Fall Conference Proceedings

Mid-Southeast Chapter

of the ACM

Gatlinburg, Tennessee
Nov. 10-11, 2016

Mid-Southeast Chapter

of the ACM

For information on the 2017 Fall Conference, select
the conference link from the official chapter website:
www.acmmidsoutheast.org

Table of Contents

Message from the Chapter Chair

Welcome to the 58th annual Fall Conference of the Mid-Southeast Chapter of the Association for Computing Machinery. The elections are over and I am ready to sit back and enjoy the views of the great Smoky Mountains, learn from the students and my colleagues, and prepare to be inspired. On behalf of the officers and members, welcome to the conference and the beautiful Smoky Mountains. Students you are special to us and we want to give you a special welcome. Everyone associated with the conference are excited to hear what you have to say, what you have done and what you are going to do. Welcome students. Faculty and industry, we are equally excited to welcome you. What a year this has been and so many exciting things have happened.

It is such an honor to be a part of and lead a conference of this type and with such a long history and a fifty-eight-year-old tradition. For those of you joining us for the first time, you will leave here in awe of all the work being done by students and your colleagues. If you are returning, you know what a treat you are in for. As you decide which session to attend, be sure you put student presentation in the mix. They have worked hard and are anxious to share what they have done. Remember these students are the future of our profession and our organization. Industry and academia, we are also excited to hear what you are doing both in and out of the classroom. Everybody take the time to look over the abstracts and plan to leave here inspired.

In an effort for continuous improvement, the conference organizers and officers are always looking for ways to improve the conference. Two years ago we experimented with poster sessions. Last year we announced we were adding peer reviewed paper. They are here! We have a peer reviewed paper session. For everyone that worked on this, thank you. It could not have been done without the help from all who participated from those who submitted papers to those who reviewed the papers. I want to give an especial thank you to Greg Kawell. He organized, setup the EasyChair site, and worked hard to make the peer reviewed paper session happen. Great job Greg. We hope this grows in the future. Exciting things are happening to your conference.

There are two additional groups of people who have to be thanked and who without this conference could not happen. First of all a very special thanks to the officers and all those you work so hard to put this conference together. Take the time to stop and say thank you. Judges and session chairs, this could not happen with you and many thanks. Last but certainly not least, I want to take the time to say thank you to the staff of the Glenstone. They have been a

joy to work with. The newly decorated rooms look great. As you are out and about please take the time to tell the hotel staff thank you.

There are exciting things happening in our profession and this conference allows us to get together and talk about them. This conference cannot happen without your help. Think about how you can get involved for next year. How can you do that? There are two very simple ways: 1) attend the business meeting at the close of the conference held in the Highlander; all are welcome and 2) let one of the people listed in the program know you are willing. It truly takes us all.

Now sit back, enjoy the beautiful Smoky Mountain, and the conference. Again, thank you for taking you time to come and participate. Plan to be inspired.

Kathy Winters – University of Tennessee Chattanooga

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Kathy Winters, *University of Tennessee-Chattanooga*
Paul Wang, *Columbus State University*
Joseph Elarde, *Austin Peay State University*

Undergraduate 4-year

Kim Dongjin, *Georgia State University*
Paul Wang, *Columbus State University*
Shamim Khan, *Columbus State University*
Amiangshu Bosu, *Southern Illinois University Carbondale*
June West, *Spartanburg Community College*
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Xuejun Liang, *Jackson State University*
Mark Terwilliger, *University of North Alabama*
Aurelia Smith, *Columbus State University*

Graduate

Glenn Wiggins, *Mississippi College*
Melissa Wiggins, *Mississippi College*
Joseph Elarde, *Austin Peay State University*
Paul Wang, *Columbus State University*
Kathy Winters, *University of Tennessee-Chattanooga*
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Amber Wagner, Kennesaw State University
Robert Lowe, *Maryville College*
Sri Krishnaprasad, *Jacksonville State University*
Chenchutta Jackson, *Austin Peay State University*

Conference Session Chairs

Azalea
> Session I: Ken Adcock- *Cleveland State Community College*
> Session II: Ken Adcock - *Cleveland State Community College*
> Session III: Hao Qiu - *Fort Valley State University*
> Session IV: Hao Qiu - *Fort Valley State University*

Dogwood I
> Session I: Bruce Myers - *Austin Peay State University*
> Session II: Bruce Myers - *Austin Peay State University*
> Session III: Denise Williams – *University of Tennessee – Martin*
> Session IV: Kathy Winters - *University of Tennessee-Chattanooga*

Dogwood II
> Session I: Craig Tanis - *University of Tennessee-Chattanooga*
> Session II: Craig Tanis - *University of Tennessee-Chattanooga*
> Session III: Eric Brown – *Tennessee Tech University*
> Session IV:

Highlander I
> Session I: Eric Brown – *Tennessee Tech University*
> Session II: Eric Brown – *Tennessee Tech University*
> Session III: Ken Adcock – *Cleveland State Community College*
> Session IV: Poster

Highlander II
> Session I: David Frazier – *Tusculum College*
> Session II: Denise Williams – *University of Tennessee – Martin*
> Session III: Bruce Myers– *Austin Peay State University*
> Session IV: Poster

Notes

ACM Mid-Southeast Chapter
2016 Fall Conference
Gatlinburg, Tennessee
Glenstone Lodge

Conference Program

Thursday, November 10, 2016

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 11, 2016

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: **Graduate Degree Presentations**
                        Session Chair: *Ken Adcock*

  9:15 – 9:35   *Partitioning of Urban Transportation Networks Using*
                        Evolutionary Algorithm for Distributed Simulation in
                        SUMO - Md Salman Ahmed and Mohammad Hoque -
                        East Tennessee State University

  9:35 – 9:55   *A Framework For Collaborative Knowledge Management:*
                        Using Distributed Mentoring - Ramaraju Rudraraju -
                        University of Alabama at Birmingham

  9:55 – 10:15   *Science Workflow in the Gaussian Cloud* - Hugh Matlock -
                        Middle Tennessee State University

  10:15 –10:35   *Reducing Inter-Process Communication Overhead in Parallel*
                        Sparse Matrix-Matrix Multiplication - Md Salman Ahmed,
                        Mohammad Hoque, Jennifer Houser and Phil Pfeiffer -
                        East Tennessee State University

  Dogwood I: **Undergraduate 4 Year Degree Presentations**
                        Session Chair: *Bruce Myers*

  9:15 – 9:35   *Life as a CyberCorps Scholar: Reflections and Aspirations* -
                        Samuel Wehunt, Joseph Bivens and Brian Ledbetter -
                        Tennessee Tech University

  9:35 – 9:55   *Cyber Security Awareness Module* - Nathaniel Gibson,
                        Vinhcent Vu and Christopher Lamberson - Columbus State
                        University

  9:55 – 10:15   *Developing Mathematical and Algorithmic Thinking Skills in*
                        Children using an Adaptive Augmented Reality Game -
                        Kristen Wright - Columbus State University

  10:15 –10:35   *Hopper's Fables* - Kathelyn Zelaya, Deja Jackson, Cindi
                        Simmons and Erica Pantoja - Kennesaw State University

  Dogwood II: **Undergraduate 2yr & 4yr Presentations**
                        Session Chair: *Craig Tanis*

  9:15 – 9:35   *GPS Guided Soil Analyzing Rover: How The Iot Can Aid*
                        in the Consumption of Scarce Environmental Resources - Savas
                        Mavridis and Dongjin Kim - Georgia State University
                        Perimeter College

  9:35 – 9:55   *The Impact of Artificial Intelligence on the World Economy* -
                        Alex Debate and Dongjin Kim - Georgia State University
                        Perimeter College

  9:55 – 10:15   *Improving the Delivery and Usability of our Data Structures*
                        Classes - Olivia Horace and Radhouane Chouchane -
                        Columbus State University

  10:15 –10:35   *Design of a Grade Evaluation System Based on Statistics* -
                        Wayne Pinkston and Hao Qiu - Fort Valley State University

Highlander I: **Professional Presentations**
Session Chair: *Eric Brown*

9:15 – 9:35   *Rendezvous Abstraction in Concurrent/Distributed Programming* - Srinivasarao Krishnaprasad - Jacksonville State University

9:35 – 9:55   *Angular, Firebase and PIs Oh My at CompileIt.Online* - Bob Bradley and Kurt Wesner - Dr. Brown's Apps

9:55 – 10:15   *A Teaching Module of Vectorization and Parallelization of Loop Computations in C/C++ Programs* - Xuejun Liang - Jackson State University

10:15 –10:35   *What's all the buzz about Docker Swarm?* - Bob Bradley and Michael Singleton - University of Tennessee at Martin

Highlander II: **Professional Presentations**
Session Chair: *David Frazier*

9:15 – 9:35   *Lessons Learned While Serendipitously Developing a CS-0 Style Companion course for AP CS Principles* - James A. Jerkins and Mark Terwilliger - University of North Alabama

9:35 – 9:55   *Lava Lamps, Entropy, and Betrayal: A Personal Journey in Computer Science* - Robert Lowe - Maryville College

9:55 – 10:15   *Using Prolog and Facebook for Genealogy Research* - G. Jan Wilms - Union University

10:15 –10:35   *What Analytical Skills do Sports Business Employers Value Regarding an Analytics or Data Analysis Class?* - Denise Williams, David Williams and Dexter Davis - University of Tennessee at Martin

Session II: 10:40 – 12:00 p.m.

Azalea: **Graduate Degree Presentations**
Session Chair: *Ken Adcock*

10:40 – 11:00	*Big Data Analytics for Smart Health* - Jin Cho, Mina Sartipi and Zhen Hu - University of Tennessee at Chattanooga
11:00 – 11:20	*Fuzzy Decision Tree-based Inferencing for Liver Disease Diagnosis* - Himaja Sivaraju - Columbus State University
11:20 – 11:40	*Activity Recognition Using Wearable Technology and Machine Learning* - Austin Harris, Mina Sartipi and Zhen Hu - University of Tennessee at Chattanooga
11:20 – 11:40	*Diagnosing Heart Disease with Deep Convolutional Neural Network* - David Odaibo and Zheng Zhang - University of Alabama at Birmingham

Dogwood I: **Undergraduate 4 Year Degree Presentations**
Session Chair: *Bruce Myers*

10:40 – 11:00	*Fighting Zika Pandemic with Machine Learning in the Cloud* - Rotimi Olotu and Allison Higgins - Clayton State University
11:00 – 11:20	*K-Means Algorithm for Organ Segmentation and Isolation* - Carlos Priddy and Chunhua Dong - Fort Valley State University
11:20 – 11:40	*Building a GUI-based Image Processing and Statistics Software* - Dequan Medina, Wayne Pinkston and Hao Qiu - Fort Valley State University
11:40 – 12:00	*Virtual Chemistry Lab* - Jeremy Greenburg and Angela Mccabe - University of Tennessee at Martin

Dogwood II: **Undergraduate 4 Year Degree Presentations**
Session Chair: *Craig Tanis*

10:40 – 11:00	*Tag You're [Storing] It* - Alexander Molbert and Gauge Pendergrass - University of Tennessee at Martin
11:00 – 11:20	*Extracting Causal Relationships for Text Data Mining* - Sam Rensenhouse - Columbus State University
11:20 – 11:40	*Making a Street Map: Searchable, Updatable, and Accurate* - Caleb Shown - University of Tennessee at Chattanooga
11:40 – 12:00	*Using A Common Sense Knowledge Base To Create Stories* - Dominique Tillman - Columbus State University

| **Highlander I:** | **Professional Presentations** |
| | Session Chair: *Eric Brown* |

10:40 – 11:00	*Information Security – The Effectiveness of Network Security Protocols* - Joseph Elarde - Austin Peay State University
11:00 – 11:20	*Security by Design: Defense-in-Depth IoT Architecture with Dual-Data Abstraction Model* - Paul Wang - Columbus State University
11:20 – 11:40	*Heartbleed, the Limits of Static Analysis and the Need for Formal Specification* - David Frazier - Tusculum College
11:40 – 12:00	*A Secure Mobile Cloud Storage System* - David Schwab, Li Yang and Kathy Winters - University of Tennessee at Chattanooga

| **Highlander II:** | **Professional Presentations** |
| | Session Chair: *Denise Williams* |

10:40 – 11:00	*Developing a CS/Math/STEM Outreach Ecosystem to Lubricate the Transition from High School to College* - James A. Jerkins, Cynthia Stenger, Jessica Stovall and Janet Jenkins - University of North Alabama
11:00 – 11:20	*Improving the odds of success in Computer Science 1 (version 3.0) – Using Freshmen Readings and Computational Thinking to generate Real-World Problem-Solving* - Wayne Summers - Columbus State University
11:20 – 11:40	*Getting Involved in the ACM Programming Competition: A Faculty Perspective* - Joshua T. Guerin and Kathleen Ericson - University of Tennessee at Martin
11:40 – 12:00	*Supporting Student Success in CS by Building a Self-Sustaining, Diverse Team of Students* - Radhouane Chouchane - Columbus State University

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

Session III   1:00 – 2:20 p.m.

Azalea: **Undergraduate 4 Year Degree Presentations**
Session Chair: *Hao Qiu*

1:00 - 1:20   *Learning App* - Jessica Craig - University of Tennessee at Martin

1:20 - 1:40   *Klikit - Web Based Quizzing* - Brooks Becton and Cody Thomason - University of Tennessee at Martin

1:40 - 2:20   *CompTrain: Teaching Computational Thinking Skills through Educational Game using Augmented Reality* - Valencia Coleman - Columbus State University

2:00 - 2:20   *Using an Augmented Reality Mobile Game to Teach the Java Programming Language* - Richard Myers - Columbus State University

Dogwood I: **Undergraduate 4 Year Degree Presentations**
Session Chair: *Denise Williams*

1:00 - 1:20   *"Trend Following" Algorithms and their Implementation in the Stock Market* - Matthew Matze - High Point University

1:20 - 1:40   *Smart Fridge* - Chase Breeden, Justin James and Carter Crews - University of Tennessee at Martin

1:40 - 2:00   *Using the Internet of Things to Assist Volunteer Firefighters* - Mason Cordell - Austin Peay State University

2:00 - 2:20   *Gas Scan* - Taylor Coomer and Tanner Thurman - University of Tennessee at Martin

Dogwood II: **Undergraduate 4 Year Degree Presentations**

Session Chair: *Eric Brown*

1:00 - 1:20   *Domain-Specific Languages: A Study in Scala* - Charlie Hicks - Tennessee Tech University

1:20 - 1:40   *QIIME 2 Cloud* - Christopher Goulet, Daniela Zieba and Trevor Brown - Western Kentucky University

1:40 - 2:00   *Mathematics in Functional and Imperative Languages* - Samuel Van Amberg - Tusculum College

2:00 – 2:20   *Accelerating Ray Tracers* - Dominique Pennington - University of Tennessee at Chattanooga

Highlander I: **Peer Reviewed Presentations**
Session Chair: *Ken Adcock*

1:00 - 1:20   *Text Mining to Explore the Use of Learning Theories in Data Structures Education Literature* - Hillary Fleenor and Rania Hodhod - Columbus State University

1:20 - 1:40   *Launching Your Cyber Defense Competition* - Barry Bruster and Joseph Elarde - Austin Peay State University

1:40 - 2:00   *Increasing the Cybersecurity Workforce through Innovation and Collaborative Approaches to Education and Training* - Katherine Winters, Li Yang, Joseph Kizza and Chang Phoung - University of Tennessee Chattanooga

2:00 – 2:20   *Android Permission Vulnerabilities and Awareness* - Farah Kandah and Steven Schmitt - University of Tennessee at Chattanooga

Highlander II: **Peer Reviewed & Professional Presentations**
Session Chair: *Bruce Myers*

1:00 - 1:20   *Collaboratively Designing and Building an Extensible Software Toolset for 2D and 3D Facial Modeling and Analysis* - Eric Patterson, Jessica Baron and Devin Simpson - Clemson University

1:20 - 1:40   *Clean Interfacing with Service Oriented Architecture* - Chenchutta Jackson and Bettina Shank - Austin Peay State University

1:40 - 2:00   *Vulnerabilitiy with Cisco ASA 5500-X* - Kazi Zunnurhain - Northern Kentucky University

2:00 - 2:20   *A Fuzzy Logic-based Approach to Teacher Performance Measured by Principal Evaluations* - Ashley Moran and Shamim Khan - Columbus State University

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

Session IV   2:35 – 3:55 p.m.

Azalea: **Undergraduate 4 Year Degree Presentations**
Session Chair: *Hao Qiu*

2:35 - 2:55   *Dungeon Diver* - Adam Fuqua and Trevor Dych - University of Tennessee at Martin

2:55 - 3:15   *FosterMe* - Terrance Maxwell and James Hicks - Columbus State University

3:15 - 3:35   *One Size Doesn't Fit All* - Zane Johnston - Kennesaw State University

3:35 – 3:55   *UTM Computer Store Inventory System* - Joseph Carpenter and Alex Schuck - University of Tennessee at Martin

Dogwood I: **Undergraduate 4 Year Degree Presentations**
Session Chair: *Kathy Winters*

2:35 - 2:55   *Identifying Twitter Bots* - Danny Freeman - University of Tennessee at Chattanooga

2:55 - 3:15   *Identifying Repackaged Android Apps Based on Static Program Analysis* - Ayush Kohli - Southern Illinois University

3:15 - 3:35   *Customizing a Sentiment Analysis Tool for the Software Engineering Domain* - Jacob Reed - Southern Illinois University

3:35 – 3:55   *Inducing Lucid Dreams Using Raspberry Pi* - James Marlowe - High Point University

Dogwood II:

Highlander I: **Posters**

2:35 - 3:55   *Topper Cloud* - Bhargava Konduru and Dhamodhar Bhati - Western Kentucky University

Android UI State Inference - Justin Bullard, Andre Carter and Timani Gill - Fort Valley State University

Expanding the Accessibility of Conventional Smart Home Systems - Brody Bruns and Chisom Caleb Ogbonnaya - Western Kentucky University

Software as a service; Code Cloud - Daniel Salami - Western Kentucky University

Highlander II: **Posters**

2:35 - 3:55   *Virtual Lab on GPUs - Implementing an IaaS Cloud with GPUs* - Trevor Brown - Western Kentucky University

A Model for Robots-as-a-Service Through Cloud-Based Hub Control of UAV Fleets - Connor Brooks and Michael Galloway - Western Kentucky University

Education Connection - Chandler Staggs - Western Kentucky University

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**

Notes

Keynote Address
Abstract

Dr. Farah Kandah
Department of Computer Science and Engineering
University of Tennessee at Chattanooga

Software Defined Networks and the Future of Networking

Abstract

Recent years have shown an increase demand on networking technologies, where everything is connected and easily accessible. This demand increase has open eyes on the weaknesses of traditional networks. In fact, it is very time consuming to configure and later reconfigure these networks to overcome any dynamic changes in the network such as faults and load changes. Software defined network has shown its ability to overcome the traditional network shortcoming and introduce efficient modeling to enhance the performance in different areas such as data centers, storage, and security. This talk gives an overview of Software Defined Networks and how it changed the networks applications.

About the Speaker

Dr. Farah Kandah is an Assistant Professor in the Department of Computer Science and Engineering at the University of Tennessee, Chattanooga, TN. He earned his Ph.D. from the Computer Science department at North Dakota State University, Fargo, ND. He received his M.Sc. from the Computer Science Department at the University of Jordan. He has been serving on the technical committee of many internationally reputable conferences and Journals, such as IEEE GLOBECOM, and IEEE WCNC, IEEE Sensor Networks Journal and Computer Systems, Networks and Communications (JCSNC) Journal.

Dr. Kandah is leading the Network Communication Lab at the University of Tennessee at Chattanooga, focusing his research on Wireless Network, Advance Computer Networks, Future Internet, Urban Science, and Security and Privacy in Computer networks.

He has multiple publications in multiple internationally reputable journals and conferences including; WILEY Security and Communication Networks (SCN) journal, ACM/Springer Mobile Networks & Applications (MONET) journal, IEEE Global Telecommunications Conference (IEEE GLOBECOM) and IEEE International Conference on Communications (IEEE ICC).

Student Abstracts
Undergraduate Two Year Programs

GPS Guided Soil Analyzing Rover: How The Internet of Things Can Aid in the Consumption of Scarce Environmental Resources

Savas Mavridis and Dongjin Kim

Georgia State University Perimeter College

The state of Georgia experiences routine seasonal drought. Georgia primarily gets its water from man-made reservoirs as it is geographically at the headwater of many of the regional streams and rivers. This prevents the general population from drawing these resources in times of drought. The main attraction for prospective residents of the City of Peachtree City are its five golf courses. A golf course in Georgia typically needs 975,000 gallons per acre per year to remain sustainable. In high drought, there are restrictions on water consumption and golf courses are the first to be limited.

It is our ecological and environmental responsibility to set up efficiencies using data retrieved from the field to predict and plan for proper resource management. Utilizing open source software and the easily available Arduino platform, a solution is more accessible than ever. The platform will not only automate the data collection process; it will be capable of relaying the information remotely to a workstation from the field over a Wi-Fi connection.

A GPS Module will guide the rover over a predetermined path to collect data on ground temperature, barometric pressure, soil hydration, soil pH levels, and the time of day. Using a rocker-bogie suspension system, the rover will be capable of traversing any rough terrain present on the course, including sand-traps. The information will be stored directly in its internal storage, then transferred wirelessly to the operator. With this information, golf course maintainers will be able to adjust irrigation techniques more rapidly and efficiently thereby reducing the impact on scarce freshwater resources in times of drought as well as the management's operating costs due to water consumption.

The Impact of Artificial Intelligence on the World Economy

Alex Debate and Dongjin Kim

Georgia State University Perimeter College

The purpose of this report is to discuss the possibility and ramifications of a theoretical, imminent, and widespread introduction of artificial intelligence into the world economy. This is done by comparing such an event to its closest analog: the industrial revolution. In much the same way that machines are capable of automating human physical labor, artificial intelligence will be able to automate human intellectual labor.

We used pre- and post-industrial labor statistics from the United States to extrapolate a post-artificial-intelligence economy. We will discuss the impact on society, both beneficial and detrimental, that such an economy would produce. Modern economic forces demand cheaper, more efficient labor, and this applies to both blue and white-collar jobs. This report is not intended to be a discussion of ethics, so much as a discussion of possibility and eventuality.

Student Abstracts
Undergraduate Four-Year Programs

Life as a CyberCorps Scholar: Reflections and Aspirations

Samuel Wehunt, Joseph Bivens and Brian Ledbetter

Tennessee Tech University

In this presentation, we (1st group of SFS CyberCorps scholars of Tennessee Tech) will present our experiences with this prestigious program, which is the only one of its kind in Tennessee. CyberCorps is a federally funded national initiative supported through the National Science Foundation that creates a pipeline between students and government positions in cybersecurity. We will discuss the scholarship benefits, eligibility and most importantly share our cybersecurity education, research and outreach activities so far as the 1st CyberCorps cohort in the State, and how we plan to best utilize this exceptional opportunity afforded to us by the program.

Cyber Security Awareness Module

Nathaniel Gibson, Vinhcent Vu and Christopher Lamberson

Columbus State University

Cybersecurity is of increasing importance due to the rise in reliance on digital equipment and programs to manage our daily lives. More and more, we find ourselves using digital devices to transmit and store personal, private information. Research studies establish that an effective security awareness program is one of the most important steps towards increasing cybersecurity. In this project we set out to understand the current level of security awareness among college students and develop a module that will help raise their awareness.

The main features of our module are interactivity and the presentation of the consequences of careless cyber habits of common Internet/technology users. To test the effectiveness of our awareness module, we designed a survey that includes pre and post-tests which were administered it to students on our campus. Our survey results indicated that the module has been effective particularly among non-Computer Science majors. It has raised their level of awareness not only for the specific topics covered in the, but resulted in an overall increase in cybersecurity awareness.

Developing Mathematical and Algorithmic Thinking Skills in Children using an Adaptive Augmented Reality Game

Kristen Wright

Columbus State University

Every year the modern education system puts more and more pressure on harnessing math, science, technology, and engineering (STEM) core subjects. In an ever-industrializing world the United States is losing its competitive edge; the National Math and Science Initiative reports that as recently as 2013, only 44% of high school graduates were ready for college-level math. Beginning in elementary school students struggle with the concepts of visualizing and understanding mathematical concepts. With growing pressure to build algorithmic and mathematical skills in children, this project aims to develop a game that addresses the growth of these skills in our target age group (8-11 years old) using fractions and algorithmic instructions in a unique and adaptive augmented reality environment. The game tackles two major learning styles by using the user's response to the game environment to determine which technique to apply between cognitive apprenticeship or guided discovery. Using cognitive apprenticeship, the game takes on the role of "master" and shows the user through animations and indicators how to complete a certain task. The student, in an "apprenticeship" role, learns through the guidance of the agent. Should the game operate under the guided discovery mode, the agent provides prompts and indications that promote critical thinking rather than direct instructions, guiding the user to come up with the answer on their own. The game is designed in such a way to engage students in mathematical learning and let them create their own unique solutions to the provided problem while tracking and evaluating the student's performance to change the style of guidance as well as alter the difficulty level based on user performance, creating a challenging and engaging environment.

Hopper's Fables

Kathelyn Zelaya, Deja Jackson,
Cindi Simmons and Erica Pantoja

Kennesaw State University

Block Programming languages (e.g., Alice, Scratch) are used heavily in teaching students in K-12 classrooms and in some universities in hopes of bridging programming with beginner students. This is in an effort to encourage students' interest in computer programming utilizing Papert's "low floor" and "high ceiling" metaphor. While the current block languages are helpful and engaging, there are not many offering an emphasis on advancing students' reading and mathematical skills. This presentation describes our creation of a block language using Blocky's API, HTML, JavaScript, and CSS. The language, entitled Hopper's Fables (named after Admiral Grace Hopper), is based on storytelling through completion of mathematical problems with the intention of being highly interactive to engage the students during the learning process. The ultimate goal of Hopper's Fables is to aid elementary students with learning disabilities in strengthening their math and literacy skills, while simultaneously developing the students' computational thinking skills, and building on their digital fluency. By combining Papert's "low floor" and "high ceiling" philosophy, modeled by other block languages, with educational foundations, Hopper's Fables will provide students with a sound and engaging learning environment.

Improving the Delivery and Usability of our Data Structures Classes

Olivia Horace and Radhouane Chouchane

Columbus State University

A course on data structures has for years been viewed as one of the most challenging CS courses to develop and deliver, mostly because of the learning curve that requires the students to rethink the way in which they are used to organize data (e.g., as an array). This challenge has made data structures one of the classes that sees a major drop in student performance, compared to such classes as CS1 and CS2.

We will present a set of five new labs to help the students determine why they should use one data structure instead of another to solve a problem. We will focus on drawing the connection between trees (such as the BST) and arithmetic expressions. Making this connection is one of the key steps in program analysis and compilation. We will also focus on where queues, and stacks should be used by a program analyst or a compiler in their quest to verify a program's syntax, as well as the design tradeoffs that would make a compiler produce optimal code by replacing one data structure with another. Our initial lab will have the data structures student code a parser for arithmetic expressions, which will require the student to construct a parse tree and then evaluate the components of the tree to find ways to optimize it. Subsequent labs will build on the initial lab by identifying the relationships between the nodes that compose a data structure and reducing complex source code by simplifying the data structures that hold the code.

We hope that our labs will improve the way data structures classes are (1) delivered by the instructors, (2) received by the students, and most importantly (3) used later by the students in their study of such topics as program analysis, programming languages, and compiler construction.

Design of a Grade Evaluation System Based on Statistics

Wayne Pinkston and Hao Qiu

Fort Valley State University

Undergraduate students are usually confused or misjudged with their course strengths and weakness, which would influence much on their future career or further academic pursuit. A GUI-based software, written in Java, was developed to easily self-evaluate their own academic ability and give advice based on the input grades by means of statistics analyses.

The input courses would be registered by student's name or ID and categorized by predefined fields: student's Major, Science, Technology, Art and Liberals, or even finely by personal preference. The grades including objective grade (Rubrics System, A-F), course credits, grade pass time, subjective reevaluation grade point(1.0-4.0) and factor (1-5), and personal interest(1-5) would be integrated by different reasonable weights. As a senior or sophomore, course number (usually over 30) is sufficient enough for required data collection, fine data visualization and plausible data analysis.

The final statistics analyses will be given as a grade statistics chart and a table of mean, standard deviation, fact-expectation difference percentage in different course fields including 3 sections (self-comparison among all course fields, standard comparison with a default but adjustable standard, peer comparison within the input group of students if two or more students use the system). The final advice would be given as strength and weakness in the predefined categories.

Fighting Zika Pandemic with Machine Learning in the Cloud

Rotimi Olotu and Allison Higgins

Clayton State University

The Zika virus is a serious ailment that has garnered a bevy of international medical attention and amassed speculation and hysteria alike of the same aforementioned scope due to its potential to cause severe fetal brain defects, such as microcephaly. This virus has spread to countries on every habitable continent and it has been said by the World Health Organization that as many as 4 million people could be infected with this disease by next year. In this research we will study how can we prevent and predict Zika spreading with visual data mining and Microsoft Azure machine learning studio to get insight of Zika spreading patterns, and build predictive models to help us to make decision even before it starts to spreads.

Visual data mining allows users to mine and gain insight into the data and draw conclusions and directly interact with the data, we will explore how Zika virus outbreaks across various global regions. We will explore how Zika spread over time, identify top disaster regions, and dig down to see how Zika spreads in terms of regions, size, spreading speed, and case type identified. The analysis of Zika confirmed cases will show how fast Zika travels over time.

Microsoft Azure Machine Learning Studio will be used in our study to further build potential prediction models to help us to identify which global zones that Zika is moving to, how travel impacts the spread of Zika, and how can we cluster and detect outbreak boundary of Zika epidemic.

Advanced computational techniques, such as visual data mining and machine learning, can potentially help predict outbreaks, ultimately leading to better preparation and therefore mitigating its spread as much as possible.

K-Means Algorithm for
Organ Segmentation and Isolation

Carlos Priddy and Chunhua Dong

Fort Valley State University

This research focuses on improving organ segmentation accuracy in computer-aided diagnosis (CAD) systems. The goal is to quickly and effectively extract an organ from all surrounding tissues, muscle and bone. Since tree-dimensional (3D) volumetric medical data are represented in a series of DICOM (Digital Imaging and Communications in Medicine) files, the segmentation of a 3D organ can be achieved in two-dimensional (2D) axial space. The largest obstacle in medical image segmentation is the low contrast between different tissues present in an image. It is difficult to distinguish organs solely based on their intensity information. In this research, our target organ is the liver which is almost indistinguishable from some of the surrounding musculature. To solve this problem, we manually draw the boundary of the target organ in a single image, which can be used as a prior knowledge to define a search region for the organ in adjacent slices. Due to strong correlation between neighboring slices, the boundary of the liver in the next slice does not go far from its border in the previous slice. Along with a Gaussian blur technique, the K-Means algorithm will separate the immediately surrounding tissue, muscle and bone from the target organ in the search region, resulting in clean and accurate representation of the boundary for that organ.

Building a GUI-based Image Processing and Statistics Software

Dequan Medina, Wayne Pinkston and Hao Qiu

Fort Valley State University

This project was to design a friendly and easily-used GUI-based software to process images and analyze image statistics. The software was designed in Java and can be used interactively to 1) visualize processed images by means of sorts of fundamental and sophisticated parameters-configurable images processing algorithms in comparison to the input images simultaneously; 2) analyze pixel-wise statistics of the entire image or ROI (Region of Interest) and 3) further for a physician to extract and segment abnormal or interested regions in medical images. The software frame mainly includes file menu, preprocessing menu, segmentation menu, statistics menu, images' name list, log panel, modal parameters dialogs, various necessary toolbars and shortcuts for interactive actions. File menu can load and save one image or group load a folder with interested image file in selectable formats efficiently. The image preprocessing methods mainly include, but not limited to, image Negatives, Color to Grey Scale, filtering (mean, Gaussian, Edge-detection, sharpening, blurring, etc.), Histogram Equalization, K-means clustering, etc. The statistics of an image and its ROI (selected by moving mouse cursor) would be analyzed and displayed as a table of pixels number, mean, median, standard variation, etc., as well as the image histogram in a pane. The interaction of user and the images includes to display the input image and processed image at separate panes but the same screen or hide one of them for better visualization, manually to select regions, panning or moving, zooming in and out and so on.

The on-going further research on medical diagnostic purposes would be including other segmentation algorithms (Gaussian Mixture Method plus EM, Random Walker, etc.) besides above-mentioned K-means, 3D restoration algorithms (GAC method, etc.) , as well as VTK and ITK packages .

Virtual Chemistry Lab

Jeremy Greenburg and Angela Mccabe

University of Tennessee at Martin

With the Virtual Chemistry Lab, students will be able to simulate a graphical interaction environment to better understand the inorganic qualitative analysis and identification of 12 cations and five anions. These groups of ions are used by the UT Martin General Chemistry 122
labs, and are commonly used by other universities as well.

The Virtual Chemistry Lab will be useful to any UTM students taking Chemistry 122 because the qualitative analysis lab takes place over 7 weeks and is a difficult, time consuming process with little forgiveness in regards to errors. A mistake could set you back an entire week. Our virtual lab will allow students to experience the entire qualitative analysis lab in less than an hour, allowing easy practice of the procedures before they are required in a physical lab.

This project was developed in Visual Studios using C# and OpenTK, and is designed to run on Windows machines.

Tag You're [Storing] It

Alexander Molbert and Gauge Pendergrass

University of Tennessee at Martin

Today, many people face the problem of having their documents improperly organized. With no type of cataloging available to them, it's hard for a lot of people to track down even a single document in their sea of files.

Tag You're [Storing] It is a file hosting service that will allow users to upload their documents to the cloud in an easily searchable and manageable manner. The database is hosted on Google's Firebase servers. TagIt will have a user friendly system to allow users to Tag (keyword) and index their documents for greater accessibility. This allows for much cleaner storage and access to your files. Through text analysis, TagIt will also determine Tags for your file that are not specified by the user. For other documents such as pictures, Google's cloud vision technology will be used to generate custom search tags by analyzing your pictures and determining the content.

With TagIt, shifting through folders and directories will be a thing of the past.

Extracting Causal Relationships
for Text Data Mining

Sam Rensenhouse

Columbus State University

This presentation on text data mining will explore how a machine can extract meaning in various text data by exploring semantic relationships in the language - specifically, causal relationships. An overview of the current research in the field will be presented – both where it is at and where the work needs to continue. This will lead into my research to identify causal patterns in nominal pairs and using them to extract causal relationships in text. To conclude, I will describe preliminary results and the method for evaluating the accuracy of the text mining process developed in this project.

Making a Street Map: Searchable, Updatable, and Accurate

Caleb Shown

University of Tennessee at Chattanooga

The development of mapping software usable on widespread handheld devices has vastly improved the quality of life of many people. With this in mind, what would be the next step for gathering and utilizing information about real time traffic flow to map more efficient traffic routes? Some of today's most popular map services do an amazing job of routing users between two points with great efficiency, but fall short when it comes to higher accuracy on a smaller scale. Additionally, many of these systems are not accurately equipped to handle situations with multiple actors attempting to complete similar tasks without overlay. Using mapping tools such as OpenStreetMap, we are exploring options that would allow us to accurately measure real time traffic flow in order to efficiently direct and navigate a fleet of commercial motor vehicles around a city. This presentation will cover the tools used to create such a system and explain the concepts behind our goals for achieving an efficient search structure capable of handling dynamically updating edge weights.

Using A Common Sense Knowledge Base To Create Stories

Dominique Tillman

Columbus State University

From the beginning, humans have expressed how they viewed the world as stories. However, as more people tell a particular story, it may undergo changes that alter the overall meaning—essentially creating a new story. We have pinpointed this as a central aspect to computers in the modern era. The ability to tell a story just like a human.

Using ConceptNet—a commonsense knowledge base for computers along with Google cloud computing, we have been able to create a system in which stories are given and new ones are generated. This is accomplished by first sending a sentence (or just words) to the Google cloud API which generates a syntax tree. Then, from this syntax tree, the agent can associate the word with it's part of speech and query ConceptNet accordingly. For example, if John is a word in the sentence, Google would return to the program that John is a noun (specifically, a proper noun and the subject of the sentence). When the system asks ConceptNet, it uses a phrase such as: "Find a noun that is similar to the word John". When this query is executed, a new word is returned that is similar enough to John—ideally, another male name. The system—using a combination of Google's language API with ConceptNet, intelligently determines how to rephrase a sentence. This story creation can be applied to many uses such as education, games, and entertainment.

Learning App

Jessica Craig

University of Tennessee at Martin

Learning will always be a big part of human life. We begin learning from a very early age and it continues throughout our lives, because of this learning can become a little tedious and monotonous for children especially. So I have designed an app that will foster a fun learning environment. The app will have games that promote learning with the alphabet, numbers, and colors. The games will include matching and recognition, tracing, and coloring. The Learning app was developed using Objective-C programming language and Xcode software. In this talk I will be discussing the overview of the app development and the current state of the app.

Klikit - Web based quizzing

Brooks Becton and Cody Thomason

University of Tennessee at Martin

The use of test taking technologies is becoming more and more expensive in a learning environment. Our school uses small remotes to punch in answers to a multiple choice quiz that a professor puts up on a projector. These physical "clickers," are cheap and break easily after little use. In a college setting, any extraneous spending is rare and most students want something cheap and reliable.

Klikit is a web app that is an alternative that allows users to take quizzes on any device that can browse the internet. It takes advantages of many technologies to deliver a responsive and reliable application. The klikit system is built on NodeJS and Express. These two technologies are the basis for our server side system, and adapts information coming from the user, processes that information and then stores information needed on our Google Firebase backend. Firebase is a real time noSQL database that fits perfectly into our application. We wanted instructors to be able to watch as students enter their answers, and monitor input from them. The front end of our system is built on AngularJS and Angular Material. We chose AngularJS because of its two way binding to provide a snappy experience. Angular Material is based on Google's Material Design documents. Material design promotes practical approaches to web design. Angular Material, in conjunction with AngularJS, provide a clean, responsive, and accessible user experience.

CompTrain: Teaching Computational Thinking Skills through Educational Game using Augmented Reality

Valencia Coleman

Columbus State University

When people are faced with a problem, they will either tackle it head on or they will give up. One essential skill to solving critical and huge problems is computational thinking. Computational thinking is the process of breaking down problems into simpler tasks, discovering patterns within each task, and completing each task to solve the problem. Computational thinking can help in every field. One way to embrace computational thinking skills in our future youth is to introduce and develop this way of thinking at our young children.

Today's modern world has a heavy reliance on technology. Many interventions have been used to incorporate technology into teaching, such as educational games. Educational games have proven to be a useful tool for teaching and developing various skills as they engage and motivate the player. Adaptive educational games allow the game to progress based on the player's current skills; the next presented task is at the right level for their current skills.

This research project aims to develop an adaptive educational game using the Unity Game Engine for children between 6 and 9 years old. The augmented reality uses the device's camera to format the game on a specialized game mat and the background shows the player's surroundings. Augmented reality gives the player different perspectives on each level. Each game level is designed as a puzzle that can be solved through problem decomposition and logical thinking, two important computational thinking skills. The developed game tracks the player's performance and uses Unity analytics to analyze the player's behavior and skills in order to decide on the next 'appropriate' task to present to the player. The game has been tested for adequacy of user interface.

Using an Augmented Reality Mobile Game to Teach the Java Programming Language

Richard Myers

Columbus State University

Cardiovascular diseases are the major cause of death globally. Each day, thousands of people in U.S. are diagnosed with heart failure. Currently, doctors determine cardiac function by measuring the heart's squeezing ability with the patients Magnetic Resonance Imaging (MRI) manually. However, reading MRI images is a difficult and time consuming task, even for a skilled cardiologist.

With the modern state-of-art machine learning technology, we seek to build a deep convolution neural network model to automate this evaluation process. We explore different data preprocessing methods and implement various convolutional neural network architectures to solve this problem. In the conclusion, our model is able to predict the volume of the heart of a patient in different stage and achieve a Continuous Ranked Probability Score (CRPS) of 0.034015, which put us in top 10% of the Kaggle Second Annual Data Science Bowl Competition (2015).

"Trend Following" Algorithms and their Implementation in the Stock Market

Matthew Matze

High Point University

In today's day and age programs that analyze data, react, and trade nearly instantaneously largely dominate our Stock Market. The world is becoming more and more largely influenced by these split second decisions that are being made autonomously. In this way it is continuing to be more and more important to better understand how these work and might influence our day-to-day lives. One of the best ways to understand stock trend following algorithms is to go through the process of building one yourself. The algorithm was developed based on a number of papers using technical indicators to assess whether a trend is starting or ending and then making the trades appropriately. We have had success and now better comprehend how the industry develops such programs. There are a number of paths that can be taken by developers from approaches that use static indicators to more complex ideas like machine learning. There are vast areas of future research in the field and there will always be new and innovative ways to interpret random walks of data.

Smart Fridge

Chase Breeden, Justin James and Carter Crews

University of Tennessee at Martin

If you have ever left your house wondering whether you left the refrigerator door open, had a roommate stealing your food/drinks, or just wanted to monitor the temperature in your fridge, then Smart Fridge is what you're looking for. With less than $100, you can build your own Smart Fridge monitoring system. The Smart Fridge uses a door sensor with two temperatures sensors mounted to a Raspberry Pi. The sensors utilize a python script that is executed on the Raspberry Pi. This setup communicates with Amazon Web Services to monitor the fridge in real time and alert the owner if the temperature makes a dramatic change.

Using the Internet of Things to Assist Volunteer Firefighters

Mason Cordell

Austin Peay State University

Volunteer firefighters often serve in rural areas that do not possess the budget to fund a full time fire department. Volunteer firefighters often will receive a call and the firefighters will rush to the scene. This poses a grave problem, as the fire chief often has no idea who is on the scene or what capabilities are currently available with which to fight the fire. We are designing a system that uses Estimote Bluetooth beacons and any Android 5.0 device to track which firefighters and trucks are on the scene of an emergency. In this system, the Android 5.0 device detects which beacons are present on the scene and stores this information in a Postgresql database. The database provides centralized storage which is also accessible by a Sails.js web application. The web application allows users to view all stored data as well as set assignments between beacons and various individuals. We hope that this technology will not only make the work of volunteer firefighters easier, but also save lives.

Gas Scan

Taylor Coomer and Tanner Thurman

University of Tennessee at Martin

This project provides a useful tool with which users can keep track of their expenditure on fuel, average fuel economy, and other related statistics. The application will utilize Google Cloud Vision services for OCR. It uses Firebase database services to hold receipt information for useful calculations for each individual user. The application runs on Android platforms starting on Ice Cream Sandwich and supporting up to Marshmallow. Users will be able to store receipts even without an Internet connection with an offline queue for pending receipts.

Gas Scan is a new innovative way to keep track of all of your gas receipts and mileage information to help you keep track of your gasoline and car expenditures. With fuel supplies becoming a more scarce resource, users can use Gas Scan to limit their fuel usage. Gas Scan will allow users to monitor and keep track of total spending, average miles per gallon, miles driven, and average price per gallon. Gas Scan uses new technologies to look at your gas statistics.

Domain-Specific Languages: A Study in Scala

Charlie Hicks

Tennessee Tech University

Domain Specific Languages (DSL) are an important skill for students and professionals to learn. They allow us to solve problems that are specific to certain companies or groups. DSLs give us the capability to give professionals the tools they need to rapidly solve problems. They provide a capability to non-programmers to efficiently model problems within their own field without converting the ideas into code. They might allow a business professional to describe transactions, or a DSL may allow a physicist to model his experiment. The research presented here is an example of applying this technique to the domain of chemistry. The language adds in common functionality such as percent composition calculations on a compound. This allows students and professors in the field to quickly solve chemistry related problems. Through the application and study of this example, it has been shown that there are virtually no equivalent applications that are readily available to the student body. DSLs can be rapidly built with the Scala programming language which is the platform used for this example. Scala was implemented with DSLs in mind which makes it the perfect language. Students or professionals, working on DSLs, help other fields such as physics, chemistry, astronomy, and medical. This gives those fields a more efficient way to model and solve problems specific to their needs.

QIIME 2 Cloud

Christopher Goulet, Daniela Zieba and Trevor Brown

Western Kentucky University

Web applications powered by cloud platforms are revolutionizing the way end users interface with complicated distributed computer architectures. The field of bioinformatics is a prime target for the implementation of cloud architecture because of the complicated workflows involved in the discipline. Cloud architectures have allowed for more robust bioinformatics systems while maintaining simplicity for the end user. Qualitative Insight into Microbial Ecology, or QIIME, is a bioinformatics program that performs microbial ecology analysis. Currently, it has no interface, and relies on the user's interaction with it through a terminal.

Our project is integrating the console-based application, QIIME 2, into a cloud architecture to create a simpler and more powerful use of QIIME 2. This is accomplished by providing an intermediary process that simplifies the interfacing with the software and adding features. These features include deploying the software more easily and designing load balancing on top of QIIME. The way to communicate with the architecture is through an intuitive web interface.

Furthermore, this project involves the production of an ecosystem of tools dedicated to interacting with QIIME. In addition to the web interface, notifications and job scheduling will contribute to the overall ease of using QIIME. The notifications allow users to see when their jobs are completed and when the interface is closed, which is helpful during long jobs. Job scheduling across users allows for the management and balance of the computational load of jobs, distributing the load across dedicated compute nodes in the cloud architecture.

Mathematics in Functional and Imperative Languages

Samuel Van Amberg

Tusculum College

Functional Programming is a programming paradigm distinguished by a lack of assignment statements. Every task it is used to perform is completed by calling a function. One property of functional languages, known as "referential transparency," allows functional programs to replace variables with their values. Since functions in mathematics share this property, mathematical processes fit more naturally in functional languages than in imperative languages. This project demonstrates the advantages of functional programming by comparing the length and understandability of a mathematical equation written in a functional language and an imperative language. MIT Scheme was used as an example of a functional language. C++ was employed as an example of an imperative language.

Accelerating Ray Tracers

Dominique Pennington

University of Tennessee at Chattanooga

The impressive speeds to which we have pushed CPU clocks have turned what were once theoretical concerns into the reality of hardware development. CPU manufacturers are no longer realizing the benefits that Moore's Law promises and are, as a result, increasing lead times between iterations.

As clock speeds rise, there is an increasingly direct correlation with power consumption and heat production. Additionally, propagation delays of the chipset are now growing longer than the clock speeds themselves. In response, manufacturers have begun a shift away from the pursuit of clock speed toward a trend of providing more processing cores at relatively slower speeds with the intent of dividing the labor of processing among a set of cores which can work together to complete given task. This model puts parallelization at the forefront of developing technologies.

Hardware Accelerators or "Coprocessors" coupled with parallelization frameworks allow for data to be offloaded to a highly parallelized discrete processing unit optimized for parallel arithmetic. This study includes use of multiple coprocessors including Intel MIC (Many Integrated Core) and Nvidia Kepler/Tesla architectures. The parallelization paradigms include two compiler-directive based frameworks OpenACC and OpenMP, as well as Nvidia's CUDA API.

Using a simple implementation of a Ray Tracer we will explore the costs of using different pragma-based approaches and comparing them to manual CUDA implementations. Ray Tracing is a process by which a three-dimensional scene is rendered by the simulation of light interaction between objects.

The Ray Tracing algorithm is often to referred to as "embarrassingly parallel" as the calculations have little interdependency. This lends naturally to coprocessor offloading and concurrent processing which allows us to more clearly investigate hardware rather than algorithmic finesse. The presentation will include preliminary results of this study.

Dungeon Diver

Adam Fuqua and Trevor Dych

University of Tennessee at Martin

Dungeon Diver is a mobile game targeted for the Android OS, built with the Unity game engine, and designed using C# scripting. It is a semi-infinite dungeon crawler of the roguelike genre. Comprised of multiple themes, the player traverses one floor at a time acquiring weapons and potions that are randomly spawned. The player must defeat procedurally generated enemies that grow increasingly more difficult as the player progresses, while managing the scarce resources that he/she finds along the way.

The game will include the use of a self-designed room generation algorithm and various theme order permutations, making each time playing the game slightly different than the last. Every five levels the player will be faced with a random boss. If the player is victorious, he or she will receive a powerful bonus.

The game will utilize touch screen controls, and have a turn based combat system. This will give the player time to think about their next move; however each decision will be very important. Conserving resources, taking enemies down in an efficient manner, and using position to the player's advantage will all be important tasks to maintain.

FosterMe

Terrance Maxwell and James Hicks

Columbus State University

FosterMe is a project that aims to improve the social skills of autistic students by using research from educational teaching, psychology and game design. This research in addition to the Unity game engine allows for the development of environments that will test the player in various aspect of their social skills. Examples of focused social skills of interest are turn taking in conversations, detecting sarcasm, facial recognition and understanding implied expressions.

One Size Doesn't Fit All

Zane Johnston

Kennesaw State University

Graphical user interfaces (GUIs) allow users to perform complex tasks through the manipulation of on screen graphical elements. However, the GUI's dependence on traditional inputs (e.g., mouse and keyboard) requiring a certain level of dexterity bars users with mobility impairments from using applications that make use of GUIs. One method for allowing users with mobility impairments to have access to more applications that utilize GUIs is to create a vocal user interface (VUI) mapped to the underlying GUI, allowing the user to perform actions normally achieved through physical input by using voice. Unfortunately, the process of mapping a VUI to a GUI is not always straightforward. In the case of the Myna VUI, which is mapped to the block-based language development environment Scratch, there are three problems in particular that have proven difficult: scaling up and down with different screen resolutions, handling scrollbars, and navigating through dialogs. My work presents general solutions to these three problems.

UTM Computer Store Inventory System

Joseph Carpenter and Alex Schuck

University of Tennessee at Martin

Speed and efficiency are essential to customer service; today, that means having quality software with a clean underlying database. After serving the university for almost a decade, the UTM Computer Store's inventory system fails to meet these expectations. The system experiences numerous issues including erroneous user input and faulty permission checking. Many of the store's systems, including its inventory, are based in FileMaker Pro, a database management system with its own built-in applications and scripting functionality. We will work with the current FileMaker Pro applications to add new features while preserving the store's current infrastructure. By automating processes including barcode entry as well as providing previously unwritten documentation to users, we intend to include features that will provide partial cleanup to the store's disorganized database without burdening the user.

Identifying Twitter Bots

Danny Freeman

University of Tennessee at Chattanooga

The open nature of Twitter's API has given way to a large number of automated posting on the site's user accounts. These bot users can sometimes be difficult to distinguish from accounts managed by humans. Without looking at any kind of meta data for a twitter account such as account age, retweets, or mentions from other users, it may be possible to identify bots on the social media service by analyzing the content of original tweets using a variety of natural language processing techniques.

Data from a variety from Twitter accounts are being gathered and analyzed using the Twitter API and the Natural Language Toolkit (NLTK) library for Python. The first technique employed is creating Markov transition matrices for a large set of tweets from known human users and known bot users. The probability that an individual tweet can be represented in the Markov chains for both human and bot users is calculated from the matrices. This probability is used to determine if the tweet was posted by a bot or not. In addition to this, a calculation of a twitter user's lexical diversity is also used to determine if that user is a bot. The hypothesis behind these techniques is that rudimentary bots on Twitter do not produce content that is as diverse and complex as the content produced by human users.

The presentation will cover the techniques used to gather and analyze the data, as well as the preliminary results of the experiments.

Identifying Repackaged Android Apps Based on Static Program Analysis

Ayush Kohli

Southern Illinois University

More than 80% smartphone users now use the Android OS. Currently, the official Android marketplace (a.k.a. Google play) has more than 1.62 million Android applications apps. However, users can customize the Android OS relatively easily and install apps from unofficial third-party marketplaces (e.g., GetJar, SlideMe, and AppBrain). Sometimes third-party developers modify the popular apps obtained from the official marketplace by replacing some of the classes (e.g., ad library) or by injecting malicious code, and upload it to the alternative marketplaces. Therefore, many of the apps in the alternative marketplaces are pirated. This practice not only violates the intellectual property of the original developer but also makes the users of the repackaged apps vulnerable to malicious code.

Researchers have proposed several techniques to identify repackaged apps. Popular techniques include: pairwise comparisons based on similarities in opcode sequences (i.e., DroidMOSS and JuxtApp), similarity searches based on functionalities (i.e., PiggyApp and ViewDroid), pairwise comparison of the program dependency graphs (i.e., DNADroid), and similarity based statistical features like number of activities, permissions and structural features (i.e., ResDroid). However, due to pairwise comparisons those techniques are not scalable (i.e., complexity $O(N^2)$) for market-scale app analyses.

I plan to encounter the scalability issue based on a machine learning technique on attributes extracted from the apps using a static analysis tool. I am using a customized version of the IC3, a static analysis tool to extract the characteristics of the app components and their inter-connections. My preliminary results have identified several attributes that may be useful to predict repackaged app pairs. I am working on the identify more such attributes and plan to use decision-tree learning to classify repackaged app pairs.

Customizing a Sentiment Analysis Tool for the Software Engineering Domain

Jacob Reed

Southern Illinois University

Sentiment Analysis is a natural language processing technique that analyzes people's attitude towards entities such as products, services, organizations, individuals, issues, or events. While majority of current research focuses on analyzing customer reviews and social media posts to derive marketing decisions, various other domains can possibly benefit from the application of sentiment analysis. For example, an analysis of the software developers' discussions can provide insights into the mutual relationship among the team members. Therefore, sentiments expressed in the developer messages on different channels (i.e., mailing list, code reviews, and bug repository) may impact their mutual impressions and ultimately impact project outcomes.

Since each of the domain has its own custom vocabulary, natural language techniques like sentiment analysis requires a customization for that domain. My initial results suggest that current sentiment analysis techniques, which are built primarily for analyzing social media posts, perform poorly on messages written by software developers. To build a customized vocabulary, I randomly selected 1000 code review comments from 10 popular open source projects. I worked with two more researchers to manually classify those comments as positive, negative, or neutral. I used Fleiss Kappa to measure the level of agreements among the three raters. Fleiss Kappa was valued at 0.43, indicating a moderate agreement.

I am currently classifying those 1000 rated comments using SentiStrength, one of the most popular sentiment analysis tools. SentiStrength uses an emotion lookup dictionary to determine the sentiment expressed in a sentence. Based on the classification results, I am determining the frequency of different words in misclassified comments and learn the best emotion term weights for those words. After improving the precision of SentiStrength, through a customization of the dictionary, I plan to study the impact of expressed sentiments on software project outcomes.

Inducing Lucid Dreams Using Raspberry Pi

James Marlowe

High Point University

One's dreams at night are mysterious, elusive, and transient at best. Most individuals wake up, only to remember disjoint fragments of their dreams. Despite this, not only it is possible to increase general dream awareness, but one can also become conscious during the dream state, and go on to exert significant control over their dream. This phenomena, known as lucid dreaming, is an art which often demands great dedication of practitioners in order for consistent achievement. However, with the usage of Raspberry Pi and Arduino micro-controller, we propose a method of inducing the lucid dream state consistently, even with total novices to the art-form.

While asleep, one's dreams are very impressionable by external stimuli. If an external stimulus is insignificant enough such that it doesn't wake the dreamer, it will be incorporated into their dream in some manner. Exploiting this characteristic, we propose building a device which exerts visual stimulus on an individual while they are dreaming. Seeing the stimulus in the dream, we will "shock" the dreamer into recognizing they are actually in the dream state, thus inducing lucidity. We accomplish this by building an electroencephalogram (EEG) device to monitor an individual's brainwaves while they are sleeping. We use an Arduino micro-controller to collect analogue data, and a Raspberry Pi to analyze the data in real time in order to determine when the user in is Rapid Eye Movement (REM) sleep, in which case they will be subjected to a visual stimulus. This presentation discusses constructing the necessary hardware to obtain data, collecting and processing the data through carefully designed experimentation methods, and future analysis of data to improve results.

Notes

Student Abstracts
Graduate Degree Programs

Partitioning of Urban Transportation Networks Using Evolutionary Algorithm for Distributed Simulation in SUMO

Md Salman Ahmed and Mohammad Hoque

East Tennessee State University

For large transportation network simulations, network partitioning is an effective method for speeding up the simulation process as well as maintaining the compatibility with machines with low resources. While an effective network partitioning is crucial for simulating large-scale transportation networks, the partitioning is also very challenging for two main reasons. First, the network partitioning is NP-hard problem, so the optimal partitioning is not possible. Second, inadequate and unbalanced portioning may lead to output errors and high communication costs. This paper describes a genetic algorithm based partitioning scheme for the real-world transportation networks incorporating previously unaccounted parameters like signalized traffic intersection, road segment length, traffic density, number of lanes and inter-partition communication overhead due to the migration of vehicles from one partition to another. In the partitioning algorithm, we specially focus on transportation network partitioning rather the normal graph partitioning in almost all steps of a genetic algorithm: selection, crossover, mutation and fitness function. The fitness function considers overall communication cost, load balancing factor, minimum number of intersection cuts, minimum number of system boundary nodes, and minimum number of link cuts. The selection mechanism considers both roulette wheel and pseudo-elitism selections to select more diverse individual along with the best individuals, so that the chance of getting near optimal solution is increased. In crossover, the algorithm makes sure that the signalized nodes and intersections do not get cut. The mutation mechanism is designed to limit the number of system boundary nodes. In this paper, we also describe our hypothetical framework for distributed simulation of the partitioned road network on SUMO, where a master controller is currently under development using TraCI APIs and MPI library. The master program takes the OSM file from openstreet.org as input, parses it to generate transportation network graph, makes partitions using the abovementioned algorithm, and simulates each partition using SUMO. The MPI library is used to coordinate the parallel simulation and synchronization between the partitions generated by our algorithm.

A Framework For Collaborative Knowledge Management: Using Distributed Mentoring

Ramaraju Rudraraju

University of Alabama at Birmingham

Knowledge management consists of four key processes, generation, distribution, storage, and application. Today, with the simultaneous growth of World Wide Web (WWW) and usage of computing devices (e.g. phones, tablets, laptops) knowledge is being generated by knowledge-contributors (mentors) into various sources like wikis, blogs and Q & A websites. Several new storage technologies have recently emerged in order to efficiently handle huge volumes of unstructured data. But, distribution of knowledge to knowledge-consumers (mentees) has not evolved to keep up with the exponential growth in generation and storage. Since all four phases of knowledge management are interdependent, sub-optimal growth in only some of the phases causes an imbalance to the knowledge management effort as a whole. This results in problems like disconnected learning, inadequate knowledge summary, repetition of efforts, and limited recommendations. We introduce a framework for collaborative knowledge management using distributed mentorship where individual knowledge of all participants is collected into a shared knowledge repository and systematically transformed into visual community knowledge by collaborative efforts of both mentors and mentees. We explain various phases of the framework along with algorithms for efficient storage and metrics that can be used to measure effectiveness of knowledge management. We apply the framework in educational, organizational and online settings. Architectural design to implement the framework along with initial results from implementing the framework in an online community are presented.

Science Workflow in the Gaussian Cloud

Hugh Matlock

Middle Tennessee State University

Increasingly, scientific knowledge is discovered computationally. For many disciplines, complex computational workflows are used to transform raw observational data to well-structured repositories of useful information. These workflows can now be processed on a cloud-based platform, where dynamically allocated virtual machine resources are used, where the potential number is open-ended.

To estimate the cost-effectiveness of running a workflow on a cloud platform, a simulation of the workflow that includes cost accounting is necessary. The time and cost of running the workflow depends critically on the algorithm used to map workflow tasks to available instance types. A great deal of research has been done for grid mapping, where a given workflow is run on a fixed-size platform of distributed computing resources. In the last few years, researchers have also considered the challenges regarding the use of a cloud environment for scientific workflows.

The assignment problem is to select the appropriate instance type for each task in the workflow, given an objective to minimize run time or cost, or a combination of them. A cloud instance is sharing the underlying computational hardware with others, and so the performance of virtual machines can vary unpredictably based on other activities in the cloud. Despite the use of virtualized resources, some tasks may fail as a result of failures in underlying hardware; this becomes more likely the larger the workflow. Both of these issues suggest that for some cases, using dynamic, adaptable algorithms may be preferable to using a static algorithm that finds an optimal, but fragile solution. Our research focuses on developing effective assignment algorithms, which we evaluate in contexts modeled with the CloudSim framework. In this presentation we describe the orchestration of scientific workflows in cloud environments, review the literature, and describe our simulation results for different algorithms.

Reducing Inter-Process Communication Overhead in Parallel Sparse Matrix-Matrix Multiplication

Md Salman Ahmed, Mohammad Hoque, Jennifer Houser and Phil Pfeiffer

East Tennessee State University

The widespread use and importance of matrix applications has created a compelling need for efficient algorithms for matrix-matrix multiplication. Over the past few decades, researchers have extensively studied the Parallel Sparse Generalized Matrix-Matrix multiplication problem, hereafter referred to as PSpGEMM. Parallel processing is one of the common approaches to solve computationally intensive algorithms. In parallel computation, a master processor decomposes a large problem into smaller sub-problems and distributes them among multiple processors. The processors compute their individual part and send back the results of the individual part to the master processor. The master processor synchronizes the final result of the problem. However, most parallel algorithms spend their running time on inter-process communication. In the case of distributed matrix-matrix multiplications, much of this time is spent on interchanging the partial results to calculate the final product matrix. This communication overhead can be reduced with a one-dimensional distributed merging algorithm that uses a novel accumulation pattern based on logarithmic complexity of the number of processors (i.e., $O(\log(p))$ where p is the number of processors). In the one-dimensional algorithm, computing processors communicate with other processors in a particular pattern and order of the processors. Each computing processor also sends a particular chunk of its partial result in a turn, so that the overall data communication is minimal. The number of iterations in our merging algorithm is $\log(p)$, in contrast to typical $O(p)$ algorithms. The multiplication algorithm and communication pattern are implemented using MPI library. The communication overhead and execution time of this algorithm were evaluated on an HPC cluster, using randomly generated sparse matrices with dimensions up to one million by one million. The results showed a reduction of inter-process communication overhead for matrices with larger dimensions compared to another parallel algorithm that takes $O(p)$ run-time complexity for accumulating the results.

Big Data Analytics for Smart Health

Jin Cho, Mina Sartipi and Zhen Hu

University of Tennessee at Chattanooga

The idea of big data has been around for many years, and the tools to analyze the data is improving continuously. Big data analytics allow institutions/organizations to explore and exploit the data and use it to discover underlying opportunities and meanings which in turn, guides to build efficient algorithms to solve the problem. Exploration on big data analytics for smart health is continuing to grow due to its immense potential and its positive impact in the healthcare field. Big data analytics for smart health can be used to provide intuition into the past and explain the historical data, use statistical models and predicting techniques to forecast and understand the future, and optimize existing models to provide better solutions.

For our work, we have explored and investigated big data analytics to build a predictive model that could predict Tennessee stroke patient's hospital discharge disposition status. Stroke is the fifth leading cause of death in Tennessee and is a serious problem in the United States. Because of its severity, treatment planning is critical to stroke patients and can impact their recovery and survival. Predicting stroke patient's discharge disposition status would allow hospitals and caregivers to perform efficient post-stroke management which could improve patient's healthcare outcome, reduce the caregiver's burden, and reduce the healthcare cost. For the prediction model, we have considered following: sex, age, race, stroke type, comorbidities (i.e., diabetes, heart disease, hypertension, peripheral arterial disease, chronic kidney disease, hyperlipidemia, arrhythmia, and depression), type of bill, type of admission, source of admission, and primary/secondary payer classes. To analyze and predict the discharge disposition status of patients, several machine learning techniques such as logistic regression, support vector machine, random forest, and neural network were applied to build the model.

Fuzzy Decision Tree-based Inferencing for Liver Disease Diagnosis

Himaja Sivaraju

Columbus State University

Medical diagnosis can be challenging because of a number of factors. Uncertainty in the diagnosis process arises from inaccuracy in the measurement of patient attributes, missing attribute data and limitation in the medical expert's ability to define cause and effect relationships when there are multiple interrelated variables. Given this situation, a decision support system, which can help doctors come up with a more reliable diagnosis has a lot of potential.

The proposed project aims to investigate the application of fuzzy logic to help diagnose liver diseases based on blood test results. In particular, the project will design and implement inferencing systems to classify patient data using a fuzzy decision tree and a fuzzy rule-based system. The fuzzy decision tree will be used to generate rules that will form the rule-base for diagnostic inferencing. Decision Trees are used in data mining for classification and regression. They are simple to understand and interpret as they can be visualized. But, one of the disadvantages of decision tree algorithms is that they deal with only crisp or exact values for data. Fuzzy logic is described as logic that is used to describe and formalize fuzzy or inexact information and perform reasoning using such information. Although both decision trees and fuzzy rule-based systems have been used for medical diagnosis, there have been few attempts to use fuzzy decision trees in combination with fuzzy rules.

To build a fuzzy inferencing system for liver disease diagnosis, first the patient dataset will be acquired, then a fuzzy decision tree which combines the concept of decision trees with fuzzy logic will be built. Fuzzy rules will be extracted from this fuzzy decision tree and used in building a fuzzy inferencing system. The system's performance will be evaluated by comparing it with regular (non-fuzzy) decision tree-based classification.

Activity Recognition Using Wearable Technology and Machine Learning

Austin Harris, Mina Sartipi and Zhen Hu

University of Tennessee at Chattanooga

The advancements of sensor technologies as well as communication and information infrastructures have allowed mobile health to be widely adopted, which will have great impacts on personalized and population health promotions. The connectivity among elderlies or patients, physicians, and caregivers will be enhanced. We can explore mobile health to pervasively monitor health and behavior of elderlies or patients with decreased function and increased dependence and delivery timely healthcare services anytime and anywhere. Wearable sensors, playing a fundamental role in mobile health, can quantitatively measure physiological signals of human subject, such as heart rate, respiration rate, glucose, temperature, body acceleration, representing their health statuses or behavioral characteristics in real time. In my talk, I will present several emerging applications of mobile health and the corresponding scientific and technological innovations. One motivated example of mobile health by taking advantage of wearable sensors is active recognition. Activity recognition tries to identify different human activities and estimate the corresponding dwell times which can be used in the areas of eldercare, healthcare, assisted living, and athlete training. Extended from our current research on real-time fall risk assessment using functional reach test built in mStroke, a real-time and automatic mobile health system for post-stroke recovery and rehabilitation, our investigation here is to explore one wearable sensor on the human chest to acquire motion data and apply the state of the art machine learning methods for activity recognition. Nine different activities, i.e., sitting/standing, walking, going upstairs, going downstairs, lying down, forward fall, backward fall, left fall, and right fall are considered. Filter-based feature selection methods such as k-best selection, relief-f selection, and robust feature selection will be used for dimensionality reduction. Multi-class classification based on random forests, support vector machine, k-nearest neighbor, or multilayer perceptron will be employed for activity identification. The corresponding performances will be presented to demonstrate feasibility and efficacy of activity recognition using wearable technology and machine learning.

Diagnosing Heart Disease with Deep Convolutional Neural Network

David Odaibo and Zheng Zhang

University of Alabama at Birmingham

Cardiovascular diseases are the major cause of death globally. Each day, thousands of people in U.S. are diagnosed with heart failure. Currently, doctors determine cardiac function by measuring the heart's squeezing ability with the patients Magnetic Resonance Imaging (MRI) manually. However, reading MRI images is a difficult and time consuming task, even for a skilled cardiologist.

With the modern state-of-art machine learning technology, we seek to build a deep convolution neural network model to automate this evaluation process. We explore different data preprocessing methods and implement various convolutional neural network architectures to solve this problem. In the conclusion, our model is able to predict the volume of the heart of a patient in different stage and achieve a Continuous Ranked Probability Score (CRPS) of 0.034015, which put us in top 10% of the Kaggle Second Annual Data Science Bowl Competition (2015).

Professional Abstracts

Rendezvous Abstraction in Concurrent/Distributed Programming

Srinivasarao Krishnaprasad

Jacksonville State University

Rendezvous is a programming abstraction for representing client/server applications in a simple and elegant style. In its complete version, it combines communication, synchronization and scheduling aspects of the interactions. SR (Synchronized Resources) language, developed by Gregory Andrews of the University of Arizona, introduced a comprehensive version of rendezvous where a server process will wait for call to an operation from a client using an input statement that has a guard (basically the operation name and parameters), a synchronization expression and a scheduling expression. The input statement of SR, in its most general form, can have multiple operations upon which the server process may be waiting. Ada language design team, independently, introduced rendezvous abstraction using ACCEPT statement with or without synchronization expression. Also, Ada has a SELECT construct using which a server process can non-deterministically wait for a call to specific services from the clients. The coding of various client/server applications that use these abstractions is greatly simplified. Java supports the simplistic notion of threads waiting on each other to finish using Join methods. The Java concurrency package has an Exchange method using which two threads can meet and exchange objects with each other. The JR programming language, developed at University of California, Davis, extends Java to provide a programming model similar to SR concurrent programming language. Use of JR leads to a more flexible programming as it is object-oriented. In this paper, an introduction to rendezvous technique will be presented followed by an overview of the notations used for it in SR, Ada and JR languages. Simple examples based on these language styles will be provided to clarify the syntax and semantics.

Angular, Firebase and PIs Oh My at CompileIt.Online

Bob Bradley and Kurt Wesner

Dr. Brown's Apps

This talk will discuss the development of the CompileIt.Online system and the current state of web and cloud development using tools such as Angular JS, Firebase, NodeJs and more. CompileIt.Online is a free to use online web IDE that we are developing that will allow anyone to edit, store, compile and test programs from a browser on any device. Currently it supports C++ and Python, but more languages will be added soon. This talk will also describe the unique cloud, server and distributed compile client architecture that we designed for this system. A companion talk will discuss the PI Docker swarm cluster that this system uses as one of its backends.

A Teaching Module of Vectorization and Parallelization of Loop Computations in C/C++ Programs

Xuejun Liang

Jackson State University

Modern computer processors can support the vector operations by using their extended Single Instruction Multiple Data (SIMD) instructions and support the parallel execution of a program by using their multicores. To utilize the capacity of extended SIMD instructions and multicores of a processor and to make a program running faster on the processor, the loop computations in the sequential program can often be vectorized and/or parallelized.

In this teaching module, four methods to perform vectorization and parallelization for a loop in a C/C++ program are discussed. (1) Some compilers perform loop vectorization automatically, called auto-vectorization. (2) Some compilers perform loop parallelization automatically, called auto-parallelization. (3) Programmers use intrinsics to tell compilers to generate specific SIMD instructions for vectorization. (4) Programmers use pragmas defined in OpenMP to guide compilers to parallelize a loop computation for parallelization.

In this teaching module, the vector multiplication and the matrix multiplications (stored in row-major and in column-major, respectively) are used as examples to illustrate the detailed steps in the above four methodss to perform vectorization and parallelization for a C/C++ program when using the Microsoft Visual C++ compiler and the GNU gcc (g++) compiler. An overview of the Intel@ Advanced Vector Extension (AVX) instructions and their intrinsics as well as OpenMP are given. Meanwhile, the performance testing results and their comparisons are given for the combinations of the cases with or without vectorization and with or without parallelization. These show when programmers should perform vectorization and parallelization explicitly by using intrinsics and pragmas, respectively, or leave the compiler to do the job. These also show that how memory access patterns affect the performance of vectorization and parallelization.

What's all the buzz about Docker Swarm?

Bob Bradley and Michael Singleton

University of Tennessee at Martin

Docker is an open-source system that automates the deployment of applications inside of a software container. Docker containers wrap up an application with everything it needs to run, regardless of the host system. Docker is a relatively new technology that is fast evolving. Everyone from Amazon AWS to Google is using Docker for everything from a version control system to a bot management system. This talk will discuss the differences between containers and virtual machines, how to run node.js inside of docker, how to create a swarm of docker machines, and more as it relates to the Raspberry Pi bots running on CompileIt.Online.

Lessons Learned While Serendipitously Developing a CS-0 Style Companion course for AP CS Principles

James A. Jerkins and Mark Terwilliger

University of North Alabama

Motivated by the creation of a "Computing Education for the 21st Century" (CE21) grant proposal in 2012, we began the process of developing a replacement course for our introductory computer science university service course. As we developed requirements and content for the new course, we noticed our efforts closely aligned with the nascent AP CS Principles movement. Following this discovery, we began a deliberate effort to coordinate our course objectives with the evolving goals of the AP CS Principles framework. Our team of eight college faculty, three computer science, three computer information systems, and two mathematics scholars have created and adapted content over the past four years in our new course "CS 135 Computer Skills for Problem Solving". Our primary goal is to prepare students to be successful in computer science, mathematics, and programming courses by improving their reasoning and problem solving skills. Since this course is a service course that satisfies a general studies requirement at our university, we have adopted the AP CS Principles "Big Ideas" as our guiding framework to insure the course retains the appropriate breadth. A natural outcome of our process is that we plan to offer CS 135 credit to high school students who pass their AP CS Principles exam. We will present lessons learned from two years of pilots and two years of regular course offerings and how we plan to close the loop when the AP CS Principles exam is offered for the first time in Spring 2017.

Lava Lamps, Entropy, and Betrayal: A Personal Journey in Computer Science

Robert Lowe

Maryville College

Back in the dark ages of early microcomputing, I was a budding hacker. Like all such creatures in the 1980's, I wrote a lot of BASIC code. One of my favorite things to do was create computer responses using some sort of transformation based on the RND function, a function which claimed to generate a random number between 0 and 1. I made dice rolling programs, which helped with Dungeons and Dragons, and I made programs where random sentences could be generated, and all sorts of other wonderfully random programs. Or so I thought. When I went to college, my illusions of the RND function were shattered forever!

In rapid succession, I took courses in Assembly Language, Computer Architecture, and Discrete Structures. Along the way, I realized the horrible truth that there is no place in a computer where randomness can emerge. Feeling betrayed by the Commodore BASIC manual, I set out on a quest to find out how I could generate numbers that were truly random.

There were many twists and turns along the path, but I eventually settled on a scheme which allowed me to extract random bits from my dorm room lava lamp. Along the way I was introduced to information theory, probability, and various philosophical ideas on the nature of the universe. I then used this as a tool to study other systems available to me in my dorm-centric world.

My talk will detail my path from betrayal, to discovery, and then finally inspiration. This simple undertaking is really what I credit with my pursuit of academic computer science, and it even resulted in a lesson plan which I have used in various courses. So come, gaze into the lava lamp and feel the entropy wash over you.

Using Prolog and Facebook for Genealogy Research

G. Jan Wilms

Union University

Ancestry.com and Myheritage.com are great tools for doing genealogy research, but because many countries have privacy laws about what can be displayed for living people, it is ironically harder to explore current generations than ancestors.

Commercial genealogy software has reporting tools to show how any 2 people are related, but it maxes out at collections that have more than 5,000 listings, presumably because the search takes too long. Prolog is an ideal language to create your own tool because it performs an exhaustive depth-first search by default. The tricky thing is that a family tree is not a tree in the strict sense since every node has two parents and connections sometimes go laterally through the spouse. Many times the path between 2 nodes that Prolog finds is not the most direct, so programming it to continue searching may yield "better" relationships. The challenge is to avoid infinite recursion on account of "loops" in the tree where for example spouses in a small village are themselves related. In addition to looking for the closest connection, Prolog can be programmed to discover additional "interesting" non-trivial connections.

Facebook is a great data-mining resource for updating a family tree with information on distant relatives (particularly to obtain pictures and current events like weddings and births). A Facebook profile may contain birthdays and hometowns, as well as a listing of other relatives on the social media site. It takes a good bit of detective work though, especially if you don't know the relative personally, because a name search typically turns up multiple people, and because the new default privacy settings of Facebook are quite effective in hiding useful information to viewers outside the circle of friends. Some tips will be discussed that can be used to get around these limitations to harvest information.

What Analytical Skills do Sports Business Employers Value Regarding an Analytics or Data Analysis Class?

Denise Williams, David Williams and Dexter Davis

University of Tennessee at Martin

The purpose of this research in process is to explore the expectations of the skills an employer in the sports industry would expect or want to see if a student had taken an analytics class or a data analysis class. There is growing importance being placed on acquiring and analyzing data from a variety of sources. Sport organizations are being challenged to find the value in that data and using it in meaningful ways. Our goal is not to consider the programming or Excel skills needed, rather the purpose of this research is to identify skills relating to problem solving, critical thinking, and identifying potentially useful analyses.

Information Security – The Effectiveness of Network Security Protocols

Joseph Elarde

Austin Peay State University

With Cyber Crime costs projected to be $2 trillion dollars by 2019, the continuous impact of Information theft and Cyber Espionage, and the threat of Cyber Warfare, researching and new approaches to develop a future "Secure Internet" is of critical importance.

This presentation discusses existing Network Security related protocols, for example: SSL/TLS, IPSec, and select wireless protocols. For each protocol, we will review the associated benefits, identify some known vulnerabilities, and describe select common attacks. We then propose an alternative protocol designed to mitigate some of the vulnerabilities.

And finally, we brainstorm some possible requirements for a future Secure Internet.

Security by Design: Defense-in-Depth IoT Architecture with Dual-Data Abstraction Model

Paul Wang

Columbus State University

In this session we introduce a defense-in-depth SCADA architecture that uses multiple layer security measures involving two security mechanisms in discovering and understanding attack vectors. The advantage is that the impact of failure in any one measure is minimized. The defense-in-depth architecture uses firewalls, demilitarized zones, intrusion detection and prevention systems along with associated security policies. For data acquisition and abstraction, we use multiple-tier data models with REST API at the bottom layer and a system process in the middle in extracting data, processing and feeding to the application API.

Using the newly proposed architecture, we are implementing a water treatment SCADA system that has more than 3,000 PLCs. The data acquisition layer uses US Department of Defense developed API to collect data. The defense-in-depth architecture reduces the risk to SCADA networks from being hacked or data from being stolen. Initial tests show that the proposed architecture has the advantages of easy connecting various sensors and reducing the risks of cyber intrusions.

SCADA networks undergird critical infrastructure, such as electric grids, transportation hubs, and nuclear power plants. They also link to systems containing valuable and sensitive personal information. A failure in one of these systems or a cascade of such failures across systems, either in their operations or security, could lead to potentially catastrophic consequences for the population of that region, city and beyond. The defense-in-depth architecture we proposed reduces the risk to SCADA networks from being hacked or data from being stolen.

Heartbleed, the Limits of Static Analysis and the Need for Formal Specification

David Frazier

Tusculum College

The Heartbleed Vulnerability is a software defect that affects certain versions of OpenSSL. OpenSSL is a widely used implementation of the Transport Layer Security (TLS) protocol. OpenSSL is used in many of the world's secure web servers.

The vulnerability occurs in the Heartbeat section of OpenSSL. This section was added in 2011 to check to see if a secure connection is still open. In the intended series of events, a client sends a small, variably sized message to the server, which stores and then returns the same message. The problem is that the client sends along the size of the message rather than the server determining the size.. The server stores the sent message in memory, and then sends back a message starting at the first memory address. The server sends everything from that first memory address to the reported message size. A malicious user will send the minimum size message but report it to be the maximum size.. The server then sends back a snapshot of whatever is stored in memory after the message. This snapshot could include active TLS session keys or login credentials.

My presentation will focus on the genesis of this software problem, and what steps could have been implemented to stop it. Static analysis is one method to look for known errors in computer code. Several static analysis tools were applied to the Heartbeat code. None were able to detect the error. I will argue that more advanced specification and verification tools are needed to stop vulnerabilities like this from being released.

A Secure Mobile Cloud Storage System

David Schwab, Li Yang and Kathy Winters

University of Tennessee at Chattanooga

In today's digital environment security and privacy of personal information becomes important as an increasing percentage of the population makes daily usage of both mobile devices and cloud storage. Security and assurance of mobile computing is vital to both the normal functioning in people's lives as well as our social, economic and political systems. In this paper we propose and implement a mobile cloud storage system that authenticates users using a gesture based password, and stores private information securely in the cloud using the Amazon Simple Secure Storage Service (Amazon S3). Our solution makes use of the AES and SHA-1 algorithms to protect data, while also making use of SSL to transfer data between the mobile device and the Amazon S3 buckets.

Developing a CS/Math/STEM Outreach Ecosystem to Lubricate the Transition from High School to College

James A. Jerkins, Cynthia Stenger, Jessica Stovall and Janet Jenkins

University of North Alabama

As faculty in a department of Mathematics and Computer Science at a regional public university, we observed students struggle in Computer Science I and Calculus I and concluded one issue was due to the transition from a memorization and example driven pedagogy in the K-12 system to the abstract reasoning required in college courses. In response, we developed an explicit method for teaching students how to abstract and generalize mathematical concepts in the summer of 2011 for a professional development course in association with the Alabama Math Science and Technology Initiative (AMSTI). Since then we have presented regular professional development for secondary teachers, curriculum development, and STEM outreach activities supported in part by funding from a Math Science Partership (MSP) grant from the U.S. Department of Education. Our MSP project, "Collaborative Partnership to teach mathematical Reasoning through Computer PRogramming" (CPR2) is one piece of a larger outreach effort to motivate and engage students to consider STEM careers and studies. Our CPR2 instructional treatment uses targeted programming exercises to induce participants, students and teachers, to develop the mental frameworks for reasoning abstractly using generalizations. The CPR2 project provides professional development for high school and middle school teachers as well as classroom visits throughout the year. We will present an overview of our instructional treatment and show how our work with regional high schools and middle schools fits into a comprehensive ecosystem of STEM outreach, scholarly production, and secondary and post-secondary curriculum that prepares students to make the transition from high school to college while introducing them to computer science and mathematics as essential 21st century skills.

Improving the odds of success in Computer Science 1 (version 3.0) – Using Freshmen Readings and Computational Thinking to generate Real-World Problem-Solving

Wayne Summers

Columbus State University

Two years ago Version 2.0 addressed the issue that "between 30% and 60% of every university computer science department's intake fail the first programming course.1" By teaching Python in CS 1 and spending the first two weeks teaching problem-solving through computational thinking, we have been able to move the pass rate [A, B, C] between 60% and 70%. However, we still struggle with sizable number of students who are able succeed in CS1, only to fail in CS2 or Data Structures. Many of these students have become overly dependent on "Googling the solution" or relying on help from sires like StackedOverflow.

For the past five years, the author has taught CS1 as part of a Freshman Learning Community where students are enrolled the same English 1 class. The students are expected to participate in a common reading. Using the theme of the book, the author has designed unique programming assignments that pose real world problem solving scenarios. When the students were reading "Garbology", they were writing programs about recycling; when they reading "Son of a Terrorist", they were writing programs about refugees and migration.

This paper discusses several successful and unsuccessful strategies for creating unique assignments in the first programming class, Computer Science 1 (CS1). Samples of these programing assignments will be shared at the presentation as well as a discussion of the computational thinking concepts and exercises used in the classroom.

Getting Involved in the ACM Programming Competition: A Faculty Perspective

Joshua T. Guerin and Kathleen Ericson

University of Tennessee at Martin

The Association for Computing Machinery (ACM) International Collegiate Programming Contest (ICPC) is a team-based programming competition sponsored yearly by the ACM and IBM. The regional competition, held in numerous locations across the United States, serves as a common-place activity for students in many Computer Science programs and many student-led ACM chapters across the region and the country.

In recent years new faculty members at our University have taken up the responsibilities of mentoring our local ACM chapter, acting as coaches for multiple teams, and have started getting involved in the administrative duties regarding the running of the competition for our University and for the greater region.

In this presentation we will discuss our experiences running local qualifying rounds and coaching ICPC teams. We will also discuss how to get involved in the process of assisting in the development of the regional competition, including writing and reviewing competition problems.

Supporting Student Success in CS by Building a Self-Sustaining, Diverse Team of Students

Radhouane Chouchane

Columbus State University

The CS department at Columbus State University was recognized by the Students in Technology, Academia, Research, and Service (STARS) Alliance as a national chair of retention. It has inspired students from underrepresented minorities in computing to consider computing as a major, be engaged as student leaders, and then go on to succeed as computing professionals. This talk will share with the audience our findings and ideas about the challenges and, most importantly, the methods that a CS department can use to succeed at broadening participation in computing.

We will give a timeline that starts with our earlier outreach efforts that we started in 2011, which were supported by a stipend-providing NSF grant through UNCC. The timeline will discuss the methods that our STARS students have refined, the lessons that they have learned, and the benefits that they have reaped by leading numerous outreach activities, which included running an Emagination Computer Science Camp, hosting discussions for our university's Cyber Security Week and Women in Computing Week, and leading our yearly First Lego competitions, Visitation Days, as well as other events that impacted hundreds of our region's K-12 students, including a number of at-risk students. Our enrollment numbers and the success rates of our students have increased substantially. Meanwhile, our STARS Corps has started to function almost on auto-pilot thanks to the STARS students, to the support that they are now able to secure from the community, and to the students' social media engagement through Twitter, Group Me, and other tools that have played a great part in allowing the students to stay in touch with each other and with the community.

The STARS student's projects for Fall 2016 include leading a 3D Printing Workshop and supporting a Hope for Autism Walk and Family Day at North Highland Church in Columbus, Georgia.

Vulnerabilitiy with Cisco ASA 5500-X

Kazi Zunnurhain

Northern Kentucky University

Denial of Service (DoS) attack or Distributed Denial of Service (DDoS) attack are very customary and elementary strategy to hamper a system's standard activities. Since none of the data will be stolen, or deleted. Statistically 73% of the organizations across the globe are suffering from DDoS attack, an analytical report generated by a firm named Neustar. With the advancement of communication and networking, every sector is prone to DoS/DDoS attack if adequate measurements are not considered by the organization. Are we paying sufficient attention to mitigate DoS/DDoS attack? One could argue about the available solutions in the market like ASA firewalls, VAC from OVH. But then again there are blogs and articles which claim that OVH cannot mitigate an attack more than 250 mbps. Such another firewall solution is Cisco ASA 5500-X series. This firewall device can be deployed as a layer 3 switch as well as prevent unwanted packets from reaching the host. But can we really trust the robustness of an ASA firewall? In this study we investigated the capacity level of Cisco ASA 5505 firewall and measured the vulnerabilities involved within this device. We generated DoS attack from a virtual machine and then amplified the attack by increasing the number of VMs. A botnet was created to measure the vulnerabilities of a Cisco ASA from different aspects. We have several interesting observation from this study of ASA.

A Fuzzy Logic-based Approach to Teacher Performance Measured by Principal Evaluations

Ashley Moran and Shamim Khan

Columbus State University

The development of mapping software usable on widespread handheld devices has vastly improved the quality of life of many people. With this in mind, what would be the next step for gathering and utilizing information about real time traffic flow to map more efficient traffic routes? Some of today's most popular map services do an amazing job of routing users between two points with great efficiency, but fall short when it comes to higher accuracy on a smaller scale. Additionally many of these systems are not accurately equipped to handle situations with multiple actors attempting to complete similar tasks without overlay. Using mapping tools such as OpenStreetMap, we are exploring options that would allow us to accurately measure real time traffic flow in order to efficiently direct and navigate a fleet of commercial motor vehicles around a city. This presentation will cover the tools used to create such a system and explain the concepts behind our goals for achieving an efficient search structure capable of handling dynamically updating edge weights.

Peer Reviewed Abstracts

Text Mining to Explore the Use of Learning Theories in Data Structures Education Literature

Hillary Fleenor and Rania Hodhod

Columbus State University

The importance of computer science education in the modern world has become increasingly apparent. Current research efforts focus on effectively teaching computer science subjects in classrooms using different learning theories and various technologies. Despite the fact that a data structures course is one of the core courses in any computer science track, the course is characterized by a low success rate in our institution. Although the literature is rich with research for computer science education, there is no clear guide on the use of learning theories to teach data structures topics. Because of the large number of research papers in these areas, the use of readily available and user friendly software for text mining can help find the information in question. This paper presents the results from analyzing 97 papers to discover the current state of research related to the use of learning theories in computer science education, specifically data structures, using Voyant, a text mining tool.

Launching Your Cyber Defense Competition

Barry Bruster and Joseph Elarde

Austin Peay State University

Cyber exploits are prevalent between state nations, world regions, businesses, and communities. This paper describes combating illegal and unethical exploits through student education and skill building. The authors established a recurring Computer Science & Information Technology Department (CSIT) Collegiate Cyber Defense Competition, which has been labeled affectionately as the AC3DC. The intense trek experienced is discussed to help model startup cyber defense competitions for other universities and institutions.

Increasing the Cybersecurity Workforce through Innovation and Collaborative Approaches to Education and Training

Katherine Winters, Li Yang, Joseph Kizza and Chang Phoung

University of Tennessee Chattanooga

There is a growing need for trained professionals in cybersecurity both on a national and regional basis. This shortage has implications for security at both state and federal government levels as well as industry Along with this need comes a shortage of trained professionals. In order to meet the growing need for trained professionals in cybersecurity, a multi prong approach is needed. The issue cannot be solved with a single focused approach. The problem can be addressed through collaboration and innovation of industry and education. This paper will explore these issues.

Android Permission Vulnerabilities and Awareness

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Recent year have shown a significant attraction toward the development of mobile applications. The Android development nature and its open architecture provide more flexibility that attracted more developers to consider this platform to develop their application. This in fact left Android mobile devices susceptible to malware threats. In answer to these malware threats Android devices use a permission based security system that seeks to allow users to filter what an application has access to. The permission declaration is created during the development of an application, and it is then passed to mobile device during installation. In this paper we will provide a broader risk assessment model that takes into account an application's given nature of use to provide awareness for the user regarding the applications they use on their devices.

Collaboratively Designing and Building an Extensible Software Toolset for 2D and 3D Facial Modeling and Analysis

Eric Patterson, Jessica Baron and Devin Simpson

Clemson University

In this paper we describe aspects of collaboratively designing and developing, with a small team, a software toolset for modeling, parameterizing, and analyzing images and meshes of the human face, and we also present proof-of-concept results of using the system. The effort is based on years of experience in research and development of tools for working with representations of the face. The related impetus for the project was two-fold: firstly to create a system for carefully reducing dense three-dimensional meshes of the human face in a corresponded representation that would facilitate building parametric facial models, and secondly to replace and improve upon less flexible software that had been built primarily for research rather than designed with long-term use and development of new approaches kept in mind. Through this work we seek to create more capable, flexible, and extensible software that can be used by a variety of researchers to study the human face in many domains over the coming years.

Clean Interfacing with Service Oriented Architecture

Chenchutta Jackson and Bettina Shank

Austin Peay State University

The purpose of this paper is to present the software engineering process for the Austin Peay Patient Application (APPA). The application was designed and implemented using modern techniques based on service oriented architecture (SOA) for developing web/mobile applications. The benefit of this design is that it promotes the foundation of software engineering with the goal of extensibility, maintainability, and security as a forethought as opposed to an afterthought. APPA was designed under the direction of Mrs. Bettina Shanks of the Nursing Department. The goal of APPA was to allow information storage and retrieval of patient's data in a safe, accurate, and quick manner which is vital to the success of daily clinical procedures. The application was developed to be cross-platform having the capability to be accessed from various clients such as tablets, desktop computers, and mobile phones. APPA also was designed to comply with Health Level 7 (HL7) standards which is necessary for transmitting, integrating and accessing information in hospital and clinical settings. APPA was created to be more manageable, secure, and decoupled which promotes clean interfacing. The details of the application architecture, tools, and techniques used are discussed in the methodology section of the paper. The result and conclusion of the design choices are detailed in the last two sections of the paper

Poster Abstracts

Topper Cloud

Bhargava Konduru and Dhamodhar Bhati

Western Kentucky University

TopCloud is a cloud-based computing service that allows students to access their own virtual machine through the TopCloud web interface. TopCloud will allow the students to work on homework assignments in an environment with the appropriate software and a small amount of personal storage to save their assignments to be graded by professors. TopCloud will be free and accessible by all WKU Computer Science students. The students will be able to login to the web interface, check their announcements, find the contact information for professors, and launch their cloud computer all from a simple dashboard. Professors will be able to monitor student activity on the virtual machines, collect assignments by accessing student personal drives, send announcements, and post important dates for the students to remember. Administrators will be able to modify anything the professors can, in order to regulate for abuse. Also, the administrators will be able to view all VM activity and modify current VM connections.

The web interface will make it possible for users to sign into account select a class and launch virtual machine with a system image tailored to the class with all necessary course software. From the web interface the user will have the opportunity to select and online SSH session, in-browser VNC session or information on connecting to the virtual machine via an external VNC client (for better performance). From this session the student will have access to do their coursework and files. There will be included scripts where students can submit assessments to a network location where a teacher can login to their machine and see the files submitted for their class.

User Characteristics :
All listed users are assumed to have the following characteristics:
1. Have access to a broadband internet and a computer.
2. Ability to access a web page via a web browser and be able to register on the webpage.

Android UI State Inference

Justin Bullard, Andre Carter and Timani Gill

Fort Valley State University

In recent years, Android operating systems have taken ridicule for its security constraints or lack thereof for mobile devices. In our research we explored a plethora of attacks and security exposures that many hackers use to hijack personal information, photographs, and login credentials. One of the most dangerous Android system attacks is referred to as UI State inference attack. This attack exists in most popular GUI systems and does not require system permissions. This attack does not directly reveal the exact pixel, or more accurately, the activity that is being conducted. However, it serves as a powerful building block for more serious attacks from background applications. The vulnerabilities provided by UI include hijacking sensitive user input (login credentials) and camera images shot by the user (personal check photos for banking apps). For our research we developed a basic listing application using Android Studio. By uploading the application to an outdated Nexus mobile device we tested the functionality of the UI State exposure. While the results were not as accurate as expected we were able to conclude the attack itself is most volatile during the updating process of software systems.

Expanding the Accessibility of Conventional Smart Home Systems

Brody Bruns and Chisom Caleb Ogbonnaya

Western Kentucky University

The mobility and versatility of modern computers has sparked a transformation in how consumers interact with common household objects. Items such as light bulbs, locks and thermostats are now able to interact and communicate with each other using wireless technologies; forming a collaborative network that improves the usefulness of the devices. These smart home systems can improve a person's way of life and has evolved how they live and interact with their environment. This project will seek to explore the interaction between users and systems of smart devices and how the interface for this interaction can be improved. Our project aims to consider alternatives and supplements to the traditional smart system interface in order to improve its usefulness. These alternatives include technology such as voice recognition and motion control.

In order to gain insight into the design and implementation of a smart home hub, our group previously designed and created a smart home system with a Raspberry Pi acting as the central hub. Our system utilized the ZigBee wireless protocol to allow a user to communicate with and control several smart devices using a web based interface.

We are now focusing on expanding the interface for our system by allowing alternative methods for the user to interact with our system. The first method will be a voice control application. The second method is less conventional, allowing the user to utilize their hands and motions to control the system. We will track the motions and gestures of a user, allowing them to interact with our system with their movements in addition to their voice and the web based interface. Both methods will expand on conventional smart home controls and make the use of smart home systems more accessible to users.

Software as a Service; Code Cloud

Daniel Salami

Western Kentucky University

Cloud computing is a better way to run your business. Rather than running it yourself, they can be run on a data center; the concept of cloud computing dates back to the 60's. Code Cloud is an on demand software that implements one of the three architectures of cloud computing: Platform as a service, Infrastructure as a service, and Software as a service. The particular architecture implemented by code cloud is Software as a service. This provides the "on demand" of the software, making it accessible to users from anywhere, at any time on any day. Software as a service is proving to be a more reliable way of making efficient scalable resources available for the public or the clients. SaaS structured models are also beginning to take over Application service providers (ASPs) models, by creating mechanisms flexible enough and in an efficient manner thereby providing clients or users with more resources. Code cloud is an example of software as a service, this software will make an Integrated Development Environment available for the users that require the service. This software also would manage issues like safety, storage, compatibility etc. The users of this software wouldn't need to worry about issues that arrive via Application Service Providers model on code cloud, all issues are handled by the vendor of the software.

Virtual Lab on GPUs - Implementing an IaaS Cloud with GPUs

Trevor Brown

Western Kentucky University

Cloud computing has become commonplace over the past decade. From Amazon Web Services to Google's Cloud Platform, many organizations are now providing clouds tailored for many uses. Many fields and industries apply cloud computing to their various tasks, like diagnostic imaging in medicine and CAD programs for engineers, to desktop publishing applications used by graphic artists. Because of techniques used by cloud architectures, like virtualization and load balancing, all of the applications have the ability to run on the same cloud simultaneously. While many of these clouds can be adapted for particular uses, they are sometimes restricted in their computational abilities. The virtual machines used in these cloud architectures rely on traditional computer CPUs and memory. However, if GPUs could be applied in a cloud, practicing GPGPU computing, the speed in which machines in a cloud could process information could increase drastically.

I propose a project where an Infrastructure as a Service cloud is constructed, using GPUs as the primary computational component. With this arrangement, virtual machines, when running, either run virtually on the GPUs, or they interface with the GPUs in a way that allows them to send and receive jobs. As a proof of concept, I propose the first practical application of such a IaaS cloud is a virtual computer laboratory, offered to Computer Science students. By using GPUs are the primary computing resource, it may be possible to handle many virtual machines simultaneously, running somewhat resource intensive applications without issue. By the end of the project, I anticipate that the GPU-based Infrastructure as a Service cloud can replace a small computer lab of 15-20 PCs, running without issues.

A Model for Robots-as-a-Service Through Cloud-Based Hub Control of UAV Fleets

Connor Brooks and Michael Galloway

Western Kentucky University

As autonomous unmanned aerial vehicles (UAVs) become more ubiquitous, it is possible to think of UAVs as a resource or service. In fact, many users could benefit from the services provided by a UAV that may not have frequent enough need of services to own one, or may not have the technical experience to set one up. Even if considering UAVs as only having the capabilities to take images and video, potential users could include farmers, news stations (both for news and traffic updates), businesses that could use metrics of traffic flow around their location at certain times, event organizers, and emergency services. Additionally, it would be simpler to ensure safety regulations introduced by national entities are followed by a central UAV fleet controller rather than ensuring all individuals operating UAVs are following these regulations. This service can be though of as an extension of cloud services into real-world capabilities, and is termed Robots-as-a-Service (RaaS) by some preliminary research.

Our project focuses on creating a cloud-based hub, or base station, for RaaS operations, specifically with focuses on two problems: ease of use for users and emergency services. The hub project consists of creating a scheduler that manages the UAVs, allocating tasks and jobs to various UAV vehicles and optimizing this allocation for efficient use of the UAV resources. While we assume all UAVs have the same capabilities – only image and video capturing – potential further work includes extending this into various UAVs having different capabilities based on their sensory payload. Additional extensions of the project include dispersed base stations for rapid deployment.

Education Connection

Chandler Staggs

Western Kentucky University

Access to computing services for many students attending a university can be quite difficult. Students need to be able to access typical programs such as Microsoft Office, course work given by their professors, and storage of their work. Education Connection is the cloud based service that will revolutionize this shortcoming. This is Infrastructure as a Service (IaaS) where students will be able to access their work via a browser hosted on a virtual machine on one of the project's servers. With this service they will be able to use basic programs associated with standard computing, see assignments submitted by professors, and store much of their work. This allows much of the hardware from a typical computer terminal to be excluded, thus significantly reducing the costs.

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– Graduate	**Session I– Undergraduate 4**
	Chair: K Adcock	Chair: B Myers
9:15 AM	Ahmed, et al	Wehunt, et al
9:35 AM	Rudraraju	Gibson, et al
9:55 AM	Matlock	Wright
10:15 AM	Ahmed, et al	Zelaya
	Session II– Graduate	**Session II– Undergraduate 4**
	Chair: K Adcock	Chair: B Myers
10:40 AM	Cho, et al	Olotu, et al
11:00 AM	Sivaraju, et al	Priddy, et al
11:20 AM	Harris, et al	Medina, et al
11:40 AM	Odaibo, et al	Greenburg, et al
12:00 PM	**Lunch–Patio Restaurant**	
	Session III– Undergraduate 4	**Session III– Undergraduate 4**
	Chair: H Qiu	Chair: D Williams
1:00 PM	Craig	Matze
1:20 PM	Becton, et al	Breeden, et al
1:40 PM	Coleman	Cordell
2:00 PM	Myers	Coomer
2:20 PM	**Break–Poolside**	
	Session IV– Undergraduate 4	**Session IV– Undergraduate 4**
	Chair: H Qiu	Chair: K Winters
2:35 PM	Fuqua, et al	Freeman
2:55 PM	Maxwell, et al	Kohli
3:15 PM	Johnston	Reed
3:35 PM	Carpenter, et al	Marlowe
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 - Undergrad 2 & Graduate	Session I– Professional	Session I– Professional
	Chair: C Tanis	Chair: E Brown	Chair: D Frazier
9:15 AM	Mavridis, et al	Krishnaprasad	Jerkins, et al
9:35 AM	Debate, et al	Bradley, et al	Lowe
9:55 AM	Horace, et al	Liang	Wilms
10:15 AM	Pinkston, et al	Bradley, et al	Williams
	Session II– Graduate	Session II– Professional	Session II– Professional
	Chair: C Tanis	Chair: E Brown	Chair: D Williams
10:40 AM	Molbert, et al	Elarde	Jerkins
11:00 AM	Rensenhouse, et al	Wang	Summers
11:20 AM	Shown	Frazier	Guerin, et al
11:40 AM	Tillman	Schwab, et al	Chouchane
12:00 PM	Lunch–Patio Restaurant		
	Session III– Undergraduate 4	Session III– Peer Reviewed	Session III– Peer Review/Profession
	Chair: E Brown	Chair: K Adcock	Chair: B Myers
1:00 PM	Hicks	Fleenor, et al	Patterson, et al
1:20 PM	Goulet, et al	Bruster, et al	Jackson
1:40 PM	Van Amberg	Winters, et al	Zunnurhain
2:00 PM	Pennington	Kandah, et al	Moran, et al
2:20 PM	Break–Poolside		
	Session IV–	Session IV– Poster	Session IV– Poster
2:35 PM		McMillan, et al	Brown
		Bullard, et al	Brooks, et al
		Bruns, et al	Hooper, et al
		Salami	Staggs
4:30 PM	Business Meeting–Highlander I		
7:00 PM	Awards Banquet–Azalea		

Glenstone Floor Plan

Dogwood II

Dogwood I

Azalea

Restaurant

Conference Registration

Parking Lot

Pool

Hotel Desk Check In

Highlander (2nd floor)

Highlander II

Highlander I

(2nd floor)
At the top of the stairs
turn right or
just off the elevator