



Fall Conference Proceedings

Mid-Southeast Chapter



of the ACM

Gatlinburg, Tennessee  
Nov. 15-16, 2018



# Mid-Southeast Chapter



of the ACM

For information on the 2019 Fall Conference, select  
the conference link from the official chapter website:  
[www.acmmidsoutheast.org](http://www.acmmidsoutheast.org)





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## Message from the Chapter Chair

1958 was the year that Jack Kilby co-invented the Microchip. It was the year the US successfully launched Explorer 1, its first satellite into space, and also the year President Dwight Eisenhower signed the National Aeronautics and Space Act, NASA, into law. 1958 was a big year for things in the tech world and so it is that here in 2018 the ACM Mid-SE Fall Conference celebrates its 60<sup>th</sup> anniversary. I wish I had a box of old proceedings from all 60 fall conferences. It would be an amazing trip to go through them and read just the titles of the presentations that have been made. I feel certain I would discover that many of the presentations in the 60 years of this conference would be describing the beginnings of much of the technology that we use in our everyday lives. If we had a complete list of all the names of the different presenters over the years, I am confident we would find names of people that today we study in textbooks for the contributions they have made to this amazing field. So sad that the people running those early conferences did not have the technology of today to archive all the proceedings.

As much as we can sit here today and wonder what the past was like I feel certain that the people back in 1958 could never imagine how the technology they were discussing would lead to communication devices in our pockets that could send moving pictures around the world in real time. They could never imagine computers that would not only be able to play chess, but computers that can store data collected minute by minute from around the world and from that data model the weather for the next seven days. They could not predict that the average person would have not only one computing device, but own multiple devices and that some of those devices would have practical functions in response to voice commands. The presenters in the early days of this conference only read about such things in science fiction books and many wanted to make those technologies a reality, but all they could do is come to Gatlinburg, TN and talk of their research without knowing they were setting the foundation for what we do today.

This of course makes me stop and wonder about the abstracts, papers, and posters that will be presented at this year's conference. Some of these presentations will be laying a new foundation for future generations to build new technologies that we can't comprehend. Today as you sit and listen to each presenter, is there a chance you will be hearing of some new idea that will be the foundation for the next new technology? I truly hope that many of us here today will live long enough to see some of the crazy ideas discussed here become

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the technology of the future that drives our society in new and better ways in the days ahead.

I have been serving on this chapter's board for 10 years and this will be my last conference to serve in this capacity. It is time to let new people with new energy and ideas come and build the conference and continue to draw in fresh faces, new abstracts, and new foundations for the future. It has been a true blessing to serve with the many great people who help to make this conference a success year after year. I look forward to attending and presenting more in the years ahead.

One last thought on how the past and current day sometimes crash together and can affect us. As I prepared for this year's conference, I discovered a box that I was given 8 years ago that has some ACM Mid-SE chapter documents from the 1990s. It was amazing to look through some of the proceedings from that era and read some of the titles. "Object -oriented Programming – Its Place in the College Curriculum", "What is involved in Writing Programs for Microsoft Windows?", "OOP: Ada versus C++", "Neural Nets Without the Neurons", and "Weaving the Web" were just some of the abstract titles. There was one document in this history tour that gave me a great pause when I saw it. I found a sheet of paper that had the title "Student Winners". The reason it gave me pause was the name of the winner of 2<sup>nd</sup> place in the doctoral category. The person who won that award was Steve Donaldson from the University of Alabama – Birmingham. In May, Steve and I had just finished our 17<sup>th</sup> year of being co-faculty members in the Computer Science Department at Samford University. In early June, Steve announced he had stage 4 bone cancer and over the Labor Day weekend he passed away. Steve was the person who first brought me to this conference and I never knew he had won an award here. We have brought many students to this conference over the years and many have presented and won as he did. Now they are off working in a variety of technology places and maybe some will develop the next great tech that future generations will use daily. And maybe the idea for that future tech was planted in their mind right here in Gatlinburg.

History is about the past, but never forget we are also making history right now. Enjoy this conference, listen to the presentations, and take some time to reflect that things happening today may have a great impact in ways we cannot even imagine.

Greg Kawell – Samford University

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## ACM Mid-Southeast Chapter Officers

### **Chair**

Greg Kawell  
Samford University  
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### **Vice Chair**

Robert Lowe  
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### **Secretary**

Melissa Wiggins  
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### **Treasurer**

Bob Bradley  
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## Fall 2018 Conference Committee

### **Conference Chair**

Greg Kawell  
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### **Program Chair**

Robert Lowe  
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### **Student Paper Competition**

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### **Hospitality Suite**

Brandy Cartmell  
Kevin Cartmell  
Tennessee Department of Health  
Brandy.Cartmell@tn.gov

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# Student Paper Competition Judges

## Chair

Brian Toone, *Samford University*

## Undergraduate

Melissa Wiggins, *Mississippi College*

Glenn Wiggins, *Mississippi College*

Masoud Naghedolfeizi, *Fort Valley State University*

Jeff Roach, *East Tennessee State University*

Nabil Yousif, *Fort Valley State University*

Hillary Fleenor, *Columbus State University*

Xiangdong An, *Univ of Tennessee at Martin*

## Graduate

Brian Toone, *Samford University*

John Nicholson, *Austin Peay State University*

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## Conference Session Chairs

### Azalea

- Session I: Mellissa Wiggins - *Mississippi College*  
Session II: Deborah Mudali - *University of Tennessee - Chattanooga*  
Session III: Hillary Fleenor - *Columbus State University*  
Session IV: Panel Discussion

### Dogwood I

- Session I: Glenn Wiggins - *Mississippi College*  
Session II: No Presentations  
Session III: Posters  
Session IV: David Frazier - *Tusculum College*

### Dogwood II

- Session I: Brian Toone – *Samford University*  
Session II: John Nicholson - *Austin Peay State University*  
Session III: Xiangdong An - *University of Tennessee at Martin*  
Session IV: No Presentations

### Highlander I

- Session I: Haifei Li - *Union University*  
Session II: James Church - *Austin Peay State University*  
Session III: No Presentations  
Session IV: No Presentations

### Highlander II

- Session I: Leong Lee- *Austin Peay State University*  
Session II: Robert Lowe- *Maryville College*  
Session III: Suk Lee - *Columbus State University*  
Session IV: No Presentations
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# Notes



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ACM Mid-Southeast Chapter  
2018 Fall Conference  
Gatlinburg, Tennessee  
Glenstone Lodge

Conference Program

Thursday, November 15, 2018

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

Friday, November 16, 2018

- 7:30 – 9:00 a.m.      **Registration**
- 7:30 – 8:00 a.m.      **Morning Coffee**
- 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**
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**Session I:**                    **9:15 – 10:35 a.m.**  
**Azalea:**                      **Cyber Security Panel Discussion**

9:15 – 10:15

*Criminal Schemes & Moving Forward:  
SPAM, Malware evolution, IOT exposure, e-commerce  
attacks, Public-Private Partnerships*

Mark Grantz  
(Washington FO, Electronics Crime Task Force),  
Jason Brown  
(Knoxville Resident Office), and  
Roy “Brent” Harlan  
(NCFI) –  
United States Secret Service

**Dogwood I:**                    **No presentations**

**Dogwood II:**                    **No presentations**

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**Highlander I:****Professional Presentations**Session Chair: *Haijfei Li*

- 9:15 – 9:35 *Garbage Collection Issues in Solid State Drive* - Srinivasarao Krishnaprasad - Jacksonville State University
- 9:35 – 9:55 *Robots, Emotional Intelligence, and Security?* - Barry Bruster - Austin Peay University
- 9:55 – 10:15 *Bring Your Own Device, Computer Usage Policies, and User Privacy*- Charles Foltz and Laura Foltz - University of Tennessee at Martin
- 10:15 –10:35 *Developing Projects with Angular, Firebase and Google Maps* - Bob Bradley - University of Tennessee at Martin

**Highlander II:****Professional Presentations**Session Chair: *Leong Lee*

- 9:15 – 9:35 *Applications of Blockchain to Education* - Nabil Yousif, Masoud Naghedolfeizi and Xiangyn Zeng - Fort Valley State University
- 9:35 – 9:55 *Redesigning Software Engineering* - Kathleen Ericson - University of Tennessee at Martin
- 9:55 – 10:15 *TAS: A Teaching Allocation System to Manage Teaching Resources in a University Computer Science Department* - Leong Lee and Bruce Myers - Austin Peay State University

**Session II: 10:40 – 12:00 p.m.****Azalea: Undergraduate Presentations**Session Chair: *Deborah Mudali*

- 10:40 – 11:00 *Improved Face Recognition using Principal Components of Histogram of Oriented Gradients and Support Vector Machine* - Dequan Medina and Chunhua Dong - Fort Valley State University
- 11:00 – 11:20 *Converting Bitmap Images to Stylized Vector Images* - Amanda McNair - Austin Peay State University
- 11:20 – 11:40 *Ray tracing with Open MPI* - Isaac Shore - High Point University
- 11:40 – 12:00 *Low Bandwidth Image Transfer with Client-Specific Dynamic Processing* - Andrew Freeman and Brian Toone - Samford University

**Dogwood I: Undergraduate Student Presentations**Session Chair: *Glenn Wiggins*

- 10:40 – 11:00 *Applications of Raspberry Pi to Internet of Things: Smart Greenhouse Monitoring and Control* - Kaleb Smith- Fort Valley State University
- 11:00 – 11:20 *Evaluation of a Visual Positioning Algorithm for a Table-Top Robot* - Jordan Miller - Austin Peay State University
- 11:20 – 11:40 *A Comparison of Robotic User interfaces for People with Disabilities* - Harrison Welch - Austin Peay State University
- 11:40 – 12:00 *Affordable Differential GNSS (GPS) for Undergraduate Autonomous Vehicle Research* - Ryan Diaz - High Point University

**Dogwood II: Graduate Presentations**Session Chair: *John Nicholson*

- 10:40 – 11:00 *INSuRE Projects: Tennessee Tech University Working with Government Agencies and National Labs* - Will Johnson, Md. Ahsan Ayub and Rahat Masum - Tennessee Tech University
- 11:00 – 11:20 *Latency, Cost and Energy-Efficient Workflow Scheduling in a Cloud Environment* - Huda Alrammah and Yi Gu - Middle Tennessee State University
- 11:20 – 11:40 *The Future of the Internet After The Repeal of Net Neutrality* - Paul Luft and Cedric Ashe - Columbus State University
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**Highlander I: Professional Presentations**Session Chair: *James Church*

- 10:40 – 11:00 *Clean Programming in Python* - David Frazier - Tusculum University
- 11:00 – 11:20 *Bayesian Statistics, the Markov Chain Monte Carlo Algorithm, and Stan: An Introduction to Probabilistic Programming* - Ken Adcock - UPS
- 11:20 – 11:40 *Adaptable Skin Disease Classification* - Deborah Mudali - University of Tennessee
- 11:40 – 12:00 *Procedurally Generating Flat Surfaces, Cuboids, and Spheres* - Jeff Roach - East Tennessee State University

**Highlander II: Professional Presentations**Session Chair: *Robert Lowe*

- 10:40 – 11:00 *Integration of Hardware/Software-based Hand-on Activities into Computer Organization* - Sukjin Lee - Columbus State University
- 11:00 – 11:20 *HabPI: Sending Computers to the Edge of Space* - Robert Lowe - Maryville College
- 11:20 – 11:40 *Enhancing Student learning Experiences in Computer Programming Classes using Robotics* - Masoud Nagedolfeizi, Xiangyan Zeng and Nabil Yousif - Fort Valley State University
- 11:40 – 12:00 *Creative Computing in Computer Science 1* - Hillary Fleenor - Columbus State University

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

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**Session III**                      **1:00 – 2:20 p.m.****Azalea:**                              **Undergraduate Presentations**Session Chair: *Hillary Fleenor*

- 1:00 - 1:20                      *CodeBox64, A Tactile Input Approach to Scratch for Students with Visual Impairments* - Zirui Wang and Amber Wagner – Birmingham-Southern College
- 1:20 - 1:40                      *Towards a Collaborative Outreach Platform* - Anisha Nizar Ali and Gabby Hoefer – Samford University
- 1:40 - 2:20                      *SAE Airplane Competition Project* - Meredith Brown and Matthew Austin - University of Tennessee at Martin
- 2:00 - 2:20                      *A Topical Analysis of Content Curation on Front-Page Based Content Aggregate Sites* - Landon Bentley - University of Alabama

**Dogwood I:**                              **Posters***Blockchain and Cryptocurrency* - Kenneth Romines - Tusculum University*Building a Virtual Reality Headset* - Ryan Felton - High Point University**Dogwood II:**                              **Undergraduate Presentations**Session Chair: *Xiangdong An*

- 1:00 - 1:20                      *All the King's Men (Video Game)* - Steven Alford and Ruchik Patel - University of Tennessee at Martin
- 1:20 - 1:40                      *Graph Based DoS Attack Detection* - Peter Harlan - Western Kentucky University
- 1:40 - 2:00                      *EGGY: The egg-cellent home security system* - Amie Newman and Jeremy Coleman- University of Tennessee at Martin
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**Highlander II: Graduate Peer Reviewed Presentations**Session Chair: *Suk Lee*

- 1:00 - 1:20 *Classifying Basketball Players by Hall of Fame Merit* -  
Trupesh Patel, Andrew Schatz and Chengcui Zhang -  
The University of Alabama at Birmingham
- 1:20 - 1:40 *An Exploratory IoT Testbed for Cyber-Physical Systems Security*  
*Research* - Gustavo Angeles, Terry Guo and Ambareen  
Siraj - Tennessee Tech University
- 1:40 - 2:00 *Smart Weather Forecasting Using Machine Learning: A Case*  
*Study in Tennessee* - A H M Jakaria, Md Mosharaf Hossain  
and Mohammad Ashiqur Rahman - Tennessee Tech  
University

**Break****Poolside 2:20 – 2:35 p.m.**

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**Session IV****2:35 – 3:55 p.m.**

- Azalea:**                    **Undergraduate Student Presentations**  
Session Chair: *Melissa Wiggins*
- 2:35 - 2:55                *Variations on the Iterative Prisoner's Dilemma* - Taylor Woods – Columbus State University
- 2:55 - 3:15                *Character Creation Through Genetic Algorithms* - Ciara Ryan- Tusculum University
- 3:15 - 3:35                *PillIdentify: The Pill Identifying Mobile App for Android* - Adam Chisolm, James Smith and Jon Sulcer- University of Tennessee at Martin

**Dogwood I:**                **Professional Peer Review Presentations**Session Chair: *David Frazier*

- 2:35 - 2:55                *Teaching Computer Ethics through Debate* - Max Li- Union University
- 2:55 - 3:15                *Using a Windows MFT to locate stolen files on a USB drive* - Mike Lehrfeld – East Tennessee State University
- 3:15 - 3:35                *Enhancements to PeayNotes: Extending the Generic Web-based Patient Clinical Notes Sharing System* - James Church, Tabitha Lee and Bettina Shank - Austin Peay State University
- 3:35 – 3:55                *Risk Assessment of Type 2 Diabetes Based on Life Style and Socioeconomics* - Xiangdong An, Joshua Guerin and Kate Ericson – University of Tennessee at Martin

**Dogwood II:**                **Graduate Student Presentations**Session Chair: *Brian Toone*

- 2:35 - 2:55                *Conversational Agent: Developing a model for intelligent agents with Transient Emotional States* - Angie Dowdell - Columbus State University
- 2:55 - 3:15                *Merging College and Business with Natural Language* - Daniel Rockwell - Columbus State University
- 3:15 - 3:35                *Data Gathering in Multibop Cognitive Radio Ad Hoc and Sensor Networks* - Kimberly Brown and Lixin Wang - Columbus State University
- 3:35 – 3:55                *Time and Cost Optimization of Scientific Workflows in Cloud for Big Data Science* - Khem Poudel and Yi Gu - Middle Tennessee State University
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**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**

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## Notes



# Keynote Address

## Abstract

Mark Grantz

*United States Secret Service  
Washington Field Office, Electronics Crime Task Force*

## **Cybersecurity Public/Private Partnerships – Bridging the Gap**

### **Abstract**

Over the past 50 years private industry and research has fostered explosive growth in the world of technology with the internet changing the way we do business and the way we live our lives. This third industrial revolution has allowed information to be freely and instantaneously shared around the globe. At issue though is as society and industry have quickly adopted these newfound capabilities, the focus has been and continues to be on speed, shared access and ease of use. The expansion of network-connected technologies has also ushered in an era where cyber criminals take advantage of the fact that security is not at the forefront of design. As soon as new developments are released, highly skilled and motivated criminals are looking for ways to exploit them. This has led to a wider variety of cyber-crime as well as more complex tactics, techniques and procedures and as a result, law enforcement has struggled to keep pace. To ensure that government is able to provide a secure internet, public and private institutions must fundamentally change the way we do business in two key areas. First, law enforcement must find ways to leverage subject matter experts in an attempt to identify locate and successfully prosecute cyber criminals. Second, government must share its knowledge regarding the current trends in cyber-attacks and work with private industry to emphasize the integration of security measures during the initial design phase of new technologies as opposed to trying to apply security after the fact.

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## About the Speaker

Is currently serving as the Assistant to the Special Agent in Charge of U.S. Secret Service's Washington Field Office. Mr. Grantz has been with the Secret Service for 16 years and has over 23 years of law enforcement experience. During his tenure with the government, Mr. Grantz has overseen high level international investigations, managed intrusion detection and video surveillance systems at the White House and other protected facilities and is presently a supervisor in the field office's protection squad where he oversees Presidential, Vice-Presidential and foreign dignitary visits and events in the National Capitol Region. Working with private, government and law enforcements partners, Mr. Grantz recently served as the Field Office Supervisor for the 2016 Nuclear Security Summit, an NSSE event which saw 35 foreign heads of state visit the Washington DC area. Mr. Grantz has spoken internationally as a plenary and keynote speaker on the subjects of cyber-crime and insider threat and was the co-author of the paper "Toward an Adaptive Structuration Model of International Cyber-Crime".

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Student Abstracts  
Undergraduate Degree Programs

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# Variations on the Iterative Prisoner's Dilemma

Taylor Woods

Columbus State University

This research will consist of five studies in which human participants are pitted against computer software in variations of the iterative prisoner's dilemma. The prisoner's dilemma is a game/ scenario wherein two parties may choose to cooperate or defect with mutual cooperation yielding mutual benefit, one sided defection benefiting the defector more than mutual cooperation (at the expense of the other participant), and mutual defection being harmful to both parties. The dilemma is typically described as a choice being made by two partners in crime who have been arrested and must decide whether to confess or remain silent. In the classic prisoner's dilemma the choice to cooperate or defect is made only once and neither participant is aware of the actions taken by the other. In the iterative prisoner's dilemma, however, players repeat the scenario several times and are aware of the other player's previous actions. In the versions of the iterative prisoner's dilemma being used in this research, the players will be able to conceal either their first 50 or last 50 moves from the computer and the computer will be able to conceal it's first 50 or last 50 moves from the player. Players will not be aware that their opponent is a computer, but rather will be under the impression that they are playing against another human. The intelligent agent (software) will use a randomly assigned strategy. By adding the element of partial concealment we are able to bring the dilemma closer to numerous real world scenarios in which uncertainty is present, examine the impact of trust and mistrust on cooperation. This, in tandem with the use of both computerized and human participants may allow us to discover novel, stable, strategies for the prisoner's dilemma.

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# Character Creation Through Genetic Algorithms

Ciara Ryan

Tusculum University

Genetic algorithms (GA) are used to randomly create variables that serve the purpose of generating their own techniques and traits to optimize the solution to a problem. The theory of evolution in nature describes an environment in which life managed to find a way to flourish and define unique ways and tools for survival. Each organism's main objective defined as survival. Exploration into the idea of how a certain object with the ability to respond and receive the environment around it grows grants us unique perspective into the origins and processes that are set precedent by nature. From a technological standpoint, this process can be extended to other topics and practices of coding through genetic algorithms. As a method of optimization, its theoretical basis in biology defines its ability to pervade ranges of possibilities as well as its applicability, ease of use, and global perspective. This paper attempts to cumulate the definition, theory, and current processes which are used by GAs, as well as delve into the application of GAs through a character creation program. The purpose of this character creation process that I am working with is to create some kind of abstract object (the character) that adapts most efficiently to fulfill the criteria of a certain environment. The physical representation of the character is abstract; it would not be a humanoid creature specifically, although certain functions would have to be maintained for mobility and functional purposes. The idea of an environment is what drives and creates this character. A singular objective created within this environment combined with elements such as different obstacles and environment types will mimic the processes of adaptation that exist in nature. This is not only a look into the functionality of genetic algorithms, but also into the productiveness of evolution and the ability to create a character that is formed by its environment. Future implications of this could be for video game characters to become complete products of their environment. My goal is to ascertain questions from these experiments; I want to provoke thought into science, technology, psychology, and religion, opening the doors to what the basics of evolution are and the possibilities of what could lie before us.

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# PillIdentify: The Pill Identifying Mobile App for Android

Adam Chisolm, James Smith and Jon Sulcer

University of Tennessee at Martin

Due to certain patent laws that govern brand name medication pills, generic drug manufacturers are forbidden from copying how existing brand name pills look in terms of color, size, shape, or imprints. This means that most pills can be identified through these qualities alone. Software should be able to take these attributes and search a database to identify any pill in question. This software could be useful for both workers in the medical field who may have to work with hundreds of different types of pills, and to the public who may have many prescriptions with mixed or ambiguous pills.

We developed an app called PillIdentify to do this in Android Studio using the Java programming language. To use the app you will simply snap an image of the pill with your phone. The app then uses the Google Vision API Optical Character Recognition to read the imprints on a pill. Next the OpenCV library will be used to determine the color and shape. Finally, an online Firebase database (which we put together) will be used to try to identify the pill based on the characteristics measured.

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# Applications of Raspberry Pi to Internet of Things: Smart Greenhouse Monitoring and Control

Kaleb Smith

Fort Valley State University

A current trend in the tech community is the concept of the Internet of Things: a world full of internet-enabled devices that automate and simplify tasks in our lives. With the advent of IoT, developers, both commercial and independent, have sought a development platform that can support their IoT-based creation. Multiple boards are available for electronics prototyping as well as simple computer via microcontrollers with add-on boards (such as the Arduino platform), but this project focuses on the versatility of the Raspberry Pi as an IoT development platform by using the Pi to create a Smart Greenhouse Monitoring and Control Module: a device capable of measuring the current temperature, humidity and moisture of the environment; displaying the data real-time on its own locally hosted web server; and triggering climate control functions by activating heaters or ventilation to adjust temperature and running spray lines to regulate moisture. The Raspberry Pi is the ideal platform for this project because the board itself is a tiny computer capable of running a full-featured Linux distribution (Raspbian). Through Raspbian, the Pi can use Python, an extremely versatile scripting language, to take the sensor readings through the General-Purpose Input Output (GPIO) pins and insert the data into an HTML page using Python Flask as a backend router service. Furthermore, the data is organized into easy to read, dynamically updating charts through use of CanvasJS, a minified JavaScript library that is also run locally. This project demonstrates both the reliability, versatility and affordability of the Raspberry Pi platform, proving its effectiveness in the field of an ever-growing Internet of Things.

Research Advisor: Masoud Naghedolfeizi

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# Evaluation of a Visual Positioning Algorithm for a Table-Top Robot

Jordan Miller

Austin Peay State University

This presentation will discuss the implementation of a vision-based control and positioning algorithm for an autonomous table-top robot. The goal is to develop an accurate yet simple, vision-based control algorithm that allows the robot to detect targets and move within 0.5 cm of the targets' positions. The test robot is a custom Raspberry Pi-based platform that uses the standard Raspberry Pi Camera Module V2, which is attached to the top of the robot. A custom Python library implements functionality for the servos, camera, and positioning algorithm. The robot's actions are based on input from the camera and are controlled with a software based proportional-integral-derivative (PID) controller. The algorithm detects the size of the targets, which vary according to distance. The PID controller uses the visual information to determine the speed, acceleration, and direction of the robot. The algorithm has been tested using one experiment using four 2.5 cm targets, which represent the corners of a square. In this experiment, we measure the distance from the robot to the targets allowing us to calculate the positioning error. Successful development of the positioning algorithm will allow us to further develop exploratory and manipulative algorithms that will allow the robot to explore and map a large area looking for targets and then reposition them as necessary.

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# A Comparison of Robotic User interfaces for People with Disabilities

Harrison Welch

Austin Peay State University

This research project compares several user interfaces that allow people with disabilities to remotely control a robot. There are four methods under examination: a standard mouse-based interface, using computer vision to capture hand gestures, voice control, and eye tracking. The four interfaces will be tested using a common task in which a robot is directed to collect several objects in another room. Users will only see what the robot sees through video feedback. The basic commands for all task are: forward, backward, left, right, and stop. The mouse-based interface is a basic graphical user interface where the user uses a mouse to click on buttons. In the hand-gestures interface, computer vision is used to sense the hand position. In the voice-control interface, the user will speak the basic commands. Finally, in the eye-tracking interface, the user will look at specific sections of the screen which correspond to the five operations. In the end, the goal of the project is to gain a better understanding of the advantages and disadvantages of each interface.

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# Affordable Differential GNSS (GPS) for Undergraduate Autonomous Vehicle Research

Ryan Diaz

High Point University

A group of students at High Point University has the goal of enabling a golf cart to travel autonomously around our campus. High accuracy location tracking technology is vital for the development of autonomous vehicles such as this. While consumer grade Global Navigation Satellite System (e.g. GPS) receivers can be easily acquired, their value is limited when it comes to accuracy on a sub-meter scale. Differential GNSS is poised to solve this issue by providing corrections to receivers based on calculations made on a nearby base station. The project aims to use inexpensive, readily available hardware paired with open-source software to implement a complete Differential GPS system. The end goal is to allow the fully autonomous golf cart to have significantly more accurate position data than if it were relying on a GPS receiver alone. During the talk the results of testing the accuracy of standalone GPS vs Differential GNSS will be presented along with how we approached our problem.

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# Improved Face Recognition using Principal Components of Histogram of Oriented Gradients and Support Vector Machine

Dequan Medina and Chunhua Dong

Fort Valley State University

Face recognition is a popular area in the research and applications of artificial intelligence. The purpose of face recognition is to find the feature representation of a facial image and recognize the identity of the person present in the image. In this study, we propose a face recognition algorithm based on feature representation by Histogram of Oriented Gradients (HOG) and classification by support vector machine (SVM). We first extract the features of the images by utilizing the HOG algorithm which has proven to yield decent classification accuracy. Next, the initially extracted high-dimensional HOG features are transformed into a lower-dimensional space by applying the principal component analysis (PCA) algorithm. The main idea of using PCA for face recognition is to represent the high-dimensional HOG features into the compact principal components of the feature space. Thus, the number of features decreases, and outlier features are eliminated, which is crucial in reducing the training time and improving the prediction accuracy. Finally, the SVM is trained using a set of training data and a test face can be classified by the trained SVM. Compared to using the original extracted HOG features for SVM classification, the principal component features achieve a higher accuracy of face recognition.

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# Converting Bitmap Images to Stylized Vector Images

Amanda McNair

Austin Peay State University

In this project, small bitmap images are converted to vector images and are then converted into stylized representations of the original bitmap images. The stylized techniques include representing pixels as circles, squares, and lines in color and gray scale. For example, in one conversion, pixels are represented as circles with the radius of each circle determined by the gray scale value of the original bitmap picture. The source images are PNG images and the final vector images are scalable vector images (SVG). A secondary goal of this project is to raise awareness of women in computer science. With my converter, I have taken images of influential women in computer science and created stylized versions of their images, which will be printed out as collection of posters. I have chosen important computer science women such as Grace Hopper and Lady Ada Lovelace because of their huge accomplishments. Lovelace serves as an inspiration to me because not only was she the first computer programmer, but she was a woman in the 1800s – a time when women were undervalued and a time when computer science had barely scratched the surface. Likewise, Grace Hopper invented one of the first compilers. Without important people like Lovelace and Hopper, my project would not work, let alone compile.

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# Ray tracing with Open MPI

Isaac Shore

High Point University

The basis for this project is to implement a ray tracing application to run on a cluster of machines using open MPI. The main focus of the project was to balance the two competing factors of photo realism and efficiency. We also consider how breaking apart the data and work across multi machines and processors can decrease computation time but also incur data passing overhead. Finally topics related to lighting surfaces, anti-aliasing, triangulating objects, and using KD trees to increase efficiency are investigated thoroughly.

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# Low Bandwidth Image Transfer with Client-Specific Dynamic Processing

Andrew Freeman and Brian Toone

Samford University

This paper outlines a new method for processing and transmitting images to a web client. It takes full advantage of the client device's display resolution without sacrificing significant bandwidth, by sending images that are cropped and scaled to match the client's view window. This is achieved by transmitting information on precise pixel coordinates in relation to the client display, without the need for hierarchical representation. The system stores decompressed image arrays in memory on the server for quick access and processing. When a request to the server is made, a copy of the full image array is cropped to the dimensions indicated by the client, scaled down to match the client's maximum display resolution, then stored as a compressed JPEG image file. This small file is delivered to the client, saving significant bandwidth by not sending the entire full-resolution image. Compared to traditional methods like pyramidal imaging or Microsoft's Deep Zoom format, this system allows for a far more accurate viewing experience without sacrificing bandwidth savings. There is a slight time delay for images to appear on the client, but said images have a perfect one-to-one correspondence to the pixels on the client display. The system relies on Node.js with Express.js on the server, and raw JavaScript on the client.

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# CodeBox64, A Tactile Input Approach to Scratch for Students with Visual Impairments

Zirui Wang and Amber Wagner

Birmingham-Southern College

Based on the data from College Board, over 44,000 students participated in the Advance Placement Computer Science Principles exam in 2017. Computer Science in K-12 is continuing to become more prevalent. In order to make computer programming more approachable, many teachers take the advantage of block languages. Blocks languages, such as Scratch, are comprised of blocks representing different syntax. Therefore, students can focus on simple programming concepts and logic instead of learning syntax and debugging. However, block languages are not accessible to students with visual impairments because of block-environments' high dependence on visual aspects. This research invented a peripheral device called CodeBox64 which can help students with visual impairments access Scratch by simply remembering six buttons and guided by auditory cues generated by the computer.

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# Towards a Collaborative Outreach Platform

Anisha Nizar Ali and Gabby Hoefler

Samford University

Volonte is an application developed to connect volunteers and non-profit organizations. After conducting user interviews, results indicate a desire in college students for community outreach involvement, but a lack of knowledge, available time or marketed opportunity. Volonte fills this gap by forming a bridge between non-profit companies and potential volunteers on a common platform. The progressive web application (PWA) narrows down potential volunteer to agency matches based on user-specified qualities such as age, gender, location, date, and interest, to provide accessibility to potential volunteers, and event promotion for non-profits. Volonte also integrates popular styles in order to appeal to the college student enjoyment allowing users to be fully immersed in the application experience.

In addition to connecting college students with volunteer agencies, Volonte acts as a tool to link non-profit agencies together. This enables and encourages multi-company collaboration on events, fundraising and coordination of volunteers. With Volonte, non-profit organizations can form a community of volunteers across agencies, laying the foundation for a variety of collaborative opportunities for outreach.

This project was originally developed for Crimson Hacks, a hackathon at the University of Alabama in April 2018. Volonte won Second Place overall at the hackathon, as well as Best Rookie Hack and Best Hack for Social Good. Future directions include the full development and application launch in winter 2019.

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# SAE Airplane Competition Project

Meredith Brown and Matthew Austin

University of Tennessee at Martin

The UT Martin SAE Aero Team participates in an annual competition that involves flying a student-built plane. One aspect of this competition is based on the accuracy of a package drop onto a target during flight. In recent years the UTM Aero Team has desired an automation system for the drop of this package and a GUI for activating this automated portion of flight. This year, their package will consist of three smaller “drone” planes. These three planes will each also need to be automated to fly to a designated GPS location to a successful and accurate landing.

Our primary goals throughout this semester (the first half of this project) will consist of automating the flight of a larger “mothership” plane, automating the flight of three smaller “drone” planes, and creating a GUI to gather and display telemetry data from each of these aircrafts. Smaller goals will consist of making an Arduino Mega and an Arduino Nano (Mega in the ground station and Nano on the drone planes) communicate with each other to transmit flight data, create a GUI that displays a flight path for the mothership and flight data for all aircrafts, create an automated package drop mechanism for releasing the drones, and automate the drones to fly to a GPS location and land safely. The second half of the project will run throughout Spring 2019, but our team will try to accomplish as many smaller goals as possible during the Fall 2018 semester.

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# A Topical Analysis of Content Curation on Front-Page Based Content Aggregate Sites

Landon Bentley

University of Alabama

In studies of online human-to-human interactions, it has been discovered that users typically behave according to the concept of positive herding, signifying that an individual is more likely to agree with the message of recommended content if it has already been well-received by others. As a result, many individuals are more likely to interact with content in contrast to their actual beliefs when doing so while online. This presentation introduces a study that examines the algorithms responsible for curating the content with which users interact. The purpose of this study was to determine whether inherent thematic bias is present in curation algorithms on content curation sites. This study implements a Long Short-Term Memory (LSTM) neural network developed using TensorFlow to classify online content based on its thematic elements. This model is additionally used to predict in real-time whether given content will be curated based on its thematic elements alone. This study was implemented using posts from the Reddit platform in order to analyze a robust set of interactions. Results from this study suggest that the curation algorithm on Reddit is highly dependent upon post content, indicating that certain topics are more likely to be positively engaged with by users. Consequently, this study implies that the curation algorithm does not offer users an unbiased representation of topics, but rather yields a set of common themes that are typically well-received.

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# All the King's Men (Video Game)

Steven Alford and Ruchik Patel

University of Tennessee at Martin

All the King's Men is a top-down 2D Action-RPG with a player leveling system, scaling combat, a multitude of enemies and environments, all culminating in the first boss fight of the game: The Keeper of the Archives. Players will play as an ousted king, fighting through hordes of enemies summoned by their traitorous council in an attempt to reclaim their throne before the kingdom is thrust into darkness.

Using Gamedev: Studio, we have carefully constructed the King's castle, populated it with enemies, and given the player a full-fledged leveling system that allows them to use the gold that they have gathered from their fallen adversaries to become more powerful. As the player explores the castle, the enemies will become more difficult, but the rewards will become greater. As a work in progress, the game will culminate in the first boss fight, the Keeper of the Archives. The player will need to rely on mechanical skill and use the knowledge of the enemies' abilities that came before the boss to defeat them.

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# Graph Based DoS Attack Detection

Peter Harlan

Western Kentucky University

A denial-of-service (DoS) attack is a malicious act with the goal of interrupting the access to a computer network. An example of a network layer DoS attack is flooding a computer network with bogus packets which causes a network congestion. For instance, a network layer DoS attack tries to overflow a server/network with messages that have invalid return addresses, causing the targeted computer network to expend resources trying to direct packets to the fabricated address. Since a DoS attack can cause serious repercussions, it is important to find the inception of the attack before actual damage has occurred. We hypothesize that a graph-based approach will allow us to identify the onset of the DoS attack because a graph data structure can provide a rich source of contextual information.

Generally, approaches that implement distribution charts based on statistical analysis or honeypots have been applied to detect a DoS attack. However, we propose that a graph-based approach will be a better method since this approach similarly reflects the structure of a computer network. Moreover, this method has the capability to provide contextual information that exists between series of relationships between multiple hosts. In detail, we propose that this concept can help identify the inception of a DoS attack by analyzing the anomalies relationships associated with the early stages of a DoS attack. The network traffic can be represented as a graph ( $G = (V, E)$ ) where  $G$  is the graph,  $V$  is the host on the network, and  $E$  is the relationship indicated by a transfer of data between the  $V$ . Normative patterns between the relationships between the host on the network such as  $V_a \rightarrow V_b \rightarrow V_c$  can be established and deviations from the normative patterns such as  $V_a \rightarrow V_c \rightarrow V_b$  will be flagged as anomalous.

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# EGGY: The egg-cellent home security system

Amie Newman and Jeremy Coleman

University of Tennessee at Martin

Surveillance and monitoring services have become very important for security purposes. Many schools, hospitals, banks, and other businesses use the most extensive surveillance systems out there, and that comes at a high cost. For our project, we are going to create our own budget friendly security system that gets the job done but at a fraction of the price. Our system uses a camera paired with motion detection software to scan a room for any abnormalities that might come across the camera's field of vision, triggering an alert to be sent to a given phone number. Through the use of an app, we are able to monitor everything in our house regardless of our location via video feeds or updated images.

We are using a Raspberry Pi B with a Pi cam as the main hardware for this project. For the software we are using OpenCV for the motion detection and tracking because OpenCV has a nice built-in vision software that will make this project more robust. The language we will be using is python because we are able to have easy connectivity with the database where we will be storing all the pictures or videos. From there we will be using XCODE for our IOS app. Paired with the app, we will be using twilio to send SMS alerts to the user when any abnormalities are detected in the images.

For additional hardware, we wanted to put our own twist on the appearance of the camera. The name of our project is called "Eggy", and with that being said we wanted to create a case that was shaped similar to the top half of an egg shell to protect the camera from any damage. The outer casing of the unit is created from a PET-G acrylic sheet .09 inches thick for durability. We will then heat mold and vacuum form the shape we need, after creating a wooden buck for the shape out of MDF board. To get the final shape, we used multiple shop tools such as a band saw, drill press, belt sander, hand held drill, and vacuum-form table.

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## Notes

Student Abstracts  
Graduate Degree Programs

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# Conversational Agent: Developing a model for intelligent agents with Transient Emotional States

Angie Dowdell

Columbus State University

The inclusion of human characteristics (i.e., emotions, personality) within an intelligent agent can often increase the effectiveness of information delivery and retrieval. Chatbots offer a plethora of benefits within an eclectic range of disciplines (e.g., education, medicine, clinical and mental health). Hence, chatbots offer an effective way to observe, assess, and evaluate human communication patterns. Current research aims to develop a computational model for conversational agents with an emotional component to be applied to the army leadership training program that will allow for the examination of interpersonal skills in future research. Overall, the current research explores the application of the deep learning algorithm to the development of a generalized framework that will be based upon modeling empathetic conversation between an intelligent conversational agent (chatbot/bot) and a human user in order to allow for higher level observation of interpersonal communication skills. Preliminary results demonstrate the promising potential of the seq2seq technique (e.g., through the use Dialog Flow Chatbot platform) when applied to emotion-oriented conversational tasks. However, this implementation may be extended by utilizing, a larger more high-quality dataset. Future implementations will expand the training dataset utilizing Cornell Movie Corpus and will improve training results through the application of transfer learning.

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# Merging College and Business with Natural Language

Daniel Rockwell

Columbus State University

The needs of businesses are changing every single year as well as the colleges preparing them for it. Many of these businesses are burdened with needing to train students for the job instead of them coming prepared. In fact, “Only 11 percent of business leaders strongly agreed that colleges are properly forming our nation’s workforce.”, which is an astounding number. When setting people up for the workplace it can be a challenge for colleges to truly know if they are doing the right thing. A project is being put together that will use job descriptions as well as syllabus from throughout the courses. With these two items it can tell you if a program is teaching the right skills needed for a job and which ones will benefit the most for it. Using Natural Language Tool Kit with python, tools it provides are used in order to extract text from syllabi and job descriptions. At Columbus State there are multiple different tracks of computer science that vary in different ways. Students come out having different skill sets that they may or may not need for the job they are going for based on their track. The product of comparing the syllabi and the job description will order the classes by relevance and decide how many of the skills that are covered by a class and by the course. Students, administrators, and job owners will be able to take advantage of this tool. With this tool courses can be modified or added in order to cover the areas that are needed for the workplace. Students will be able to take what skill sets they need for a particular job that they want to work for and use them in this application. It will let them know which courses teach the skills that they need for that job. This application aims to bridge the gap between the workplace and colleges so that instead of students needing to learn the job when they get there, they will be able to start up right away. Hopefully at that point students will feel better about having taken the time to go to his/her college.

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# Data Gathering in Multihop Cognitive Radio Ad Hoc and Sensor Networks

Kimberly Brown and Lixin Wang

Columbus State University

In cognitive radio ad hoc and sensor networks (CR-AHSNs), the specific channels available to each unlicensed, secondary user (SU) vary with time and location. In addition, network topology information is often not available to the SUs. These factors make the design of network protocols such as data gathering challenging. Due to the importance of the data gathering operation on CR-AHSNs, we propose a distributed, time-slotted, data gathering protocol for CR-AHSNs. In this protocol, each SU has little information about the network topology and no information about neighboring SU's channel availability. Channel selection is an important factor in the success of the data gathering operation. We present a channel selection algorithm that guarantees that matching channels are selected by SU pairs with a common channel and compare it to a random channel selection method.

The successful data gathering ratio is the probability that the designated sink SU receives the messages from all other SUs in the network. The successful data gathering ratio is affected by various factors, such as each SU's current channel availability and collisions between messages, and it is random. Currently, there is no solution to analyze this issue. Because the successful data gathering ratio is an important metric for evaluating channel selection algorithms, we propose a novel algorithm to calculate the successful data gathering ratio for multi-hop CR-AHSNs. The proposed algorithm is a generic methodology that can be applied to CR-AHSNs with any network topology.

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# Time and Cost Optimization of Scientific Workflows in Cloud for Big Data Science

Khem Poudel and Yi Gu

Middle Tennessee State University

Over the last few years, efficient scheduling and optimization of distributed scientific workflows for big data sciences have become a key concern in an on-demand cloud computing environment. In this work, we propose a multi-objective optimization-based scheduling algorithm that computes a time and cost-efficient mapping scheme between tasks and virtual machines to run the corresponding workflows. We implement and test our algorithm using WorkflowSim, which is an extension of the CloudSim that provides an efficient workflow management through an easy implementation of various scheduling and planning algorithms. We compare the performance of our algorithm with some existing heuristics and the results show that our approach provides cost-effective workflow scheduling capability of reducing workflow execution time and total cost of virtual machine instances.

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## INSuRE Projects: Tennessee Tech University Working with Government Agencies and National Labs

Will Johnson, Md. Ahsan Ayub and Rahat Masum  
Tennessee Tech University

The National Science Foundation supported InSuRE project is a partnership among several Centers of Academic Excellence in Information Assurance Research (CAE-R), Centers of Academic Excellence in Cyber Defense, the National Security Agency (NSA), the Department of Homeland Security and other federal agencies and national labs in order to design, develop and test research problems of national interests. These projects provide students with a rare glimpse at research work that is done outside of pure academia. Tennessee Tech University is one of a handful of universities that is participating in this initiative led by Purdue University. Students from Tennessee Tech University will be speaking on the specific INSuRE projects they are currently involved in. These projects include “Expansion of Cyber Attack Data from Unbalanced Datasets Using Generative Techniques”, “Network Covert Channel Analysis”, and “Proactive and Adaptive Cyber Security Defenses for Operational Technology.” The enabling technologies and methodologies for these projects run the gamut from emerging network system cryptography, to Neural Network generation of attack data, to Machine Learning classification of network traffic. Students working on these projects will provide unique insight into the benefits of working with government agencies, national labs, and other universities. The unique perspective that these students have gained from their respective projects will illuminate future areas of research, and lend credence to the prospect of research projects being shared across universities, agencies, and laboratories.

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# Latency, Cost and Energy-Efficient Workflow Scheduling in a Cloud Environment

Huda Alrammah and Yi Gu

Middle Tennessee State University

Cloud computing has become the most popular distributed computing paradigm among others which delivers salable services and resources for execution and optimization of scientific workflows. Workflow scheduling and optimization in cloud environments are one of the most challenging problems in which these scientific applications typically feature data- and network-intensive workflows comprised of computing tasks with intricate inter-task dependencies. Additionally, the large number of user requests and the limited cloud resources have posed a significant challenge on resource allocation, scheduling/mapping, power consumption, latency, monetary cost, and so on. Multi-objective Optimization Problems (MOP) along with the heterogeneity of cloud environments make resource utilization and workflow scheduling even more challenging.

In this work, we tackle a tri-objective optimization problem that reduces total execution time (makespan), monetary cost, and energy consumption for scheduling a large-scale scientific workflow in a heterogeneous cloud environment. We conduct an in-depth investigation into workflow execution dynamics, formulate mathematical models for the execution time, monetary cost, and energy consumption, and explore an efficient scheduling method for executing workflows on an appreciate set of cloud resources. The main contribution of our work is that we consider resource sharing for tasks execution which means independent tasks mapped on the same node may run simultaneously and share node resources. We also take into account the machine acquisition delay for a more accurate performance modeling.

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# The Future of the Internet After The Repeal of Net Neutrality

Paul Luft and Cedric Ashe

Columbus State University

In 2015, the FCC, under Title II of the Communications Act, put forth the concept of the open Internet. This means with open standards, transparency, and lack of censorship, the internet is easily accessed by individuals, companies, and organizations. Net neutrality sets the standards for the open internet. Net Neutrality policy standards evolve around issues concerning access to ISP services to be free from discrimination according to the source's destination, content, and application. Net neutrality prohibits the ISP providers from regulating the flow of internet traffic and allows consumers of the internet to have the right to access the internet free from discrimination according to source and destination. Legislation could not fully pass in the House of Representatives and an executive order was signed by President Obama in the hopes of giving easily accessible internet to everyone. No longer would there be internet speed slow-downs. All internet traffic would be treated the same. In December 2017, FCC commissioner Ajit Pai voted to partially repeal the open internet executive order. The repeal went into effect on April 23rd, 2018. Proponents of the repeal claim by regulating the internet it interferes with the free markets and advancements.

What does this mean for the future of the internet? Will internet costs increase? Will small businesses have to work harder to drive traffic to their websites? Will internet speeds be slower? What does this mean for cyber security and personal data protections?

The debate stems from different sectors: private, homeland security, public, health, etc. utilizing the internet services. It is important to evaluate the existing laws and policies regarding the governance, usage, and security of the Internet. The goal of our research is to analyze the existing laws and policies and determine how these will impact the future Internet users.

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## Professional Abstracts



# Garbage Collection Issues in Solid State Drive

Srinivasarao Krishnaprasad

Jacksonville State University

While the flash memory based Solid State Drive (SSD) has become ubiquitous in large, non-volatile storage, its operational characteristics with respect to write operations and lifetime limit on the erase operations requires additional measures to effectively utilize the device. SSD storage space is organized as an array of blocks where each block has several pages. The operational characteristics of the device dictate that the unit of read or write is a page, the write operation requires an erased page of a block and the unit of erase operation is an entire block. For this reason, an in-place write is never done to update a page. Instead, an out-of-place write is performed where the new page data is written to an erased page and the old page is marked as stale. After a series of data updates, this will result in blocks with several stale pages. Reclaiming these stale pages requires garbage collection techniques.

The out-of-place write is typically done using a single log-structure that uses a block called the Write Frontier (WF), a block that has only valid and erased pages. In due course, when the WF becomes full, a garbage collection process will create a new WF by choosing, among existing blocks, a suitable candidate: this requires copying valid pages of the candidate block to memory, erasing the candidate block and rewriting the valid pages back. Researchers have suggested different approaches to this garbage collection process, considering the effect they may have on performance and lifetime of the device. Some of these garbage collection algorithms include FIFO, Greedy, Windowed and d-choices approach. The algorithms have been augmented with a double log-structure that use two WFs, one for hot data and another for cold data, positively affecting the performance.

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# Robots, Emotional Intelligence, and Security?

Barry Bruster

Austin Peay University

This presentation addresses:

- 1) Emotional Intelligence (EI)
  - 2) the designs that enable robots to have EI
  - 3) the use of robots with EI
  - 4) robots with unlimited EI
  - 5) possibilities of limiting EI in robots
  - 6) determining security concerns to be controlled or eliminated.
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# Bring Your Own Device, Computer Usage Policies, and User Privacy

Charles Foltz and Laura Foltz

University of Tennessee at Martin

BYOD is a growing, ongoing trend. However, BYOD also presents risks to the organization; many organizations utilize usage policies and software to help limit these risks. Unfortunately many users do not read the usage policies or understand their risk in BYOD.

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# Developing Projects with Angular, Firebase and Google Maps

Bob Bradley

University of Tennessee at Martin

In this presentation, I will discuss some of the experiences I have had while developing software with Angular, Firebase and Google Maps. I will describe some of the projects I have developed using these systems including: CompileIt (an online IDE and learning management system that I use in my classes), the new Mid-Southeast ACM conference registration system, some learning apps and WhereAmI (a new system under development to assist visually impaired students on UTM's campus). I will discuss some of the advantages and pitfalls of each development system, and compare them with other products.

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## Applications of Blockchain to Education

Nabil Yousif, Masoud Naghedolfeizi and Xiangyn Zeng

Fort Valley State University

A blockchain is a decentralized and distributed digital ledger that records transactions across many computers/nodes that participating in a network. Transactions that are recorded cannot be modified retroactively without the modification of all succeeding blocks and the agreement of the network. Some elements/components of the Blockchain technology, such as open access, peer-to-peer networks, and immutability can be applied in improving the infrastructure of educational records, validating certificates and degrees, reducing administrative costs, and decentralizing access to education.

At the conclusion of the presentation the author would like to have a conversation and exchange of ideas with the participants regarding the ways that Blockchain subjects could be integrated into the university level computer science and information technology curricula.

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# Redesigning Software Engineering

Kathleen Ericson

University of Tennessee at Martin

Software engineering classes play an important role in helping students bridge the gap between smaller programming assignments and designing and developing larger scale projects. We recently redesigned the software engineering class at UT Martin, and have had successes in integrating real-world tasks and training into the course design. Both new graduates and their employers have cited it as a class that helps students enter and succeed at their new jobs. In this presentation I will be covering several the approaches used in this class to introduce topics such as the software development life cycle, agile approaches, source control, and good programming practices.

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# TAS: A Teaching Allocation System to Manage Teaching Resources in a University Computer Science Department

Leong Lee and Bruce Myers

Austin Peay State University

The Department of Computer Science and Information Technology (CSIT) at Austin Peay State University (APSU) is one of the largest computer science departments in Tennessee. Currently, it has over 600 students in all programs, around 6% of APSU's student population. It offers three Bachelor of Science Degrees which include eight concentrations, and five minors. It also has one Master of Science Degree with five concentrations, and one Professional Science Master's Degree with four concentrations.

More than 100 classes are offered every semester, taught by around 10 full-time faculty members, and around 15 adjunct faculty members. Due to historical reasons, the department has limited physical classrooms with different capacities. Around 35% of the department classes are online classes.

Although APSU provides different software systems for scheduling and student information management, it provides no software system for teaching allocation. Most department chairs use Excel spreadsheets to perform teaching allocation duties. Due to the size of the CSIT department and complexity of the teaching resources allocation duties, a web-based Teaching Allocation System (TAS) was developed. The TAS back-end's relational database model, which was designed by Dr. Bruce Myers, currently runs on a MySQL database engine. The front-end PHP web application, which runs on an Apache web server, was designed by Dr. Leong Lee.

Although the TAS is currently being used by a computer science department, it can be easily customized for other academic departments.

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# Clean Programming in Python

David Frazier

Tusculum University

Python continues to grow in popularity. With its use in a wide variety of fields, it is important to consider techniques to allow us to create code that functions properly, without side effects. My presentation will examine Python in light of using it to create clean, secure code. What does it mean for code to be clean? I will go beyond the commonly taught issues of input/output validation and proper use of encryption. Before any of that makes sense, we have to be able to ensure that our code does what we think it does. We need to learn to reason about the behavior that our code should exhibit, not just run random tests. One of the biggest hurdles to creating clean code is unchecked aliasing. I will explore how to limit this problem in Python. I will also look at other techniques from the formal verification community such as enhanced function contracts and loop invariants. Finally, I will discuss my experiences in integrating the concepts of reasoning and creating clean code into a first programming course in Python.

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# Bayesian Statistics, the Markov Chain Monte Carlo Algorithm, and Stan: An Introduction to Probabilistic Programming

Ken Adcock

UPS

This presentation involves a subject, which has become more prominent in the world of machine learning, AI, and data science. This subject provides an excellent case study on the convergence of statistics, computer science, and algorithms. The combination of these three elements provides an effective tool for quantifying uncertainty associated with real-world high-dimension problems.

Unless one specifically sought out a course in Bayesian statistics, they have likely proceeded in their academic and professional careers under the Frequentist or so-called “classical” tradition. The core premise is Bayesians and Frequentists view uncertainty differently. Frequentists view uncertainty as a measure of probabilities derived from relative frequencies via repeated sampling. To a Bayesian, uncertainty is all about belief – a belief informed by data and prior knowledge, but a belief nonetheless. This premise, along with mathematical and computational obstacles, resulted in Bayesian methods relegated to the fringes of statistical methods for many decades. This presentation will demonstrate how that has changed.

Through the use of the Monte Carlo algorithm commonly associated with simulation modeling, the Markov Chain construct, and the availability of desktop computing power, Bayesian inference, once regarded as too difficult and impractical, became practical. Consequently, the Markov Chain Monte Carlo algorithm brought Bayesian analysis out from a specialized niche to a mainstream tool. However, this advance had to be supported by programming languages flexible and efficient enough to tackle complex statistical problems. Therefore, we have the subject known as probabilistic programming.

Probabilistic programming involves domain-specific programming languages and frameworks designed to define probability models and return inferences. In other words, these languages are Computer Science solutions to the computational difficulties historically associated with Bayesian inference. The goal of this presentation is to provide an introduction for the Computer Science professional.

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## Adaptable skin disease classification

Deborah Mudali

University of Tennessee

The skin as a body organ harbors a lot of microorganisms which are of interest to study in order to diagnose a variety of diseases. Most diseases such as lupus, melanoma, measles, and others show their first symptoms in form of rashes or lesions on the skin. However, there could be rashes and or lesions for which the disease class or type is unknown. The proposed algorithm seeks to use deep learning to extract unknown features from a data set of skin images. These extracted features of the labeled and unlabeled skin image data are then used to train a learning vector quantization classifier to correctly classify disease types. The labels will include the known and unknown disease type. In the case for the unknown, the disease type will be labeled by the appropriate physician and then the new disease type features will be added to the feature data set. The classifier will be retrained to correctly classify the new identified disease type.

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# Procedurally Generating Flat Surfaces, Cuboids, and Spheres

Jeff Roach

East Tennessee State University

3D computer graphics courses include a need to draw simple 3D geometric shapes such as flat surfaces, cuboids, and spheres. These shapes are used to create simple representations of more complex objects, such as, the human body. Recent versions of OpenGL no longer generate these 3D geometric shapes for programmers, so programmers have to develop algorithms to generate them.

Several considerations are involved in generating 3D geometric shapes. Each shape is constructed from triangles. Each triangle is defined by specifying its vertices. Each vertex is defined by a number of distinct elements, including position, color, normal, and texture coordinates. The position is specified by a 3D vector relative to the shape's origin. The color is a 4D vector that specifies each vertex's red, green, blue, and alpha components. Normals are used, in part, to determine the lighting intensities on the triangles and are represented with 3D vectors perpendicular to the plane formed by the triangle. The texture coordinates are 2D vectors that specify the mapping of additional color data, such as, images, onto each triangle of the shape.

This talk will present three practical algorithms to procedurally generate triangle meshes for flat surfaces, cuboids, and spheres. The flat surface is defined in the XZ plane by specifying its width, depth, number of segments, and how to map the texture coordinates. The cuboid is defined to have six faces where each face is a flat surface. The sphere is defined with a radius, a number of horizontal stacks and vertical slices, and is generated using spherical coordinates. These algorithms are currently being used in the 3D Graphics Game Engine Development special topics course I'm teaching this semester.

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# Integration of Hardware/Software-based Hand-on Activities into Computer Organization

Sukjin Lee

Columbus State University

There are lots of contents delivered throughout the computer organization course, including Boolean algebra, logic gates, sequential logic, instruction set architecture, memory hierarchy, etc. however, there is very few chance for students to control/access physical devices or hardware combined with a programming language throughout the course. The book-and-lecture format may not be the best way to engage students in learning. This presentation introduces hardware/software-based hand-on activities for Computer Organization course. We designed a cost-effective laboratory setup and a set of hands-on exercises for the course using ARM-based single board computer, exemplified by Raspberry Pi. One of powerful features of the Raspberry Pi is the row of general-purpose input/output (GPIO) pins along the top edge of the board. This GPIOs can be used as the interface to integrate hardware and software for computer science education. This presentation introduce how to combine hardware components (e.g. logic gates, and combinational/sequential circuits) and python programs to develop hand-on activities for computer organization course.

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# HabPI: Sending Computers to the Edge of Space

Robert Lowe

Maryville College

STEM outreach is a field of growing importance, particularly among middle and high school educators. New outreach programs and projects are proposed each school year, with a wide array of topics being presented. This meant to be an intersectional project, which combines data gathering, mathematics, engineering, and computer science. The project is called HABPi (a combination of High Altitude Ballooning and Raspberry Pi).

A HabPI system consists of a payload which is constructed and programmed by grade school students and then is flown to the edge of space. Reaching altitudes of 35km – 45km, the payload will rise above 75% of Earth's atmosphere, and will be in near vacuum. Students must engineer an enclosure which is light enough to fly, yet able to protect the equipment inside. The raspberry pi computer, and all of the sensors wired to the computer, produce breathtaking photographs and plenty of data for the students to play with. Upon retrieval, they are able to examine the pictures, model weather patterns, and even study the various layers of the atmosphere. Best of all, it is relatively inexpensive to build, and all the software is open source!

This presentation will contain an overview of high altitude ballooning, as well as the status of the project. Several pilot flights have already been carried out, and future developments will include detailed curriculum guides and teacher training. The intended outcome is to develop several hands on technology workshops which will introduce students to STEM fields.

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# Enhancing Student learning Experiences in Computer Programming Classes using Robotics

Masoud Naghedolfeizi, Xiangyan Zeng and Nabil

Yousif

Fort Valley State University

College level computer programming is known to be challenging and difficult to learn, particularly for students with no prior knowledge of programming. Research has indicated that using application and reflection exercises could enhance student learning of the subjects particularly in computer programming. To this end, programmable robots could be utilized to supplement programming activities in these subjects. Since developing a computer program to instruct a robot provides an immediate feedback as whether the program has accomplished its job, it engages students in both learning and reflection processes.

In order to implement robotics activities in an introductory programming language course, robots should be ideally programmable in the same language used in the course and also affordable to purchase. Finch robot, designed by Carnegie Mellon University, is an ideal robot for computer science education since it is programmable in multiple programming languages (including Scratch, Java, C++, and Python) and affordable at a cost of \$99 per unit.

This paper presents the application of Finch robot in three computer programming classes at FVSU; namely, Computer Science and Information Systems: An Overview (CS0), Programming I (CS1), and Programming II (CS2). The language used to program Finch robot is Scratch for CS0 (where the emphasis is on designing computer algorithms) and Java for CS1 and CS2. In these classes, a Finch robot has been provided to every two students to collaboratively program the robot for a specific task. The programming problems considered for the Finch and the implementation methods will be presented in this work. It should be noted that this is still a work in progress and detailed analysis of these activities will be presented in a later article. Also, student feedback regarding the level of their interest in programming before and after robotics activities, the challenges of programming a robot, and their overall rating of the integration of robotics activities in programming classes will be surveyed at the conclusion of robotic activities in each class.

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# Creative Computing in Computer Science 1

Hillary Fleenor

Columbus State University

Employers are increasingly listing a need for college graduates to be able to solve real world problems that do not have one correct solution. In computer science degree programs, this is typically addressed in upper division courses with projects that do not have a standardized outcome. For example, in our games track, students design and create their own 2D and 3D games in the upper division games programming courses. Each student or group of students will have completely different code and games. However, lower division courses, where students are just learning how to program, tend to give assignments that have a single or very standardized output. For example, a past assignment in our introductory programming (CS 1) course required students to track a random path as well as whether or not the path crossed a certain area. Although the code could vary slightly, the outcome of the program would be the same for all students successfully completing the assignment. This jump from highly structured assignments in lower division courses to assignments with significantly less structure in upper division courses can be stressful for students. This presentation discusses the author's use of creative computing assignments in a CS 1 course to give students early experience with ambiguity in problem solving while still providing guidance and structure to support learning fundamental programming concepts. Assignments that include creating art, animation, music, and data visualization will be discussed along with lessons learned.

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## Peer Reviewed Abstracts



# Classifying Basketball Players by Hall of Fame Merit

Trupesh Patel, Andrew Schatz and Chengcui Zhang

The University of Alabama at Birmingham

Throughout basketball history there have been some truly exceptional players in the National Basketball Association (NBA) and American Basketball Association (ABA). These players are rewarded with the honor of being inducted into the Hall of Fame. However, there is not an exact science as to how voters for the Hall of Fame vote on which players are most deserving. This often leads to many players being unfairly excluded despite having truly exceptional statistics. In this paper, we analyze every professional basketball player in NBA&ABA history and try to decide whether they deserve to be in the Hall of Fame based on analyzing the players that are currently in the Hall of Fame. Our intent is to apply data mining and machine learning techniques to provide more solid ground and advanced analytics for the voting committee when they vote for deserving players.

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# An Exploratory IoT Testbed for Cyber-Physical Systems Security Research

Gustavo Angeles, Terry Guo and Ambareen Siraj

Tennessee Tech University

The industry is moving towards a connected environment using Internet of Things (IoT). Proliferation of interconnection technology has led to increase of security concerns. It is necessary to critically manage security concerns in an industrial environment where each device on the network is crucial in supporting continuity of operation. Intrusion Detection System (IDS)s are essential to detect security compromises in a timely manner. To be effective, IDSs must be trained, tuned and tested properly, which needs suitable test data and environment. In this work, we have developed a testbed that can be used to generate intrusion data that can be used to evaluate IDS performance. We mimic a working industrial environment that uses ZigBee protocol for communication, and the test data we generate captures environment specific normal and abnormal conditions of network traffic undergoing various attacks.

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# Smart Weather Forecasting Using Machine Learning: A Case Study in Tennessee

A H M Jakaria, Md Mosharaf Hossain and Mohammad  
Ashiqur Rahman  
Tennessee Tech University

Traditionally, weather predictions are performed with the help of large complex models of physics, which utilize different atmospheric conditions over a long period of time. These conditions are often unstable because of perturbations of the weather system, causing the models to provide inaccurate forecasts. The models are generally run on hundreds of nodes in a large High-Performance Computing (HPC) environment which consumes a large amount of energy. In this paper, we present a weather prediction technique that utilizes historical data from multiple weather stations to train simple machine learning models, which can provide usable forecasts about certain weather conditions for the near future within a very short period of time. The models can be run on much less resource intensive environments. The evaluation results show that the accuracy of the models is good enough to be used alongside the current state-of-the-art techniques. Furthermore, we show that it is beneficial to leverage the weather station data from multiple neighboring areas over the data of only the area for which weather forecasting is being performed.

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# Teaching Computer Ethics through Debate

Max Li

Union University

Ethical issues are controversial in nature. Modern and contemporary issues in computer ethics are no exceptions. Arguments and persuasion are good ways to analyze ethical dilemmas and to draw conclusions that skeptical, yet reasonable audience members can agree with. This paper presents the experiences and insights gained through author's teaching of computer ethics for more than 10 years. First, similarities and differences between debate and other participatory teaching methods are presented. Second, the unique debating format is described so that interested readers can try out the ideas in their own courses. Finally, three sample debate issues are presented so that readers can understand actions taken by different actors in the actual debating sessions.

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# Using a Windows MFT to locate stolen files on a USB drive

Mike Lehrfeld

East Tennessee State University

The ability for an organization to locate stolen information on company computers or removable media is imperative to good forensics practices. Acquiring the digital evidence of a crime that has been committed provides the necessary legal framework for potential prosecution, or at a minimum, termination with cause. A file system's Master File Table (MFT) is a diary of files that have existed on source media. An MFT combined with USB registry forensics provides a detailed storyline of activity on a suspect machine. An investigator can use this information to determine what USB device was used to store the confidential files. This article provides some mechanisms for applying these types of tools within an organization with minimal cost or computer expertise.

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# Enhancements to PeayNotes: Extending the Generic Web-based Patient Clinical Notes Sharing System

James Church, Tabitha Lee and Bettina Shank

Austin Peay State University

In our original paper, we detailed our new system called “PeayNotes” [1]. PeayNotes is a generic patient clinical note sharing system for healthcare professionals that is powered by a WordPress CMS. Our goal in creating PeayNotes was to make a user-friendly system that allowed non-tech savvy professionals to enter patient details using a tablet. PeayNotes is currently in the testing phase by the Austin Peay State University School of Nursing. Their feedback contributed to the enhancements that we describe in this paper.

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# Risk Assessment of Type 2 Diabetes Based on Life Style and Socioeconomics

Xiangdong An, Joshua Guerin and Kate Ericson

University of Tennessee at Martin

Different from type 1 diabetes resulting from the body's failure to produce enough insulin, type 2 diabetes occurs when the body cannot properly use insulin. The cause of type 1 diabetes is not well known, but the cause of type 2 diabetes is generally related with one's life style such as excessive body weight and insufficient exercise. Socioeconomic factors such as low income and less social support and connectedness are also known to have an effect on diabetes. In the literature, few models assess the risk of diabetes without using medical lab test results such as FPG, serum insulin level, and triglyceride level. In this paper, we propose a Bayesian network model to assess the risk of diabetes solely based on one's life style and socioeconomic status. This would make it easy and cheap for governments to monitor and manage diabetes through health surveys. The proposed method models' causal dependencies instead of correlations among variables using a Bayesian network. Experiments on a large healthcare dataset show that the proposed causal modeling method significantly outperforms the baseline naive Bayesian network models in estimation accuracy. The proposed model has the advantage of causal interpretability.

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## Poster Abstracts



# Blockchain and Cryptocurrency

Kenneth Romines

Tusculum University

In physical currency there is immediate verification when it is handed over, but with cryptocurrency if the verification process is missing it can lead to double spending. Blockchain is the confirmation mechanism that cryptocurrencies use in their verification process. It is a shared public ledger of transactions that can be inspected by anyone but is not controlled by a single user. A continuously increasing list of transaction data records is maintained, which is kept secure from tampering or revision cryptographically. The ledger is made using a linked list, or also referred to as a chain of blocks, where each block contains transactions that have been validated by the network in a certain timespan. The ledger operates on a peer to peer network of computers, and secure peer to peer transactions are made through use of both a public key and private key that are used together in an algorithm for authentication. The keys share a connection through a mathematical relationship. The public key is given out to act as an address to receive messages from other users. The private key is used to digitally sign messages that are sent to other users and should be kept secret.

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# Building a Virtual Reality Headset

Ryan Felton

High Point University

Virtual Reality is a rapidly growing industry, with constantly evolving technologies. In order to better understand how this technology works, we created our own virtual reality headset from low cost consumer available parts. The headset uses a computer for rendering and sensors mounted on the device for orientation tracking. Over the course of 8 weeks we assembled the device and programmed a simple VR application that interfaces with our headset. I'll be discussing the challenges encountered, lessons learned, and problems solved over the course of creating the device.

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## Conference at a Glance



	Azalea	Dogwood I
7:30 AM	<b>Morning Coffee–Poolside</b>	
8:00 AM	<b>Welcome and Keynote Address</b>	
9:00 AM	<b>Coffee Break–Poolside</b>	
	<b>Session I– Panel Discussion</b>	<b>Session I–</b>
9:15 AM	M. Grantz, J. Brown, & et al	
9:35 AM		
9:55 AM		
10:15 AM		
	<b>Session II– Undergraduate</b>	<b>Session II– Undergraduate</b>
	Chair: Deborah Mudali	Chair: Glenn Wiggins
10:40 AM	D. Medina & C. Dong	K. Smith
11:00 AM	A. McNair	J. Miller
11:20 AM	I. Shore	H. Welch
11:40 AM	A. Freeman	R. Diaz
12:00 PM	<b>Lunch–Patio Restaurant</b>	
	<b>Session III– Undergraduate</b>	<b>Session III– Posters</b>
	Chair: <i>Hillary Fleenor</i>	
1:00 PM	Z. Wang & A. Wagner	K. Romines R. Felton
1:20 PM	A. Ali & G. Hoefler	
1:40 PM	M. Austin	
2:00 PM	L. Bentley	
2:20 PM	<b>Break–Poolside</b>	
	<b>Session IV– Undergraduate</b>	<b>Session IV– Professional Peer Review</b>
	Chair: Mellissa Wiggins	Chair: David Frazier
2:35 PM	T. Woods	M. Li
2:55 PM	C. Ryan	M. Lehrfeld
3:15 PM	A. Chisolm et Al	J. Church et al
3:35 PM		X. An et al
4:30 PM	<b>Business Meeting–Highlander I</b>	
7:00 PM	<b>Awards Banquet–Azalea</b>	

	<b>Dogwood II</b>	<b>Highlander I</b>	<b>Highlander II</b>
<b>7:30 AM</b>	<b>Morning Coffee–Poolside</b>		
<b>8:00 AM</b>	<b>Welcome and Keynote Address</b>		
<b>9:00 AM</b>	<b>Coffee Break–Poolside</b>		
	<b>Session I -</b>	<b>Session I– Professional</b>	<b>Session I– Professional</b>
		Chair: Haifei Li	Chair: Leong Lee
<b>9:15 AM</b>		S. Krishnaprasad	N. Yousif et al
<b>9:35 AM</b>		B. Bruster	K. Ericson
<b>9:55 AM</b>		C. Foltz	L. Lee
<b>10:15 AM</b>		B. Bradley	
	<b>Session II– Graduate</b>	<b>Session II– Professional</b>	<b>Session II– Professional</b>
	Chair: Nicholson	Chair: James Church	Chair: Robert Lowe
<b>10:40 AM</b>	A. Ayub & R. Masum	D. Frazier	S. Lee
<b>11:00 AM</b>	H. Alrammah & Y. Gu	K. Adcock	R. Lowe
<b>11:20 AM</b>	P. Luft & C. Ashe	D. Mudali	X. Zeng & N. Yousif
<b>11:40 AM</b>		J. Roach	H. Fleenor
<b>12:00 PM</b>	<b>Lunch–Patio Restaurant</b>		
	<b>Session III– Undergraduate</b>	<b>Session III–</b>	<b>Session III– Peer Graduate</b>
	Chair: Xiangdong An		Chair: Suk Lee
<b>1:00 PM</b>	S. Alford		T. Patel & C. Zhang
<b>1:20 PM</b>	R. Patel		G. Angeles et al
<b>1:40 PM</b>	A. Newman		A. Jakaria et al
<b>2:00 PM</b>			
<b>2:20 PM</b>	<b>Break–Poolside</b>		
	<b>Session IV – Graduate</b>	<b>Session IV–</b>	<b>Session IV–</b>
	Chair: Brian Toone		
<b>2:35 PM</b>	A. Dowdell		
<b>2:55 PM</b>	D. Rockwell		
<b>3:15 PM</b>	K. Brown & L. Wang		
<b>3:35 PM</b>	K. Poudel & Y. Gu		
<b>4:30 PM</b>	<b>Business Meeting–Highlander I</b>		
<b>7:00 PM</b>	<b>Awards Banquet–Azalea</b>		

## Glenstone Floor Plan



