

Fall Conference Proceedings

Mid-Southeast Chapter



of the ACM

Gatlinburg, Tennessee
Nov. 9-10, 2017

Mid-Southeast Chapter



of the ACM

For information on the 2018 Fall Conference, select
the conference link from the official chapter website:
www.acmmidsoutheast.org

**A special “thank you” goes to Cengage Learning for
lending financial support to this year’s conference.**

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Message from the Chapter Chair

Welcome to the 59th annual Fall Conference of the Mid-Southeast Chapter of the Association for Computing Machinery. As many of us packed up and headed out of Gatlinburg after the 58th annual fall conference, we left with grand memories of a wonderful conference; great talks, good networking, and new friendships. Unfortunately, during our time here last year the skies were constantly filled with fire smoke, a grim reminder of the terrible on-going 2016 drought. Thus, it was not shocking that many of us sat and watched two weeks later as the internet was filled with horrific stories of the wildfires that started in the National Forest and quickly surrounded Gatlinburg. According to the Wikipedia article on the Gatlinburg fires there were at least 14 lives lost and another 134 injured with over 2000 buildings damaged and/or destroyed. Over 10,000 acres burned in the national park and another 6,000 in areas around Gatlinburg. As you move around the Gatlinburg area this weekend please remember that there are many local people trying to get their feet back on the ground. We are so glad that many structures like the Glenstone Lodge survived and we can gather once again to share our research and friendships at this year's conference.

Let's think for minute that this is the 59th annual fall conference as this conference dates back to 1958. Imagine for just a moment all the different talks that have been presented over the years. So many different technologies and so many different ideas have been introduced and then studied at a wide variety of schools throughout the Southeast. It would be wonderful if we had an archive of all the presentations through the years and maybe it is time to see if we can start to gather programs from the different years and see how far back we can go. What a legacy this conference most likely is leaving, yet so much of its history is being lost.

Today we get to hear from many people who are going to be presenting new ideas and none of us know if there might be a talk given today that will be the spark to launch an innovation that will change the way people, businesses, and countries go about their daily lives. This conference might not be like many of the larger ACM conferences, but it certainly can be just as impactful on the lives of those who attend. This conference has always been one of the few that allows such great opportunities for undergraduates, graduates, and professionals to share ideas and mix with each other in such an unimposing way. I have always enjoyed this conference as a place to bring our students to hear what it means to do "research" and hopefully stir ideas in their own heads to desire to begin a path of their own that might lead them to develop some new technology.

Please know that all participants can help to make this conference better year to year. It was only a few years ago that we introduced posters and last year we introduced peer reviewed papers. Both changes to the conference came from people making recommendations at the chapter business meeting. The meeting will be taking place right after all presentations are done on Friday in Highlander I and all attendees are welcome to attend and help shape this chapter and the conference.

As the chapter chair I do want to thank Robert Lowe and Bob Bradley for the incredible amount of work they have done putting this conference together. I also want to thank the many volunteers who have stepped up to answer the call to be judges and session chairs and keep today's presentations moving along. It is never the work of one, but the work of many who make a conference like this so good.

I hope that all attendees will enjoy the hard work of all the presenters and that many great discussions will take place and many new friendships will be established in this short time we are together. Please enjoy the conference today and the banquet tonight and please get out into the Gatlinburg area and let the local people know you are so glad they are coming back just as strong as they were before the fires of last year. We look forward to seeing you next year as we celebrate our 60th annual conference.

Greg Kawell – Samford University

ACM Mid-Southeast Chapter Officers

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Greg Kawell
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Student Paper Competition Judges

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Brian Toone, *Samford University*

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Radhouane Chouchane, *Columbus State University*

Joseph V. Elarde, *Austin Peay State University*

Charlie Hicks

James J. Johnson, *Bethel Univ*

Shamim Khan, *Columbus State University*

Srinivasarao Krishnaprasad, *Jacksonville State University*

Aurelia D. Smith, *Columbus State University*

Glenn Wiggins, *Mississippi College*

Melissa Wiggins, *Mississippi College*

Xiangyan Zeng, *Fort Valley State University*

Graduate

Jerrel R Ballard, *US Army ERDC*

Angie Dowdell, *Columbus State University*

Rania Hodhod, *Columbus State University*

Brian Toone, *Samford University*

Conference Session Chairs

Azalea

- Session I: Jerrel R Ballard - *US Army ERDC*
Session II: Glenn Wiggins - *Mississippi College*
Session III: Denise Williams - *University of Tennessee Martin*
Session IV: Gene Bailey - *East Tennessee State University*

Dogwood I

- Session I: Brian Toone - *Samford University*
Session II: Melissa Wiggins - *Mississippi College*
Session III:
Session IV: Bruce Myers - *Austin Peay State University*

Dogwood II

- Session I: Rania Hodhod - *Columbus State University*
Session II:
Session III: Posters
Session IV: Posters

Highlander I

- Session I: Randy Smith - *University of Alabama*
Session II: Shamim Khan - *Columbus State University*
Session III: Kathleen Ericson - *University of Tennessee Martin*
Session IV: Radhouane Chouchane - *Columbus State University*

Highlander II

- Session I: Lee Wittenberg - *Maryville College*
Session II: Ken Adcock - *Cleveland State Community College*
Session III: Craig Tanis - *University of Tennessee Chattanooga*
Session IV:
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Notes



ACM Mid-Southeast Chapter
2017 Fall Conference
Gatlinburg, Tennessee
Glenstone Lodge

Conference Program

Thursday, November 9, 2017

- 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 10, 2017

- 7:30 – 9:00 a.m. **Registration**
- 7:30 – 8:00 a.m. **Morning Coffee Sponsored by
Cengage Learning**
- 8:00 – 8:10 a.m. **Welcome/Announcements — Azalea**
- Welcome**
 Chapter Chair
- Conference Announcements**
 Conference Chair
- Program Announcements**
 Program Chair
- 8:10 – 9:00 a.m. **Keynote Address**
- 9:00 – 9:15 a.m. **Coffee Break Sponsored by Cengage Learning**
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Session I:**Azalea:****9:15 – 10:35 a.m.****Undergraduate 4 Year Degree Presentations**Session Chair: *Jerrel R Ballard*

9:15 – 9:35

Detecting Abdominal Aortic Aneurysms in the Clinical Narrative- Sam Renshouse - Columbus State University

9:35 – 9:55

A Homogeneity-based Region Growing Algorithm for Organ Segmentation in CT Images- Alysia Irwin, Chunhua Dong and Xiangyan Zeng - Fort Valley State University

9:55 – 10:15

A Survey of Bioinformatics Utilities with an Emphasis on Parallelization - Chandler Staggs - Western Kentucky University

10:15 –10:35

A novel Segmentation Strategy for CT Image Sequences using Support Vector Machines - Dequan Medina, Chunhua Dong and Xiangyan Zeng - Fort Valley State University**Dogwood I:****Undergraduate 4 Year Degree Presentations**Session Chair: *Brian Toone*

9:15 – 9:35

Pop-up Java: Using an Augmented Reality Mobile Game to Teach the Java Programming Language - Richard Myers - Columbus State University

9:35 – 9:55

FractionChef: Developing the Mathematical and Algorithmic Thinking Skills in Children using Augmented Reality Serious Games - Kristen Wright - Columbus State University

9:55 – 10:15

Unseen: A Step-Platformer Utilizing Echolocation- Devon Gaston- University of Tennessee at Martin

10:15 –10:35

Fall Fighter- Garrett Walker and Matt McAlster - University of Tennessee at Martin

Dogwood II:**Undergraduate 4yr Presentations**Session Chair: *Rania Hodbod*

9:15 – 9:35

CSU STARS Corps & ACM MidSE as Partners to Broaden Participation in Computing - Hilary Hok, Lisa Roy and Radhouane Chouchane - Columbus State University

9:35 – 9:55

Taking a Steppe towards optimizing Note-Taking Software by creation of a Note Classification Algorithm - Daniela Zieba and Wren Jenkins - Western Kentucky University

9:55 – 10:15

PiHome Automation- Ibrahem Alahdal and Nisha Patel - University of Tennessee at Martin**Highlander I:****Professional Presentations**Session Chair: *Randy Smith*

9:15 – 9:35

Elixir: Concurrency for Modern Applications - Charlie Hicks

9:35 – 9:55

Wear Leveling Techniques in Flash Memory Storage - Srinivasarao Krishnaprasad - Jacksonville State University

9:55 – 10:15

Ethical Machines: A Search for What it Means for Machines to be Ethical - David Frazier - Tusculum College

10:15 –10:35

Observations Regarding Search Engine and Social Media Intercommunications and Resultant Implications for Privacy and Security - Joe Elarde and Barry Bruster - Austin Peay State University

Highlander II: Professional PresentationsSession Chair: *Lee Wittenberg*

- 9:15 – 9:35 *Automating Reporting for Student Learning Outcomes for Consistency and Ease of Use* - Ashley Kilburn, Brandon Kilburn and Denise Williams - University of Tennessee at Martin
- 9:35 – 9:55 *Bringing Python to High School - The Tusculum Python TEAM Project* - Patricia Hunsader and David Frazier - Tusculum College
- 9:55 – 10:15 *Enhancing Computer Science Program through Revising Curriculum, Peer Mentoring/Tutoring, and Engaging Students in Undergraduate Research* - Masoud Naghedolfeizi and Xiangyan Zeng - Fort Valley State University
- 10:15 –10:35 *Co-Teaching an Interdisciplinary Cryptography Class: The Math / CS Perspective* - James A. Jerkins and Lee Raney - University of North Alabama
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Notes

Session II: 10:40 – 12:00 p.m.**Azalea: Undergraduate 4 Year Degree Presentations**Session Chair: *Glenn Wiggins*

- 10:40 – 11:00 *Using Python and TensorFlow for Face Detection - Michael Timbes and James Church - Austin Peay State University*
- 11:00 – 11:20 *Implementing Belief Propagation On a GPU Using Mercator Framework - Jeremy Buhler, Stephen Cole, Edgar Flores and Theron Howe - Washington University in St. Louis*
- 11:20 – 11:40 *Cloud Music - Robert Rayburn, Stephen Stinson and Kathleen Ericson - University of Tennessee at Martin*
- 11:20 – 11:40 *Expansion of an Intelligent Control System for an HO Scale Train: Multiple Load/Unload Locations with Turnouts - Cody Martin - University of South Alabama*

Dogwood I: Undergraduate 4 Year Degree PresentationsSession Chair: *Melissa Wiggins*

- 10:40 – 11:00 *Pi Maze - John Buckley and Charles Clayton - University of Tennessee at Martin*
- 11:00 – 11:20 *Multiplayer Concurrence - Ricky Hempel and Cody Robertson - University of Tennessee at Martin*
- 11:20 – 11:40 *CodeCloud: Software-as-a-Service Environment for Computer Science Education - Daniel Salami, Darshan Patel and Micheal Galloway - Western Kentucky University*
- 11:40 – 12:00 *Virtual Lab - Designing a Remote Application SaaS Cloud - Trevor Brown and Jeffrey Galloway - Western Kentucky University*
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Highlander I: Professional PresentationsSession Chair: *Shamim Khan*

- 10:40 – 11:00 *Android Logic Bombs: State of the Threat* - Radhouane Chouchane - Columbus State University
- 11:00 – 11:20 *Cloud Security: A HiSPO Approach* - Paul Wang and Amjad Ali - Columbus State University
- 11:20 – 11:40 *Intention to Secure Internet of Things Devices* - Charles Foltz - University of Tennessee at Martin

Highlander II: Professional PresentationsSession Chair: *Ken Adcock*

- 10:40 – 11:00 *Ledgard: A Target Language for Compiler Projects* - Lee Wittenberg - Maryville College
- 11:00 – 11:20 *Using Outmoded Systems to Teach Architecture* - Robert Lowe - Maryville College
- 11:20 – 11:40 *The Use of Version Control in CS2* - Michael Orsega and Lewis Baumstark - The University of West Georgia
- 11:40 – 12:00 *Video Game Development at UT Chattanooga* - Craig Tanis - University of Tennessee at Chattanooga

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

Session III **1:00 – 2:20 p.m.****Azalea:** **Graduate Degree Presentations**Session Chair: *Denise Williams*

1:00 - 1:20 *Towards Defensible Evaluation of Offensive Cyber Security Assessment* - Jacob Oakley - Towson University

1:20 - 1:40 *An Evaluation of Attacks on the Machine Learning Policy of a Robotic System* - George Clark - University of South Alabama

1:40 - 2:20 *Does Legislation Requiring Backdoor Decryption Eliminate Expected Rights of Privacy?* - Daniel Smith - East Tennessee State University

Dogwood I:**Dogwood II:** **Posters**

1:00 - 2:20 *Umbrellables: Inspiring Women to Explore STEM through Wearable Technology* - Kristen Wright - Columbus State University

CompuTrain: A Computational Thinking Educational Game - Valencia Coleman - Columbus State University

Dynamic Load Balancing using Live Virtual Machine Migration - Manh Do and Michael Galloway - Western Kentucky University

Highlander I: Peer Reviewed PresentationsSession Chair: *Kathleen Ericson*

- 1:00 - 1:20 *Grade-up: New Progress and Work Load Visualizations in Moodle* - Scot Anderson - Southern Adventist University
- 1:20 - 1:40 *NFC Unlock: Secure Two-Factor Computer Authentication Using NFC* - Walter Hufstetler, Maria Hito Ramos and Shuangbao Wang - Valdosta State University
- 1:40 - 2:00 *mStroke: HIPAA Compliant Data Solution For a Smart Mobile Health Application* - Hector Suarez, Austin Harris, Zhen Hu and Mina Sartipi - University of Tennessee at Chattanooga
- 2:00 – 2:20 *The Efficacy of Sentiment Analysis for Author Attribution* - Michael Schneider and Jay Jarman - East Tennessee State University

Highlander II: Professional PresentationsSession Chair: *Craig Tanis*

- 1:00 - 1:20 *CodeFolio - Online Compiler and Learning Management System* - Bob Bradley - University of Tennessee at Martin
- 1:20 - 1:40 *From Rural Appalachia to Washington DC: Feeding the Pipeline of our Nation's Cyber Defenders* - Ambareen Siraj, Eric Brown and Joseph Cross - Tennessee Tech
- 1:40 - 2:00 *An interdisciplinary approach to a computer science / STEM camp robot lesson* - Cynthia Stenger, Jessica Stovall, James Jerkins and Mark Terwilliger - University of North Alabama
- 2:00 - 2:20 *Exploring the Relationship between Planning and Problem Solving with CS1 Students* - Mark Terwilliger and Janet Truitt Jenkins - University of North Alabama

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

Session IV**2:35 – 3:55 p.m.****Azalea:****Undergraduate 4 Year Degree Presentations**Session Chair: *Gene Bailey*

2:35 - 2:55

Automotive App Examination - Mason Mesler, Brad Glisson, George Grispos and David Bourrie- University of South Alabama

2:55 - 3:15

University of Tennessee at Martin Weather.App - Michael Singleton and Zachary Van Lancker - University of Tennessee at Martin

3:15 - 3:35

Discovery Park of America Companion App - Tyler Matthews, Robert Rayburn, Stephen Stinson and Paul Gosser - University of Tennessee at Martin

3:35 – 3:55

Hospital Companion App- Annabelle Cormia and Tyler Archer - University of Tennessee at Martin**Dogwood I:****Undergraduate 4 Year Degree Presentations**Session Chair: *Bruce Myers*

2:35 - 2:55

Using Self-Organizing Maps for Computer Network Intrusion Detection - Manuel Parrachavez- Columbus State University

2:55 - 3:15

Propane King of the Hill (Propane KotH): Training Students in Computer Security Using Competitive Software Platforms - Casey Erdmann - Columbus State University

3:15 - 3:35

Host Based Intrusion Detection - Implementing Windows Event Viewer Logs as a Sensor for Host Based Intrusion Detection - Christopher Sanchez and Radhouane Chouchane- Columbus State University

Dogwood II: Posters

2:35 - 3:55

Expanding the Accessibility of Conventional Smart Home Systems - Chisom Ogbonnaya - Western Kentucky University

Integrating Traffic Incident Management Interfaces - Christopher Kawell, Celia Loya, Katherine Atwell, Jamiahus Walton, Quinn Monaghan, Hesham Hassan, Lakshay Ahuja, Anuj Sharma and Stephen Gilbert - Iowa State University

ConceptNet Explorer: An Easier Way to Use ConceptNet - Loran Shaver - Columbus State University

Highlander I: Peer Reviewed Presentations

Session Chair: *Radhouane Chouchane*

2:35 - 2:55

Segmentation of Unorganized Point Cloud Data - James Church - Austin Peay State University

2:55 - 3:15

ERP in the Cloud: Opportunities Beyond On-Premise ERP - Stephen Hendrix - East Tennessee State University

3:15 - 3:35

Demonstrating Parallel Architectures Using the Raspberry Pi - David Tarnoff - East Tennessee State University

3:35 - 3:55

See-Through Technology Using V2X Communication - Rebekah Thompson, Zhen Hu, Jin Cho, Jose Stovall, Austin Harris and Mina Sartipi - University of Tennessee at Chattanooga

Highlander II:

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

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

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

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

Notes



Keynote Address

Abstract

Anthony Skjellum, PhD, Director

Professor of Computer Science and Chair of Excellence

Director - SimCenter

University of Tennessee at Chattanooga

SimCenter: UTCs Innovation Hub and Research Incubator for 21st Century Challenges in Modeling, Simulation, and Data Science

Abstract

In this keynote, I describe a bit of the history of SimCenter at UTC, its evolution, and its on-going renaissance. SimCenter is UTC's premier research center, focusing on modeling and simulation, big data, and engaging R&D in a total of "five swim lanes" or focus areas, namely Defense/Aerospace, Manufacturing, Smart Cities/Urban Studies, Health & Biosystems, and Energy & Environment. An emerging 6th swim lane, Cyber and Cyberphysical systems, complements these. Underlying are technical strengths of the faculty in High Performance Computing, Data Science, Modeling and Simulation, and Networking (Wired and Wireless), Cyber, and Power Systems, among others. Interdisciplinary and multidisciplinary collaboration are at the heart of many of the most successful endeavors at UTC, and SimCenter is often the go-to incubator at UTC where these activities and programs can flourish.

In addition to funding peer-reviewed seed projects in Modeling and Simulation areas through its THEC-funded Center of Excellence in Applied Science and Engineering (CEACSE), SimCenter comprises UTC's core facility for scientific computing, and data science. I describe aspects of both of these roles of growing the research base and enabling faculty and their students to compete on the national stage in their respective areas of interests and strengths.

Affiliated professors and their students and postdocs tackle cutting-edge problems from across the spectrum of the SimCenter swim lanes. How the center enables these researchers to advance, and how it plans to engage our vibrant Chattanooga community with pre-competitive technologies and

solutions are also mentioned in this talk. I also describe how on-going cooperation on Smart Cities initiatives is leading to deployed testbeds and torrents of data that will be transferred, stored, analyzed, and acted on by SimCenter computing infrastructure running next-generation data-science and machine-learning algorithms. These efforts will help enable the Chattanooga community and UTC research partners continue their collaborative advances as a 21st Century smart, safe, innovative community.

About the Speaker

Dr. Anthony (Tony) Skjellum received his BS, MS, and PhD Degrees from Caltech. His PhD work emphasized portable, parallel algorithms and software for simulation, with a specific emphasis on message-passing systems. After graduating in 1990, he worked at the Department of Energy Lawrence Livermore National Laboratory (LLNL) for 2.5 years as a computer scientist emphasizing performance-portable message passing and portable parallel math libraries. From 1993-2003, he was on faculty at Mississippi State University, where he and his students co-developed MPICH with Argonne National Laboratory, the first implementation of the now-pervasive Message Passing Interface (MPI-1) standard. Skjellum was a leading participant in MPI-1 and MPI-2 standards as well, with specific contributions to the concepts of "groups contexts, and communi-cators," which stemmed from his PhD research. His work on MPI has made broad impact on all High Performance Computing (HPC) worldwide through the MPICH implementation and further R&D on MPI over the past 25 years.

From 2003-2013, he was professor and chair at the university of Alabama at Birmingham (UAB), Dept. of Computer and Information Sciences, where he continued work on high performance computing and cyber. During his tenure at UAB, he co-founded the university-wide center – Center for Information Assurance and Joint Forensic Sciences (CIA-JFR), together with Justice Science and Business leaders. This highly funded center was able to attract world-class cyber-security and forensics researchers, and spin-off a startup company, Malcovery, which was later acquired by PhishMe and still has a growing presence in Birmingham as of Fall 2017. In July 2014, he was appointed the Lead Cyber Scientist for Auburn University and Cyber Center director. He led the R&D in HPC and cyber at Auburn University in the college of engineering for just over three years prior to joining the University of Tennessee at Chattanooga in August, 2017 as a Professor of Computer Science, Chair of Excellence, and as the new SimCenter Director.

Skjellum's current research group is a split between cyber/Internet of Things, and High Performance Computing and Exascale Storage. FA-MPI is Skjellum's second implementation of a resilient MPI; he and students and his company, MPI Software Technology, previously designed and published MPI/FT, a fault-aware MPI based on MPI/Pro, a commercial MPI licensed from the mid-1990's through mid-2000's. He has current funding from DOE/NNSA and NSF. He is a senior member of ACM and IEEE, and Associate Member of the American Academy of Forensic Science (AAFS), Digital & Multimedia Sciences Division. Skjellum remains active in the MPI Forum (in multiple working groups), and is the former chair of the Object Management Group (OMG) High Performance Embedded Working Group as well, in which he remains actively involved as a standards designer and standardizer for high performance embedded signal and image processing libraries and related application programmer interfaces.

Student Abstracts
Undergraduate Four-Year Programs

Detecting Abdominal Aortic Aneurysms in the Clinical Narrative

Sam Rensenhouse

Columbus State University

Complications relating to abdominal aortic aneurysms (AAA) are a leading cause of death in the Western world and are responsible for substantial healthcare and societal costs. Since AAA is a degenerate disease, tracking patients with this condition is vital, however, there is still an absence of programs that do this manual work. This project seeks to fill that void by creating an algorithm for processing radiology reports and detecting if the report contains any positive indication that the patient has an AAA by utilizing both natural language processing (NLP) and machine learning (ML) in order to help find cases where an AAA was detected at some point, but never followed up on.

A Homogeneity-based Region Growing Algorithm for Organ Segmentation in CT Imagestle

Alysia Irwin, Chunhua Dong and Xiangyan Zeng

Fort Valley State University

Region growing (RG) is a region-based image segmentation algorithm. This approach is an efficient way to segment the organs in a Computed Tomography (CT) image. However, the RG algorithm requires the user to provide an initial seed pixel and a suitable threshold value for the region membership criterion. Meanwhile, boundaries of segmentation results are not smooth due to the pixel-wise growing strategy. In this study, we propose an adaptive threshold setting mechanism (AdaptRG) for organ segmentation. In addition, a confidence map is used to confine the growing within a relatively homogenous area and prevent from crossing boundaries. A smaller confidence value of a pixel indicates a greater possibility that the pixel is on a boundary. Firstly, a thresholding range is calculated from a small number of user-defined seeds. Then, the AdaptRG algorithm examines the neighborhoods of pixels currently in the region. The neighboring pixels that have intensities within the thresholding range and confidence values greater than a predefined parameter are added to the growing region. This process is iterated in the same manner for the whole image until no other pixels satisfy the growing condition. The threshold value is adaptively adjusted according to the pixels in the growing region. We applied our AdaptRG algorithm to segment a liver from an abdominal CT scan. The experimental results show an accurate image of the segmented liver. This method can also be applied to segment other organs such as the kidneys, spleen, or heart.

A Survey of Bioinformatics Utilities with an Emphasis on Parallelization

Chandler Staggs

Western Kentucky University

With the explosion of Bioinformatics tools in the recent years due to improved computational resources and a greater need for algorithmic approaches to large scale problems that only computers can handle, there are many tools available out there but little analysis on the collective community of these tools. This field represents an intersection of both Computer Science and Biology and given a void of available research on these tools there is a need to create a rigorous survey to compare the available sequencing and pipeline utilities. Sadly, these tools may not be implemented the most efficiently: many tools are still written to only utilize a single thread. Given the long run times and redundant data in this field it lends itself to multithreading. This survey will be examining these tools with an analysis of its purpose, usability, compatibility, and performance with the intent to determine whether these tools are capable of being augmented with a multithreaded architecture.

A Novel Segmentation Strategy for CT Image Sequences using Support Vector Machines

Dequan Medina, Chunhua Dong and Xangyan Zeng

Fort Valley State University

Segmentation of organs in medical images plays a significant role in identifying abnormalities. The quality of the extracted organs from CT images is very important in computer-aided diagnosis. The learning-based organ segmentation can be viewed as a classification problem that aims to differentiate target objects from other tissues. In this study, we propose a novel segmentation method which utilizes the similarities of intensity distribution, shape and location between nearby slices as a priori knowledge to guide the segmentation of a volume of image sequence, where the classification is performed using Support Vector Machines (SVM).

As the first step of our strategy, we manually drew the region of interest from the first CT slice image and selected training data for SVM training. To enhance the contrast of the CT image, we extract statistical, a priori intensity information from the training data and model the object intensity distributions using a Gaussian function. After the pre-processing of applying the Gaussian function to the image pixels, we obtain the organ segmentation result of the first slice using SVM.

Due to the similarities of organ shape and location between adjacent slices, the segmentation result of the first CT slice in the volume can be used as a priori knowledge of the organ in the adjacent slice. According to this a priori knowledge, the background and object training data of the adjacent slice can be automatically obtained by enlarging and shrinking the identified boundary in the first slice. Following a similar pre-processing method, we use this training data for the SVM learning process and finally classify the organ from other tissues in this adjacent slice. This process can be repeated over the image sequence using the new segmentation results as a priori knowledge for the next slice. As demonstrated by experiments of extracting the liver from the CT images, this method yields accurate segmentation results.

Pop-up Java: Using an Augmented Reality Mobile Game to Teach the Java Programming Language

Richard Myers

Columbus State University

Video games provide immersive environments that can be incredibly engaging. For this reason video games have been considered in education resulting in what is known as educational games, which focus on teaching a certain topic, concept or skill. New technologies like augmented reality - a technology that superimposes an image on a user's view of the real world to provide a composite view- allows the learner to interact with the games in a more tangible and personalized way. This research project aims to use the Unity Game Engine and Vuforia to develop an educational game to teach the Java programming language. The educational game has a story to immerse the player and a user interface that allows the player to use Java features, and commonly used Java libraries to write Java code within the game itself. The game introduces the player with challenges that require the use of real-world Java programming skills while playing the game to control different aspects of the game, and solve the challenges. The challenges in the game are puzzles that necessitate the use of different programming concepts like classes, objects, methods and inheritance. The game can be played on mobile devices; using the camera of the mobile device it is installed on, the game will be rendered on an “augmented reality marker” in the real world, which allows the player to physically move the puzzles to gain further insight into the challenges. These spatial reasoning challenges give the player a more tangible environment in which to learn these programming concepts, and allow them to more easily identify bugs in their code as they see it execute within the game, line by line, in real time (To our knowledge no other existing augmented reality educational game exhibits this feature). Targeted platforms are Android and iOS.

FractionChef: Developing the Mathematical and Algorithmic Thinking Skills in Children using Augmented Reality Serious Games

Kristen Wright

Columbus State University

Despite the rapid growth of job availability and demand in STEM fields, including the increasing pressure on secondary education to perform higher in Science, Technology, Engineering and Math, students continue to struggle in algorithmic-based, mathematical subjects. This presentation introduces FractionChef, an in-development adaptive augmented reality educational game, that addresses the call for step wise algorithmic thinking and mathematical visualization in children between the ages of 8 to 11. The game prompts children to follow a stepwise “recipe” and use the correct combinations of tools and fractional ingredients to create the correct results. The game monitors the child’s gameplay style and provides hints and prompts based on their ideal learning style, targeting the direct instruction needed for cognitive apprenticeship learners and the indirect suggestions needed for guided discovery learners. To engage and fascinate children we use an adaptive augmented environment generated using the camera on any Android devices. We are examining the impact of the game under two separate user interfaces optimized for different sizes of Android device, including performance changes in visualization of fractions and following directions before playing the game and after.

Unseen: A Step-Platformer Utilizing Echolocation

Devon Gaston

University of Tennessee at Martin

The project in question will be a step-platformer where the player must use echolocation to navigate the environment around them. All objects hit with the sonar from the character will light up around the edges and slowly fade over time, meaning the player must be cautious and plan ahead as they navigate past threats including natural hazards like unstable cliff sides and roaming enemies, the latter of which may track the player based on the amount of noise they make. The project is planned to reach the full basic prototype phase by the time of presentation (i.e., you can move, jump, and use echolocation to reveal the environment to find an exit while navigating past hazards including pits and enemies), but given time may include more refined mechanical details such as climbing and falling damage along with basic animations and properly designed sprites.

The game will be created using Gamemaker Studio 2 with all code written in the GML language. Some visual and audio assets may be constructed from associates with more experience in creating these respective elements, but all other work will be coded by me. The game, when officially completed, will be available for Windows, Mac, and Linux through Steam and a future hosted site that will be created later in development, presumably when there is enough content to release a demo for the game.

Fall Fighter

Garrett Walker and Matt McAlster

University of Tennessee at Martin

Fall fighter is a game that we are developing using the YoYoGames Game Maker Studio game engine. It utilizes a real-world physics engine to allow players to jump, fall, aim, etc to complete different tasks at particular points in the games lineage of gameplay. Such tasks may be collecting valuables or power-ups and interacting with enemies and level bosses.

Fall Fighter is a single player 2D platformer. The motivation for playing is to reach new depths, to upgrade your player's abilities and strength, and to battle and defeat level bosses. But there is a catch! Once you have jumped in, there is no getting out. You can only keep going until you reach the end. Each level is spawned dynamically, so there is never a dull moment. So take a leap of faith!

The game is designed to work on PC, Mac, and Linux. It is currently only being developed for English-speaking players, and has mild cartoon violence. At least 1GB of ram is recommended, and most modern architectures will be able to run the game without hiccups. In this presentation, we will demonstrate our game and we will discuss the development processes that we used to create it.

CSU STARS Corps & ACM MidSE as Partners to Broaden Participation in Computing

Hilary Hok, Lisa Roy and Radhouane Chouchane

Columbus State University

The STARS program, which is in league with the Columbus State University's Computer Science (CS) department, is continuing its efforts of partnering with the ACM MidSE conference attendees to reach students that are considered a minority within the field of computer science.

The STARS members have helped the CS department by inspiring students of different race, gender, ethnicity, and career status to consider a major in the CS field. The students within the CS department and STARS have accomplished several goals this year that will aid in the advancement of diversity. We increased diversity among chapter members by recruiting and retaining under-represented students in computing programs. We have collaborated with other organizations such as Florida State, the ACM, and Google which resulted in students awarded over \$6,000 in grants. These additional partnerships funds allowed for increased engagement with such schools as Rothschild Middle School, Carver High, and Clubview Elementary.

Our challenges for 2018 include expanding expand our collaboration with FSU, strengthening our ability to hold conferences like the Women's Leadership Conference, Women in Computing Week, and SIMS Fest. Our goals are to develop hard and soft skills for our members, which builds our partnership with ACM and BBS to host more field trips such as the Fort Benning Simulation Center.

Out of STARS efforts, the benefits are to improve retention, progress, and graduation rates of minorities in computing. Broad participation in computing increases the chances of a department securing internships, grants, and community support. We institutionalized ourselves to become a stand-alone organization. Our presentation will reach out to other universities, mentor them, and provide them some guidelines on how they can achieve their goals of creating a STARS program and self-funding.

Taking a Steppe towards optimizing Note-Taking Software by creation of a Note Classification Algorithm

Daniela Zieba and Wren Jenkins

Western Kentucky University

Note-taking software often far surpasses its paper-and-pencil counterpart when measured in metrics such as availability and reliability. However, there is ample opportunity relating to the analysis and organization of notes. ShovelWare is a project initially designed for an ongoing field research project analyzing the Bronze and Iron Ages of Mongolia. Accessible through a web interface and cross-platform mobile application, it is a replacement for pencil-and-paper data collection and error-ridden input into digital spreadsheets. This presentation describes the overall ShovelWare project architecture and proposes a machine learning algorithm that classifies notes using a variety of metrics, sorting them into graph structures to provide initial insights into the similarity of field notes. As a result, ShovelWare will allow archaeologists to more quickly and cleanly view and share their data. The algorithm, as well as the note-taking structure, are planned with hopes of scalability and applicability into more disciplines.

Data management features include importation and exportation of existing Microsoft Excel spreadsheets. This enables ShovelWare to blend together data from previous field seasons and provide backups of data. Deploying ShovelWare on smart tablets allows for use of features such as automatic collection of metadata in the form of GPS coordinates and timestamps; additionally, it allows for access to a camera, microphone, and further features such as computational power and barometric sensors.

Although ShovelWare emphasizes archaeology, the project structures can be used in any discipline. The mobile applications are designed for use in remote places with no internet connectivity, so databases between multiple tablets attempt to locally synchronize before synchronizing with the entire project post-field season. Data storage and project service hosting is accomplished through the use of various AWS services. Along with making internal data sharing amongst a project easier, ShovelWare allows archaeologists to share their findings with the larger archaeological community.

PiHome Automation

Ibrahim Alahdal and Nisha Patel

University of Tennessee at Martin

PiHome Automation is a smart home monitoring project that we are developing. It consists of a couple of Raspberry Pi's running some open source and custom software to monitor your house using video cameras and sensors. Using the cameras and door and motion sensors the system notifies the user via text messages and/or email when someone is intruding.

The system also allows for live streaming from a web page and includes a doorbell feature. The doorbell feature includes user interface, proximity lights, and a buttonless doorbell that allows guests to record and email a video when no one is home.

In this presentation, we will demonstrate this system and discuss the development processes we used to create it.

Using Python and TensorFlow for Face Detection

Michael Timbes and James Church

Austin Peay State University

Face detection within images by means of machine vision algorithms and methods is well understood and these methods are applied throughout the tech industry. This paper takes the problem of face detection and explores a solution based on machine learning using a logistic regression model written in Python and powered by Google's machine learning software library, Tensor-Flow. Implementation of this solution produces accurate results and proves to be a simple, yet powerful approach to solving the problem of face detection within images.

Implementing Belief Propagation On a GPU Using Mercator Framework

Jeremy Buhler, Stephen Cole, Edgar Flores and Theron
Howe

Washington University in St. Louis

The research lays a ground work to apply an irregular application of Loopy Belief Propagation (LBP) on general graphs using the Mercator Framework by first implementing a regular application of LBP on a CPU to solve for stereo vision, and finally, porting the regular application of LBP to an NVIDIA GPU using the Mercator framework. The Mercator framework is a data streaming framework designed to make GPU programming more feasible, and, handles the organization of NVIDIA GPU computations.

Cloud Music

Robert Rayburn, Stephen Stinson and Kathleen Ericson

University of Tennessee at Martin

The Cloud Music project explores distributed and parallel approaches to music generation using the Magenta framework. Magenta is an open source project started by Google that can be used to create and train models, which are then used to generate music. Initially, Magenta consisted of several models designed to generate single-note melodies. Our goal is to use these melody models to generate multiple melodies in parallel, then blend them together to create more complex music. Our experiments focus on comparing a purely sequential approach and a distributed approach using the Hadoop Streaming Framework. In each approach, we generate the same sets of melodies, then combine them together for more complex music.

Expansion of an Intelligent Control System for an HO Scale Train: Multiple Load/Unload Locations with Turnouts

Cody Martin

University of South Alabama

Prior undergraduate research projects were performed to create an intelligent control system for an HO scale model train using the LEGO NXT platform. That set up used a single grabbing arm to load and unload a car on the train at a specific location. Various locations were identified using the ultra-sonic sonar sensors in the standard NXT kit. In addition to the robotic grabber, a simple “hand” was used to turn the speed control knob on the voltage regulator. The current project being developed will consider the addition of a second grabbing arm to load and unload at a second location. This will also be done in coordination with the train traveling through or avoiding a turnout track section as part of the route. An additional NXT program brick will be used to control this second grabbing arm and communicate with the other bricks used by the previous project. Tests were carried out with both grabbers. This caused a myriad of errors. While debugging the system it was discovered that input/output exceptions were occurring and the system was stuck in a constant loop. Additional tests using only the second grabber were performed. The system began functioning properly indicating that the code and sensors were behaving correctly. Further research then showed that the addition of multiple NXT control units via Bluetooth increases latency dramatically, causing repeated IO exceptions between the master NXT and slave NXTs. Moving forward, another module will be added converting control from the NXT system to a computer via USB or Bluetooth. As any new modules are developed in the future not only will communication issues be addressed but overall system performance will be maintained facilitating ease of debugging, composability and scalability.

Pi Maze

John Buckley and Charles Clayton

University of Tennessee at Martin

In this project we built a Pi-robot to compare maze-solving algorithms. In addition to comparing the results we gathered from the robot, we implemented the same algorithms on a virtual robot. We used the data we collected to compare the paths the physical and virtual robots took to solve the mazes presented to them. Using this data we will try to determine if one of our algorithms is objectively better than the others for physical or virtual robots.

Multiplayer Concurrency

Ricky Hempel and Cody Robertson

University of Tennessee at Martin

As networked mobile devices are becoming more numerous, so are games and applications that utilize network communication features. When a game is given multiplayer capabilities over a network, many challenges can arise when maintaining a common state for all connected players. Currently, there are two main methods of organizing a common state: peer-to-peer connections and client-server connections. In reality, most applications feature a hybrid of the two methods. In this project, we analyze the processes and challenges associated with creating a game that features networked multiplayer over peer-to-peer and client/server connection types. We will demonstrate a game we created, with single and multiplayer sessions, compare the implementation of both peer-to-peer connections against client-server connections, and discuss how development of each section of the game compares to the other.

CodeCloud: Software-as-a-Service Environment for Computer Science Education

Daniel Salami, Darshan Patel and Micheal Galloway
Western Kentucky University

Computer Science is one of the fastest growing research fields with over 60% of universities doubling enrollment in this field since 2009. To accommodate this growth, we present CodeCloud, a web-based Integrated Development Environment (IDE). The primary purpose of CodeCloud is to make programming appear less intimidating for early computer science students. Traditionally, new CS students must install one or more IDEs before development can begin. This can be cumbersome and may lead some to consider other degree fields. CodeCloud attempts to alleviate some of these issues by providing a pre-configured software development environment accessible through any modern web browser.

Virtual Lab - Designing a Remote Application SaaS Cloud

Trevor Brown and Jeffrey Galloway

Western Kentucky University

Since the 1990s, the idea of providing applications over the Internet has been explored many times. The software solutions to this idea have varied, from remote access protocols (SSH, VNC, RDP) to web applications. Each solution has provided advantages and disadvantages. Remote access protocols typically provide full access to physical machines, so individuals can perform their work and research activities. However, this arrangement requires a physical computer allocated to a particular user, or set of users. Web applications provide a method of access that does not require dedicated physical machines to particular users. However, this type of software sometimes lacks some of the functionality that full-fledged desktop applications provide.

I propose a project where a Software-as-a-Service cloud is constructed, which provides users with remote access to applications. The primary application of this project, named Virtual Lab, is to provide desktop-grade applications to students, faculty, and staff at educational institutions. These users would use Virtual Lab for the purposes of study, research, and work. The physical machines traditionally dedicated to a user or group of users will be replaced with Virtual Machines (VMs), running on a cluster of servers. A web interface with a web-based VNC or RDP-enabled client will be provided to the end user. In turn, the user can access fully functional desktop applications within their Internet browsers. The VMs will primarily run Linux-based operating systems, but will support Microsoft Windows, in case institutions that implement Virtual Lab have Windows licenses available. Virtual Lab strives to achieve a middle ground, by providing the convenience of a web interface, along with the power of desktop applications. Additionally, Virtual Lab strives to amplify these improvements, by providing the power of cloud computing on the backend.

Automotive App Examination

Mason Mesler, Brad Glisson, George Grispos and
David Bourrie

University of South Alabama

Academicians and practitioners are increasingly becoming concerned with the security of automotive mobile applications. Recent reports indicate that residual data is resident on mobile devices and that smartphones can act as a proxy to other environments such as the cloud. Moreover, reports indicate that residual data is resident in automobiles and that this data is vulnerable to cyber attacks. However, there has been minimal research investigating artifacts specifically associated with automobiles using mobile devices as a proxy. Previous mobile device research has identified residual data artifacts as data that is comprised of information that could pertain to an individual's personal or device data such as contacts, text messages, GPS data, emails, and passwords. The residual data on mobile device apps could expose a user's personal activities. This research implements a controlled experiment to extract residual data artifacts created from fifteen (15) automotive Android apps. Functionality of these apps may include features such as roadside assistance, service reminders, vehicle navigation, and remote start. The data capture protocol for this experiment utilized XRY's logical extraction capabilities. Preliminary results indicate that nine (9) out of the fifteen (15) apps have residual data present after download and installation, opening the app, and account creation. Residual data resident on the mobile devices includes metadata information extracted from SQLite databases and XML files. This research contributes to the documentation and evidentiary discussion of Android artifacts created from specific automotive smartphone apps. This proof of concept research demonstrates that automotive apps generate residual data and warrants further research into automobile security.

University of Tennessee at Martin WeatherApp

Michael Singleton and Zachary Van Lancker

University of Tennessee at Martin

The University of Tennessee at Martin's weather station is overdue for a new user experience. With a complete redesign of backend logic, coupled with a responsive front-end that is cross-platform, mobile compatible, the UTM weather station will have a modern approach to modeling and displaying sensor data to the user in a logical, meaningful way by utilizing technologies such as xamarin.forms portable class libraries, C#, syncfusion, inVision, and auth0 single sign on.

In this presentation, we will demonstrate the app we have developed, and will discuss many of the development technologies and processes we used.

Discovery Park of America Companion App

Tyler Matthews, Robert Rayburn, Stephen Stinson and
Paul Gosser

University of Tennessee at Martin

This project is in cooperation with Discovery Park of America (DPA) in Union City, TN. The goal of this project is to create a mobile application that will enhance the experience of the patrons, not replace it. To elaborate, we do not want an app that potential visitors can download and read about all there is at DPA, but rather make their visit more immersive and entertaining by providing interactive features they can use while exploring the museum.

To accomplish this, we want to create a network of beacons within the exhibits that will communicate with the downloaded application and do a variety of things. For example, for exhibits with video footage included in the display, when patrons near the location of that exhibit the app will detect the beacon and recognize where in the museum the patron is. It can then immediately notify the patron to what displays are around them and provide additional documentation on the video they are watching if they so wish to learn more about it. Patrons will be able to find their favorite historical topics with ease, learn as much about them as they want, and this is only the beginning.

We plan to add other features as well, including a live map overlay that allows patrons to know where in the park they currently are. There will also be a link that leads directly to the website to purchase tickets. The list goes on as more features are to come as we develop and polish the application.

Hospital Companion App

Annabelle Cormia and Tyler Archer

University of Tennessee at Martin

Hospital Companion is a comprehensive mobile application that we are developing. It is designed to accompany sick children during their hospital stays. Staying in a hospital can often be an unsettling and foreign experience for a child, so Hospital Companion provides a solution. The app will provide four main features: an interactive learning area, a calendar, a question pad and an interactive story. Using this application, children can interactively learn about commonly used equipment in hospitals, and even equipment that may be used to treat their specific illness. Reminders and events may be added to the child's calendar, such as doctor and nurse check-ins, medication distribution, extended family visits, events happening in the hospital, and other reminders. The child will then be able to view their calendar and receive notifications when a doctor or nurse visits or another event is coming up so that there are no surprises. Another feature includes a question notepad where the child or parent can enter questions for each doctor and then record the doctor's answer. There is also an interactive story told from a patient's perspective that the child can read or be read.

Using Self-organizing Maps for Computer Network Intrusion Detection

Manuel Parrachavez
Columbus State University

Intrusion detection using artificial neural networks is a novel way of combating the ever present concern of computer network security for many companies, governments, and other entities around the world. Anomaly detection is a form of intrusion detection technique that is based off of data collected on normal user actions on a network system, building a profile of appropriate behavior, and notifying the proper personnel when abnormal actions occur on the said network. Artificial neural networks are able to excel in this type of environment because of the classification nature of anomaly detection. After being trained on data that was collected over a certain time, which is generally the most expensive and difficult part of a neural network based anomaly detection system, the trained neural network will be set on monitoring a computer network for misuse or irregularity in activity, thus classifying the traffic behavior as normal or abnormal. This allows for adaptability to new and different attacks if they do not fit the normal activity pattern of an organization's computer network.

There are many types of artificial neural networks: multi-layer feed forward network, recurrent networks, support vector machines, and others. For our study, we propose to implement our own self-organizing map (SOM), which we found to not be as heavily researched as the others neural network models. Using the KDD Cup 99 dataset, we will compare our own SOM implementation against other neural network implementations and determine the effectiveness of such an approach.

Propane King of the Hill (Propane KotH): Training Students in Computer Security Using Competitive Software Platforms

Casey Erdmann

Columbus State University

Capture the Flag (CTF) competitions are a common way for people in information security to prove their skills. These competitions consist of computer security puzzles. When these puzzles are solved, a key or “flag” is generated that awards points to the competitor that solved it. With companies like Facebook and Google now holding their very own CTFs, competitions dealing with computer security have become a focus in testing the skill of students and industry professionals alike. Universities like Columbus State University and the University of Central Florida even have student organizations that are using CTFs to teach and train students various concepts and skills related to computer security.

CTFs are not only type of competition however. Propane is a new take on a different type of competition called King of the Hill (KotH). KotH requires competitors break into and secure machines using offensive and defensive computer security skills to keep control of it for as long as possible. Propane is being used to allow members of Black Box Society, a computer security club at Columbus State University, to train their skills in ways the standard CTF does not allow.

Propane provides an answer to a very specific problem. How can a competition have practical, real-world application? Propane can be used as a tool to train students, teachers, and even professionals in a way that practically applies the skills they have learned. While it is still in its early stages, Propane has already proven to be effective, and adaptable to many practical needs. Whether it is running a competition for a University, or training members of an organization, I want to demonstrate how Propane is a solution for it all.

Host Based Intrusion Detection - Implementing Windows Event Viewer Logs as a Sensor for Host Based Intrusion Detection

Christopher Sanchez and Radhouane Chouchane

Columbus State University

Host based intrusion detection systems (HIDS) utilize a large variety of sensors such as log monitoring, file integrity verification, and registry checking to detect attacks. According to Netmarketshare over 90% of desktop PCs run Windows operating systems. All Windows operating systems from NT forward record various events that occur within the environment. These events range from account creation to application updates. Any number of events can be a potential sign of an intruder. For example, an event that indicates a registry modification could be an attempt by a penetrator to escalate privileges within a processes. Additionally, data retrieved from Event Viewer can be populated to establish a baseline for user activity. Should anomalies occur, such as login attempts after business hours, they too could be an indicator of an intrusion.

We propose that additional research be conducted to conclude the viability of developing a host based intrusion detection system utilizing Windows' event logs as a sensor. As proof of concept we will implement a Windows 10 HIDS in the Java Programming language. Additionally, white and black listing events will help parse events for to increased efficiency. This HIDS has been partially implemented and is showing promising results. By the end of this project we anticipate this software will detect several key events as well as trigger alerts of a potential intrusion.

Notes

Student Abstracts
Graduate Degree Programs

Towards Defensible Evaluation of Offensive Cyber Security Assessment

Jacob Oakley
Towson University

Discerning a measurable metric for the success of a particular security process or technique is extremely difficult to represent in a defensible manner acceptable in academia. This is likely one of the largest factors keeping offensive cyber security implementations from seeing widespread academic efforts at improvement. The greatest challenge towards evaluating a such a paradigm is the human factor. Offensive security assessments are conducted by human ethical hackers against networks configured, used and maintained by other humans. Further complicating matters, these networks may at the same time of assessment be the target of a separate group of humans performing malicious attacks in earnest against the host organization. Offensive security assessment such as red team engagements or penetration tests rely heavily on the skill and tradecraft of ethical hackers. This places such assessments largely in the realm of art rather than science. Validation of any new process or methodology in offensive security assessment must address the confounding variables of such an evaluation. The skill of assessors, administrators and security personnel involved must remain consistent and defensible. The effects of external malicious hackers must be mitigated or accounted for. Lastly, the influence of human users must be mitigated or accounted for. This presentation will outline a novel method for determining the success or failure of offensive security assessment processes. Showing success or failure of such techniques will require an ability to ascertain uniqueness and effectiveness of resultant findings and recommendations respectively. Both these attributes will be obtained defensibly only after mitigating confounding variables involved in offensive security assessment. This will be done using real security professionals as actors and auditors in a closed environment to conduct realistic experimentation in lieu of less defensible case study.

An Evaluation of Attacks on the Machine Learning Policy of a Robotic System

George Clark

University of South Alabama

In recent years, the field of robotics has matured using artificial intelligence and machine learning such that intelligent robots are being developed in the form of autonomous vehicles. The anticipated widespread use of these intelligent robots and their potential to do harm has raised interest in their security. This research evaluates cyberattacks on the machine learning policy of an autonomous vehicle by designing and attacking an intelligent robotic vehicle operating in a dynamic environment.

The primary contribution is an initial assessment of three forms of attacks on a robotic vehicle using the Q learning algorithm for real-time routing control. The research demonstrates a direct method of attack in the form of a traditional logic corruption attack where an adversary modifies machine learning data. Additionally, the research demonstrates an indirect attack via location sensor driver firmware that distorts the input data used by the robot's machine learning algorithm. Lastly, an indirect adversarial data attack is demonstrated such that it requires no modifications to the robotic vehicle.

A secondary contribution of the research is to highlight the effectiveness of these attacks along with relevant artifact issues. All three forms of attack were deemed successful and resulted in a manipulation of the robotic vehicle's path. The logic corruption attack and the adversarial data attack both produced artifacts in the form of residual data that might lead to the detection of an attack. The location sensor firmware driver attack resulted in no residual data for detection of an attack.

In future work, we will make use of an onboard camera for object detection and employ simulation to fully map a complete street grid. Additional research will also investigate other advanced machine learning algorithms to learn their security vulnerabilities and mechanisms for detection in a real-time dynamic environment.

Does Legislation Requiring Backdoor Decryption Eliminate Expected Rights of Privacy?

Daniel Smith

East Tennessee State University

A December 2, 2015 terrorist attack in San Bernardino, CA generated an unexpected debate over the right of private individuals to use strong encryption to protect information. Following the attack, the California Assembly introduced a bill on January 20, 2016 that would impose civil penalties upon manufacturers and operating system providers whose smartphone could not be decrypted. Other states have proposed legislation that would inhibit one's ability to protect their smartphone by using encryption methods. However, there are three current statutes commonly used to decide cases involving conflicts between individual privacy and law enforcement's right to investigate crime. The three statutes are the U.S. Constitution's Fourth and Fifth Amendments and the Communications Assistance for Law Enforcement Act. The courts have upheld the Fourth Amendment in regards to the need for a warrant for searching smartphones. Courts have differed on whether the Fifth Amendment protects individuals from having to divulge their passwords to the authorities. In the last example, Apple used the Assistance Capability Requirement in the Communications Assistance for Law Enforcement Act to counter a request for assistance filed by the Federal Bureau of Investigation. The Apple case demonstrates a conflict between the proposed legislations and current statutes and codes. Allowing legislation that requires backdoor decryption of smartphones potentially exposes users to unauthorized decryption. Even worse, there is no guarantee that such legislation would not be used by a nation to spy on its own citizens. Therefore, allowing such legislation would conflict with existing statutes and codes that currently protect individuals.

Professional Abstracts



Elixir: Concurrency for Modern Applications

Charlie R. Hicks

Elixir is a functional programming language which is built to run on the Erlang virtual machine. The main advantages of this language are strong concurrency and fault tolerance. These two qualities are rare to find in older languages which did not focus on concurrency as a feature. Companies, such as Discord, have started using Elixir to handle millions of users on their applications. While companies, such as WhatsApp, have relied strictly on Erlang as the backend server. Elixir is capable of utilizing many Erlang libraries. This is similar to the relationship that C and C++ have. The main goal of this presentation is to show the many language features. These features enable the creation applications that can take advantage of multiple cores and distributed computing. Elixir hopes to bring the ideas of distributed computing to a more modern approach with ideas gleaned from the Functional programming paradigm. The presentation will also illustrate some tools and frameworks utilized in Elixir. In particular it will mention Mix the Elixir build tool, and Phoenix which is an Elixir web framework.

Wear Leveling Techniques in Flash Memory Storage

Srinivasarao Krishnaprasad

Jacksonville State University

Flash memory storage, as used in Solid State Disk (SSD), has essentially replaced the magnetic hard-disk drives of laptops, desktops and even server machines. SSDs have the obvious benefits of lower power consumption, small size and lightweight, no noise or mechanical issues of hard disks, and fast read operations. Major disadvantages of flash memory revolve around the way write operation is done and the lifetime limit on the erase operations on the flash blocks. These drawbacks lead to slower writes and potential, long-term failure of the device.

Flash memory storage, as used in Solid State Disk (SSD), has essentially replaced the magnetic hard-disk drives of laptops, desktops and even server machines. SSDs have the obvious benefits of lower power consumption, small size and lightweight, no noise or mechanical issues of hard disks, and fast read operations. Major disadvantages of flash memory revolve around the way write operation is done and the lifetime limit on the erase operations on the flash blocks. These drawbacks lead to slower writes and potential, long-term failure of the device.

Many ideas have been proposed and investigated regarding improving the life expectancy of flash device. The underlying theme is “wear leveling”: the idea of spreading the writing to all regions of the memory, thus not overusing a small part. Wear leveling is characterized as either dynamic or static. In dynamic wear leveling, updating an existing page is typically done by writing the new data into a free page and invalidating the old page (making it stale) and modifying the flash translation layer tables. A separate garbage collection process will erase these stale spaces for later reuse. Here, read-only blocks are never erased and hence the device will wear out unevenly. In static wear leveling, static data blocks (read-only data) are periodically moved to relatively overused regions of memory in order to spread the wear out across the device.

Ethical Machines: A Search for What it Means for Machines to be Ethical

David Frazier
Tusculum College

Artificial Intelligence (AI) is becoming more entwined in our daily lives. AI is involved in such diverse areas as determining who qualifies for a mortgage, helping to diagnose illnesses, assisting in surgeries, teaching children, and soon, providing for society's transportation needs via self-driving cars and self-driving delivery vehicles.

As more machines interact directly with humans, we as a society have to ask what ethical behavior to expect. As programmed entities, smart machines can have a set of ethical behaviors can be "baked in".) What behaviors will we choose to encode, and who gets to decide what those will be? What are the possible ramifications of these choices? These are no longer purely theoretical discussions. Driverless cars will soon be on our roadways. They will be faced with situations where an ethical decision must be made.

My presentation will start with a brief overview of ethics. I will then work through some examples of the kinds of ethical dilemmas that machines might face. I will pull from the research of Joshua Greene at Harvard's Edmond J. Safra Center for Ethics and from Robot Ethics by Patrick Lin. We are going to have to rethink our assumptions about what it means to be ethical if there are machines with agency. Human beings might initially code in the parameters for the machine's ethical reasoning, but how does that change if the machine itself can "learn" and therefore make its own decisions about application of those established ethics?

Observations Regarding Search Engine and Social Media Intercommunications and Resultant Implications for Privacy and Security

Joe Elarde and Barry Bruster

Austin Peay State University

This presentation explores a cybersecurity classroom experiment designed to discover intercommunications between search engine results derived browsing and social media advertisements. Related security risks, ethical implications and the impact of profiling and telemetry with regard to privacy are discussed. We demonstrate several examples and report the results of our experiments to increase security/privacy awareness and conclude with recommendations for mitigating security risks and improving one's privacy.

Automating Reporting for Student Learning Outcomes for Consistency and Ease of Use

Ashley Kilburn, Brandon Kilburn and Denise Williams

University of Tennessee at Martin

Automated entry forms were created for the reporting of rubric-based assessment efforts for a set of graduate student learning outcomes. One obvious benefit to this is that the forms for reporting the assessment efforts are easier to complete by the faculty members reporting assessment efforts associated with each learning outcome, in addition to the benefits of consistency in presentation and coherency in disseminating and understanding assessment results. The automated form includes the various formulas so that reporting for each SLO uses consistent formulas programed based on rubrics associated with each SLO. In addition to the reporting form, a written report or summary narrating the results can be submitted with the form. The use of this form insures that the reports are provided to the correct person and should make this information easier and more efficient for accreditation team members and assessment coordinators viewing the reports.

Bringing Python to High School - The Tusculum Python TEAM Project

Patricia Hunsader and David Frazier

Tusculum College

Eight of the top ten computer science departments in the United States teach Python in introductory programming courses (Guo, 2014), yet many high school mathematics and computer science teachers are not familiar with the language. Simply providing instruction in Python ignores the issue that for technology to improve student learning, teachers need support in meaningfully integrating technology into their curriculum (Mishra & Koehler, 2006; International Society for Technology in Education, 2000). The Tusculum College Python TEAM2 Project, funded by a grant from the Tennessee Higher Education Commission, was designed to enhance the content knowledge, pedagogical skills, and pedagogical content knowledge of high school mathematics and computer science teachers to support their ability to integrate Python programming into their classrooms.

The Project began in February and will conclude in December with seventeen high school teacher participants who are learning to use Python to solve mathematical problems, with workshop sessions that alternate between the introduction of mathematical concepts and development of programming skills to solve related problems. Participants have nearly completed a credit-bearing ten month online course in Python programming facilitated by Tusculum College Computer Science faculty delivered through a Moodle site. The project has also included professional development in the Tennessee Educator Acceleration Model (TEAM), team building skills, and the use of Swivl™ robots to videotape participants' teaching.

The goal of the session is to share with other computer science educators the Project's model for developing high school teachers' ability to bring the Python computer language to their students. The session will begin with a summary of the project plan and structure. Preliminary quantitative and qualitative data will be presented about participants' growth in content knowledge related to the Python computer language, and their perception of the learning experiences and personal growth in content knowledge, pedagogical skills, and pedagogical content knowledge.

Enhancing Computer Science Program through Revising Curriculum, Peer Mentoring/Tutoring, and Engaging Students in Undergraduate Research

Masoud Naghedolfeizi and Xiangyan Zeng

Fort Valley State University

In recent years, the Computer Science (CS) program at Fort Valley State University (FVSU) has witnessed an alarming decline in retention rate and a slow progress toward graduation of its students. Additionally, the assessment results of computer programming courses and the ETS (Educational Testing Service) Field Exam, used as exit exam, have revealed that CS students are not performing satisfactorily in computer programming subjects.

Although the overall curriculum of the program has been recently revised to address the above issues, we still experience the following problems:

- Freshman and sophomore students in gate keeping courses (computer programming and logic classes) are still experiencing difficulties to progress in these courses due to lack of any programming background in K-12. Thus, many of these students tend to leave the field or have a very slow progress towards graduation.
- The unsatisfactorily performance of senior students in programming sections of exit exam conducted by ETS and the programming projects of Senior Seminar (Capstone) class indicate that many of our students do not maintain their programming skills gained in the freshman and sophomore classes. This is partly due to the fact that most of current upper level courses do not require any programming activities in the course curriculum in order to constantly engage students in writing efficient and logically sound computer programs. It should be noted that the recent CS curriculum revisions have been mainly focused on the structure of the CS program curriculum, not the content of its courses.
- Our CS program currently does not have a system to support high achieving students to realize their full potential. Thus, we are in danger of losing these students to other institutions that have enrichment programs such as undergraduate research to further their academic experiences.

To address the above issues, we propose a three-pronged approach to enhance CS curriculum as well as the retention and graduation rates of computer science students at FVSU. This approach includes revising course curricula of all upper division courses to include at least one major programming assignment/project, implementing peer-to-peer mentoring/tutoring, and engaging students in interdisciplinary/multidisciplinary undergraduate research activities.

Co-Teaching an Interdisciplinary Cryptography Class: The Math / CS Perspective

James A. Jerkins and Lee Raney

University of North Alabama

In the spring of 2017, our computer science and mathematics programs collaborated to offer an undergraduate cryptography course. The course included students from mathematics and computer science and was co-taught by one computer science and one mathematics faculty member. The course topics included the typical introduction to cryptographic concepts and ideas with an explicit effort to connect mathematics and computer science. As math and CS faculty members, we believe that students benefit when they develop an appreciation of the symbiotic relationship between computer science and mathematics. In this talk we will share how we designed presentations, materials, and assignments to demonstrate and reinforce the connection between mathematics and computer science using cryptography as a vehicle. We will also reflect on lessons learned from our experience as co-instructors and the impact the course had on our students' beliefs and attitudes about the relationship between computer science and mathematics.

Android Logic Bombs: State of the Threat

Radhouane Chouchane

Columbus State University

The popularity of the Android operating system and the apps running on it made it a very popular target for malware, including logic bombs, which are apps that intentionally execute a malicious behavior only when a certain set of triggers are satisfied (such as time of day or receipt of some SMS message).

The traditional approaches for detecting Android malware will typically scan an app in an attempt to (1) analyze the app's information flow looking for some predefined, clearly malicious action or signature (2) find out if the app will comply with the set of permissions that it has declared in its manifest file and been authorized by the user to have and (3) find out if the app will issue a malicious sequence of API calls. Google Bouncer also relies on user reviews and users flagging apps to remove malicious apps from the store. Logic bombs are the hardest to catch using just a model of the permission sets, API calls or malicious information flows. This is in part because the permission sets are not granular enough for the detector to tell exactly what the app will do with the permissions and when (e.g., a navigation app requesting access to location services and notifying a stalker of the phone's location if the phone is found to be in flagged area).

We survey the most recent articles on the subject and develop a breakdown of the state of the threat, as well as the methods that are most promising in detecting logic bombs for mobile Android devices.

Cloud Security: A HiSPO Approach

Paul Wang and Amjad Ali

Columbus State University

Cloud occupies 82% of Internet traffic; 74% of organizations reported storing some or all of their sensitive data in public cloud. Of all in the cloud, 52% applications have or are getting malware infections. Agile, cloud and team collaborations are the principles to success for corporations to tackle security in the digital age.

This talk begins with an overview of cloud security, followed by a pilot case study of applying DevSecOps concept at a financial processing company from Compliance as Code perspective by integrating security policies and auditing into Continuous Delivery. The talk then demonstrates the HiSPO approach that extends the DevSecOps from threat modeling, threat intelligence, to security operations.

Attendees will have the opportunity to learn the best practices of using public cloud and virtual private cloud to transform businesses with responsive security controls, and to minimize risks of data breaches using the HiSPO approach.

Intention to Secure Internet of Things Devices

Charles Foltz

University of Tennessee at Martin

The Internet of Things (IoT) refers to a “dynamic global network infrastructure, where objects with unique identifications, wireless communication and computing capabilities are integrated into an information network”, a collection of physical devices connected to the Internet. These devices connect and integrate the physical and digital worlds. IoT devices collect data without human interaction and range from wearable devices to city automation equipment. IoT devices are rapidly gaining acceptance; estimates suggest there may be 50 billion IoT devices in use by.

Despite the rapid growth of the IoT, many concerns, ranging from mundane to extremely concerning, are not fully addressed. Weinberg et al (2015) note that IoT devices collect data. Where will this data be stored? Who owns it? How will it be used? Although data management questions are important, concerns relating to privacy, security, and prevention of attacks are more critical. Multiple authors note the importance of these issues for the IoT.

Recent reports suggest that cybercriminals have accessed connected baby monitors in personal home. This is an excellent (and frightening) example of misuse of IoT data: and each IoT device presents another opening for attackers! Unfortunately, many users do not understand basic security settings.

This research evaluates user intention to protect IoT devices and awareness of threats utilizing the Theory of Planned Behavior (TPB). A survey instrument will be used to determine user understanding of the term IoT and to determine the extent to which subjects utilize the IoT. In addition, subjects will be asked to complete an instrument measuring intentions, attitudes, subjective norms, and perceived behavioral control.

Ledgard: A Target Language for Compiler Projects

Lee Wittenberg
Maryville College

The target language for a student compiler project is even more important than the implementation language used. It needs to be complex enough to give students a rich learning experience, yet simple enough to be implementable in a single semester. It can also be used to introduce students to features that have disappeared from use due to the disproportionate influence of the C family on the design of modern programming languages. Ledgard¹ is designed to meet these needs. Its syntax can be described in a single page of BNF or syntax diagrams, yet it provides enough complexity for a non-trivial, semester-length compiler project.

¹ Named after Henry Ledgard, whose "mini-languages" concept it embodies, as described in "Programming Language Landscape" by Ledgard and Michael Marcotty.

Using Outmoded Systems to Teach Architecture

Robert Lowe

Maryville College

In the not too distant past, computers were a bit less friendly. Some particularly difficult machines even required toggling programs in by hand! Of course, in this modern era, we have no need of such exercises. This is both positive, in that it saves a lot of wear and tear on fingertips, but it is also negative in that programmers are forever separated from the harsh realities of machine code and binary. In fact, to the modern computer science student these concepts are completely abstract. Binary, hexadecimal, and especially octal, are just not relevant to the lives of the 21st century student! This level of convenience comes with a hefty price when students turn their attention to computer architecture. Because they have never made the connection between physical states and computer code, hardware can seem very esoteric indeed. The problem then is how can we make programming students, especially those born after 1990, feel the connection between code and hardware?

The answer proposed in this presentation is to reach back to the systems of the past and use them in the modern classroom. Using modern clones and emulators of older systems, the fingers of students can once again be numbed by toggle switches. Their eyes can once again hurt from gazing into binary represented in LED lights. They can relive the exciting battles over whether hex or octal is the superior representation of binary. Most importantly of all, they can once again feel the connection between the machine and their code. Moreover, they seem to have a great time doing it. There is something about an Altair 8800 that makes people want to flip its switches. From there, it's a short step to understanding computer architecture.

The Use of Version Control in CS2

Michael Orsega and Lewis Baumstark

The University of West Georgia

This presentation discusses a post-hoc study measuring student use of a version control system while developing programs in CS2. With only a brief (10-15 minutes) introduction and a single homework showing how to use it, participants were then able to use the repository for the remainder of the semester. Participants were not evaluated based on their repositories. After the semester was over, participants were put into groups of either above average (a final grade of A or B) or below average (D or F). The above average student repositories had statistically more lines of code committed, more commits, and fewer lines of code per commit, suggesting that they were better practicing iterative development.

Video Game Development at UT Chattanooga

Craig Tanis

University of Tennessee at Chattanooga

Video Game development is a hot topic for many undergraduate Computer Science students. This presentation will describe the author's efforts to use video game concepts to complement a traditional Computer Science education and encourage self-study. It will also describe extracurricular video game projects at UT Chattanooga, and related community engagement.

CodeFolio - Online Compiler and Learning Management System

Bob Bradley

University of Tennessee at Martin

CodeFolio is an online compiler and learning management system designed for use in introductory programming classes. Students can create, edit, compile, interactively run and submit their coding assignments totally within the browser on a desktop, notebook or tablet. (It works from a smart phone too, but it works best with Chrome on a bigger screen.) C++ and python3 are currently supported. Instructors can create coding assignments, grade assignments, and give feedback to students. Instructors can also post documents such as syllabi, schedules, links and videos to their class. I have been developing this system for many years now. CodeFolio is a rewrite of the CompileIt and LabGrader systems that I have previously demonstrated, with lots of new features. The purpose of this talk is to demonstrate the system, with the objective of recruiting some beta testers who would be willing to try the system in their classes.

From Rural Appalachia to Washington DC: Feeding the Pipeline of our Nation's Cyber Defenders

Ambareen Siraj, Eric Brown and Joseph Cross

Tennessee Tech

The need for enhanced efforts to recruit new talent into the cybersecurity workforce pipeline has never been greater. It is expected that almost 3.5 million cybersecurity jobs will remain unfilled by 2021 due to a lack of qualified individuals. As the building blocks of our society become increasingly technology dependent, efforts to integrate cybersecurity concepts into all aspects of technology education is necessary. It is critical to have multifaceted cybersecurity education programs to be in place to shape the future generation of cyber conscious computing professionals and that is what we are striving to undertake in our own backyard - the rural Appalachia.

The Cybersecurity Education, Research and Outreach Center (CEROC) at Tennessee Tech University, which is situated in the Central Appalachia, is on a mission to promote public awareness, provide quality education, empower educators, and recruit future cyber defenders in the area of cybersecurity and national infrastructure defense. At CEROC, we have been providing faculty and students the opportunity to expand their cybersecurity skills through a variety of programs including SecKnitKit (<http://blogs.cae.tntech.edu/secknitkit/>), GenCyber (<https://www.tntech.edu/ceroc/outreach/gen-cyber>), and CyberCorps SFS (<https://www.tntech.edu/ceroc/education/sfs>).

In this talk, we will present how we are building a cybersecurity workforce through various education, research and outreach efforts, who are not only serving our rural Appalachia region but also having an impact in the region and in the nation.

An interdisciplinary approach to a computer science / STEM camp robot lesson

Cynthia Stenger, Jessica Stovall, James Jerkins and Mark Terwilliger

University of North Alabama

As colleagues in Computer Science and Mathematics, we developed a teaching strategy that uses computer programming, mathematical reasoning, and engineering activities to push students to build mental frameworks for generalization. In this talk, we will describe how our instructional treatment was applied in a recent proportional reasoning lesson at our Summer STEM camps. In the lesson, students explored the mathematical concept by writing computer programs, discovering general expressions in their code, then making conjectures and writing convincing arguments about the mathematical relationships. This lesson concluded with an engineering activity where students were given an $8\frac{1}{2}$ by 11 inch grid map of a search and rescue location. They computed an optimal path to rescue two victims and programmed their Parallax S2 robot to navigate the small gridded worksheet. Finally, they scaled their rescue path to a 4 by 12 foot map of the actual rescue location and performed three test runs on the large mission map.

Exploring the Relationship between Planning and Problem Solving with CS1 Students

Mark Terwilliger and Janet Truitt Jenkins

University of North Alabama

Computational thinking skills needed to thrive in today's society are a must. Problem solving skills go hand in hand with computational thinking. Developing problem solving skills in today's undergraduates is a multi-faceted task. For this study, we seek to explore relationships between planning and problem solving. Fred Brooks called the notion of a man month (a unit of work completed by one person in a month) mythical, much in part, because it is difficult to enumerate the tasks needed to complete a complex programming project. Further, if they could be enumerated, it is difficult to determine which tasks would be impeded due to roadblocks. As CS1 students begin to tread the waters of programming for the first time, they find projects for this class take longer than projects in most classes, due to the same reason. They will hit unexpected, untimed roadblocks. This study seeks to examine how tasks such as time planning and design impact student achievement. We evaluate how long students think they will take to complete projects, how long they actually take to complete projects, and how much of their time is spent on design prior to coding. We examine how those factors impact how much of their time is spent "being stuck" and, further, their performance. Does spending more time up front on planning and design actually help reduce roadblocks and frustration later? Is it possible that more accurately predicting the amount of time it will take to solve a problem is an indicator of stronger problem solving skills?

Peer Reviewed Abstracts



Grade-up: New Progress and Work Load Visualizations in Moodle

Scot Anderson

Southern Adventist University

The classroom has greatly evolved from a simple syllabus and in class discussion to modern course management systems and virtual classrooms. Students depend on these on-line tools to provide progress and work load information that they can understand at a glance. Current dashboards do not present data in a way that allows the student to easily comprehend their past performance and upcoming work load. We present Grade-Up, a dashboard containing two visualizations which builds on the Moodle system by adding visual, progress-specific and work-load information that is comprehensible at a glance. This in turn allows the student to answer questions such as: What have I completed, and what do I have left to complete? What is my current grade and projected grade at my current pace? Given what I've done so far, what is the best possible grade I could get if I receive 100% on the remaining work? And many more.

NFC Unlock: Secure Two-Factor Computer Authentication Using NFC

Walter Hufstetler, Maria Hito Ramos and Shuangbao
Wang
Valdosta State University

In this paper, we introduce the implementation of NFC Unlock, a secure multifactor authentication system for computers using Near Field Communication technology. The application is written in C# with pGina. It implements an NFC authentication which replaces the standard Windows credentials to allow the use of an NFC tag and a passcode to authenticate users. Unlike the most prevalent multifactor authentication methods, NFC authentication does not require a user wait for an SMS code to type into the computer. A user simply enters a passcode and scans the NFC tag to log in. In order to prevent the data from being hacked, the system encrypts the NFC tag ID and the passcode with Advanced Encryption Standard. Users can easily register an NFC tag and link it to their computer accounts. The program also has several extra features including text alerts, record keeping of all login and login attempts, and a user-friendly configuration menu. Initial tests show that this NFC-based multifactor authentication system has the advantage of improved security with a simplified login process.

mStroke: HIPAA Compliant Data Solution For a Smart Mobile Health Application

Hector Suarez, Austin Harris, Zhen Hu and Mina Sartipi

University of Tennessee at Chattanooga

Mobile health devices are becoming the trend in healthcare. The need to securely integrate these devices into systems has become crucial to protecting sensitive data. The Health Insurance Portability and Accountability Act (HIPAA) regulations exist to ensure such measures are taken. HIPAA requirements hold entities accountable for the misuse of Protected Health Information (PHI). The goal of this research was to design a HIPAA compliant data storage system for an iOS application called mStroke. mStroke is a real-time and automatic mobile health system for post-stroke recovery and rehabilitation. This research focused on designing and implementing a custom data storage system for mStroke that conforms to HIPAA regulations. The mStroke system uses industry standards for transmitting PHI and also uses biometric authentication.

The Efficacy of Sentiment Analysis for Author Attribution

Michael Schneider and Jay Jarman

East Tennessee State University

The field of authorship attribution seeks to characterize an author's writing style well enough to determine whether he or she has written a text of interest. One subfield of authorship attribution, stylometry, seeks to find the necessary literary attributes to quantify an author's writing style. The research presented here sought to determine the efficacy of sentiment analysis as a new stylometric feature, by comparing its performance in attributing authorship against the performance of traditional stylometric features. Experimentation, with a corpus of sci-fi texts, found sentiment analysis to have a much lower performance in assigning authorship than the traditional stylometric features.

Segmentation of Unorganized Point Cloud Data

James Church

Austin Peay State University

In this paper we propose a methodology for approximating a shape's solid geometry using the unorganized 3D point cloud data of that shape primarily by utilizing localized principal component analysis information. Our model accounts for three common issues that arise in the scanning of 3D objects: noise in surface points, poorly sampled surface area, and narrow corners. We explore each of these areas of concern and outline our approach to each. Our technique uses a growing algorithm that labels points as it progresses and uses those labels with a simple priority queue. We found that our approach works especially well for approximating surfaces under the condition where a local surface is poorly sampled (i.e a significant hole is present in the point cloud). We conclude the paper with visual results of our technique.

ERP in the Cloud: Opportunities Beyond On-Premise ERP

Stephen Hendrix

East Tennessee State University

Enterprise Resource Planning (ERP) applications provide businesses the ability to integrate core business functions and combine information from these various core business areas into one centralized application. Traditional ERP applications are installed and configured on premise for a single business. With advancements in technology, it is now possible to take advantage of cloud computing opportunities as an alternative approach to implement ERP. In cloud computing, businesses can take advantage of Infrastructure as a Service (IaaS), Platform as a Service (PaaS), or Software as a Service (SaaS) depending upon the business needs. In addition, recent research points towards a specialized SaaS that provides ERP as a Service (EaaS). The purpose of this paper is to provide a brief introduction into the history and importance of ERP systems within a business. Next, the paper will discuss critical concepts around cloud computing to provide a clear understanding of the different possibilities that are available. Finally, the paper will conclude with a discussion about some of the potential benefits and areas of concern in moving an ERP system into a cloud based environment.

Demonstrating Parallel Architectures Using the Raspberry Pi

David Tarnoff

East Tennessee State University

Modern processors incorporate many architectural features for parallel processing, most of which are difficult if not impossible for a student to correctly study and evaluate using a desktop machine. This has forced computer architecture instruction to rely on theoretical coursework. With the advent of the ARM-based Raspberry Pi, computer architecture students can gain hands-on experience with both fine- and coarse-grained parallelization techniques using this single-board computer. Resources within the ARM processor and on the Raspberry Pi allow students to implement most of the methods of parallelization available to the advanced programmer. This paper discusses how the Raspberry Pi was incorporated into a senior-level computer architecture course in order to demonstrate six different concepts of parallelism.

See-Through Technology Using V2X Communication

Rebekah Thompson, Zhen Hu, Jin Cho, Jose Stovall,
Austin Harris and Mina Sartipi
University of Tennessee at Chattanooga

In recent years, we have seen an explosion in research and design pertaining to autonomous vehicles. As a result, there are growing safety concerns for drivers, passengers, and pedestrians. To improve the safety of autonomous vehicles, we put our research effort on connected autonomous vehicles that combine automation with connectivity. Following this concept, we explore computer vision (e.g., object detection) and Vehicle-to-X (V2X) communication, which includes Vehicle-to-Vehicle (V2V) and Vehicle-to-Infrastructure (V2I) communication, to present an experiment about see-through technology which can assist the vehicle to have a real-time augmented view of traffic scene that in reality may be blocked by the vehicle in front.

Notes



Poster Abstracts



Umbrellables: Inspiring Women to Explore STEM through Wearable Technology

Kristen Wright

Columbus State University

As the number of women in technology remains lower than other comparable fields, it becomes imperative that we work to inspire women to explore technological fields. Umbrellables is a workshop geared towards women that served as an introduction to the basics of wearable technology and how to combine creativity with electricity to make lighted, decorated umbrellas. Wearables are a growing trend of technology that can be incorporated comfortably into everyday clothing and accessories, and range from smart watches to light-up shoes and beyond. It is a fun, creative way to express a love of technology and fosters growth in electrical and computing skills through the creation of electronic circuits and programmable light systems. The goal of Umbrellables is to give all women an opportunity to learn how wearables work from any skill level, with no prior knowledge required and a tangible, practical project that they may use in their daily lives. The workshop gave participants the knowledge to continue discovering wearable technology and creating their own works, while also learning about the key roles women play in computing and technology and how they can get involved. The workshop is a product of the Anita Borg Institute's 2017 Pass-It-On award and has been presented at the 2017 Grace Hopper Celebration.

CompuTrain: A Computational Thinking Educational Game

Valencia Coleman

Columbus State University

Computational thinking skill is a problem solving process that involves a number of essential skills needed to solve problems across all disciplines. It has been noticed that students at early ages lack those skills as the school system doesn't focus enough on developing those skills. Students usually memorize solutions to certain problems instead of being able to come up with a general algorithm/methodology. This lack of computational thinking skills can hinder a student from not only understanding advanced STEM concepts, but also might lead to struggle in daily life activities. Computational thinking and problem solving are part of our daily life so it is important to help young children to develop those skills at early age. Educational games is a teaching tool that teach certain concepts and/or skills. Educational games proved to be engaging and immersing environments and have been used successfully to teach different concepts and skills, such as programming languages and social skills.

This research focuses on using educational games to develop computational thinking skills at elementary and middle school students through a set of puzzles. The proposed game, called CompuTrain, uses augmented reality technology which allows each player to view the puzzle from multiple angles the way they see fit as part of the real world. CompuTrain is an adaptive game in the sense that it tracks the student's performance and provides tailored experience to individual students. The preliminary results from testing CompuTrain show that the students enjoyed the puzzles and were engaged during play time. The use of augmented reality reduce frustration due to not successfully solving the puzzles immediately. The game was exciting enough to get them willing to try several times until they solve the puzzles. Future work involves placing and testing CompuTrain in local elementary and middle schools as an assisting tool.

Dynamic Load Balancing using Live Virtual Machine Migration

Manh Do and Michael Galloway

Western Kentucky University

Recently, cloud computing is a new trend emerging in computer technology with a huge demand from the clients, which leads to the consumption of a tremendous amount of energy. Load balancing is taken into account as a vital part of managing income demand, improving the cloud system's performance and reducing the energy cost. Live virtual machine migration is a technique to perform the dynamic load balancing algorithm. To optimize the cloud cluster, there are three issues to consider: First, how does the cloud cluster distribute the virtual machine (VM) requests from clients to all physical machine when each machine has a different capacity. Second, what is the solution to make CPUs usage of all PMs to be nearly equal. Third, how to handle two extreme scenarios: rapidly rising CPU's usage of a PM due to sudden heavy workload requiring VM migration immediately and resources expansion to respond to heavy cloud cluster through VM requests. We also provide the implementation and results of this approach, which the performance of the cloud cluster is improved significantly.

Expanding the Accessibility of Conventional Smart Home Systems

Chisom Ogonnaya

Western Kentucky University

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

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

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

Integrating Traffic Incident Management Interfaces

Christopher Kawell, Celia Loya, Katherine Atwell,
Jamiahus Walton, Quinn Monaghan, Hesham Hassan,
Lakshay Ahuja, Anuj Sharma and Stephen Gilbert
Iowa State University

Traffic incident managers (TIMs) are the first people to report on an accident or traffic-related incident. Currently fifteen different applications are used to manage traffic incidents by the Iowa Department of Transportation (DoT) which leads to an excessive amount of effort put into redundant clicks, forms, screens, and task switching. This causes the TIMs to waste time on repeating information and switching programs, resulting in a delayed response time. Our project proposes a new user interface (UI) that will simplify all of the TIMs' tasks by reducing the number of clicks, forms, screens, task switching and overall time to report an incident. Previous work has been done to analyze the tasks of TIMs in Iowa DoT, and the tasks they performed will be integrated into one new interface. To verify the effectiveness of our proposed UI, we will define the current issues, propose a new solution, and test a prototype. We will compare the new UI to the previous fifteen by simulating an incident and measuring the amount of time taken to identify, report, and clear traffic incidents. We predict there will be a significant reduction in time, task switching, and amount of clicks needed to respond to incidents. This promotes productivity and a decreased response time to incidents, which is a major factor in reducing congestion time. TIMs need a UI that will record, inform, and resolve traffic incidents in an efficient manner. This project provided a UI that will create a consistent and structured environment for TIMs.

ConceptNet Explorer: An Easier Way to Use ConceptNet

Loran Shaver

Columbus State University

ConceptNet is a semantic network based around the relationships between words and the concepts that can be derived from them. This makes ConceptNet a useful utility for machine learning and natural language processing, but the large knowledge base that makes it useful also makes it difficult to navigate. Any application that aspires to use ConceptNet must contain extra code dedicated to querying, parsing, and interpreting ConceptNet's information, not all of which is immediately useful. This project is a multi-faceted approach to making ConceptNet an easier resource to use by providing means to query and store information from ConceptNet without need for project-specific code. At the lowest level, this takes the form of a lightweight Python API for performing queries and storing the results. Built upon this is a small collection of tools, in both text and graphical format, for visualization, exploration, and storage of ConceptNet relationships, as well as information related to them.

Conference at a Glance



	Azalea	Dogwood I
7:30 AM	Morning Coffee–Poolside	
8:00 AM	Welcome and Keynote Address	
9:00 AM	Coffee Break–Poolside	
	Session I– Undergraduate 4	Session I– Undergraduate 4
	Chair: J. Ballard	Chair: B. Toone
9:15 AM	S. Renshouse	R. Myers
9:35 AM	A. Irwin et al	K. Wright
9:55 AM	C. Staggs	D. Gaston
10:15 AM	D. Madina et al	G. Walker
	Session II– Undergraduate 4	Session II– Undergraduate 4
	Chair: G. Wiggins	Chair: M. Wiggins
10:40 AM	M. Timbes and J. Church	J. Buckley and C. Clayton
11:00 AM	J. Buhler et al	R. Hempel and C. Robertson
11:20 AM	R. Rayburn et al	D. Salami et al
11:40 AM	C. Martin	T. Brown and J. Galloway
12:00 PM	Lunch–Patio Restaurant	
	Session III– Graduate	Session III
	Chair: D. Williams	
1:00 PM	J. Oakley	
1:20 PM	G. Clark	
1:40 PM	D. Smith	
2:00 PM		
2:20 PM	Break–Poolside	
	Session IV– Undergraduate 4	Session IV– Undergraduate 4
	Chair: G. Bailey	Chair: B. Myers
2:35 PM	M. Mesler et al	M. Parrachavez
2:55 PM	M. Singleton & Z. Lancker	C. Erdmann
3:15 PM	T. Matthews et al	C. Sanchez and R. Chouchane
3:35 PM	A. Cornia	
4:30 PM	Business Meeting–Highlander I	
7:00 PM	Awards Banquet–Azalea	

	Dogwood II	Highlander I	Highlander II
7:30 AM	Morning Coffee–Poolside		
8:00 AM	Welcome and Keynote Address		
9:00 AM	Coffee Break–Poolside		
	Session I - Undergrad 4	Session I– Professional	Session I– Professional
	Chair: R. Hodhod	Chair: R. Smith	Chair: L. Wittenberg
9:15 AM	H. Hok et al	C. Hicks	A. Kilburn et al
9:35 AM	D. Zieba & W. Jenkin	S. Krishnaprasad	P. Hunsader et al
9:55 AM	I. Alahdal & N. Patel	D. Frazier	M. Naghedolfeizi et al
10:15 AM		J. Elarde	J. Jerkins et al
	Session II	Session II– Professional	Session II– Professional
		Chair: S. Khan	Chair: K. Adcock
10:40 AM		R. Chouchane	L. Wittenberg
11:00 AM		P. Wang & A. Ali	R. Lowe
11:20 AM		C. Foltz	M. Orsega et al
11:40 AM			C. Tanis
12:00 PM	Lunch–Patio Restaurant		
	Session III– Posters	Session III– Peer Reviewed	Session III– Professional
		Chair: K. Ericson	Chair: C. Tanis
1:00 PM	K. Wright	S. Anderson	B. Bradley
1:20 PM	V. Coleman	W. Hufstetler et al	A. Siraj et al
1:40 PM	M. Do & M. Galloway	H. Suarez et al	C. Stenger et al
2:00 PM		M. Schneider et al	M. Terwilliger et al
2:20 PM	Break–Poolside		
	Session IV – Posters	Session IV– Peer Reviewed	Session IV–
		Chair: R. Chouchane	
2:35 PM	C. Ogbonnaya	J. Church	
2:55 PM	C. Kawell et al	S. Hendrix	
3:15 PM	L. Shaver	D. Tamoff	
3:35 PM		R. Thompson et al	
4:30 PM	Business Meeting–Highlander I		
7:00 PM	Awards Banquet–Azalea		

Glenstone Floor Plan



