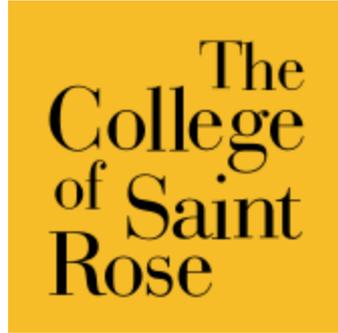


# **The Consortium for Computing Sciences in Colleges**

in cooperation with



and the

**The Association for Computing Machinery  
Special Interest Group on Computer  
Science Education**

## **CCSCNE-2017**

The Twenty-Second Annual Consortium For  
Computing Sciences in Colleges,  
Northeastern Conference

April 7 - April 8, 2017 at

The College of Saint Rose, Albany, NY

# Table of Contents

1. Chair's Welcome	4
2. CCSCNE 2017 Committee	5
3. Conference Supporters	6
4. Schedule of Events	
a. Friday, April 7	7
b. Saturday, April 8	12
5. The Keynote Speakers	15
6. Faculty Posters	17
7. Student Poster Abstracts	19
8. Programming Contest Teams	59
9. Reviewers	60
10. Campus Map	62

# WiFi Access

Individuals visiting the campus may connect to the **strose-guest** network and follow the prompts for temporary access.

Information Technology Services (ITS)  
Saint Joseph Hall, Lower Level  
985 Madison Avenue  
518-454-2190

# CCSCNE 2017 Chair's Welcome

Welcome to Albany, New York, and The College of Saint Rose, for the Twenty Second Annual Consortium for Computing Sciences in Colleges Northeast Region Conference.

Our program features two distinguished invited speakers, Pat Yongpradit of code.org, and Anthony Sabatelli of Dilworth IP. In addition, we have a broad range of topics covered by paper presentations, lightning talks, workshops, panels, tutorials, and faculty and student research posters. On Friday morning, we are hosting the traditional programming contest. On Friday afternoon, we have expanded our student-focused sessions. In addition to the career fair, there is also a student “unconference” and a session where programming contest participants and organizers can discuss the problems. Also on Friday, we have a series of sessions with a K-12 focus.

We are fortunate to have worked with an outstanding conference committee and dedicated board. The success of this conference is the result of the hard work of those groups, plus the reviewers, session chairs, and countless other volunteers. The conference continues to be selective; we accepted 15 of 33 papers for an acceptance rate just over 45%. This ensures the high-quality program that everyone expects.

We are pleased to be hosting this year's conference at The College of Saint Rose, on this beautiful urban campus in Albany's vibrant Pine Hills neighborhood. Saint Rose, which is quickly approaching its centennial celebration in 2020, enrolls 2,600 undergraduates and 1,600 graduate students.

We hope you find the conference informative and engaging. We also look forward to seeing you next year at the The University of New Hampshire at Manchester in Manchester, New Hampshire.

John Avitabile  
Conference Co-chair  
The College of Saint Rose

James D. Teresco  
Conference Co-chair  
Siena College

# CCSCNE 2017 Committee

Conference Chair, **Jim Teresco**, Siena College  
Conference Chair, **John Avitabile**, The College of Saint Rose  
Program Chair, **Ed Harcourt**, St. Lawrence University  
Papers Chair, **Aaron Cass**, Union College  
Papers Chair, **Ali Erkan**, Ithaca College  
Panels Chair, **Yana Kortsarts**, Widener University  
Panels Chair, **Susan Imberman**, The City University of New York  
Lightning Talks Chair, **Yana Kortsarts**, Widener University  
Lightning Talks Chair, **Susan Imberman**, The City University of New York  
Tutorials Chair, **Bonnie MacKellar**, St. John's University  
Tutorials Chair, **Ting Liu**, Siena College  
Workshops Chair, **Bonnie MacKellar**, St. John's University  
Workshops Chair, **Ting Liu**, Siena College  
Faculty Posters Chair, **Daniel Rogers**, The College at Brockport  
Speakers Chair, **Ingrid Russell**, University of Hartford  
Speakers Chair, **Mike Gousie**, Wheaton College (Massachusetts)  
Student Unconference Chair, **Ryan Murphy**, Worcester State University  
Student Unconference Chair, **Karl Wurst**, Worcester State University  
Encore Chair, **Darren Lim**, Siena College  
Undergraduate Posters Chair, **Sandeep Mitra**, The College at Brockport  
Undergraduate Posters Chair, **Alice Fischer**, University of New Haven  
Undergraduate Posters Chair, **Judy O'Rourke**, The College of Saint Rose  
Undergraduate Posters Chair, **Aparna Madhav**, Worcester State University  
Registration Chair, **Mark Hoffman**, Quinnipiac University  
Registration Chair, **Stefan Christov**, Quinnipiac University  
Programming Contest Chair, **Frank Ford**, Providence College  
Programming Contest Chair, **Mark Gilder**, The College of Saint Rose  
Programming Contest Chair, **Del Hart**, SUNY Plattsburgh  
Career Fair Coordinator, **Ian MacDonald**, The College of Saint Rose  
Career Fair Coordinator, **Kimberly Gero**, The College of Saint Rose  
Career Fair Coordinator, **Paul Olsen**, The College of Saint Rose  
Vendors Chair, **Kevin McCullen**, SUNY Plattsburgh  
K-12 Coordinator, **Pauline White**, Siena College

**We would like to thank our national partners  
and conference supporters**



**Google Cloud Platform**

[www.turingscraft.com](http://www.turingscraft.com)



**Carnegie Mellon University  
Information Networking Institute**

**MERCY  
COLLEGE**

**FOR THOSE WITH A PASSION TO GET AHEAD**

**Upsilon Pi Epsilon, The  
International Honor Society  
for the Computing and  
Information Disciplines**



# Program - CCSCNE 2017

The College of Saint Rose, Albany, NY

## Friday, April 7

### Registration (7:45 AM - 4:00 PM) Events and Athletic Center Atrium

### Programming Contest (7:45 AM - 12:30 PM)

7:45AM	Continental Breakfast	Touhey Forum, Lally Hall
8:40AM	Pre-contest Instructions	Touhey Forum, Lally Hall
9:00AM	Contest	Lally 048 and 051, Albertus 111, 112, 205
12:00PM	Lunch	Touhey Forum, Lally Hall

### Pre-conference Workshops (9:00AM - 12:00 PM)

#### Workshop 1

**Albertus 401**

*Teaching a Computer to Sing: A Workshop on Combining Computing and Music*

Jesse Heines, UMass Lowell

Daniel Walzer, UMass Lowell

Rachel Crawford, Bartlett Community Partnership School

#### Workshop 2

**Albertus 402**

*Bringing Computational Thinking to the Digital Humanities: Introducing Students to Explorations of Digitized Texts*

Mark LeBlanc, Wheaton College (Massachusetts)

Michael Drout, Wheaton College (Massachusetts)

#### Workshop 3

**Albertus 406**

*Counting With Code*

Saad Mneimneh, Hunter College, City University of New York

**K-12 Special Sessions (9:00AM - 12:00 PM)**

**Albertus 301**

*Building your CS Teacher Network*

Pauline White, Siena College

*K-12 Teacher Birds of a Feather session*

Facilitator: Pauline White, Siena College

*Guiding students to understand CS concepts and develop process skills with POGIL*

Clif Kussmaul, Muhlenberg College

**Welcome Address (1:00PM - 1:15PM)**

**Events and Athletic Center Gymnasium**

Richard J. Thompson, Jr., Ph.D.,

Dean of Mathematics and Sciences

**Plenary (1:15 PM - 2:15 PM)**

**Events and Athletic Center Gymnasium**

*The New Wave of Computer Science Students*

Pat Yongpradit, Chief Academic Officer for Code.org

**Break (2:15 - 2:30)**

**Events and Athletic Center Atrium**

**Career Fair (2:30 - 5:00)**

**Carondelet Symposium, Lally Third Floor**

## **Concurrent Session 1 (2:30 - 3:45)**

### **Session 1A (Papers/Lightning Talks) Curricular Issues**

**Albertus 216**

Session chair: Mihaela Sabin, UNH at Manchester

*An Extended Series of Assignments in CS2 Involving a Text Adventure Game*

Clif Kusmaul, Muhlenberg College

*How Do Faculty Partner While Teaching Interdisciplinary CS+X Courses: Models And Experiences*

Darakshan Mir, Bucknell University

Sumita Mishra, Rochester Institute of Technology

Lori Pollock, University of Delaware

Paul Ruvolo, Olin College of Engineering

Sam Engen, Bucknell University

*Lightning Talk: On Designing of a Modern Intro to Web Development Course for Non-Majors*

Karen Jin, University of New Hampshire

*Lightning Talk: A Web Browser Application For Modeling Dynamic Data Structures*

Robert Ravenscroft, Rhode Island College

*Lightning Talk: Growing Programs: An Agile Alternative To Stepwise Refinement*

John Lasseter, Hobart and William Smith Colleges

### **Session 1B (Papers) Security**

**Albertus 210**

Session Chair: David Valentine, Slippery Rock University

*Open source security assessment as a class project*

Steven Crain, SUNY Plattsburgh

*Injecting and assessing cybersecurity topics within a computer science program*

Aparna Das, Le Moyne College

Davis Voorhees, Le Moyne College

Cynthia Choi, Le Moyne College

*Virtual-Machine Based Network Exercises For Introductory Computer Networking Courses*

Robert Montante, Bloomsburg University of Pennsylvania

(an encore presentation of CCSC-Eastern 2016 paper

<http://dl.acm.org/citation.cfm?id=3015246>)

**Session 1C (Tutorial)**

**Science Center 369**

*PollEverywhere: a Web 2.0 tool to Promote Student Student Engagement in Classrooms*

Ying Liu, St. John's University

**Break (3:45 - 4:15) Events and Athletic Center Atrium**

**Concurrent Session 2 (4:15 - 5:30)**

**Session 2A (Papers) Introductory programming and underrepresented groups  
Science Center 369**

Session Chair: Clif Kussmaul, Muhlenberg College

*Program2Play: Enticing Underrepresented Groups to Program through Game Play*

Evelyn Stiller, Plymouth State University

*Summer Learning Experience For Girls In Grades 7-9 Boosts Confidence And Interest In Computing Careers*

Mihaela Sabin, University of New Hampshire

Rosabel Deloge, University of New Hampshire

Adrienne Smith, Cynosure Consulting

Wendy DuBow, University of Colorado

*Empowering Middle School Students To Create Data-Enabled Social Apps*

Lijun Ni, University of Massachusetts Lowell

Farzeen Harunani, University of Massachusetts Lowell

Fred Martin, University of Massachusetts Lowell

**Session 2B (Papers) Math**

**Albertus 216**

Session Chair: Garrett Dancik, Eastern Connecticut State University

*Counting With Code*

Saad Mneimneh, Hunter College, City University of New York

*Frogs + Puzzles = Algorithmic Thinking*

Ed Lamagna, University of Rhode Island

**Session 2C**

**Albertus 210**

Session Chair: Aparna Das, Le Moyne College

*Things I Learned at Google That I wish I had known When I was Teaching*

Stephen Bloch, Google (vendor talk)

*Connecting Across Campus*

Mark D. LeBlanc, Tom Armstrong, Michael B. Gousie

Wheaton College (Massachusetts)

(encore presentation of a 2010 SIGCSE paper

<http://dl.acm.org/citation.cfm?id=1734280>)

**Poster Session (5:30 PM - 7:00 PM)**

**Faculty Posters**

**Events and Athletic Center Gymnasium**

**Student Posters**

**Events and Athletic Center Gymnasium**

**Dinner Banquet and Awards (7:00 PM - 9:00 PM)**

**Events and Athletic Center Gymnasium**

## Saturday, April 8

Registration (7:30 AM - 10:00 AM) Events and Athletic Center Atrium

Continental Breakfast (8:00 AM - 9:00 AM)

Events and Athletic Center Atrium

### Concurrent Session 3 (9:00 AM - 10:15 AM)

Session 3A (Papers) Software Engineering

Albertus 401

Session Chair: Dan Rogers, The College at Brockport

*Discovering Design Patterns In Software Behavior Models*

Sandeep Mitra, The College at Brockport, SUNY

T.M. Rao, The College at Brockport, SUNY

*Massively (un)reliable system projects*

Steven Crain, SUNY Plattsburgh

*So What Are You Here For? Self-Efficacy (and Self-Criticism) As a Route to Coding Maturity*

Nicholas Rosasco, Valparaiso University

Michael Glass, Valparaiso University

Session 3B (Tutorial)

Albertus 402

*Guiding Students to Understand CS Concepts and Develop Process Skills with POGIL*

Clif Kussmaul, Muhlenberg College

Session 3C (Encore papers and vendor session)

Science Center 369

Session Chair: Aparna Mahadev, Worcester State University

*Lowering the Barrier to Systems-level Networking Projects*

Joel Sommers, Colgate University (an encore presentation of SIGCSE

2015 paper <http://dl.acm.org/citation.cfm?id=2677211>)

*Google's Computer Science Education Outreach Programs, a Survey*

Stephen Bloch, Google (vendor talk)

*A Practical and Sustainable Model for Learning and Teaching Data Science*

Bina Ramamurthy, University at Buffalo (an encore presentation of  
SIGCSE 2016 paper <http://dl.acm.org/citation.cfm?id=2844603>)

**Plenary (10:15 AM - 11:15 AM)      Touhey Forum, Lally Hall**

*Intellectual Property Basics for Entrepreneurs*

Dr. Anthony Sabatelli

Intellectual Property and Patents Attorney at Dilworth IP

**Concurrent Session 4 (11:30 AM - 12:45 PM)**

**Session 4A (Papers) Parallelism and Big Data**

**Albertus 402**

Session Chair: Ed Lamagna, University of Rhode Island

*Etudes For Parallel Programming Using The Traveling Salesman*

David Valentine, Slippery Rock University

*Using Phoenix ++ MapReduce to Introduce Undergraduate Students to Parallel Computing*

Suzanne Matthews, United States Military Academy, West Point

*Development Of An Introductory Big Data Programming And Concepts Course*

Roland DePratti, Garrett Dancik, Russell Sampson, Fred Lucci (Eastern  
Connecticut State University)

**Session 4B (Panel)**

**Albertus 401**

*Innovation with Scale: Turning Large Class Sizes into Opportunities for Pedagogical Innovation*

Session Chair: Susan Imberman, College of Staten Island

Michelle Trim, Neena Thota, Tim Richards, Marc Liberatore,  
William Verts, Gordon Anderson (University of Massachusetts  
Amherst)

**Lunch (on your own, 12:45 PM - 1:15 PM)**

If you wish to purchase lunch before the membership meeting, the Camelot Room in the Events and Athletics Center will be open. There are also several restaurants nearby on Madison Avenue.

**Membership Meeting (1:15 PM - 1:45 PM)**

**Albertus 401**

**Board Meeting (1:45 PM - 3:45 PM)**

**Albertus 401**

## The Keynote Speakers

### Pat Yongpradit, Chief Academic Officer, [Code.org](https://code.org)

Pat Yongpradit is the Chief Academic Officer for Code.org, a non-profit dedicated to promoting computer science education. He is a national voice on K-12 computer science education. As a high school computer science teacher, he inspired students to create mobile games and apps for social causes, and implemented initiatives to broaden participation in computer science among underrepresented groups, including tripling the number of girls. He has been recognized as a Microsoft Worldwide Innovative Educator, has been featured in the book, “American Teacher: Heroes in the Classroom”, and is certified in biology, physics, math, health, and technology education.

#### *The New Wave of Computer Science Students*

Computer science programs around the nation, at both 4-year and 2-year institutions, are seeing a wave of interest. In his keynote talk, Pat Yongpradit will discuss the factors that have led to the uptick in enrollment, describe the types of students reflected in this new wave of interest, describe how college instruction can adapt, and inspire current students to give back to their community. Pat will draw from his K-12 teaching career and experience as the Chief Academic Officer for Code.org, a national nonprofit promoting computer science education for all students.

## **Anthony D. Sabatelli, PhD, JD**

Dr. Sabatelli is a registered patent attorney and partner at [Dilworth IP.](#), an intellectual property law firm in Trumbull, Connecticut. He holds a Ph.D. in organic chemistry from Yale University and a law degree from Salmon P. Chase College of Law. Prior to joining Dilworth, Dr. Sabatelli was vice president and in-house counsel at Rib-X Pharmaceuticals Inc. (now Melinta Therapeutics Inc.) and previously held patent counsel positions at both Merck and Procter & Gamble. He is an adjunct professor at the University of New Haven and an inventor on over a dozen patents. Dr. Sabatelli serves on several boards, including: CURE (Connecticut United for Research Excellence), the Board of Governors of the Yale Alumni Association, is Vice President of the Nicholas & Viola Spinelli Foundation, and is past chair of the Yale Graduate School Alumni Association, You can contact Dr. Sabatelli at [asabatelli@dilworthip.com](mailto:asabatelli@dilworthip.com).

### *Intellectual Property Basics for Entrepreneurs*

In this informal, yet informative presentation, Dr. Sabatelli will cover important topics in patent law of importance for faculty and entrepreneurs. These topics include: patentability, freedom-to-practice, subject matter eligibility (particularly for software and biotech developments), and a timeline of key patenting events. The talk will include fun and exemplary examples and will present a potentially dry topic in an engaging manner. Plenty of time will be available for Q&A. Come prepared with your questions.

## Faculty Posters

1. *Injecting Open Source Content Into CS2/Data Structures Courses*  
Stewart Weiss, Hunter College CUNY,  
Joanna Klukowska, Courant Institute of Mathematical  
Sciences, NYU, Darci Burdge, Nassau Community College
2. *Data Science & Computing Across the Curriculum*  
Jeremiah Johnson, University of New Hampshire
3. *Using a Systems Perspective to Teach Introduction to Computer  
Organization with a Laboratory*  
Jean Herbst, Wellesley College
4. *Preventive Strategies on Cheating Among International Computer  
Science Students*  
Vladimir Riabov, Rivier University
5. *Exploring Opportunities for Interprofessiona Education in a Software  
Engineering Course*  
Stefan Christov, Quinnipiac University  
Barbara Glynn, Quinnipiac University  
Margaret Gray, Quinnipiac University
6. *Computer Science For All in Western New York*  
Sarbani Banerjee, SUNY Buffalo State  
Neal Mazur, SUNY Buffalo State  
Ramona Santa Maria, SUNY Buffalo State
7. *Teaching Embedded Systems Using The Raspberry Pi and Sense Hat*  
Kevin McCullen, Plattsburgh State University
8. *Building uSafeNH Mobile App: the Evolution of an Undergraduate  
Project over Multiple Semesters*  
Karen Jin, University of New Hampshire
9. Issue Related to Interdisciplinary Undergraduate Research  
William Joel, Western Connecticut State University

10. *Teaching a Computer Forensics Course; Challenges and Opportunities*  
Yana Kortsarts, Widener University
  
11. *Using a Temporal Weighted Data Model to Maximize Influence in Mobile Messaging Apps for Computer Science Education*  
Songmei Yu, Felician University  
Sofya Poger, Felician University

## Student Posters

### **LCARS: Lightweight Cloud Application for Realtime Security**

Mariah Molenaer, Graham Burek, School of Computer Science and Mathematics, Marist College, Poughkeepsie, New York

We present LCARS: the Lightweight Cloud Application for Realtime Security. LCARS is a web-based security application designed to identify, analyze, respond to, and help prevent attacks and threats targeting our network infrastructure. In recent years, network-based cybersecurity attacks have increased in both frequency and severity, far outstripping traditional defense methods. LCARS addresses this problem. We collect attack data from LongTail [1] honeypots and other network monitoring devices and logs, which we parse into JavaScript Object Notation (JSON) for analysis by our analytical tools. One such tool is BiG\* Data Studio, which allows us to visualize attack logs as force-directed graphs and execute graph queries for easy identification of top influencers. Other tools include hive plot visualization and translation to relational data. In order to respond to these attacks, we have implemented a threat intelligence database comprised of attack profiles, response recipes, and orchestrated responses. A response recipe consists of a collection of firewall rules, while an orchestrated response maps an attack profile to one or more response recipes. LCARS enables us to easily deploy orchestrated responses through utilization of RFW (Remote Firewall), an open-source REST API for iptables. LCARS is primarily written in JavaScript, but also employs our own REST API written in Java, which enables communication with our relational database and other server-side processes. Our poster details the software development effort and architectural decisions made in developing this system. This work is sponsored by NSF Grant Award number 1541384 CC\*DNI Integration: Application Aware Software-Defined Networks for Secure Cloud Services (SecureCloud) [2].

#### References:

[1] LongTail. <http://longtail.it.marist.edu/honey/>. Accessed January 29, 2017.

[2] NSF CC\*DNI Grant.

[https://www.nsf.gov/awardsearch/showAward?AWD\\_ID=1541384](https://www.nsf.gov/awardsearch/showAward?AWD_ID=1541384). Accessed January 29, 2017.

## **G\* Graph Database Cross-Compiler**

Torin Reilly, School of Computer Science and Mathematics  
Marist College Poughkeepsie, New York

This project presents a DGQL-to-PGQL cross compiler for G\*: The Dynamic Graph Database [1]. G\* is a graph database designed for working with big data. It is scalable across many servers to allow for peak performance on large data sets. While it is a useful tool for a great many applications, its proprietary Procedural Graph Query Language (PGQL) is unfamiliar to most people and can be difficult to learn, especially for those coming from a primarily SQL background. The Declarative Graph Query Language (DGQL), on the other hand, supports a SQL-like syntax for querying graphs. Unfortunately, G\* does not natively support DGQL at this time. With my DGQL-to-PGQL cross compiler, I have addressed this problem by enabling the use of a familiar SQL-like syntax while simultaneously maintaining the features and usefulness of the existing G\* Database. To create the DGQL-to-PGQL cross compiler I used JavaScript along with the parser generator library PEG.js to lex and parse the DGQL input. Using the lex and parse output, I built a tree-like intermediate representation and then generated PGQL for G\* to execute. I used JavaScript because this project needed to integrate with the existing BiG\* Data Studio (a web interface to interact with G\*). By creating a DGQL-to-PGQL cross compiler I made the G\* Database more accessible while taking advantage of the robustness of the original query language. My poster details the challenges I encountered along the way as well as the creative solutions I found. My poster also explains the technology used to accomplish this task and details the benefits my project has brought to the overall G\* project.

### References:

[1] Labouseur, A.G., Birnbaum, J., Olsen, P.W. et al. The G\* graph database: efficiently managing large distributed dynamic graphs. *Distrib Parallel Databases* (2015) 33: 479.

## **Chaotic Scattering for a Sliding Mass in a Complex Topography**

Avi Vajpeyi, Denise Byrnes, Department of Computer Science, The College of Wooster, Wooster, OH

The study of chaotic behavior has been instrumental in helping us understand nonlinear and fluid dynamics. To study the chaotic trajectories of particles scattering in regions with hills and valleys, I built a software simulator:

ChaosScattering. While sliding chaos simulations typically use hills rather than valleys, ChaosScattering allows users to compare and contrast both kinds of topographies and the resulting trajectories of particles. Trajectories are simulated by numerically integrating differential equations of motion using a variety of numerical integration algorithms (such as Runge-Kutta) that the user can select. We can determine the technique that is most stable and sensitive to small increments in the initial constraints by plotting the trajectories created with various numerical integration techniques on the simulator. Users can also run simulations with varying initial constraints including the velocity and position of the particles, and record the resulting scattering angles. On plotting the initial parameters to the scattering angles of the system, users can study the fractal and chaotic nature of the system. By recording data with the ChaosScattering, users can compare the fractal nature of both scattering models—a unique and new comparison to this field of research.

### **University Campus Mobile Application**

Trevor Haigh, Brandon Knierem, James Hebert, Computer Science , University of New Haven, West Haven, CT

We will be presenting our project for our senior project course in the Computer Science department at the University of New Haven. This course is intended to be a full year long experience in developing a software application using modern agile development and object-oriented strategies, including SCRUM and various diagrams such as UML, state, action, and collaboration diagrams. Our project began with the idea that we wanted to provide a map for navigating our campus using the google maps API. Looking further into this idea, and asking our peers, we determined that it would be more practical to focus on making the application more generalized, to be an all-in-one stop for anything a student might need on campus. After polling many UNH students, we settled on several features that we felt were realistic goals for our year long project. These features include an emergency alert system, the map of the university, an announcement page which links to the map to show locations of events, a list of the student's classes linked to the map, and more. Looking into mobile development frameworks, we prioritized a multi-platform solution, because we felt that it was important to have the application available to as much of the student population as possible. We settled on the Xamarin framework due to one of our team members having some experience with it, however, due to time constraints, we have focused on the Android version of the application. If time permits, we will also develop the iOS version. Our goal was to design an application that would replace and improve upon the

university's current approach to interacting with the student population, while ameliorating the struggles of freshman as they become acclimated to campus life. Our poster will discuss in detail the features of the application and methodology we used to include these features.

### **Who's In and Who's Out: What's Important in the Cyber World?**

Anthony Kelly, Info. Tech/Computer Science, La Salle University, Philadelphia, PA

Since the dawn of the 21st century, the word "cybersecurity" and its prefix "cyber" have grown exponentially in usage and in importance. In the last ten years, the realm of cybersecurity has exploded with public, professional, and academic interests. In his revolutionary work, *Blown to Bits*, Hal Abelson touches on the rapid growth of the digital world as a whole, remarking that "The world changed very suddenly...the digital explosion is changing the world as much as printing once did – and some of the changes are catching us unaware, blowing to bits our assumptions about the way the world works..." (2-3). Abelson is one of many authors and innovators who have recognized how fundamentally the cyber world has influenced the daily lives of modernity.

Amid this technological revolution, the importance of secure computing, data storage, and communication is at an unparalleled high, and it is not likely to see a decrease in priority. As the general public's usage and dependency on technology increases, so do the efforts to maintain a safe and stable infrastructure for those new technologies. Those efforts to tighten security are often hastened by the antagonistic countermovement of developments that are designed to threaten and destroy the same integrity that this new technology both necessitates and creates. World famous security expert Bruce Schneier's book, *Beyond Fear*, describes this direct relationship of the proliferation of these attacks and the defense thereof, writing "...and so changed the defensive front, just as quickly as the attacks did..." (Schneier, 5). It is not difficult to see how quickly one side will react to its opposition. This now-eternal struggle between the black and white hats continues to define how society operates; what is safe, what isn't and what needs to ensure society operates status-quo. As this research demonstrates, it is very easy to disturb the fragile ecosystem of the cyber world.

The aim of this experiment is to offer an introduction to the exploding field of cybersecurity by asking what are the most important concepts or topics that a new member of the field of cybersecurity should know. It explores this

question from three perspectives: from the realm of business and how the cyber world is intertwined with modern commerce, including common weaknesses and recommendations, from the academic arena examining how cybersecurity is taught and how it should be taught in a classroom or laboratory environment, and lastly, from the author's personal experience with the cyber world. Included information includes scholarly journals, news sources, special interest books, academic curricula, and relevant experience. By blending together information procured from these three distinct environments, this research proposes several of the most important concepts and lessons that one should know as they begin their career, whether professional or academic, in the cyber world.

### **Gesture Control of Smart Devices using Indoor positioning on an Android Device**

Stephen Mendez, Computer Science, Quinnipiac University, Hamden, CT

Although the fields of smart home and home automation technology have been growing for more than 10 years, many companies have recently begun developing products that utilize remote access and control via interfaces on the web or in a mobile app. While these applications are quite functional, they unfortunately are frequently only useful for a specific product and lack a well-developed graphic user interface (GUI). Attempts to connect the control protocols of these systems have been made with "bridges" or "hubs" from companies like SmartThings, Apple and Wink. While these products provide a single platform to interact with hundreds of different smart devices, they function the same: a GUI with many windows and options. This project aims to provide a proof of concept of an intuitive, gesture-based control system. That is, rather than controlling devices around a smart home by using a GUI in an app, the user points at the device they want to control and makes the appropriate gesture to interact with it. This ability makes it faster and quieter than audible controls and far simpler than using an advanced GUI in an application. There are also greater social impact contained therein - those with speech or physical disabilities will be able to control devices around them. Although gesture control ability research has been conducted, there has yet to be a simplified single software product that allows users to (1) quickly define the devices around them and (2) control these devices with minimal additional setup and effort. This project plans to use indoor location techniques paired with the sensors of a smartwatch or smartphone to bring the future of control directly into the hand of the end user.

## **MinNo: A Language for Arduino Development Boards**

Logan H. G. Davis, Marlboro College, Marlboro, VT

MinNo is a compiled language targeting the Arduino platform of development boards. It's an attempt to embed the distinction of the Arduino's "Modified Harvard" architecture principles at a more syntactic level than the Arduino Programming Language offers. The language's syntax emphasizes a more stylistically consistent form of programming that could be a better entry point for newcomers who are turned off by the stylistic variety of the Arduino Language/C++. MinNo's semantics are centered around more static allocation, limiting dynamic memory access and stateful idioms, avoiding many of the common points of failure that can make embedded system debugging so tedious. The language's compiler is written in Racket and produces Arduino Language sketches for the ability to hand optimize performance critical sections in a more human-readable level than pure AVR assembly.

## **A Path to Learning Cryptology**

Michael Blithe, Computer Science Department, Widener University, Chester, PA

The purpose of this project is to create a learning path to an introduction to Cryptology. This will be done in an explorative and hands-on way. The path will allow students to implement many of the concepts from discrete mathematics and computer science into a set of non-trivial projects. This path is targeted towards second and third year computer science students, who have completed an Introduction to Cryptology course. A full path is provided and the curriculum is detailed, specifying the goals, knowledge prerequisites and exercises of varying difficulties. These are given in a high-level structure that will be expanded to allow flexibility and discretion to be used by the teaching faculty. The course style is targeted towards advanced students in small class sizes or independent studies. To optimize the progression of the student and to ensure that he or she is always learning new information while not being overwhelmed, an initial survey was done of the algorithms selected and the required knowledge was assessed. Each of these has been completed by a student in the targeted student group to ensure feasibility. The path is able to cover a wide variety of topics including: Knapsack Public Private Cryptosystems, Cryptanalysis of the algorithms implemented and Digital Signatures. The amount of time this path is expected to take to complete is about a semester.

The result of this project was a complete layout for an upper level course on the topic of more advanced Cryptology.

### **Development of an Alumni Relations Web App Using an Agile Approach**

Spencer Linsner, Ryan Connors, Department of Computing Sciences  
The College at Brockport, State University of New York, Brockport, NY

We present our experience developing a web app to interface with an alumni database for the Computing Sciences department at Brockport. Prior to the end of each semester, the College seeks to gather relevant information from graduating students (e.g. contact information, employment data, etc.) All this information is stored in a database, whose schema was designed by the department faculty some years ago. A prior project took a UML modeling-based waterfall approach to constructing the web app to interface to this database using a 'pure' MVC approach and the CakePHP tool. This effort did not meet user needs. Therefore, over the past year, we adopted a more Agile-based approach to building this system. We decided to drop the use of CakePHP and explore other contemporary web technologies that were not previously incorporated, such as jQuery, Bootstrap, and PHP data objects (PDO). In this poster, we will describe how the development team would explore the use of a tool to achieve a certain kind of behavior, meet regularly to demonstrate the results of their exploration, and then seek to implement and thoroughly test a feature of the actual system using (or deciding against the use of) the explored tools. Seeking customer feedback on this feature, we then moved ahead with the same approach for the next feature. We will discuss how the use of an Agile approach, as opposed to the traditional waterfall method, gave us the opportunity to both continually have a working system and to receive feedback on the direction in which our project was headed. Additionally, we will touch on other aspects of our experience, such as the benefits we derived from having the learnings from the earlier failed project, and the compromises we had to make with architectural purity in order to use appropriate tools.

### **Emotion Recognition Test (ERT)**

Olivia Morsey, Computer Science, Saint Anselm College, Manchester, NH

### **The Memorizing Game: Powered by Python**

Christina DiVita, Computer Information Systems, SUNY Buffalo State, Buffalo, NY

This research project would create a learning game for kids with cognitive disabilities. The program would fulfill the need to help special needs kids improve their vocabulary knowledge. Python (Version 2.7), a programming language, would be used to create the memorizing game. The game would include pictures and words as well as audio features where kids would try to match the pictures with the common vocabularies that they see on the screen. There would be a main menu where the kids can pick a category of their choice. The purpose of creating this game is to have a well-designed game for special needs kids with cognitive delays. The HTML (Version 5) would be used for creating the framework for the game and Java programming language would be used for the active events needed for the matching to work properly. Once the game is developed, it can be downloadable to any laptop or desktop with Windows Operating Systems.

The game tested by kids from 5-8 years of age who have some kind of disabilities that make them unable to do things that are normal for other kids. These kids attend Cleveland Hill elementary and middle schools. The game would provide different levels of difficulties, ranging from easy to moderate, that the kids are able to do. This would be a fun and interacting game for all kids with or without disabilities to learn new words, since the game would improve their knowledge of vocabulary.

### **Sparking the Stock Market: Big Data Analysis for S & P 500 Index with SparkR** Meng Lin Ma, Computer Information Systems, SUNY Buffalo State, Buffalo, NY

Big Data” is one of the hottest terminologies of recent days. It is a term for large scale data sets with three common characteristics—large volume, huge variety and high velocity, often called 3Vs that define Big Data. These characteristics give rise to a problem of how to store, implement and analyze Big Data.

The purpose of this research project is to do a data analysis on the daily data of S&P 500 Index using SparkR on the RStudio. It will develop suitable time series model based on over thousand daily data of the S&P 500 Index which is stored in the Spark cluster within Amazon Elastic Compute Cloud server (EC2) and eventually derive a best fitting model.

Stock index has become a significant tool for the investors as well as for financial managers to describe market performance, and to compare the return on specific investments. S&P 500 index is an American stock market index

based on the 500 large companies which have common stocks listed on the NYSE or NASDAQ since 1950s.

As one of the open source cluster computing framework, Apache Spark not only provides high-level application programming interfaces in Java, Python, Scala and R, but also allows other environment to access the Spark clusters. For instance, SparkR is an R statistical package that allows front-end Graphic User Interface (GUI) to use Apache Spark to work on the large datasets. In addition, RStudio will be able to import large data sets from Spark clusters.

### **Deterring Prescription Drug Abuse through Mobile Apps**

Kelli Bores, Computer Information Systems , SUNY Buffalo State, Buffalo, NY

Opioid abuse is a serious problem in America. Many die every year through overdoses on medications that have been prescribed to them by their doctors. Patients will take their medications more frequently or more in number to help alleviate their constant pain. Addictions happen quickly and without warning; anyone is susceptible to addiction and in turn abuse. Through this research project an app will be made help combat this epidemic. Programmed in JavaScript, CSS, and HTML, this app will be written for Android devices. Notepad++ will be used to write this program. This app will allow the user to set timers to remind them when to take their medications so they are not taking too many a day or taking too many each time they are scheduled to have a dose. It will have the function for the user to input a list of drugs they are taking and when they got them, so they will know when to refill them. In addition to helping manage the times and functions of the medications, this app will help identify potential dangers of abusing these drugs and the risks associated with them. It will also encourage users to not take more medications than they should. The goal of this app is to make the user feel like their pain is indeed manageable and in turn make them less likely to develop an addiction.

### **GameTime: A Raspberry Pi Powered Goal Light**

Muhamed Catovic, Computer Information Systems, SUNY Buffalo State, Buffalo, NY

In the modern era most of the everyday mundane tasks are becoming automated. Normal devices and appliances used to do those tasks now also have the ability to connect to the Internet. These devices are generally referred to as “The Internet of Things” (IoT) or “Smart Devices”. This research project

will look into the possibility of attaching a Raspberry Pi (a cheap computer the size of a wallet) onto an ordinary Goal Light to transform it into a "Smart Device" and have it become automated.

The Goal Light is a battery powered light that resembles the lights seen behind the goals in hockey arenas that lights up indicating that a goal has been scored. The Raspberry Pi and the light will be connected together by attaching wires going from the Input/Output pins on the Raspberry Pi to the wiring of the button that is used to activate the light. The Raspberry Pi will have a program written in Python (version 3.0), a general purpose programming language, that reads live JSON (JavaScript Object Notation) data to determine if a goal has been scored in order to activate the light. On a graphical interface created with a Python library called Tkinter, users will be instructed to choose their favorite team so the light will only activate for the selected team. Advanced analytics and stats about current games will also be displayed to give users a more comprehensive experience.

### **Stock Market Prediction based on Machine Learning Algorithms.**

Aidan McCracken, Joseph Chouinard, Joshua Raymond, Matthew Goldstein  
Savanah Many, Machine Learning Group, CS/EG department, DWC/Southern  
New Hampshire University, New Hampshire

We are presenting our research which involves using machine learning algorithms and neural networks to find and predict patterns in stock market data. Our data is sourced from google and/or yahoo and dynamically read into a software program. A representative example would be the S&P500 ETF SPY price data. We then clean the input data removing any invalid entries. Using mainly Python for programing we use Libraries such as Numpy, Pandas, and SciKit learn to analyze and predict stock prices. We compute technical indicators such as moving averages and Bollinger bands. We feed these inputs into machine learning algorithms such as deep neural networks. The algorithms are accelerated using GPU's that reduced training time from days to minutes. Where possible we use Quantopian/pipeline for back testing the models. Our results show positive yearly returns.

### **Leveraging Apache Spark for Real-Time Regex Matching on Bro Log Data**

David Brownfield, Sean Deaton, Leonard Kosta, Zhaozhong Zhu, Department of  
Electrical Engineering and Computer Science, United States Military Academy  
West Point, NY

Network Intrusion Detection Systems (NIDS) are an important part of protecting Army and Enterprise Networks. As governments and corporations grow increasingly reliant on reliable and secure network infrastructure, the amount of traffic data collected by NIDS grows proportionally, making it difficult for network administrators to protect users from malicious activity. In this poster, we describe the Parallel Signature Detection using Apache Spark (PSDAS) project, which seeks to improve computer network security by quickly parsing through large amounts of security log data. Our contributions include new search algorithms at the intersection of specialized pattern matching and parallel computing. More specifically, we discuss the use of the cluster-computing framework Apache Spark for real-time detection of malicious Uniform Resource Identifiers (URIs) in industry-standard log files.

### **Automating Engagement Detection**

Anne Schwartz, Computer Science, Connecticut College, New London, CT  
Ozgur Izmirli, Connecticut College, New London, CT

We present our work in developing a method for automatic detection of human engagement. The solution makes use of several areas in Human Computer Interaction, such as face detection and angle estimation, eye detection, and speech recognition. Our research combines the outputs of these computer vision and voice processing algorithms to decide whether or not a person has the intention to engage from the first person perspective of a computer. The aim is to create a practical application which, for example, could notify a visually impaired person that someone wants to engage or could make machines more interactive by gauging the user's engagement in response to avatar guidance.

It is so ingrained in humans to determine if another individual is looking at us but it is a difficult problem for computers. For our research, we use a camera to acquire the first person view. We designed an algorithm that decides whether or not an individual is looking, by locating the position of the pupils within the eye region, offset by the angle of the face. A video of an individual turning one's head looking at the camera and another one in which the subject is not looking at the camera is used for learning. The algorithm is highly accurate and it correctly labeled 53 out of 57 images as looking or not looking. We then analyze a person's actions over time, using speech recognition and considering how often the subject looks at the camera, to decide whether or not the individual is engaging.

## **Developing a Cancer Publication Portal**

Michael Underwood, Mathematics and Computer Science, Eastern Connecticut State University, Willimantic, CT

We present steps taken to begin the development of a search engine specifically designed for organizing and querying publications in the area of cancer genomics. Our long-term goal is to provide a tool that uses text mining to aid in the identification of cancer publications involving specific genes or proteins. Text mining has become a widely used tool in biomedical research because it is very easy to convert textual information into database entries for the purpose of data analysis or hypothesis generation. Furthermore, the increasing number of published research articles in the field of cancer genomics is difficult to summarize using search engines and databases that are not cancer-specific. With our finished product, cancer researchers will more easily be able to obtain published work that is relevant to their interests, which would accelerate the research process. Multiple Biopython scripts were written to extract all abstracts from PubMed based on specific search terms. Using these scripts, >400,000 abstracts related to lung, pancreatic and bladder cancer were collected. R scripts were developed to filter those collected abstracts based on the presence of at least one approved gene symbol. The implementation of these scripts and their results will be presented in detail. These scripts will be the basis for data collection and pre-processing. Subsequently, we will populate a database and develop a website hosting a Cancer Publication Portal to interested researchers.

## **Two Methods for the Detection of Cyberbullying**

Serena Schaefer, Bryan Bradley, Mathematics and Computer Science  
Ursinus College, Collegeville, PA

The growth of social media leaves its users vulnerable to cyberbullying, which is hard to track and impractical to detect manually across the increasing number of communication platforms. We present our research in cyberbullying detection using Twitter and SMS messages. The project aims to identify cyberbullying messages without flagging an excess of innocent messages.

Cyberbullying has many different shades and forms, though some syntactic commonalities such as part of speech patterns can be identified and utilized during detection. We propose a system that uses those commonalities and addresses challenges in accurate detection such as variations in context and vocabulary. One approach was that we automatically compiled a dictionary based on words found in actual instances of cyberbullying, which we found by collecting and labelling a set of tweets as cyberbullying or non-cyberbullying. When compiling it, we searched for similar permutations of words to account for spelling errors. We removed words common to posts labeled as non-cyberbullying messages. This can capture unexpected bullying words that manually compiled dictionaries might not contain. The detection system is supplemented by contextual features such as part of speech tagging. The results of the detection algorithm on this set demonstrate that the system correctly classifies nearly all posts we labeled as non-cyberbullying. The second algorithm works by first separating SMS messages into conversations in an automated way. The algorithm then analyzes the conversations and scores the severity and frequency of the bullying words. A scoring threshold is used to predict whether or not a message or a conversation contains cyber bullying. Future work is needed on both algorithms to increase overall accuracy and account for the different shades of cyberbullying.

### **Investigating the Distribution of Rings in an Orbital System Using Genetic Algorithms**

Andrew Miller, Computer Science, Widener University, Chester, Pennsylvania

The existence of rings in an orbital system is often explained by the conservation of angular momentum, but unfortunately it is difficult to model the evolution and the resulting distribution of the rings in such a system due to mathematical complexities involved in such a model. To get around this problem, we attempted to generate a model using a genetic algorithm to evolve a system which minimizes energy while maintaining a constant momentum and total mass. By modeling the system in this way, we hope to generate optimal distributions without the need to know many of the key characteristics of such a distribution. The system involves first developing a method of representing potential ring distributions. We chose to represent these distributions as a set of rings which have both a radius and mass. Once this was conceived, we then worked to describe three key features of genetic algorithms for our system: fitness evaluation, crossover, and mutation. By describing the distribution of mass in such a way, we could use an initial population of randomly distributed mass to evolve a distribution which is

optimized for a minimal energy with our mass and momentum constraints held constant. With this system, we plan to look for any potential mathematical patterns which may be present in an optimal solution, as well as additional constraints which may play a role in optimizing the system.

### **Classroom Helper – A Facial Recognition Approach to Attendance Taking**

Gavin Killough, Computer Science , Merrimack College, North Andover, MA

I present an Android application used for taking classroom attendance via facial recognition. The goal of this project is to offer a solution to the various problems with current attendance taking methods in medium sized classrooms (those with 25 to 100 students). The methods currently used for taking attendance include roll calling, passing around a physical attendance sheet, or scanning id cards. Each of these techniques is prone to environmental factors, dishonest manipulation, or inefficiency. Such problems may cause attendance to be taken inaccurately, or cause instructors to give up on the process entirely. This motivated the search for a novel, practical approach to attendance taking. Biometric identification presents an accurate and efficient solution, as one of the quickest ways to record the presence of 25 to 100 people is through facial recognition using a mobile phone camera. An app was developed to facilitate this attendance-taking method, which connects to Google Classroom and Google Drive to manipulate attendance sheets, download and view class rosters, and save data points for future learning and identification. The app's UI is custom built to facilitate fast attendance-taking, and the system was built using Android Studio. This project represents a semester of work, and combines facial recognition algorithms with Android app development and professional API integration to culminate in a novel and useful Android application.

### **PyPyGUIMAKER: A Native Python GUI maker**

Robert Bofinger, Computer Science Dept., Canisius College, Buffalo, NY

Creating a GUI for a Python application poses a challenge to early programming students due to the large amount of boilerplate code and by not being able to preview the GUI until the execution of the application. PyPyGUIMAKER aims to tackle these two problems by being a visual GUI designer that is able to load and generate Python GUI programs. By creating the GUI maker in Python we are able to leverage the existing Tkinter GUI packages in Python to display the editor. Using the same GUI packages for the editor and for the generated

program allows for simple WYSIWYG editing. As the GUI maker is written in Python it allows for the users who are already familiar with the language to explore and contribute to the code. In order to load pre-existing Python programs we make use of the abstract syntax trees of the loaded programs. By doing so we are able to identify what and how GUI objects are created in order to display them in the editor. In order to export a GUI from the editor we are able to save the state of GUI objects into the editor to a file using a template. Although the tool is not currently being used in classes, the tool is planned to be used in intro computer science courses to introduce students to concepts used in GUI programming.

### **Daily Diet App**

Keilon La Barrie, Computer Information Systems, SUNY Buffalo State, Buffalo, NY

Everyday more people are learning that one of the keys to being healthy is not just what you do during the workout; it is not actually what you eat throughout the course of the day. By watching calories and having a set meal plan to help meet particular goals can make a difference for someone looking to take fitness seriously. Sometimes it can be hard to find recipes of cost effective meals that meet ones particular goals. A user-friendly Daily Diet App would be created as part of the current research project. This App would help people to target their calories and figure out the meals that are designed to fit those particular calorie choices. When the users would open the Daily Diet App they could select the meal time, for example, breakfast, lunch, dinner or snack. After making the selection they would be interfacing a screen that would show a variety of calorie levels for them to select. Based on their selection on the number of calories, the users would have the option of picking meals that are designed to fit their number of calories. In this screen, based on their meal selection the user would be sent to a website with the recipe of how to make that particular meal.

The Daily Diet App program would be developed using Xcode 8.2.1, an Apple Developer with Swift 3.0, a programming language. This App would have several user-friendly features, such as easy screen navigation, view picker selections, as well as web views within the App. When fully developed the App would be published to the Apple store.

### **How well can you hear me now? – A Virtual Reality Project**

Michael Peters, Computer Information Systems , SUNY Buffalo State, Buffalo, NY

As Virtual Reality (VR) becomes more prevalent as a medium, its capabilities as an art form have received further exploration and development. When creating a VR experience, two main parts are essential for an immersive VR environment; the visuals, and the audio.

This project will explore the audio-side of the VR experience with the goal being to develop procedurally adjusted audio within a virtual environment. This project will create a small virtual experience for a Windows 10 computer with an Oculus Rift DK1 attached to it. Using the Unity 5 development engine and Microsoft Visual Studio C# programming language, this project will attempt to blend both ray-casting and pathing methods to determine the quality changes that need to be introduced to the sound, and distance traveled from source to listener. Using that data, the volume and the equalization of the sound will be adjusted by changing settings in Unity 5's mixer feature.

To test this the viewer will be able to directly trigger different audio sources regardless of the viewer's location in relation to that source. The viewer should hear a difference in the quality of the audio depending on their location even though the sound emitter itself is constantly playing the same audio file.

### **Student-Tutor Scheduling Made Easy Through An App**

Alaa Hamzi, TJ Adeniji, Computer Information Systems, SUNY Buffalo State Buffalo, NY

Currently, there is an urgent need for a system for setting up appointments with tutors without contacting the tutors by phone. Students who need help with difficult subjects like Calculus or Writing typically call the Tutoring Help Desk to schedule an appointment. The goal of the current research project is to create an App which will help the students to schedule an appointment with a tutor to receive assistance with their work.

This project will be using Android Studio (version 2.2.3) for the Windows operating system to develop the application. Android Studio's framework is based on Java and includes elements of XML. Java is an object-oriented development language that is very similar to C++. XML (eXtensible Markup Language), is a metalanguage that is almost identical to the web programming language such as HTML. XML is used primarily to store and transport data.

Android Studio uses these two languages (Java and XML) in its Integrated Development Environment (IDE) to develop applications.

The App will be used by students for an easier way of setting up appointments, canceling, and changing appointments with their tutors. This App will simplify things for tutors by creating a way for them to reschedule or cancel appointments as well as sending email to the students. If for any reason the student, advisor, or tutor needs to cancel the appointment they will be able to do so, and each of them would receive an email whenever changes take place. By creating this scheduling App, student will be able to access tutoring services more easily.

### **Raspberry Pi Based Smart Home Security**

Abu Shohag, Computer Information Systems, SUNY Buffalo State, Buffalo, NY

Raspberry Pi Zero is a super-ultra-low-cost self-sufficient computer. It is one third the size of a regular credit card. Raspberry Pi (RPI) comes with endless possibilities with little bit of programming. In the present age, Internet of things (IOT) has entered a golden era of rapid development. In this project, a system is being developed to connect any door with the internet, so that owner gets notified of any visitor, stranger or guest in their door.

This smart doorbell system will allow visitors to leave a voice message for the owner of the house if they are not at home. The message then gets transcribed into text and sent to the owner's phone as a text message. A copy of the recording can be set up to be uploaded to the Google Drive as well.

Underneath the hardware, powerful Linux (Distribution: Raspbian, Kernel Version: 4.4) and Python (Version: 3.4) scripting will be used alongside with Google's Speech Recognition API (3.6.0). Guest will interact with the system by using the doorbell button, microphone and speaker. RPI will use a door sensor to monitor if the door has opened or not.

Upon pressing the doorbell for a certain number of times, if no one opens the door, an audio message will be played to the guest, that will inform the guest that no one is at home and if they want to leave a message to the owner's phone they can press the button to start recording.

### **Oscilloscope'd: Polishing An Asteroids Clone Game**

Arsenio Colon, Computer Information Systems, SUNY Buffalo State, Buffalo, NY

For Global Game Jam 2017 event, a game called Oscilloscope'd was developed. It is an asteroids-based clone that uses "sound waves" to attack the enemies and stay alive until your health points reach zero. The idea for the project was derived from someone playing with an oscilloscope, and displaying 3D images on it via oscilloscope "music". The initial goal of the project was to make the aesthetics as close to how an oscilloscope looks like in real life. The final goal and the scope of the project is to embellish the game's already existing systems, add user interface elements to the game, make a game menu, add more levels, add a "boss battle" stage, with an overarching goal of improving the "game feel".

To achieve this, Unity 5 will be used. It is a popular cross platform game engine that uses C# (C-Sharp), a widely used programming language in the gaming industry that runs on the .NET framework. C# will be used to code and implement various systems needed for the game. Unity is a powerful game engine, used in 34% of the top 1000 free mobile games, and used by both independent developers and large companies in the industry. Due to Unity 5's multi-platform engine and package builder, the game will be able to run on both PC and MAC. The intended audience is meant for casual gamers of all ages, although an experienced gamer may have an easier time playing the game due to increased hand-eye coordination.

### **Boan: a HTTP/HTTPS Man-in-the-Middle Proxy**

Dylan Murphy-Mancini, Computer Science/Computer Security , Marlboro College, Marlboro, VT

Boan is a cross-platform HTTP/HTTPS man-in-the-middle proxy designed to aid in web application penetration testing which is part of my senior thesis. It can send, intercept, modify, and forward web requests allowing for the fuzzing or manipulation of the parameters, headers, and body of HTTP traffic to detect vulnerabilities. Boan creates a self-signed CA certificate and generates corresponding host certificates on the fly to handle HTTPS interception. Within the program the user can also set up filtration settings to manage what is in-scope during a penetration test by blacklisting or whitelisting filetypes, hosts and domains. The code base is mainly Python3 in conjunction with the QT application framework. My results include the recreation of attacks like SSLsplit and Slowloris and the successful detection of web application vulnerabilities from OWASP's top ten most prevalent list such as: SQL injection, cross-site scripting (XSS), cross-site request forgery (CSRF), broken authentication and session management, and HTTP response splitting.

## **Diversified Recommendation Systems**

Nilay Bhatt, Department of Computer Science  
Central Connecticut State University, New Britain, CT

In the current industry, there exist various recommendation algorithms that are widely used in popular applications such as Netflix or Amazon. The difficulty that we are facing is a fairly static view of user preference. This research is an attempt to understand the need and importance of diversity while using recommendation systems. Existing recommendation algorithms today often give the highest rated recommendation but miss out on the fact that the user might want to explore something outside of the box [1]. For example, it is not always the case that the movie with the highest predicted rating for a user is the one the user would prefer to watch at a particular point in time. Our goal is to examine how the differences in recommendations produced by different algorithms may help users explore a more diverse set of items that match their interests than simply what item they would give the highest rating. We are exploring how the fact that, given previous ratings provided by the user, the highest predicted rating produced using the user's ratings, is not necessarily the item that is preferred. In this research, we are trying to create new data mining algorithms that help produce diverse recommendations using movie data for when similar parameters are served as input parameters. My poster will be discussing in detail the need to have diversified recommendations using contextual data and the process of the creation of a web application that will serve users with better and more relevant results.

References:

[1] Vargas, S., & Castells, P. (2011). Rank and relevance in novelty and diversity metrics for recommender systems. Proceedings of the fifth ACM conference on Recommender systems - RecSys '11.

## **Utilizing Voice Recognition and Text-to-Speech to Improve Daily Efficiency**

John Aromando, Diego Holguin, Department of Computer Science  
Quinnipiac University, Hamden, CT

Zoey is designed to be unique in three areas: accessibility, device orientation and household assistance. First, greater accessibility allows for intriguing social impacts. Through Zoey's voice recognition and text-to-speech abilities, usage is nearly 100 percent hands-free. This could redefine how an individual goes about their routine by organization and minimization of mundane activities.

Also, greater accessibility is important for those that have impairments impacting their mobility. Second, we desired a virtual assistant that would work well on a PC device. While Siri and Cortana dominate the mobile market, they leave a lot to be desired when working on a desktop or laptop. Third, not many virtual assistants offer useful features to aid individuals with important tasks around the house. Zooley is able to locate any file on your computer, open it, and then close it when specified. Along with this, users are able to access a particular search engine and search a specified topic. Zooley features the ability to turn on and off lights wirelessly by command. Furthermore, Zooley can utilize 36 mathematical calculations, chat locally across a server and schedule, alter and remove appointments in order to keep one's day organized. In order to construct Zooley, a background is necessary with Python/Java/C++, Win32 API, Networking, Cryptography, Raspberry Pi, utilizing libraries and basic Machine Learning ideas. The motivation behind this projects stems from our desire to learn the concepts listed above in greater detail while designing something that would be useful and interesting. With Zooley nearly complete, the results are beyond what we hoped to accomplish. Not only is Zooley a tool we can use daily, but we can be proud of creating something incredibly complex and ranging over a diverse amount of fields. A potential future feature includes the capacity to send commands to any computer on the network.

### **DocuWare Voice Recognition**

Samuel Perreault, Arianna Conti, Joseph Ricci, Donald Sbabo, Computer Science and Cyber Systems, University of New Haven, West Haven, CT

DocuWare, one of the largest document management software companies in the world, offers a comprehensive and complete solution for securely archiving business documents of all types. Their Electronic Content Management (ECM) software allows users to search through all stored electronic files in seconds. DocuWare requested a program capable of voice recognition, with an interface matching the modern style of their website. For this project we developed a voice recognition user interface that allows for searching through documents utilizing existing DocuWare API's. Specifically, we developed a C# program that displays a modern user interface while incorporating voice recognition, which guides the user through the document search. For example, the interface inquires "which file cabinet would you like to search in?", once the user responds, the interface prompts "what type of parameter would you like to search by?", and so on. The program will ask if the user would like to add another search parameter, until the user is satisfied with the search criteria, at which point they can stop the voice recognition. The parameters are then

organized and packaged before being sent to the DocuWare API. The backend applies matching algorithms, and when a match is found, returns a link to the document, which our program displays in the user specified format. Originally we utilized a custom dictionary to recognize the user voice, but our focus shifted to incorporate the BING Speech-to-Text API, downsizing the frontend storage by eliminating the need for a local dictionary. This program is both scalable – providing the ability to voice search through large or small document file cabinets, and flexible – providing the ability to search by few or many parameters. Being able to search by voice will enhance user accessibility and ease of search for the DocuWare platform.

### **Implementation of Huffman Coding Tree Using Linked Lists**

Tuna Temiz, Department of Computer Science , SUNY Fredonia, Fredonia, NY  
In 1952, David Huffman invented a new coding technique which is called Huffman Coding.

In Static Huffman Coding, code-words are generated based on the frequency of symbols in a given source. Huffman codes are stored in a table. Later, encoding is performed by outputting the corresponding code-words from the table for each character read from the source.

In this project we use a linked lists data structure in building a Huffman Tree. In order to do this, a sorted linked list based on frequencies of symbols is formed. By adding the frequencies of the two symbols at the front of the linked list a new node with a frequency that is the sum of the frequencies of two symbols is formed. Next, the two symbols are removed from the list and the newly formed node is inserted by preserving the sorted structure of the list. The nodes which are removed from the list are connected to the parent node as left and right children leaf. By repeating this process, until one element is left in the linked list, we form the Tree. To generate a code-word for a symbol, the Tree is traversed; outputting a 0 when we move the left and a 1 when we moved to right, until the symbol in the leaf node is reached. Once a table of code-words are formed, encoding may start. The symbols and their frequency information are stored in the encoded file. To decode, using the frequency information in the file the Huffman Tree is built. As the bits are read from the file the tree is traversed left or right until a leaf node is reached and the corresponding character is emitted. Repeating the process decoding can be completed.

### **Visualization of Environmental Data for the Billion Oyster Project**

Giuseppe DiMeglio, Computer Science, Pace University, New York, NY

The Billion Oyster Project (BOP), an initiative of the New York Harbor Foundation, is an ecosystem restoration and education project aimed at restoring one billion live oysters to New York Harbor while engaging school children through related STEM education programs. At each site where oysters are introduced, regular sampling of the water is performed with data collected and samples analyzed for pollution content. Our work was to collaborate with the scientists to build a data storage solution and couple it with a responsive website design providing understandable visualizations of the data. We gathered ten examples of different types of environmental data visualizations found across the web and began to test their effectiveness with users. From the studies, we learned that users were often unable to follow the data that was presented. Interfaces and visualization methods were often crude and not designed to compare data between locations over time. After the user-research and case-study phase, we created several prototype wireframes of the website's layout. We utilized an interactive map pin-pointing each site, and below different charts illustrating the collected data from the respective sites. After receiving positive feedback from users that were interviewed, we used design tools including Sketch3, Konigi, and GoogleCharts to develop and implement a usable website that features the data collected to date. Once more data is available, we will add a timeline feature and a sign-in portal for researchers to be able to enter their raw data that would immediately update the live data on the website.

\* This work was funded by the National Science Foundation, Award DRL 1440869, PI Lauren Birney, EdD, Pace University, and performed in collaboration with Dr Elmer Mojica, Chemistry Dept, Pace University, and Pace student Jahaira Zapata, who performed the data collection and analysis.

### **Getting Started With Multi-Threaded Programming and NVIDIA CUDA**

Nolan Tunny, Computer Science & Mathematics  
Siena College, Loudonville, NY

This poster is a preview of a paper I am currently working on and as such will contain content reflective of the paper, which I hope to publish later this year. The paper is meant to serve as a guide to getting started with parallel programming and NVIDIA CUDA for professors of undergraduate students and undergraduate students unfamiliar with CUDA. A strong conceptual knowledge of data structures, particularly matrices, is required to fully grasp the complexities presented by the paper. I will provide a rationale for learning to

write parallelized code and hardware specific code to accelerate computations. The paper provides details on the NVIDIA GPU architecture as it relates to more common CPUs to illustrate the benefits of utilizing hardware optimized for parallelization. Additionally, I will cover the concept of parallelization and how it can benefit runtimes in a theoretical capacity as well as actual results demonstrating its benefits. By reading the paper you should have the necessary knowledge to get started with parallel algorithm design and to implement some basic CUDA C programs. The poster will focus primarily on the tangible benefits achieved by leveraging CUDA and an overview of the technology.

#### REFERENCES:

ALEJANDRO SEGOVIA. 2010. PARALLEL PROGRAMMING WITH NVIDIA CUDA. LINUX J. 2010, 200, PAGES.

[HTTP://DL.ACM.ORG/CITATION.CFM?ID=1891757&DL=ACM&COLL=DL&CFID=839652297&CFTOKEN=86282814#URLTOKEN#](http://DL.ACM.ORG/CITATION.CFM?ID=1891757&DL=ACM&COLL=DL&CFID=839652297&CFTOKEN=86282814#URLTOKEN#)

PROGRAMMING GUIDE :: CUDA TOOLKIT DOCUMENTATION

[HTTP://DOCS.NVIDIA.COM/CUDA/CUDA-C-PROGRAMMING-GUIDE/INDEX.HTML#CUDA-ENABLED-GPUS](http://DOCS.NVIDIA.COM/CUDA/CUDA-C-PROGRAMMING-GUIDE/INDEX.HTML#CUDA-ENABLED-GPUS)

INTEL® CORE™ I7-4790K PROCESSOR (8M CACHE, UP TO 4.40 GHZ) PRODUCT SPECIFICATIONS

#### **Virtual Reality for Existing Structures**

Jessica Napolitano, Computer Science, Connecticut College, New London, CT, Rebecca Napolitano, Civil Engineering , Princeton University, Princeton, NJ

Virtual reality (VR) is becoming crucial for building documentation in fields such as civil engineering and archaeology. By viewing a building in a VR environment, a user can better understand it. For archaeologists, sites of cultural heritage consist of complex 3D structures with a good deal of associated information. In VR, excavation reports, find logs, etc can be interactively viewed in a VR environment. VR can also help civil engineers in life cycle management of structures. The maintenance of modern infrastructure requires all parties involved understand the current state of a structure, as well as past and future interventions. Currently, there is not a VR tool flexible enough to handle these described capabilities.

We have developed a VR environment in C# using the Unity Game Engine. We chose Unity to leverage its multi-platform support including mobile, VR, and desktop. Unity also supports 3D rendering capabilities which we will utilize to display our building models. These models will be pulled from a central repository which will allow users to easily update models. The user can navigate using an interactive geographic map which has intuitive zooming capabilities. 3D models can be found on this map through two ways. The first is using markers which indicate to the user existing models on the map. The other way is by inputting latitude, longitude, or a building's name. Once a user has found their geographic area of interest, they can view any existing 3D models in a street view. A user can then click on the model to show images or records that would enhance their understanding of the structure. These records can include construction plans and previous reports. This VR tool will be flexible enough to not only be applied to the real life examples given previously but to many other situations.

### **Virtual Reality Human Research Toolkit**

Zach Phillips-Gary, Department of Computer Science, The College of Wooster, Wooster, OH

We present a series of Unity3D scripts for automatically collecting data from human experiments in virtual reality. The goal of this project is to make the creation of virtual reality environments for HCI and Social Sciences research more accessible to those without programming experience. These scripts were developed over the 2016-17 academic year to facilitate data collection for an interdisciplinary undergraduate thesis project investigating whether virtual experiences are real. We also critically analyze our experimental design and sketch out how the inclusion of biometrics could help improve experimental results. We discuss the implementation of the experiments that spurred the development of the toolkit and the scripts themselves. Additionally, we describe several hypothetical pedagogical and research applications of these tools.

### **Multi-Agent Simulation of Battle of Ankara, 1402**

Ruili Tang, Computer Science Department, Union College, Schenectady, NY

I have designed and implemented a multi-agent simulation of military units to analyze the reason for the Ottoman defeat at the hands of Tamerlane's army in the Battle of Ankara, 1402. Although historians largely agree on the general battle procedure, the details are still open to dispute. Several factors may have

contributed to the defeat, such as the overwhelming size of Tamerlane's army, poisoned water, the tactical formations of the military units, and betrayal by the Tartar cavalry in the Ottoman left wing. The approach is divided into two stages: the simulation stage, which provides data to analyze the complex interactions of autonomous agents, and the analysis stage, which uses data mining to examine the battle outcomes. The simulation is built on a finite state machine to evaluate the current situation of each agent and then choose the most appropriate action. To achieve historical accuracy, the simulation takes into account the topography of the battlefield, line-of-sight issues, period-specific combat tactics, and the armor and weapons used by the various military units at that time. The analysis stage uses WEKA's AttributeSelection Classifier to evaluate the association strength between the battle outcome and the various factors that historians consider crucial to the outcome. The result shows that the overwhelming size of Tamerlane's forces and betrayal by the Tartar cavalry were probably the most important factors. Increasing the number of Ottoman soldiers by 40,500 raises the chance of Ottoman victory from 0 to 10%, while an increase of 54,000 soldiers boosts the probability to 90%. Nevertheless, if the Tartar cavalry betrays their Ottoman allies, the chance of an Ottoman victory falls back to zero.

### **3D Boundary Detection using Cellular Automata and Genetic Algorithms**

Walter Gerych, Department of Mathematics, SUNY Geneseo, Geneseo, NY

We designed and implemented an algorithm for boundary detection in 3D images that consisted of a cellular automaton [1] optimized by a genetic algorithm [2]. The method involves randomly generating an initial population of rule sets for cellular automata. The fitness of each rule set is determined by the Peak Signal to Noise Ratio of the image generated after running a cellular automaton using that rule set on a ground truth test image. A genetic algorithm then breeds the most fit rule sets together. After several generations, the fittest rule set resulting from the genetic algorithm is used to define the cellular automaton that acts as the boundary detector for the 3D images. We compared the performance of this genetic algorithm-derived cellular automaton to the performance of other boundary detectors, using the PSNR as a metric for performance. The cellular automaton rule set derived from the genetic algorithm produced results that outperformed a previous method of 3D boundary detection when run on brain scans from the BRATS 2016 dataset [3].

This project was motivated by the goal to create an automatic method of detecting brain tumors in 3D MRI scans. This method can be used as a

diagnostic tool, as well as a method of determining the volume of brain tumors. An automatic method of determining tumor volume is of interest to medical professionals because tumor volume correlates to the stage of the tumor.

Sources:

[1]: Wolfram, Stephen, A New Kind OF Science. Champaign: Wolfram Media, 2002. Print.

[2]: Toffoli, T., MArgolus, N., Cellular Automata Machines. Cambridge: MIT Press, 1987. Print.

[3]: MICCAI - BRATS 2016, <http://www.brain tumors segmentation.org>

### **Indoor Positioning Systems via WiFi**

Zakar Handricken, Bridgewater State University  
Bridgewater, MA

The goal of this research is to utilize signal data from WiFi hotspots for Indoor Positioning Systems (IPS). Separate research on IPS has used a variety of approaches ranging from cell signals and ultrasound. This study seeks to achieve comparable results by using machine learning to determine with accuracy a position indoors.

This project consists of multiple stages. First, a mobile application was developed to acquire signal data from WiFi hotspots and upload it to a server. The app prompts the user for information on their location, then it pings all visible WiFi hotspots, which then uploads the collected data to a server. Second, a python script was written to process the data and allow for visual analysis to observe any correlations. Third, several machine learning methods are being explored to find which one best determine a position indoors when receiving new signal data from WiFi hotspots. Fourth, a Software Defined Radio (SDR) is being used to identify if other stray radio signals, across the spectrum, correlate with position indoors.

The outcome of this research is to determine with accuracy a position indoors using only signal data received from WiFi hotspots. Upon getting an accurate position indoors, we intend to apply it in several ways: a mobile application to assist users to find a room, help firefighters in locating the source of a fire in a burning building, or control software to allow autonomous vehicles to navigate hallways.

## **A Type-Guided Transformation-Based Programming System**

Avinoam Henig, Computer Science, Sarah Lawrence College, Bronxville, NY

This project is motivated by a desire to make writing programs on a touchscreen device as practical as it is on a conventional computer. As it stands, virtual keyboards on smartphones are not well-suited for programming. A potential solution is a visual interface where one can program without relying on a keyboard, similar to Scratch [1] or Touch Develop [2]. In this project, we develop a new model for creating and editing programs in a way that does not rely on a text-based language.

Instead of defining a text-based syntax that parses into an abstract syntax tree (AST), we define a set of transformations that modify one valid program into another. Since these transformations operate directly on the AST, we eliminate the need for concrete syntax. The transformations are meant to correspond to user actions on a touchscreen UI. The system filters the set of possible transformations to only those that preserve the type-correctness of the program. This ensures that the program is always in a type-correct state and reduces the number of viable transformations “visible” at one time. The latter feature is essential for making the system easy to navigate on a small touchscreen. It also makes it impossible to write a program that contains a type error.

We have implemented (in Haskell) a prototype language with Standard ML-like semantics, an interpreter, and a command-line shell for building programs via the transformations. Using our implementation, we can create and execute practical algorithms such as merge sort. The poster will formally describe the system, explain the underlying design decisions, and illustrate how it might be used for programming with a touchscreen.

[1] <http://web.media.mit.edu/~mres/papers/Scratch-CACM-final.pdf>

[2] <https://www.touchdevelop.com/>

## **Manipulation of search results during the 2016 US elections**

Yada Pruksachatkun, Department of Computer Science, Wellesley College, Wellesley, MA

Web spammers are individuals who attempt to alter the structure of the Web to achieve a higher ranking position and visibility in search engines (SE) than they would have otherwise. Spammers manipulate SEs to affect

perception of information quality for personal financial, political, or religious agendas. Arguably, this is more crucial during election times, when voters are likely to use SEs to gather information about electoral candidates. Thus, there is potential for SE results to affect election results.

In this paper, we investigate the degree to which SE results of electoral candidates were manipulated by spammers during the 2016 US congressional election, an election that saw the rise of "fake news" sites. I designed and implemented data collection, cleaning, analysis, and algorithm design for prediction.

I first created an automated scraping mechanism to scrape Yahoo, Bing, and Google for 2016, collecting for top ten results and suggested searches for electoral candidates on a weekly basis from June 2nd to November 7th. I then helped design and implemented two algorithms to model SE results, one using mode and the other a smarter walking time interval algorithm. We operated under the assumption that the more predictable the SE, the more secure it is against spam attacks.

Our results indicate that Google had the most success defending against spammers. Google did not allow much variation in the ranking of the top-10 results. It also did not allow "fake news" sites to appear in its top results. Bing and Yahoo, on the other hand, did not have a good record, which may have allowed for a more biased political affiliation in their results. Our poster will discuss the in-depth findings in the behavior of SEs on candidate queries, prediction algorithms, and potential problem areas in SE ranking methodology.

### **A Peer Mentoring Program for Underrepresented Students in Computer Science Majors**

Thoa N.V. Ta, Ozanam Scholars Program & College of Professional Studies, St. John's University, Jamaica, NY

Conducting an Independent Study on a social justice issue of interest is one of the requirements for juniors in the Ozanam Scholars Program. As an Ozanam Scholar majoring in Computer Science, I have identified the gender and racial-ethnic gaps to be an important social issue in my domain. Nation-wide statistics have historically acknowledged women, as well as non-White and non-Asian minorities, as the two underrepresented groups in STEM, particularly in computing. Per my experience as a female of color in the major, I was motivated to develop with the help of my research mentor, a female faculty member who also experienced the issues first-hand, an intervention program in this area, hoping to first impact the intermediate circle – the Department of Computer Science at our school – and later on extend to the surrounding

community. Research indicates that recruitment and retention are the two key areas needed to resolve the gap. Focusing on retention, my study investigates a peer mentoring program for college students currently in Computer Science and related majors, with the case study being St. John's University. Institutional reports show that St. John's University, a highly diverse populated college, has higher enrollment percentages of women and non-White non-Asians compared to the national averages; however, the underrepresentation of these two groups still exists. Informed by literature insights on the characteristics and experience of these minority students, this study utilizes extant mentoring models and faculty resources at St. John's University to propose components for a pilot program that will run in the 2017-2018 academic year.

#### Acknowledgements:

1. Research Mentor: Dr. Joan E. DeBello, Associate Professor of Math and Computer Science;
2. Ozanam Scholars Program: Carline Bennett, Director, and Dr. Barrett Brenton, Professor of Anthropology, Faculty Advisor.

#### **Quinnipiac University Weather Service Website**

Melkis Espinal, Department of Engineering, Quinnipiac University, Hamden, CT

The Quinnipiac University (QU) community currently uses weather information from publicly available weather services that rely on weather data obtained miles away from Quinnipiac. We found, however, that these data could sometimes be inaccurate (e.g., several degrees variation in temperature) by comparing it with weather data collected by newly deployed weather stations at Quinnipiac. Such weather data discrepancies could have serious consequences—e.g., QU facilities personnel could make wrong decisions regarding de-icing walkways during winter months. The goal of the project described in this poster is to design, implement, and evaluate a prototype of a website for a Quinnipiac Weather Service (QWS). The QWS collects weather data from weather stations deployed in two different campuses of QU, stores these data, and makes them available to the Quinnipiac community and the public through the QWS website. We designed and implemented some of the features of the QWS website. We are in the process of implementing the remaining features and evaluating the QWS website. The first evaluation approach is based on a user study. Different members of the QU community will use the website and provide feedback. The second evaluation approach aims to measure the reliability of the website once it is deployed. The creation of the QWS and its website would not only improve the accuracy of the

weather data used by the Quinnipiac community, but should also provide educational opportunities for students from different majors. For example, software engineering and computer science students could work on projects related to improving existing and adding new features to the QWS website. Interactive digital design students could work on improving the user interface and civil engineering students could use the collected weather data for course and research projects.

### **Web-Controlled RPI-Arduino based Robot for iCREAT**

Hillary Ssemakula, Computer Science, MassBay Community College, Wellesley, MA

Our technology today is interconnected in many ways. We can have phones that are connected to our desktop computers that are connected to our thermostats. With one touch, one can adjust the heat in the house, pop open a trunk of a car or lock a home; this is the future of the world. This interaction between software and hardware is fascinating. The focus of my research is to devise methods of interconnecting easily accessible hardware and controlling it from anywhere with a touch of a button.

The iCREAT I course (funded by NSF) at MassBay Community College introduces students to coding, robotics, engineering and technology. In this project-based, hands-on course students learn to design, build, program and control an autonomous Arduino based robotic car.

The goal of my project is to explore connectivity systems that will allow us to control the Arduino based movable robot by any device that is connected to the Internet.

My work will present a movable robot that can be controlled by any device that is connected to the Internet using a Raspberry Pi computer. I will layout the step by step procedures needed to combine all the components, including programming languages, necessary to accomplish this task. I will talk about the challenges of striving to make the project functional, new ideas I learned from my research experience and the reasons for my hardware choices. I will also talk about how the project can be expanded to incorporate more functionality.

### **Deadly Distributed Denial of Service in Depth**

Gabriel Rivera, Michael Tantalos, Seidenberg School of Computer Science and

Distributed Denial of Service attacks have become increasingly more disruptive in the past couple of years. In fact, in the year 2016, the highest bandwidth DDoS attacks ever, were observed. However, this is a direct result of new ways to generate malicious internet traffic, via Internet of things (IoT) devices. In this poster, we perform an overview of distributed denial of service attacks, and how Internet of things devices are utilized to perform these attacks. We will examine the Mirai botnet, how it infects IoT devices, the damage it has performed on websites all around the world, and how companies have responded to the exploitation of their products. Methodologies on how IoT devices perform DDoS attacks, and how they are infected are discussed, as well ways to harden devices that are subject to exploitation by Mirai. The goal of this poster is to inform its readers on the potential security hazards that IoT devices expose their users to, as well as the advanced methodologies employed by malicious hackers to perform high bandwidth distributed denial of service attacks.

### **Making Sound You Can See: Visualization of Audio Source Separation & Instrument Detection for Augmenting the Concert Experience**

Corbin Dzimian, Daniel Luong, Samuel McCagg, Computer Science  
SUNY Fredonia, Fredonia, NY

We present our experience working alongside the School of Music at SUNY Fredonia; the goal of the project is to add a new way for the audience to enjoy a musical concert. A live orchestra concert is an adventure; under the guidance of a conductor, dozens of players take you on a wonderful musical journey. Traditionally it is true that enjoying music requires your sense of hearing. For example, audiences can even close their eyes and enjoy the sounds of their surroundings. However, for many untrained ears, distinguishing the different instrument timbres and color can be difficult in heavily orchestrated sections. The goal of this project is to extract and visually present music semantics to concert audiences. Specifically by developing state-of-the-art technologies, perceptual musical features can be extracted, such as separated signals from individual instruments, visual representations of a music piece, conductor gestures. Our project consisted of multiple major steps. We first used an Audio Technica microphone to receive the sound, which was converted into spectrogram, a visual representation of the spectrum of sound frequencies. Then a deep learning network was trained to separate the real-time audio signals by instrument. Besides visualizing the individual instrument playing , the

conductor gesture features (eg. tempo, dynamics, articulation) are captured and analyzed using a Kinect; this would enable us to enrich the visualization of a live concert. Our poster will discuss how we went about separating the sound and the roadblocks we ran into along the way. The full description and implementation of the process will be displayed on our poster.

### **Buddy the Budgeting App**

Artem Aleksanyan, Computer Science, MassBay Community College, Wellesley, MA

How do you teach people to budget? Budgeting and managing money are things are seldom taught in high school. But when 63% of Americans are not able to handle an emergency expense of \$500 without relying on their credit card or borrowing money (Maggie McGrath, Forbes 2016), it is evident that there is a not sufficient education on the subject. My project is to create Buddy, the budgeting app. My primary objective, as someone who has never developed an app before, is to find the best way to start learning about app development and to create something useful that people could use. With Buddy, users will ideally slowly learn good budgeting habits. Buddy is to be a budgeting app in which you can record your expenditures, but that also provides help based on information from finance experts. I also keep a log of my progress in learning and building the app, in hopes that it will serve as a useful as a teaching tool for future students. The goal is to make creating an app a more accessible venture. The full app, the progress and build log with the details and explanations of problems and solutions, and potential future features will all be presented.

### **Vision Based Software Implemented for Low Budget Autonomous Quadcopter Landing on GPS Guided UGV Augmented with Landing Platform**

Consuelo Howard, Taher Al Sharif, Computer Science, Bridgewater State University, Bridgewater, MA

Recent developments in inexpensive autonomous vehicles have been the object of research interest in areas such as environmental testing and “Search and Rescue” OPS. Combining the use of a UAV (Unmanned Aerial Vehicle) alongside a UGV (Unmanned Ground Vehicle) can prove to be efficient with deployment and recovery alongside data retrieval when used synchronously in

a testing environment. The goal is to have a UGV equipped with a GPS system that can navigate to a designated way-point to which the UAV will deploy off of the landing platform, collect data and return. However, with the short life span of a UAV's battery, there needs to be a readily available location for which the UAV can quickly and efficiently drop to. This is where the idea of having a landing platform with a specific target came into place. In order to track this target, a Vision-Based Software is needed which will further assist in the landing sequence for the UAV. Where this is a low-budget based project, we wanted to make sure we selected a software that was accessible to anyone thus our software of choice is OpenCV. Using this software, various methods for object tracking were implemented on targets of various shapes. To test the motion of the object in view, optical flow proved to be useful. This will aid in the positioning of the UAV. Finding proper algorithms alongside filtering effects are still being examined and tested for efficiency in image processing. With the UGV, different motor shields are currently being tested to find one that is compatible with the AMPS that are needed to make both motors work without overheating. The larger challenge that is being faced with the UGV is finding proper hardware that will allow the compass, motor and GPS to work synchronously.

### **MuhlenTour**

Jalal Khan, William Shiel, Jason Gerstenfeld, Math/CS, Muhlenberg College, Allentown, PA

MuhlenTour is an application developed to interact college visitors, from prospective students to returning alumni, with the campus. The primary goal is to increase physical involvement with the community in a fun, natural way and to provide an alternative method for users to view a college campus. We have utilized augmented reality (AR) technology on a mobile platform to maximize real world interaction, education, and convenience.

The application requires extensive, precise data collection of the real world, particularly with geography. Data will be stored in a local SQLite database, due to low throughput, high read speed, and lightweight requirements. Data must then be processed in real time, as the user interacts with the world. Processing involves creating a virtual representation of the user's environment. We have opted to use Location Tracking to accomplish this, to accommodate lower end mobile devices. Since accuracy of location coordinates decays proportionally with power usage, we will maximize power consumption while minimizing frequency to create an ideal user experience and application lifespan. This

involves creating a synchronized management system of API calls and hardware readings. MuhlenTour is being developed for the Android platform using Java 8. Gradle is used to manage dependencies and build platforms within the Android Studio IDE, with deployment to either a physical device client or an emulator. The application features include location aware triggers, geofencing, a reward system, POI popups, route highlighting using AR. We aim to complete the project by April of 2017.

### **A Plane-based Approach to Mondrian Stereo Matching**

Dylan Quenneville, Department of Computer Science, Middlebury College, Middlebury, VT

This summer I developed and implemented a novel stereo vision algorithm able to match difficult image pairs depicting untextured scenes. Stereo vision is the problem of estimating a 3D depth map—encoded as pixel displacements, or disparities—of a scene from two images taken from adjacent viewpoints. Disparities can be computed by finding for each pixel in the left image the best color match in the right image. However, this strategy does not work well in completely untextured regions, where a pixel in the left image can easily match to any number of pixels in the right, such as blank walls, blackboards, and other objects we regularly encounter.

The goal of this project was to devise a stereo algorithm that can handle even the pathological case of synthetic scenes consisting solely of solid-colored regions, resembling the abstract paintings by Dutch artist Piet Mondrian. Unlike existing algorithms that rely on matching image texture, my method matches the edges (borders) of single-colored image segments and uses their 3D locations to fit 3D planes that correspond to the original colored segments. Progress was driven by generating increasingly complex test image pairs, designing a new implementation that solves these, and repeating the process with new even more challenging images. In its current state my algorithm solves all test cases we have developed, while existing state-of-the-art algorithms fail completely on these images. This holds promise for using similar concepts and strategies in robust algorithms for difficult real-world images.

A paper describing my approach and its results was submitted to the 2017 International Conference on Image Processing (ICIP 2017).

### **Student Research Interactive Public Display**

Jamie Drayton, Computer Science , Connecticut College, New London, CT  
S. James Lee, Connecticut College, New London, CT

The goal of this research project is to create an interactive public display that advertises the accomplishments of student researchers in the Computer Science department to prospective students and prospective majors. The system is designed around a 55" touch screen monitor that will be located in a hallway that all Connecticut College tours pass through. Research includes studying work that has been done for similar systems, including methods for attracting users, potential pitfalls to avoid, and creating a user-friendly environment. The system is comprised of a homescreen that delineates the different sections, such as student research, facilities, and departmental philosophy. The student research section displays some of the best projects that have been done within the department and allows for users to engage with the material and learn more. By clicking on different projects, users are presented with a multi-media representation including pictures, movies, and blurbs of text describing the student research. Building on prior work, a proof of concept was created in Unity Game Engine that includes each of these sections and runs on the touchscreen display. Extending across disciplines, graphic designers in the Art department have recently joined the project to help design the user interface. Current work is focused on finalizing the different pages of the project and implementing an idle screen that cycles through different pages of the system (encouraging passersby to engage with the display).

### **The Analysis of Frog Calls Using a Sound-Filtering Neural Network**

Christian Brady, Nicholas Abreu, Perry Warner, Amber Nieves, Computer Science, Bridgewater State University  
Bridgewater, MA

By figuring out what frog species are in certain wetlands of Massachusetts, one can determine what wetlands are being used and what ones are not. This will help to protect endangered species of frogs and aid the preservation of their habitats. Professor Thilina Suringhe, an amphibian biologist, needs an affordable, weatherproof device for recording frog calls across multiple different wetlands with a battery life capable of lasting multiple days. Thus, the objective of our project is to provide a device for Professor Suringhe that can not only record and store audio data of frog calls, but also be able to classify these calls. Our project work has multiple components. The first is an Arduino microcontroller, microphone, SD card, and high-capacity LiPo battery that can

be deployed to a swamp for as long as a week. The second is a software suite that analyzes an audio stream and picks out the specific frog species present. The software suite is powered by the use of a trained neural network, in addition to common audio signal processing techniques, including Fourier analysis. Our future work will be to create a 3D-Printed casing unit for our recording device, and to empirically study the accuracy of our neural network based upon field work performed by Prof. Surasinghe.

### **Networked Smart Camera Using Raspberry Pi**

Heath Loder, Patrick Dzioba, Computer Science, Central Connecticut State University New Britain, CT

We present our experience designing an Internet-of-Things prototype of a networked “smart camera” that captures images after a thermal sensor is triggered and sends them to an email address or a file server.

Network cameras have grown in popularity due to falling costs and technology improvements, but many offerings tie the user to expensive hardware, a restrictive home security service, or a preset level of customizability.

Our design was based on several key attributes. First, the entire system should be low-cost, so we decided on incorporating a simple passive infrared (PIR) sensor to automatically detect motion, a Raspberry Pi computer, and an inexpensive camera/video module in order to keep the total price well under \$100. Second, the system should have low power requirements, such that it can run solely off of a 5V 2A (Micro USB) power connection. Third, the underlying software and incorporated libraries should be open source and have small storage requirements for the necessary files. Above all, we wanted the system to be secure, so we utilized certificate-based security (SSL, SSH, etc.) when uploading files to file servers, and SMTPS when sending emails.

We found the most cost-effective method of detecting motion was through the use of a PIR sensor. To interface with the PIR sensor, we incorporated WiringPi, a library for accessing the Raspberry Pi’s GPIO pins. Finally, due to its cross-platform nature and vast protocol support, the CURL library was chosen to perform all network transfers, and the libquickmail library was chosen for email support.

The resulting prototype came together quickly, even considering the short project timeline and a learning curve with the sensor input. Combining the Pi hardware with simple electronics and highly customizable software libraries provides a solid camera monitoring solution that can be easily expanded in an endless variety of ways.

## **Evaluating Similarity Measures For App Inventor Projects In Large-Scale Learning Analytics**

Maja Svanberg, Computer Science, Wellesley College, Wellesley, MA

When applying a learning analytics lens to how users learn and use App Inventor, it is helpful to formalize a notion of structural similarity between their mobile app projects. This notion facilitates filtering out unoriginal work like tutorials when analyzing projects for computational thinking and promises to be more effective than attempts (e.g., by Xie [2]) based on project names. Moreover, a formal definition of similarity allows performing unsupervised machine learning algorithms and discovering linked projects, e.g., collocated classroom activities and collaborative projects between users (e.g., Mustafaraj et. al. [1]).

To experiment with different notions of similarity, I represent App Inventor projects as feature vectors. I evaluate similarity measures that differ by feature selections, normalization, and distance metrics between vectors. In App Inventor, users build projects using blocks (behavior) and components (GUI and functionality). The feature selections consider which combination of blocks and components to use. For feature normalization, I consider TF-IDF (term frequency over inverse document frequency), feature scaling, binary values, and counts. For distance, I consider metrics in n-dimensional space, e.g., Euclidean, Manhattan, and Jaccard.

The dataset consists of over 46,000 users with more than 20 projects each. As ground truth, I use a labeled subset consisting of 894 student App Inventor projects from a Fall 2015 Wellesley CS0 course. I evaluate the similarity measures on the ground truth data to determine which is best. I will use the best similarity measure on the large dataset to compare structural and name-based tutorial identification.

[1] Mustafaraj, E., Turbak, F., Svanberg, M., "Identifying creative projects in App Inventor", to appear in The Florida Artificial Intelligence Research Society, 2017, Marco Island, Florida, USA.

[2] Xie, B., "Progression of Computational Thinking Skills Demonstrated by App Inventor Users, "Master's Thesis, Massachusetts Institute of Technology, 2016

### **Generating Jokes with a Sequence-to-Sequence Model**

Jiri Roznovjak, Department of Computer Science, Clark University, Worcester, MA

Using a deep long-short term memory network, we developed a sequence-to-sequence model that is trained to generate jokes. The training data comes from the subreddit r/Jokes of the reddit.com website. We only take jokes of the question-answer form. The input to the model is a question ("Why did the chicken cross the road?"), and the output is an answer to that question ("To get to the other side"). The model was trained with over 30,000 training examples. It generates responses that are semantically meaningful, and can sometimes be considered to be funny. However, from our results it is clear that in order to successfully model humor there is still a long way to go. Humor is a very abstract concept that relies on a high-level understanding of the world, and it will require much larger datasets and more powerful models to successfully generate it. We will present full description of the model as well as generated examples in detail.

### **Scene Classification**

Jessica Spencer, Computer Science, Connecticut College, New London, CT

Scene classification in images is a challenging machine learning problem that has application in many fields, including archiving, museum work, automatic image retrieval, and social media tagging. For example, scene classification can be used to target advertisements in social media, through pre-tagging images to learn more about people's location preferences. Much research has been done on scene categorization in the past, using a variety of features and machine learning techniques. My research builds upon these approaches, and attempts to create a scene classifier that performs comparable to methods that incorporate more complex analyses such as object detection. My research is

done using an eight-category database of landscapes with complementary infrared photographs. These categories are country, forest, street field, urban, mountain, indoor and water scenes. I considered many image features reported in the literature and chose a small subset of those features to implement for my work. The features I have used primarily capture texture and color. For color, a set of features create histograms of the hsv color profile of each of the images. Many of the categories, most notably forest and water, have a higher likelihood of having a similar color profile, for example, forests will often have a high number of pixels in the green hsv spectrum, while water scenes will often have a high number of pixels in the blue hsv spectrum. Another set of features divide the image into horizontal thirds, and then creates a hsv histogram on each of the thirds. Indoor scenes likely have uniformity of color throughout, as do most forest scenes, while scenes of the country, field, and street will likely have the sky at the top of the image, but greenery or urban development in the lower thirds. A feature including a Hough line transform quantifies the amount and strength of straight edges in an image. Indoor and outdoor scenes have many human-made objects with straight lines and right angles, which differentiates them from natural scenes. I am generating a confusion matrix from my results to evaluate each of my features separately and in combination. My application is correctly classifying the images 53% of the time, with chance being 12%.

### **Development of a Mobile Personal Health Guide for HIV-infected African American MSM**

Yifan Lu, Computer Science , Connecticut College, New London, CT

The research focuses on a relational, educational, and motivational virtual human(VH) mobile phone application for African American men who have sex with men(AAMSM), funded by National Institute of Nursing Research. The VH encourages interaction with information and functions that promote engagement with the HIV Care Continuum, provide fundamental HIV information, present motivating statements, facilitate interaction with healthcare, visualize laboratory results, and encourage, explain, and illustrate relevant behavioral skills. The app is being developed using Unity3D software and LifeLike framework originally written in C/C++ for a desktop application has been ported to Unity3D environments to support platform independent deployment for both Google Android and Apple iOS devices. Since last year, we have been mostly worked with Unity and some of its plugins to build different scenes and functions of the project, such as the medical calendar, background setup, etc. as well as processed the digital materials for the app usage which

are essential segments of the application. We already performed the beta test with different participants last year and we modified the application according to their responses. Ongoing development of this app includes the pilot test with each participant uses the app for three months. In the meantime, we are also working on adding speech recognition into the application as well as improving the graphics of the virtual human so that the users can have a better interaction with the avatar and their experience with the app will be improved which has always been our goal.

### **Data Collection of Bull Elephants**

Tyler Goulski, Kevin Fung, Kayla Velez, Matthew Lalibertebaron  
Computer Science, Bridgewater State University, Bridgewater, MA

Our research team presents our Undergraduate Research Project in the Computer Science department at Bridgewater State University. African bull elephants in Zimbabwe have been responsible for uprooting trees contributing to the declining biodiversity in Africa. Currently, wildlife officials respond by culling, castrating, or transporting the bull elephants. The purpose of this project is to develop a tracking collar that will obtain vital information allowing researchers to predict the bull elephants destructive behavior. This collar has the functionality to record and store the vocalization, GPS coordinates and temperature of the bull elephant. To ensure the accuracy of the data, a remote station will collect the data miles away without coming into contact with the elephants foregoing disturbance to their behavior. The collar will feature an Atmel microcontroller connected to a GPS, microphone, A/D converter, SD shield, and a radio module.

# Programming Contest Teams

Comm Coll of Baltimore County  
Ramapo College of New Jersey

Worcester State University  
The College of Brockport  
Framingham State University  
Clark University  
University of Hartford  
La Salle University  
St. Lawrence University  
Penn College  
Massbay Community College  
The College of Saint Rose  
Daniel Webster College  
Widener University  
Assumption College  
Saint Anselm College

University of Rhode Island  
Bloomsburg University of  
Pennsylvania  
SUNY Oneonta  
Fitchburg State University  
McGill University  
Saint Michael's College  
Plymouth State University  
St. John's University in Queens, NY  
Middlebury College  
Siena College  
UHN Manchester  
SUNY Fredonia  
Wheaton College  
Providence College  
Merrimack College

## Reviewers

Michalina Hendon, Bloomsburg University  
Anurag Dasgupta, Valdosta State University  
Kevin McCullen, SUNY Plattsburgh  
Sofya Poger, Felician University  
Xiaojun Yuan, University at Albany, SUNY  
John McManus, Randolph-Macon College  
David Levine, Saint Bonaventure University  
Mahmood Hossain, Fairmont State University  
David Shaffer, Westminster College  
David Furcy, University of Wisconsin Oshkosh  
Bill Nicholson, University of Cincinnati Clermont College  
Zachary Kissel, Merrimack College  
Mary Courtney, Pace University  
Gurmukh Singh, SUNY at Fredonia  
Christopher Stuetzle, Merrimack College  
Nadeem Hamid, Berry College  
Lijun Ni, University at Albany, SUNY  
Robert Noonan, College of William and Mary  
Barbara Bracken, Wilkes University  
Eileen Peluso, Lycoming College  
Jimmy Chen, Salt Lake Community College  
Lucia Dettori, DePaul University  
Patricia Morreale, Kean University  
William Harrison, St. John Fisher College  
Jeff Martens, University of Maryland Baltimore County  
Daniel Rogers, The College at Brockport  
Giovanni Vincenti, University of Baltimore  
Seth Freeman, Capital Community College  
Joan E. DeBello, St. John's University  
Aparna Mahadev, Worcester State University  
Christopher League, LIU Brooklyn  
Seikyung Jung, Bridgewater State University  
Shoshana Marcus, Kingsborough Community College of CUNY  
Debbie Hughes, Lyndon State College  
Jeffrey Stone, Pennsylvania State University  
Bradley Kjell, Central Connecticut State University  
David Valentine, Slippery Rock University

## **Reviewers (continued)**

Jean Griffin, Temple University

Ingrid Russell, University of Hartford

Joseph Abandoh-Sam, Valley View University

Michael Jonas, University of New Hampshire at Manchester

Paul Olsen, The College of Saint Rose

Choong-Soo Lee, St. Lawrence University

Christine Wania, The College at Brockport, SUNY

Alice Fischer, University of New Haven

Susan Imberman, College of Staten Island

Ira Goldstein, Siena College

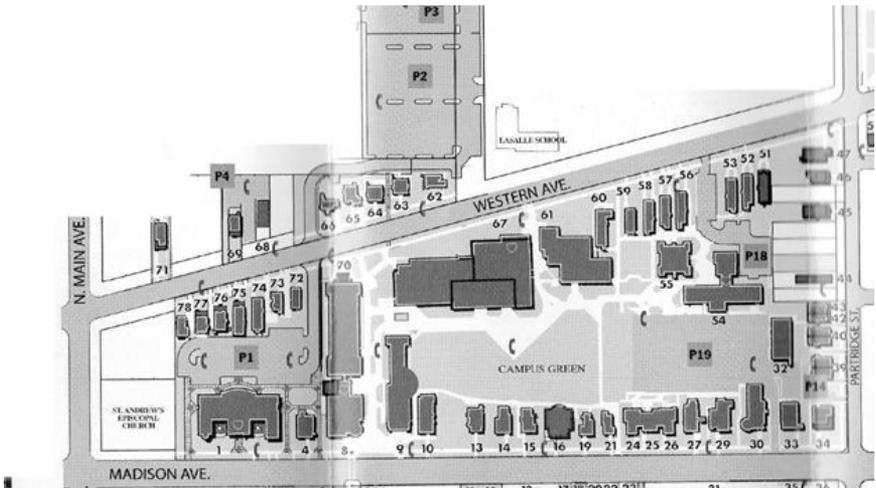
Delbert Hart, SUNY Plattsburgh

Judith O'Rourke, The College of Saint Rose

Paul Dickson, Ithaca College

Alfreda Dudley, Towson University

Meg Fryling, Siena College



**P2** – LaSalle Parking Lot (recommended parking lot)

**1** – Thelma P. Lally School of Education

**8** – Science Center

**67** – Events & Athletic Center

**70** – Albertus Hall