is necessary for beneficial results in data mining. The example data used is tri-axial accelerometer data collected from a Body Sensor Network (BSN), and from an Android smartphone. The data is grouped into ten second intervals from which over 40 features are extracted, including average acceleration, standard deviation, average absolute difference, average resultant acceleration, binned distribution, and time between peaks. The resulting condensed data is then used for training and testing data mining models used to identify the original activity. Dual level classification is also used to improve prediction accuracy. Results indicate that employing feature extraction as a pre-processing tool is both a more efficient means of data storage and will produce accurate results more quickly. Other means of data transformation used in combination with feature extraction are also explored, including symbolic aggregate approximation, or SAX.

Secure Software Design and Development Incorporating Role-based Access Control, Cryptographic Storage and Validation, and Parameterized SQL Statements

Sandeep Thumma and Natarajan Meghanathan

Jackson State University

In this presentation, we describe the design and development of a secure online real time paint management system (RTPMS) that can be implemented in any automobile manufacturing facility. RTPMS automates the process of logging in the amount of different chemical compounds that were mixed in the paint spraying units of the various divisions of an automobile plant so that the concentration of the volatile organic compounds (VOCs) released to the external environment can be controlled at a centralized unit without scope for any error. VOCs are considered to be pollutants and their concentration needs to be below the safety and environmental regulations. The RTPMS application is developed under a role-based access control model so that only employees who have the appropriate login permissions can access the critical forms and data that are processed to generate reports on the required release of the VOCs. The role-based access control model provides scalability and facilitates the RTPMS application to be deployed in automobile companies that employ several workers under various roles. The reports generated from the RTPMS application form the basis to increase or decrease the concentrations of the different chemical compounds pertaining to the mixing and spraying of paints. The software packages and environment used in the development of the RTPMS application are: Microsoft .NET Framework, ASP.NET, Microsoft Visual Studio, C-Sharp, Microsoft SQL Server and Crystal Reports. In addition to role-based access control, the other security features implemented are: cryptographic storage and validation of user authentication information (implemented using the 3DES algorithm for encryption operating in the Electronic Codebook, ECB, mode and the MD5 algorithm for cryptographic hashing) as well as use of parameterized statements (implemented using the SqlCommand class in C-Sharp) for processing employer inputs to access the database and protect the latter from SQL injection attacks.

Design and Implementation of Parallel Approximate Search Algorithm

Krerkchai Kusolchu

Columbus State University

Data finding and object searching emerge as important topics in the information age, where new data are created and posted on the Internet at a rapid pace. Traditional algorithms often eliminate a large number
of objects whose properties are not sufficiently matched with those identified by the criteria of the algorithms. This is a major weakness for these algorithms. An approximate search algorithm was proposed to deal with this weakness. It is based on a measurement of the Euclidean distance, adapting to find objects with similar properties and identifying them. This algorithm works well with a small data set, but as the amount of data increases, the execution time also increases. This research proposes a design and implementation of parallel approximate search algorithm, aiming to reduce its execution time. The
experimental results include comparative performance evaluations of serial and parallel approximate search algorithms.

Keeping Up With Modern Day Malware

Rodrigo Sardinas

Columbus State University

Malware, specifically the detection and prevention of malware, is an area of computer science whose importance has not just increased, but increased drastically over the past decade or so. With new technologies and techniques constantly being introduced into the computer science field, developers of anti-malware solutions find themselves inundated with an ever-increasing amount of malware to analyze. Nowadays, the majority of malware is not developed "?by hand" anymore, this task is largely automated and it has become an almost trivial matter to develop not just one instance of malware, but multiple unique instances as well as variants of it. The fact that this is true has forced anti-malware creators to research ways to also automate the task of detecting malware.

We try to approach this topic from the perspectives of both the malware author as well as the anti-malware author. We begin by providing an overview of different types of malware. We look at the techniques used by malware authors to create these different instances of malware, and then we take a look at what anti-malware creators did to detect these instances of malware in order to prevent their spread. Next, we take a look at how the development of malware has been automated in such a way that the statement in the previous paragraph holds true; that creating malware nowadays is almost a trivial matter. We will then take a look at current methods of detecting malware, and we will examine current approaches at handling automated malware detection; we examine some obstacles present when attempting to automate this process and how much automation is actually feasible (for example, automating detecting new instances or simply automating the detection of variants of known malware and flagging new possibly malicious code for human review.

Knowledge Base Framework for Building Personal Health Information System.

Pramukh Reddy Karla

Texas A&M University - Commerce

Knowledge in the medical systems is rapidly growing and there are very few approaches that can build a bridge between information technology and medical systems. Though there are many tools in the cloud which serve the people in finding health related information, they fail in bridging the semantic gap between medical researchers, developers of information technology, and consumers of health information technologies. In order to relegate this aforementioned semantic gap we provide an information technology frameworkusing concept maps. This way we can create graphical information can be converted into a machine understandable form of information.

This paper will provide detailed information about a knowledge base framework that can be used to develop a health care decision support system. This system will also attempt to bridge the aforementioned semantic gap.

Efficiently Annotating a Genome

Nathaniel Perry and Thomas Richards

Middle TN State University

Genome annotation is used discover genes and determine their function within a genome. Tools available today for annotating genomes claim to annotate genomes well. However, there is room for improvement in these tools, specifically with regard to time. Computational biology has almost completely eliminated by-hand annotation and can now perform the operation in days or weeks. We hope to reduce that time significantly (to a matter of minutes). With fifteen thousand new species discovered each year, faster genome annotation would not only increase future productivity, but also reduce the current backlog of species waiting to be described.

We are investigating multiple strains of the Buchnera aphidicola bacterium. This prokaryotic organism was chosen because it has one of the smallest known genomes of any living bacteria. Currently, there are a few thousand known genes associated with the Buchnera bacterium. The proposed method takes the complete genome for Buchnera and finds every possible gene, including known genes, that exists within it and have some specified characteristics (e.g. start codon, length, etc.). Afterwards, we convert all the known and putative genes into their equivalent protein sequences. We then convert the protein sequences to k-mers and determine whether or not the hypothetical genes appear to be valid, based on the content they share with known genes. However, we ignore the position of the content, which can speed up the process considerably. A detailed description of the process along with a discussion of the results will be presented.

Visually Trace back Stepping-Stone Intrusion

Malika L. Harris, Lydia Ray, and Jianhua Yang

Columbus State University

A key concern for detecting systems dealing with network intrusion is the intruder's ability to avoid being detected by maintaining his anonymity. Intruders have frequently used multiple intermediary computers called stepping-stones to launch attacks on other computers. The use of stepping-stones helps hide the location of the attacking computer. In earlier related work, there were algorithms designed solely around packet contents. However, the primary limitation with those algorithms was that it was not able to detect encrypted connections. Time-based algorithms were then designed to make up for the encrypted traffic. In 2002, Kwong H. Yung [1] proposed an approach to detect stepping-stone intrusion based on the round-trip time (RTT). Yung tested echo-delay comparison and found in his experiment that the number of upstream jumps in a connection chain was not being detected, as well as losing accuracy.
In this project, we propose an algorithm which visually displays a more accurate length of the connection chain in real-time. By designing a program to monitor incoming and outgoing packets, it will be able to compute the roundtrip time gap between a client's request and the server's reply. Thus, from the changes in the gaps, it is possible to estimate the number of hosts from a detecting machine to the destination host.

[1] H.K. Yung, "Detecting Long Connecting Chains of Interactive Terminal Sessions," RAID 2002, Springer Press, Zurich, Switzerland, pp.1-16, 2002

Implementation of a Virtual Network for Cloud Computing

Markus Bailey and Natarajan Meghanathan

Jackson State University

In this presentation, we describe the implementation of a virtual network comprising of virtual machines communicating with each other and to the Internet through virtual routers. Oracle Virtualbox (run on Windows 7 physical hosts) is used as the underlying virtualization software. Ubuntu and PFSense are used as the guest operating systems for the virtual machines and virtual routers respectively. Each virtual machine was on its own subnet on a private 192.168.1.1 network. They received the proper ip addresses from the PFSense router since it was configured with the DHCP option. The LAN port of both of the routers was set to 192.168.1.1/29 on different physical machines. The WAN port of the routers was set through virtualbox to be bridged. This means that they get an IP address from the same router as the host machine. This is the port that is connected to the computer and the LAN port routes all of its traffic through the router software to this port for Internet service. The subnets were set up differently so that the virtual computers got different addresses depending on which group they were in. After setting this up, the virtual computers were able to connect to the Internet through the virtual router. With the virtual computers set to bridged mode so that they could see each other on the network, we were successfully able to send packets from one virtual workstation to the other through the network. The next step is to do the same thing through the routers. This is done through a set of static routes on the different PFSense routers to the subnets of the different workstations (e.g., route 143.132.4.5 - 143.132.4.6 for all traffic destined for 143.132.4.6 network). This facilitates the virtual machines to be accessed as a cloud from anywhere in the Internet.

Learning Math With NeuralPlay Using Mobile Technologies

Gyanchand Pankaj Jain

Texas A&M University - Commerce

The Flagway Game, patented by the Algebra Project, Inc., is a game that helps students learn about prime factors through a constructive learning approach. An Android Flagway Game application is developed to provide school children an opportunity to learn mathematical facts and to expose them to logical reasoning processes through the visual medium of gaming. Our ultimate goal is to use mobile technology for students to learn an advanced mathematics theorem that underlies the Flagway Game.

The application targets multi-level user interfaces for the game based on the degree of complexity of the interaction. At the initial level, the application presents a graphical user interface with three colored circles placed around a central circle in which integers equal or larger than two are generated randomly. These integers are generated within one of five specified ranges, with the user having control of the selection of a particular range. The rules of the game, which in the final product will be discovered by the users, are mutually exclusive and the simple single layer neural networks which is trained determines a set of rules and relations on input numbers generated. This application will allow users to simultaneously think and develop their own set of rules for the integers that are generated. The end product will contain three levels with five selection ranges. Finally, there is a scoring rubric that will be used to assess the correct or partially correct placement of the integers by the users.

The significance of this approach to learning mathematics is that students of low socioeconomic status are more readily able to access information through mobile technology than through online services.

Student Abstracts
Doctoral Degree Programs

Community Survey on Claims and Beliefs about Code Clones.

Debarshi Chatterji

University of Alabama

Researchers have made a number of claims about code clones and their effect on software maintainability. Some argue that clones are problematic for maintenance. Others argue that it is necessary for developers to keep track of them. Claims like these are typically not supported by concrete empirical evidence. Furthermore, there are studies which contradict these claims entirely. In this presentation, we describe the results of two surveys of code clone researchers. The goal of the surveys was to gauge the researchers' level of agreement regarding clone management, detection, and other key topics. The survey asked researchers to use their knowledge and beliefs to describe their views on claims from the literature that have yet to be empirically validated. We used the answers provided by the survey respondents to reach some consensus. The first survey questions were motivated by three research thrusts: general clone usage information, clones and developer behavior and clone evolution. The second survey focused specifically on developer behavior and maintenance scenarios. Twenty-two active code clone researchers responded to the first survey while twenty-one responded to the second one. The goal of these surveys was not to validate any claims from the literature; rather, it was done merely to judge the level of agreement among researchers. While the results did show agreement in some areas, researchers were divided on major issues. We observed strong disagreements regarding the definitions and taxonomy of clones. Also, the community seemed to be uncertain regarding developer behavior and ways to handle code clones so that system quality is not affected. From the second survey we observed disagreements on the use of clone-aware tools and in the area of clone management. The combined results of the surveys indicate that there is room for more focused research in order to assist the practice of software maintenance.

Domain-Specific Languages for Developing and Deploying Signature Discovery Workflows

Ferosh Jacob

University of Alabama

A signature is a unique or distinguishing measurement, pattern, or collection of data that detects, characterizes, or predicts a target phenomenon (object, action, or behavior) of interest. Signatures are valuable to a wide range of application domains - including medicine, network security, and explosives detection - for anticipating future events, diagnosing current conditions, and analyzing past events. However, current approaches suffer from a lack of re-use of existing algorithms, tools, and techniques across application domains and scientific disciplines. Domain-agnostic signature discovery entails study across multiple scientific disciplines. The breadth and cross-disciplinary nature of this work requires that existing executable applications be integrated with new capabilities into workflows, representing a wide range of user tasks. An algorithm may be written in multiple programming languages for various hardware platforms, and so workflow composition requires integrating executables from any number of remote hosts. This raises an engineering issue on how to generate web service wrappers for these heterogeneous executables and to compose them into a scientific workflow environment (e.g., Taverna).

In this presentation, we summarize our work on two simple Domain-Specific Languages (DSLs) that automate these processes for converting remote executables into scientific workflows. SDL can generate services that are deployable in a signature discovery workflow using WDL. We separated the domain-specific information required to create the workflows from the accidental complexities introduced by web services and the Taverna workflow engine, which allows end-users (scientists) to design and develop workflows. The two DSLs are introduced using a BLAST execution workflow, a frequently used workflow in the scientific community. This project is an initial step towards scientists designing and developing complex workflows in various signature domains utilizing the best algorithms available on best resources.

OpenFortran: Extending Fortran with Meta-Programming

Songqing Yue

University of Alabama

Meta-programming has shown much promise for improving the quality of software by offering programming language techniques to address issues of modularity, reusability, maintainability, and extensibility. A system that supports meta-programming is able to generate or manipulate other programs to extend their behavior in a manner that separates the core functionality of an application from the separated extension. Thus far, the power of meta-programming has not been explored deeply in the area of scientific computing. This presentation describes my research that brings the power of meta-programming to Fortran by designing a meta-programming tool named OpenFortran. This tool provides a framework to build arbitrary source-to-source program transformation libraries that offer extensions for Fortran programs. The design focus of OpenFortran is to enable program transformation in a straightforward and transparent way, so that application programmers only need to add a simple annotation to modules or sub-functions that need to be manipulated, while removing the need to know the details on how the transformations are performed. The presentation provides a general motivation for using meta-programming and offers details about the implementation of our OpenFortran framework. Additionally, the presentation will show how to use OpenFortran to build transformation libraries for a few example extensions, such as profiling and tracing. Our analysis demonstrates how efficient the libraries can be developed and utilized to improve the quality of legacy Fortran code. We also discuss our future work in the area of meta-programming for scientific computing and summarize our lessons learned.

Managing Complexity In Cyber-Physical Systems With Design Patterns

Jerry A. Higgs

Univ of Alabama-Birmingham

As cyber-physical systems continues to emerge as a research discipline, we are faced with the evermore difficult role of lessoning complexity. These complexities are increasing significantly making the composition and reusability of cyber physical systems important. Besides some of the major challenges faced by software engineerings include developing, modifying and integrating abstractions that cover CPS design spaces. Classical thought increased the interdependencies and limited compositionally because it restricted the design process. We propose a novel but simple technique of deploying the use of design patterns in order to manage the design process. Additionally, we examine the challenges associated with designing such system and the benefits of using design patterns.

A Comparison of Parallel Machine Learning Algorithms in a Cloud versus a Cluster

Jeffrey A. Robinson

University of Alabama

There are machine learning algorithms have been made to be parallelized so that it can be run on many machines. Therefore many of these algorithms are run on high performance clusters. In this research the algorithms are run on both a cluster and a local private cloud and from this compare the performance and resource utilization of the algorithms. From these results we plan to find out where bottlenecks occur in each system. In the cloud the expectations are that the bottlenecks on each machine will be the disk, CPU, network, and memory because each machine will have multiple virtual machines running. The biggest performance problem that is expected is when data is initial sent out to each machine. Because each machine has multiple virtual machines accepting data the network card and the disk drive will be highly utilized. Also in the cloud infrastructure there is an expectation for each machine to be slow to start due to the initial instantiation of virtual machines. In the cluster we expect bottlenecks to occur when we perform merging of results. The final result there will be a runtime analysis that compares the two algorithms. The expectation is that the cloud will run slower; however it will have higher utilization while the cluster will run faster but have lower utilization.

Transaction Management of Cloud Databases

Md. Ashfakul Islam

University of Alabama

Cloud storage service is currently becoming a very popular solution for medium-sized and startup companies. However, there is still no suitable solution being offered to deploy transactional databases in a cloud platform. The maintenance of ACID (Atomicity, Consistency, Isolation and Durability) properties is the primary obstacle to the implementation of transactional cloud databases. The main features of cloud computing: scalability, availability and reliability are achieved by sacrificing consistency. The cost of consistency is one of the key issues in cloud transactional databases which must be addressed. While different forms of consistent states have been introduced, they do not address the needs of many database applications.

In our earlier work, we proposed a tree-based consistency approach, called TBC that reduces interdependency among replica servers to minimize the response time of cloud databases and to maximize the performance of those applications. We explored different techniques of maintaining consistency, such as the classic approach, the quorum approach and our tree-based consistency approach. We identified the key controlling parameters of consistency maintenance in cloud databases and studied the behavior of the different techniques with respect to those parameters. Now we need to implement transaction management and serializability for the TBC approach. Currently available locking mechanisms usually apply locks on a schema level, which is not suitable for cloud databases due to communication latency with other replicas or fragments of a cloud database. Granularity levels of the locking mechanism need to be increased. In that case multiple non-conflicting operations can acquire locks and access to different data items of a schema concurrently. Identifying non-conflicting operations on a schema is a challenging problem and needs accurate analysis to ensure serializability is not compromised. We are in the process of designing such a locking mechanism to increase the granularity level.

Creating a VUI for Initial Programming Environments

Amber Wagner

University of Alabama

Graphical User Interfaces (GUIs) often require the use of both a mouse and keyboard, which motorically challenged users typically are unable to adopt due to the dexterity needed to use such hardware. A Vocal User Interface (VUI) is an alternative interface that allows a user to describe their intentions to an application through voice commands. There are two primary disadvantages with VUIs as a technology to address the limitations of motorically challenged users: 1) vocal strain can emerge for technical solutions that require a deep amount of vocal interactions, and 2) the process of integrating voice controls into a legacy application is a very time consuming process. There are existing vocal tools (e.g., the generic Vocal Joystick) that could be integrated into various applications; however, due to the needs of many applications, the Vocal Joystick is not feasible due to the potential vocal strain.

In this presentation, we describe our work that uses "Programming by Voice" (PBV) as a paradigm for writing a program without the use of a keyboard or mouse. Specifically, we apply the PBV concept to Initial Programming Environments (IPEs), such as Scratch, which have a graphical blocks language and often used to teach children about computer science. With PBV, a command-driven VUI has shown benefits from an initial prototype that we built for Scratch. This presentation summarizes our results in providing a mapping from an existing GUI to a newly formed VUI, in order to support the goals of providing an IPE for children with physical disabilities. We will also outline current challenges and future work in the area of VUI to GUI mapping.

Model Transformation Design Patterns

Huseyin Ergin

University of Alabama

Model transformation has a key role in model-driven engineering. Designing rules and applying them on model instances is the core of model transformation. But there is a lack of re-usability in the rule designing phase. In this paper, some list of design pattern techniques and the ways how to merge them with model transformation rule designing phase are investigated. The motivation behind the design patterns and the structure of model transformation languages are reviewed in details to deduce the correlation between two and to gain a track of a research in this direction. Some already published works that combines model transformation and design patterns are also reviewed.

On The Performance of Apache Hadoop in a Tiny Private IaaS Cloud

Gabriel Loewen and Michael Galloway

University of Alabama

High performance and parallel computing are traditionally implemented on very large dedicated compute clusters. However, as many organizations begin to adopt service-oriented cloud-based infrastructures, we can expect to see the development of parallel computing in the cloud. The goal of a parallel compute cluster is to divide a large job into several small jobs, execute the small jobs in parallel on many compute nodes, and then combine the results in some coherent manner. The biggest hurdle in moving this type of service to a cloud-based infrastructure is that performance will undoubtedly be affected by many factors, particularly those related to virtualization in clouds, such as memory and CPU overhead, limited resources, and others relating to hardware virtualization. In order to fully understand how virtualization can affect parallel computing in a tiny private cloud, we have devised four case studies that examine the performance of Apache Hadoop in varying environments on our private cloud. Our case studies are comprised of a baseline or bare metal (non-virtualized) cluster deployment consisting of seven nodes, a seven-node virtual machine cluster, a twenty-node virtual machine cluster, and an optimized seven-node virtual machine cluster. We compare the performance of the bare metal cluster with the other case studies using six different data sets to determine the factors responsible for affecting performance of Apache Hadoop in a tiny private IaaS cloud. We use job completion time, map phase time, reduce phase time, CPU utilization, and memory utilization as metrics in this study. Results show that, although small data sets result in comparable job completion times, as the data size increases the performance of Apache Hadoop is affected greatly by virtualization even when we attempt to optimize the configuration of our cloud.

Accountable Cloud with B+ Tree

Kazi Zunnurhain

University of Alabama

Cloud is becoming the most attractive buzzword in the industry of IT business also as a big path to save money. This statement may raise a lot of arguments in the computing community but still the rate of acceptance of cloud each year is dragging it towards the crown of computational era. But even though it is productive and economic, still it is vulnerable to different types of external threats. Those threats points to various security directions one of which is accountability. If any kind of unwanted phenomenon takes place then how to determine who is responsible for that event and how to resolve any dispute between the clients and the cloud providers. Let's consider some of the existing works and ongoing works based on accountability. One of the works was deploying the AVM (Accountable Virtual Machine). An AVM is running a virtual machine with an accountable virtual machine monitor which will continuously log each of the states of the running servers and which could be reproduced depending on the consumer demand in case of a dispute. These temper evident logs won't be 100% accurate because of the nature of the consumers will vary. For that purpose the victim will run the same application replica in her local machine to produce the log and then compare it with the actual one (produced in real time by the servers). Now to detect any kind of cheating in online gaming that might work but considering the same phenomenon in a large industry which relies all of their data on cloud will be charged with a great amount of money for enabling each of their local machines with AVM and AVMM. Also the time it will take to reproduce the log for comparison, could jeopardize a lot of time specific works for that company. So instead of deploying an expensive mechanism to prevent threats let's secure our data internally and structure the data block in such a way so that the search, update, insertion, deletion or any kind of operation on them will be unique to individual clients and not general for all the users.

Pay Attention to Your Data

Sui Gong

University of Alabama - Huntsville

Data on 2D grids is used in many application areas in science, medicine, and engineering. Some of this data is collected from sensing. Some sensing methods collect an instantaneous measure at each grid point. In other methods, each data point represents an aggregation of properties over a small region about a grid point. A slice image from a CT dataset is an example of the latter.

Statistical methods are often used to study data, but it may better to visualize before choosing which analysis to do. The value of visualization can be shown in M. Kozak's case study [1]. That study's data is in two groups that form a certain pattern visually; and the visualization results help to choose the most appropriate statistical analysis techniques later. Since accurate visualization results are most useful, one must understand the impact of data collection on visualization. An example of such impact is that aggregated property data can cause incorrect contour finding results.

Finding a contour is often needed in 2D grid data visualization, image processing and image analysis. Many contour finding methods have been developed. Marching Squares is one of them. One type of error produced by Marching Squares is that it can incorrectly reconstruct linear edges if the data is not instantaneously measured. Such error, which can occur even without the presence of sensor noise, is caused by the quantization during data collecting. Such error is analyzed and quantified in this presentation.

In this presentation, the incorrect linear edge reconstruction error of Marching Squares, which is caused by data collected over a small region around each grid points, is carefully examined and quantified. We also provide the error comparison between Marching Squares and Chain Code.

Reference:
[1] M. Kozak. "Watch out for superman: first visualize, then analyze." IEEE Computer Graphics and Applications, vol. 32, no. 3, pp. 6-9, May-June 2012.

Professional Abstracts

Lessons Learned in Piloting a CS Principles Course

Amber Wagner and Dr. Jeff Gray

University of Alabama

The new CS Principles course represents a joint effort by the College Board and NSF to revitalize the national importance of K-12 Computer Science. As compared to the existing AP Computer Science exam, the CS Principles course focuses less on the very specific details of a particular language, and instead concentrates on what many consider to be the fundamental principles of computing ; the so-called "Big Ideas" in the CS Principles curriculum. Interest in CS Principles curriculum is growing, with many high schools and colleges beginning to offer an initial informal offering of the course, in order to prepare for the expected first exam in a few years. In both 2011-2012 and 2012-2013 we were official Pilot instructors for both Pilot II and Pilot III cohorts for the peer college-level class. We have interacted extensively with the College Board and other Pilot instructors to develop new materials and approaches for teaching the Big Ideas. The presentation will provide the background and motivation for the course, summarize the key Big Ideas, and share lessons learned from implementation the course over two years. A particular discussion point will be how the context of mobile computing (using App Inventor) serves as a background theme for parts of the course.

Teaching a New Web User Interface Design Course to Computer Science - Web Technology Undergraduates

Leong Lee

Austin Peay State University

In today's IT industry, employers would expect a computer science graduate in a Web Technology concentration to have the ability or the general knowledge to plan, design and develop a dynamic back-end database driven web application with creative front-end aesthetics.

By its very nature, web user interface design and development combines scientific conformance and individual artistic balance. Web site design and development crosses multiple disciplines of computer science, design, information technology, and visual communication. A "good" web design should be not only functionally usable and serve the desired purposes, but also aesthetically appealing with engaging presentation layouts and attractive graphics.

Students want to design an "attractive" and functional website. Businesses want our students to have at least some basic interface design skills. At Austin Peay State Universityersity we started teaching a new course "Web User Interface Design" several months ago and I want to share our teaching experiences. We introduced basic web design principles and reinforced these principles through customized design exercises. Different design topics are covered and web development tools are taught. This presentation will cover how the course was conducted with examples of students' assignments/works, challenges faced and a discussion on teaching outcomes.

Implementation of Software Engineering Techniques in System Analysis and Design Courses

Masoud Naghedolfeizi and Nabil Yousif

Fort Valley State University

The department of Mathematics and Computer Science at Fort Valley State Universityersity (FVSU) offers a major in Computer Information Systems (CIS) in addition to Computer Science and Mathematics. As part of CIS curricula, students are required to complete a sequence of two courses in System Analysis, Design, and Implementation. These courses are upper level classes that are taught into two consecutive semesters.

In the first sequence course, a comprehensive overview of software engineering techniques with emphasis on the system development life cycles (SDLC) is presented. The first three phases of SDLC: system planning, analysis, and design are thoroughly described and discussed in the first course. After students demonstrate sufficient depth of the subject matter, they are divided into groups of three or four in order to carry out an information system project as a major course requirement for their final grade. Each group will select a project related to a real-world business information system that will be designed and implemented during the two semesters. Some examples of projects include payroll, registration, inventory, airline reservation, and hotel reservation systems. Students are required to perform project planning, analysis, inputs/outputs design, and collaboration with an industry related to their project in the first sequence course. Upon completion of the first course students will demonstrate the ability to evaluate and choose among alternative system solution strategies.

In the second semester, students review and revise their design and start the implementation phase based on software engineering principles. Students will have the freedom of selecting a programming/application software to implement their project information system. For instance, some students use Microsoft Access with integration of Visual basic. Others may use different software, such as Java or C++. After completion of implementation phase students prepare the project support and documentation. In this phase students will document their information system project and prepare a user manual that will guide any non-technical person to operate the system project. Then, students are required to present their projects for their peers and invited faculty members. Finally, students submit hardcopies and electronic files of their projects for grading.

This method of instruction teaches students how to implement the course concepts from the classroom to real-world application. In addition, students gain a thorough practical knowledge of software engineering techniques. Moreover, they learn how to work collaboratively and resolve conflicts in the interest of completing their project tasks.

Javascript as a First Language

Nicholas Coleman

Austin Peay State University

Over the past few decades there have been many advances in the field of programming languages. Many of today's most widely used programming languages were originally introduced in the last 20 years. Even older languages have undergone changes and added new features to keep up with the latest trends and techniques.

As computer science educators we are responsible for introducing our students to the power and possibilities of computer programming. A student's first programming experience will inevitably influence how they think about computing and help determine whether or not they continue in the discipline. There is no universal consensus about which language should be used for introductory classes, but it would appear that Java and C++ are still the most widely used languages for typical CS1 classes.

Statically typed object-oriented languages like Java and C++ have many advantages when used to develop large scale complex systems. However, as a first language for students developing their first simple programs, the complexity of such languages can be overwhelming.

An alternative to this approach is to use JavaScript as a first language. JavaScript is a dynamically typed language with object-oriented features. It is powerful enough to express typical CS1 programs, but simple enough to be approachable to the novice. In addition, no IDE or compiler is required to execute a JavaScript program. The student only needs a text editor and a browser.

In this presentation I discuss my experience with using JavaScript and HTML in a CS1 class. I contrast this approach with the use of statically typed object-oriented languages like C++ and Java to teach the same material. It is my conclusion that this approach is sufficient to teach the necessary concepts of CS1 without many of the difficulties caused by C++ and Java.

Observations from the Bunker: BYOD Usage in Computer Science Education

Eric L. Brown and Jeremy Ey

Tennessee Tech University

Following up on our 2010 presentation "Living on the Bombing Range: The Expanding Role of Remote Services," this presentation will discuss the experiences of the Department of Computer Science at Tennessee Technological University in moving from a fixed computer lab to a laptop-driven, mobile environment, a trend now widely mirrored within our university at the department, college, and university level as well as within many other institutions.

As noted previously this shift brings with it a variety of opportunities and challenges. Overall reactions from students and faculty to this project have been positive. The move to mobile technology has brought with it changes in the relationship between student, course material, and support services. While many positives have emerged, this project has also highlighted shortcomings in service availability across the campus. While this migration was driven partially by financial constrains present in the University environment, increased utilization of computing resources by students has shown the value of this design, bringing the learning environment to students regardless of location, device, or connectivity.

Incorporating Declarative Programming in a Discrete Mathematics Curriculum

Joshua T. Guerin

University of Tennessee - Martin

The importance of Discrete Mathematics in an undergraduate Computer Science curriculum is widely recognized. Despite the role of Discrete Mathematics as a foundation for much of the theoretical, applied, and scientific pursuits of a computing discipline, many undergraduate students are unable to draw immediate connections between Discrete Mathematics and the study of Computer Science or programming.

Most undergraduate Computer Science majors are used to an imperative or procedural style of programming where the focus is on how the problem should be solved (an algorithm). Declarative programming languages such as Prolog place primary emphasis on the specification as the program, leaving the algorithm for finding the solution largely up to the implementation of the language. In Prolog a problem is specified formally using logic. Direct connections can be drawn between logic, reasoning, and inference as taught in a Discrete Mathematics course and the syntax and semantics of the Prolog language.

In this presentation the author shows how a declarative approach to programming can be used to reinforce ideas taught in a Discrete Mathematics course including, but not limited to, the study of logic.

Detecting Machine-Morphed Malware Variants Via Authorship Attribution

Radhouane Chouchane

Columbus State University

Machine-morphed malware has forced detectors to face the challenges of recognizing possibly obfuscated binaries, as well as never-before-seen, machine-generated variations on these binaries. This presentation explores the challenges of detecting machine-morphed malware by using an engine-attribution approach inspired by prior work on author attribution of natural language text to its authors. The good design practices (GDPs) of morphing malware are enumerated. These are the practices that need to be followed by morphing malware to considerably challenge the computational resources of traditional malware detectors. Approximate solutions are proposed which require only one signature per engine to attribute any of the possibly vast number of malware instances that can be generated by a given morphing engine to the engine. The proposed solutions employ heuristic strategies that we designed to utilize GDPs against the authors. These solutions are evaluated on morphed malware instances generated by the engines of W32.Evol, W32.Simile, W32.NGVCK, and W32.VCL. The results of these experiments yielded detection accuracies of 95% and above, which suggests that the proposed solutions and the overall signature-based engine attribution approach may well be worth considering as a defense against the large numbers of morphed, possibly obfuscated, binaries that are currently being churned out by constantly-improving morphing engines.

Security for Mobile Devices

Katherine H. Winters

University of Tennessee - Chattanooga

Mobile devices are as common as a wrist watch once was. If you leave home without out it, you feel as if you are only half dressed. Worst still have you had one stolen or lost. We take our digital devices with us everywhere and they contain tremendous amounts information of about us. We are very careful with our non-digital information; we shred, we hid, encrypt and find other avenues of securing our data. The question then is: do we take as much care with our digital information as we do with non-digital. Just how secure is the information on our digital devices. We will explore this topic from a technical and nontechnical perspective and discuss possible solutions and simple steps to secure that data.

Unifying Object Model and Data Model with a Verb/Verb Phrase-Driven Approach

Tzusheng Pei

Jackson State University

In business software design, there are two models involved, the object model and the data model. Object-oriented analysis and design (OOAD) is applied to create the object model. The result is a collection of classes created for a software domain. The software system in execution will be a collection of interacting objects of these classes. Relational database design is applied to create the data model, usually following the entity-relationship model. The result is a collection of database tables for the software domain.

Traditionally different approaches are used for developing these two models, and this causes inconsistency in the two models for the design of a software system.

Since there is a natural correspondence between a class and a database table, we believe that the data model should be embedded into the object model. Hence there is a need to unify the process of creating these two models. In this paper, a unified approach is proposed to follow a verb/verb-phrase driven process.

Object-oriented analysis and design is not standardized. Different authors may have different approaches. Previous work has been done in object-oriented analysis and design where class identification process is driven by verbs/verb phrases in domain documents. This work is an extension of that previous work, and the creation of data model is incorporated into the object-oriented analysis and design process. An example will be presented to show this unified verbs/verb phrases-driven approach.

Online, Offline, and Out of Line: Plagiarism and the Demise of Academic Integrity

Robert A. Fleck, Jr., Ph.D. and Dina Samora Ed.S, MBA

Northcentral University

Plagiarism is almost as old as the written word and many famous and infamous people have been accused of using the works of others as their own. Authors such as H.G. Wells and Stephen Ambrose, Wall Street Journalists, politicians, faculty, and students have lost jobs and reputations due to plagiarism. Some have claimed that the error was unintentional, an oversight, or bad judgment. But if plagiarism carries penalties, why is plagiarism apparently endemic in our society and classrooms? Do the perpetrators not understand the meaning of plagiarism? Are the penalties not clear and or enforced? Are the rewards larger than the costs? Are there cultural issues involved or other factors that lead to plagiarism? Perhaps those who plagiarize lack self confidence in their ability to create new knowledge or thoughts. As academics, we should be encouraging our students in ethical behavior and to use the works of others to build arguments for or against a position or theory. The authors provide an historical background on plagiarism with examples and then focus on the evolving meaning of plagiarism. University policies are discussed and presented based on publicly available web sites. Solutions are then presented with an emphasis on software checking packages including Turnitin and Google.

A Void-Cluster Technique For Half-Tone Visual Cryptography

Ali Abu El Humos

Jackson State University

To secure confidential information embedded in digital images from being disclosed, some image processing techniques have been developed to accomplish this goal. One of these image processing techniques is visual cryptography for halftone images, which uses threshold arrays generated by a void-and-cluster method. The remarkable feature of visual cryptography schemes is that the decoding process is done by human eyes. Halftone Visual Cryptography (HVC) using threshold arrays shows great flexibility for combining share images in order to decode the embedded digital secret image. Moreover, it also achieves high quality share images, high speed processing and extensibility to (k,n) visual cryptography of three share image categories, such as (2,3) or (3,3). Results show that all the above features are achieved, while an embedded digital secret image is clearly decoded, and it cannot be seen on the share images.

Will Spam 4 Work

Kurt Wesner and Bob Bradley

University of Tennessee - Martin

How hard could it be to send out an email message to half a million people? Only a few years ago, anyone could run an SMTP server on his or her own machine and send all the email he or she wanted. Today, however, sophisticated spam blocking software networks will quickly quit a spammer after only a few attempted emails. Rogue SMTP servers will be throttled and quickly become gray or black-listed. Now, large amounts of legitimate bulk email is only accepted from a few "big named" companies.

There are several SMTP bulk sending services from which you can purchase plans, but the rates are incredibly expensive. Amazon has recently entered the market with its cloud based SES service. Amazon SES will gladly send 10,000 emails a day for you for only $1 per 10,000 emails.

This talk will describe our ongoing project of sending out emails to every teacher in America. This project was not sponsored by or supported by our university, but was instead undertaken as a private consulting project. A list of over half-a-million US teacher email addresses was obtained from a site that promoted the list as "verified opt-in" email addresses.

One dollar and ten thousand emails later resulted in over 2,000 email bounces and many spam complaint reports. Amazon revoked our email sending privileges the very next day, but they kindly sent us their terms of use policy and a handy guide to sending bulk email through their system. The guidelines warned against using the "opt-in" mailing lists and warned of things to look for such as "spam trap" address and bad data in general. The email database we had purchased was full of both.

So the next task was to find a method to determine if an email address is really valid. Commonly used REGEX expressions removed many of the simple data errors, but the bounce rate was still too high, close to 20 percent.

This talk will present some of the other standard ways of validating an email address, including looking at the MX record, connecting to the SMTP server and attempting to "almost" send a message to the user.

This talk will also discuss the legal ramifications of sending "opt-in" and "opt-out" email spam in the US and in certain states. Finally, we will present the results of our "research" so far.

Alternative Techniques and Tools for Mobile Cross-Platform Development

John Nicholson

Austin Peay State University

Android and iOS are currently the leading mobile platforms. Although the average consumer may think they are similar due to the wide variety of apps that appear on both platforms, they are largely incompatible when it comes to software development. Native Android apps are mainly written in Java and iOS apps in Objective-C. If a developer wishes to deploy her app on both systems, she must port the application from one language to the other, often extending the release date for one or both versions of the app. In order to address this problem, cross-platform tools and techniques are being developed to speed the development time of apps that are to be released on multiple platforms. This talk will discuss several tools and techniques that have been investigated by and used at APSU's Mobile Technology Center during the development of school's main app Peay Mobile as well as other apps. The cross-platform development techniques and tools that will be discussed include WebView-based apps, RhoMobile, and Moai. Strengths and weaknesses of each will be discussed, in addition to how they may fit into an introductory mobile app development course.

Application of Computing Neural Networks to Forecasting Service Life Estimation of Plant Components

Masoud Naghedolfeizi, Ramana M. Gosukonda, and Nabil Yousif

Fort Valley State University

In recent years, there has been a growing need in numerous industries to forecast the service life of aging system components and instruments that have been in operation for a prolonged time. To ensure reliable operation of these components, it is essential to gain a realistic and thorough understanding of degradation mechanisms that could eventually lead to unexpected component failures. This knowledge is valuable both for service life estimation and for maintenance programs that could help reduce unexpected and/or costly component failures.

To predict degradation processes of system components, the neural networks must be trained with a variety of degradation data, in order to create accurate and meaningful neural network prediction models. This type of data is normally collected over a long period of time during the service life of a class of similar components operating under different conditions. However, such data either may not exist or contain a limited amount of information. In such situations, the required data may be generated based on the simulation models of the physics of the degradation processes.

A nonlinear degradation model was used to generate training data for the neural network prediction models. The model in term of complexity is similar to models used in thermal and material- related aging degradation processes for system components such as sensors (e.g.; strain gauges, linear voltage differential transformer, and resistance temperature detectors) solenoids, and electric insulations. The generated data was used to train three types of neural prediction models: short-term, intermediate, and long-term.

The prediction results showed that the neural network models were capable of recognizing the correct future degradation trends in data even with a limited amount of input data. In addition, the models were able to capture the dynamics and nonlinearities associated with the degradation process data that is often very difficult to obtain using traditional parametric or non-parametric models.

Experiences with Virtual Desktop Infrastructure (VDI)

Jeremy Ey

Tennessee Tech University

Starting in the fall of 2011, Tennessee Technological University undertook two projects expanding its Virtual Desktop Infrastructure (VDI). This moved VDI at Tennessee Tech from a small number of fixed thin-client desktops to a continually expanding number of desktops (approximately 550 at time of writing), in a wide-variety of configurations. The past year has seen an increase in the number of thin-client based deployments, the use of virtual desktops to supplement lab- and office-based software installs, and providing virtual desktops to support bring your own device (BYOD) computing to on-campus and off-campus users (faculty/staff and students).
VDI at Tennessee Tech is based on VMWare View, vSphere, and Unidesk software as well as Dell hardware. Based on experiences of the past year, deployment of this solution has provided many advantages over previous methods, enabling new services and functionality across the campus computing environment. This presentation will describe the varying uses of VDI across campus, the hardware and software used to support these use cases, challenges faced (including software licensing), and plans for the future. In the process of describing Tennessee Tech's decisions and selections, the wider issues with VDI deployments will also be explored.

Pros and Cons of Blocking and Non-blocking Techniques in Concurrent Programming

Srinivasarao Krishnaprasad

Jacksonville State University

As modern processors employ multi-core architectures, exploiting them entail concurrent programming of software applications. One common approach is to implement the concurrency in applications using multithreaded programs. Concurrent execution of threads often requires synchronization amongst cooperating threads. Mutual Exclusion and Condition Synchronization are two primary types of synchronization. Exclusive execution of Critical Sections requires Mutual Exclusion. Waiting for a specific condition to be met before continuing the execution is achieved via Condition Synchronization. These requirements are often coded using popular synchronization tools such as locks, semaphores and monitors. During these situations threads are often blocked. Blocked threads wait in a queue, either associated with a lock or a condition variable. Whenever the lock becomes free or the condition is met, a waiting thread is awakened and rescheduled for execution. Rescheduling a waiting thread involves context switching which is pure overhead. When several threads contend for the same resource, the run-time system will incur significant overhead and affect the system performance.

Unlike blocking algorithms, non-blocking algorithms use low-level atomic instructions to implement synchronization requirements. For example, Java 5.0 and later versions provide classes for atomic variables and atomic operations in the package java.util.concurrent.atomic. By avoiding the cost of blocking (suspending a thread, manipulating waiting queues and restarting a thread), non-blocking algorithms often outperform blocking algorithms, especially on multi-core processors executing multiple threads. These involve busy-wait loops or spin loops and may result in high memory traffic and wasted CPU cycles. Also, many non-blocking techniques use speculative execution where an operation is done assuming there will be no interference. But, if interference is detected then we need to back off and retry. Thus, non-blocking logic is often difficult to design, understand and debug.

Improving the odds of success in Computer Science 1

Wayne Summers

Columbus State University

"Between 30% and 60% of every university computer science department's intake fail the first programming course.1" At the author's university, the pass rate [A, B, C] averages 60% for the first programming class, Computer Science 1 (CS1), between 2000 and the present. This was true when C+ was taught as well as now when Java is used to teach CS1.

The author has taught CS1 since 1981 at four different universities in languages ranging from PL/I, BASIC, and Pascal to Modula-2, C++, and Java. His classes have been consistent with these results and are typical of the pass rate for his colleagues. Given our challenges today with a dynamic job market for our students and only slight increases in new enrollments, it is imperative that we attempt to increase our retention rate (successfully pass: A, B, C) dramatically.

While teaching CS1 in Fall 2011, the author finally came to the realization that Java is too complicated for novice student programmers and should be replaced with a simpler first language like Python. Many faculty at other universities have come to the same conclusion. Many now teach Python in CS1 and Java in CS2.

At the author's university, there are multiple sections of CS1 that require that all sections prepare the students for CS2 taught in Java.The author's approach is unique and centers on the introduction to programming using Python for 5-6 weeks followed by the remainder of the semester being taught in Java. This format resulted in a pass rate of 80% in Spring 2012 and appears that similar results will take place this Fall 2012. Results from the two cohorts will be shared at the presentation.

1 "Separating Programming Sheep from Non-Programming Goats," http://www.codinghorror.com/blog/2006/07/separating-programming-sheep-from-non-programming-goats.html, created - July 14, 2006, last viewed - October 10, 2012

Modeling and simulation of distributed computing workflows in heterogeneous network environments

Yi Gu

University of Tennessee - Martin

Next-generation computation- and network-intensive collaborative applications in various science, engineering, and e-commerce fields feature large-scale computing workflows of complex structures. Efficient algorithms are needed for task scheduling, module deployment, and service provisioning to support the execution of such distributed workflows in heterogeneous network environments and optimize their end-to-end performance for fast system response or smooth data flow. However, deploying large-scale distributed applications in real network environments is extremely challenging due to the inherent dynamics in the reliability, availability, accessibility, and capacity of massively distributed system resources, which are typically shared among a broad community of users over the Internet or dedicated connections. We propose a simulation system to study the execution dynamics of distributed computing workflows and evaluate the network performance of workflow scheduling or mapping algorithms before actual deployment and experimentation. The proposed simulation system visually illustrates the dynamic execution process of workflows in network environments by simulating module execution on computer nodes and data transfer over network links in a completely distributed and parallel manner. Furthermore, the simulation system takes background traffic and workload into consideration to achieve a high level of simulation accuracy for distributed applications deployed in shared production network environments. We implement the simulation system using multi-threaded programming and conduct extensive testing on various mapping schemes using a large number of simulated workflows and networks. The simulation-based performance measurements are quantitatively confirmed by both the experimental observations collected in real networks and the theoretical results obtained by rigorous performance analysis based on well-defined mathematical models.

Teaching Robotics Vision Applications Using Tekkotsu

Xuejun Liang

Jackson State University

A great effort has been made to adopt and create robotics teaching materials, especially robot programming lab projects, for a new upper-level undergraduate robotics course in our Computer Science Department. The major topics of this course are involved in the field of intelligent mobile robots, including robot control architectures, localization, navigation, sensing, planning, and uncertainty.

In robotics vision applications, robots use their visions (cameras) to sense their environment to act to achieve their goals. These robotics applications require that a robot can be programmed to be able to know what it wants to see, to recognize what it observed, to compute the size, the orientation, and the location of objects it detected, to reason about the spatial relationship among observed objects and background, and to figure out the geographical layout of the objects. These applications will be very interesting to computer science students, and able to broaden their understanding of computer science concept and encourage them to learn more. Therefore, it is desirable to use these applications in our robotics course. But, these applications can be very sophisticated and programming a robot in these applications from scratch can be very difficult. Fortunately, the Tekkotsu robot programming development environment provides users with a set of high level supports, including vision processing for shape predicates, object recognition, and mapmaking.

In this presentation, we will examine several robotics vision applications to show how to use and teach the Tekkotsu to program robots for challenging problems. These applications include using visual fiducials to command or guide a robot for its navigation, and pushing some canisters into a pen. These applications have already been or will be used as robot programming lab projects in our robotics course.

Exploring CASE Tool Impacts on Software Project Success

Denise Williams and David Williams

University of Tennessee - Martin

The purpose of this research-in-progress is to explore the impact of CASE tools on software project success and failure. This research will explore the impact of the use of CASE tools on scope creep and changes in project functionality. The goal of the research is to test various hypotheses involving CASE tools as a dependent variable in several models. The authors seek to learn more about the impact of CASE tools on software project success or failure.

CS Student Engagement Through Physical Computing

David Brown
Richard Barber

Pellissippi State Community College

A Chinese proverb says "Tell me and I'll forget; show me and I may remember; involve me and I'll understand." The traditional class lecture is a form of "telling." The lab work that follows lectures is usually a form "showing." Both of these methods of instruction often fail to reach today's learners who demand more personal instruction to keep their attention. A "studio model" of teaching modeled on art instruction in which teachers circulate among students who are working on individual tasks suited to their level of understanding is discussed in this paper. The idea for this model is based partly on the work of Seymour Papert, former Director of MIT's Artificial Intelligence Lab, who pioneered direct active involvement of computing students through the use of his Logo programming language and its "Turtle Graphics," and through his famous book, "Mindstorms: Children, Computers and Powerful Ideas."
The authors of this paper are instructors at Pellissippi State Community College and are currently involved in classes that utilize physical computing resources to actively engage students in their personal learning process. Lego Mindstorms, Carnegie-Mellon's Finch robot, the Arduino and Phidgets microcontrollers and the Raspberry Pi computer are being used in or under consideration for classes at Pellissippi State as an adjunct to or as a replacement for traditional textbooks. This paper will discuss the authors' experiences with these physical computing platforms in teaching computer science classes and their ideas on the post-lecture future of educational instruction.

Conference at a Glance

	Azalea	Dogwood I
7:30 AM	**Morning Coffee–Poolside**	
8:00 AM	**Welcome and Keynote Address**	
9:00 AM	**Coffee Break–Poolside**	
	Session I–Masters	**Session I–Undergraduate 4**
	Chair: Adcock	Chair: Johnson
9:15 AM	Kwon, Turnitsa	Thornton
9:35 AM	Husainy	Brown
9:55 AM	Ahmed	Myers
10:15 AM	Ringstaff	Goodwin
	Session II–Masters	**Session II–Undergraduate 4**
	Chair: Adcock	Chair: Winters
10:40 AM	Ringstaff	Plagge
11:00 AM	Thumma	Overton
11:20 AM	Kusolchu	Wright
11:40 AM	Sardinas	Orsega, Carlson, Siver
12:00 PM	**Lunch–Patio Restaurant**	
	Session III–Masters	**Session III–Undergraduate 4**
	Chair: Chouchane	Chair: Johnson
1:00 PM	Karla	Kennemore
1:20 PM	Perry, Richards	Poirson, Hicks
1:40 PM	Wayne	Platta
2:00 PM		
2:20 PM	**Break–Poolside**	
	Session IV– Masters	**Session IV– Undergraduate 4**
	Chair: Chouchane	Chair: Jerkins
2:35 PM	Harris	Bond
2:55 PM	Bailey	Dzugan
3:15 PM	Jain	Bright
3:35 PM		Ervin, Howrd, Michener, et al.
4:30 PM	**Business Meeting–Highlander I**	
7:00 PM	**Awards Banquet–Azalea**	

	Dogwood II	Highlander I	Highlander II
7:30 AM	**Morning Coffee–Poolside**		
8:00 AM	**Welcome and Keynote Address**		
9:00 AM	**Coffee Break–Poolside**		
	Session I–Doctoral	**Session I–Professional**	**Session I–Professional**
	Chair: Smith	Chair: Jerkins	Chair: Loewen
9:15 AM	Chatterji	Wagner	Brown, Ey
9:35 AM	Jacob	Lee	Guerin
9:55 AM	Yue	Coleman	Chouchane
10:15 AM	Higgs	Naghedolfeizi	Winters
	Session II–Doctoral	**Session II–Professional**	**Session II–Professional**
	Chair: Chouchane	Chair: Jerkins	Chair: Johnson
10:40 AM	Robinson	Pei	Nicholson
11:00 AM	Islam	Fleck	Gosukonda, Yousif
11:20 AM	Wagner	Pei	Ey
11:40 AM	Ergin	Bradley	Krishnaprasad
12:00 PM	**Lunch–Patio Restaurant**		
	Session III–Undergraduate 4	**Session III–Doctoral**	**Session III–Professional**
	Chair: Adcock	Chair: Winters	Chair: Jerkins
1:00 PM	Jackson	Loewen	Gu
1:20 PM	Childress	Zunnurhain	Liang
1:40 PM	Jackson	Gong	Williams
2:00 PM	Tyner		Brown, Barber
2:20 PM	**Break–Poolside**		
	Session IV–Undergraduate 2	**Session IV–Undergraduate 4**	**Session IV–Undergraduate 4**
	Chair: Johnson	Chair: Winters	Chair: Smith
2:35 PM	Bowell, Mack	Lamm, Wolfe	Erisson
2:55 PM	Mathew, Hughes	Rath	Skelton
3:15 PM	Nyengele, et al.	Berry, et al.	Overton
3:35 PM		Hart, Myers et al.	Newman
4:30 PM	**Business Meeting–Highlander I**		
7:00 PM	**Awards Banquet–Azalea**		

Glenstone Floor Plan

