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Applying the Coding of Quantized Images Based on Pseudo Distance Together with Particle Swarm Optimization

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This work consists of applying two previously made algorithms for the lossless compression of color-mapped images. One of the said works consists of using a pseudo distance technique for the lossless compression of images, while the other one builds on previous work in the area of one dimensional lossless color compression. Lossless compression is a class of data compression algorithms that allows the original data to be perfectly reconstructed from the compressed data. By contrast, lossy compression permits reconstruction only of an approximation of the original data, though usually with improved compression rates (and therefore reduced file sizes). Lossless data compression is used in many applications. In computational science, particle swarm optimization (PSO) is a computational method that optimizes a problem by iteratively trying to improve a candidate solution with regard to a given measure of quality. It solves a problem by having a population of candidate solutions, here dubbed particles, and moving these particles around in the search-space according to simple mathematical formulae over the particle's position and velocity. Each particle's movement is influenced by its local best known position, but is also guided toward the best known positions in the search-space, which are updated as better positions are found by other particles. This is expected to move the swarm toward the best solutions. The proposed technique replaces the cross entropy based TSP algorithm with a particle swarm optimization (PSO) for the task of color reindexing. By using the output of the first algorithm as the input for the second, the aim was to discover whether there was any potential for finding better results in terms of compression in the future.

A HoneyNet Environment for Analyzing Malicious Actors

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A honeypot is a web application or other resource that is deceptively constructed to log the actions of its users, most (but not all) of whom can be assumed to be malicious actors. A honey**net** is a network of interconnected honeypots that allow vast amounts of data to be collected for analysis. We developed our honeynet as a result of the natural (for us) evolution of our cyber security research that began by using graph analytics to examine data we were collecting from individual SSH and SDN honeypots. The analytical core of our cyber security research evolved while using G-star Studio, a web-based front end to G*, the Dynamic Graph Database. Shortly after making G-Star Studio available on the public Internet, we observed several unauthorized connection attempts to its Application Programming Interface (API). These attacks specifically targeted G-star's REpresentational State Transfer (REST) API. We noticed that our virtual machine ran out of disk space because the G-star API log file grew too large. Looking at the large log file, we realized we had inadvertently invented an API honeypot. Since our spontaneous invention, we have developed more honeypots, many of which we linked together to form a mesh-like web – our honeynet. Each honeypot in our honeynet resides in their own Docker container running a standalone dedicated Unix environment. By utilizing an IBM cluster hosted at Marist College, we scattered our honeypots across multiple TCP ports on a single network with a public IP address. Recently, this honeynet lured in and recorded malicious actors attempting to kill a PHP5 Hash function and attempting to access Apache files via CGI (the Comon Gateway Interface). This poster describes our honeynet and shows some of the insights we gained by analyzing attack data gathered from it.

Exploring Cryptology and Cryptanalysis

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Cryptography is the art of communicating confidentially through an insecure channel. Cryptanalysis is the art of deciphering those communications when one is not the legitimate receiver. Cryptology is the union of these two domains - the study of codes and ciphers. Digital encryption techniques are used to protect data in two ways: to maintain privacy and to prove integrity.

The goal of this on-going project is to explore various cryptology algorithms and design visualizations. The poster will focus on the results of the first stage of the project that was completed during the Summer 2018 and explored further in the Spring of 2019. Symmetric Key Cryptology Algorithms such as Caesar, Shift, Hill, and Vigenere Ciphers along with their visualizations will be presented. Poster will discuss computational approach and vulnerabilities of these algorithms. In addition, the poster will also cover the social aspects of the project. Password system remains the front line of defense against intruders. Poster will discuss various password selection strategies, including online safety approaches and development of good password habits that help to enhance computer security by encouraging users to employ strong passwords and use them properly and change passwords at appropriate times. A short survey on password habits was conducted and analysis of the results will be presented and discussed.

Bulls AI

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Sentiment Analysis is becoming one of the primary tools used in Behavioral Finance and Behavioral Economics. The technique is dependent on gathering opinions on a specific topic and deciphering whether the opinions have a positive, negative or neutral connotation. The results are used to help make decisions on various topics. Over the past decade, AI has exponentially increased the speed with which we sort and analyze data. Marketing departments, political parties, and the financial world, use sentiment analysis to create optimal positions within their given spaces as accurately and quickly as possible.

Our program, Bulls AI, uses a social media crawling API, called Tweepy, along with IBM's Watson natural language processing (NLP) AI to make a predictive tool that is capable of identifying possible speculative trends within the stock market. It capitalizes on the volatility within equity markets resulting from hyper-aggressive social media behavior. Given the complexities associated with tracking multiple topics across all platforms, we focused on building a skeleton program, written in Python, that looks at a single platform, Twitter, and that monitors a single subject. In this case, we chose the video game industry because it has scheduled releases and updates that allows us to focus on specific time periods. This also allows us to backtest previous events to validate our results. The targeted documents are scored using a custom RESTful Node.JS API after a predefined volume threshold is met. The score calculation API will utilize Watson's NLP AI to determine tones, relations, and sentiment throughout the documents. Paired with emotion analysis, sentiment can be a leading indicator for stock prices of the game companies. The program is not only a proof of concept but is flexible enough to add additional media platforms (i.e. Facebook, Reddit, etc.) and sectors (i.e. Health Care, Energy, etc.).

Facial Expression Recognition Interface (FER.i)

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The goal of this project was to develop an iOS application for Autism Spectrum Disorders (ASD) individuals to practice recognizing facial expressions.

One characteristic of ASD is difficulty recognizing facial expressions. The iOS Facial Expression Recognition Interface application (FER.i) lowers the anxiety when recognizing facial expresssions, because it does not require face-to-face interaction.

FER.i allows the user to practice recognizing facial expressions on a default set of images expressing six basic emotions established by Paul Ekman: happiness, sadness, anger, surprise, disgust, and fear. Additionally, users can practice recognizing emotions of friends and family by uploading and categorizing additional images.

FER.i collects data about user practice sessions. Individuals with ASD often take longer to recognize facial expressions so FER.i tracks improvements in recognition speed. FER.i also tracks recognition progress by emotion.

Feedback has been encouraging across a broad set of users, and we are working with the business program's marketing department to increase application usership. Future plans include a centralized database that stores and analyzes data about all FER.i practice sessions for use by ASD researchers and FER.i users.

Reference: Ekman, P. & Keltner, D. (1997). Universal facial expressions of emotion: An old controversy and new findings. In Segerstråle, U. C. & Molnár, P. (Eds.), Nonverbal communication: Where nature meets culture (pp. 27-46). Mahwah, NJ: Lawrence Erlbaum Associates.

The relationship between information spread and sentiment on Twitter

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The spread of information on social media, such as Twitter, can be useful, but can also be detrimental when messages contain misinformation and can be manipulated by bots. This research seeks to further our understanding of how and why Twitter messages (i.e., tweets) spread. We determine if the sentiment of a tweet is associated with its likelihood of being retweeted, and if positive and negative tweets are spread in different ways. To visualize the spread of a tweet, we create response networks with nodes corresponding to users that responded to (retweeted, replied, or quoted) a tweet and links corresponding to one user following the other. We build response networks for a random sample of positive and negative tweets and analyze them using graph theoretic measures to compare features of the network and the corresponding sentiments.

A total of 209,307 tweets were collected and analyzed using the *R* packages *Rtweet* and *sentimentR*. Network analysis and visualization was carried out using Gephi. Our analysis shows that the tweets with the greatest emotional content, i.e. the highest positive or negative sentiment, are more likely to be retweeted than tweets with a more neutral sentiment. Although only *positive* and *negative* sentiments were considered, these findings suggest that messages are more likely to be retweeted if they elicit joy, shock, fear and sadness rather than having an apathetic undertone. We also found that there are more positive tweets than negative tweets, though negative tweets were more likely to be retweeted, suggesting a negativity bias.

Developing an Inventory Management System using an Agile Approach

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We present our experience completing an undergraduate thesis project in the Computing Sciences Department at The College at Brockport, SUNY. The goal of this Agile software development project is to create an application to manage the inventory and the rental process of an on-campus sports department. At the start of the project, we met with our client to understand their current business processes, which were largely paper-based. We then undertook a requirements capture process to better understand the features we would need in the envisaged software application, making sure that we kept close contact with the customer, and discussing the consequences of each feature they suggested with them. We then embarked on a short design phase in which we took an Agile Modeling approach to create a minimal model that primarily outlines the behavior of the software application, relying mainly on UML sequence diagrams and GUI mockups/state diagrams. We reviewed the GUI mockups with our client in detail, outlining the sequence in which the GUI screens would be seen as each significant feature was realized. We received valuable feedback from them regarding changes in the GUI for user-friendliness, and also in the overall workflow of the features. We modified our design accordingly and moved onto the development phase, in which we currently are. We follow the Agile approach and prototype each major feature, demonstrate it to our client and seek feedback. Our goal is to practice the Agile methodology to its fullest, both in the overall project management and, especially, in the development and testing phases.

Women in Computing

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We present our experience participating in the Women in Computing Club at Widener University. The goal of the club is to promote the retention and recruitment of female students in computing disciplines - Computer Science, Computer Information Systems and Digital Media Informatics. The members of the Women in Computing Club participate in weekly meetings and work together on computing related projects. Engaging in extracurricular activities and participating in various events has a strong positive effect on student retention.

The Women in Computing Club provides an opportunity to gain skills outside of the classroom and allows for female students from different majors in computing fields to bond.

The poster will summarize various events students participated in, mostly focusing on a STEM Camp for High School girls organized by Widener's School of Engineering. The Women in Computing Club has been an active participant of the camp for the last few years and has successfully collaborated with IBM, Widener University's student section of the Society of Women Engineers (SWE), and Widener Alumni. Camp sessions run in small interactive settings throughout the day promoting an encouraging discussion about females in computing disciplines. This open dialogue allows for all students to gain insight on topics centered on women in STEM fields and stimulates girls to explore their options. Our sessions provided an interactive programming experience that included labs in computer animations with Alice and machine learning with Scratch and IBM Watson. The full description of camp activities and curriculum will be presented and discussed.

Conferdense - Connecting Users with Conferences around the World

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Finding information on a conference requires multiple search tools and visiting multiple websites. Conference attendees want a way to connect with other professionals to begin organizing and collaborating before a conference even begins. Right now there is no one-stop shop for all these needs. The goal of our application is to streamline conference searches in a central location and enable users to better prepare for their conference experience. Our project encompasses the design, development, and deployment of a mobile prototype to achieve our partners' vision.

The prototype aggregates disparate conference databases into one location to improve user experience. In addition to a seamless search experience, users have a social platform to connect with conference organizers and other attendees. The application consists of three components, (1) a Python utility for web scraping and data aggregation, (2) virtual private servers hosting an API for data access, and (3) an Android application which provides a mobile interface for the end user. The API is built on Python's web framework Flask and the application uses Google's NoSQL cloud database, Firebase, for back-end data storage. Clients using the mobile app communicate with the API over HTTPS to ensure a secure channel of communication. API key authentication helps keep the use of our web application strictly for registered users.

Testing and data validation are key components to our project because data is pulled directly from the web. Every event that is scraped from the internet is sent to an intermediary storage bucket to undergo further data sanitation and verification. The web scraping utility collects data from reputable sources that are vetted by the team in order to decrease the occurrence of garbage data. Automated testing is performed with Postman and Android's Roboelectric framework to help produce a quality product.

Kobe

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We introduce an innovative application that incorporates many features of modern phones, such as augmented reality and the gyroscope, in order to allow the user to interact with their environment by throwing their phone. Kobe is an Android application that can be experienced in two different modes: ThrowMode and KobeQuest. The former allows the user to toss their phone at an AR-generated target displayed on the phone and overlaid onto the real world. The latter is a text-based interactive story that challenges the user to toss their phone to satisfy specific metrics in order to advance the plot. The goal of this project was to explore novel ways to manipulate a phone's sensors and AR in order to provide a thrilling interactive gameplay experience.

We used Android Studio for development in collaboration with Google's ARCore technology. In Throw Mode, we used the anchor of the AR generated target and the current position of the user's device to detect when the target was "hit." We also used the accelerometer to detect when the phone was in free fall; thus the phone had to be both in freefall and within a certain proximity of the target to confirm the hit and implement the streak. In the KobeQuest section, we used the accelerometer, gyroscope, and proximity sensor to create criteria for a text-based adventure. For example, in KobeQuest a user might be prompted to "escape chains" by rapidly spinning (> 1o rps) their device for 300-400ms.

In general, this project provided an ideal learning platform for us to explore novel technologies rarely utilized by app developers. As a result, in making this game, our team has engineered a robust framework that can be used for new forms of gameplay which introduce the user to unique experiences.

Assessing Applied Computer Vision in Determination of Crowd Estimation

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We present our hands-on project that extends our work with the Python programming language into the field of Computer Vision (CV). Computer vision uses cameras and other visual input devices to provide computer programs with imagery for processing, analysis, and prediction. Our research used the openCV library (an open source CV library) and Python to develop an application that can process a live video feed from a camera and determine the length of a line or density of people in a specified visual area without human intervention. The goals of the research where 1) to understand how the OpenCV library can be used to process video frames in real-time, 2) classify objects in the frame as people, 3) and track human object movement through the specified visual area. Existing machine learning libraries where used. We worked with our faculty mentor to research and acquire the skills to use the OpenCV library in a Python programming environment and applied that knowledge to the problem. The outcome was a working system prototype. Our poster will discuss our research process, development, and challenges we encountered during the project. The full description and implementation features of the project will be presented in detail.

Land Maverick

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Golf requires well-kept grounds, achieved with consistent chemical analysis. These tests can take hours of a superintendent's time, and a portion of their funds to send samples to labs for analysis. Our industry sponsor, Land Maverick, aims to alleviate some of that strain with a soil sample collection robot. Our team's goal is to design and implement a database and website for past and current data.

The Land Maverick team established two responsibilities: designing and implementing a backend (database), and creating a user friendly front-end (website). The website allows users to view different golf courses using Google Maps; colored overlays are embedded to display the sample collection location. The red, yellow, or green indicators determine whether the sample taken from the robot lies within the appropriate range selected by the superintendent. The final product will be accompanied with thorough documentation.

The system is hosted on a DigitalOcean (Cloud provider) and utilizes an NGINX web server and MySQL database server. The Google Maps API is used to load satellite images of the golf courses and place correct latitude and longitude locations. The database is populated with data sent to the server from the robot in the form of a CSV file, which is parsed using a python script.

Testing is achieved through a number of automated tests and user feedback. Functionality, usability, interface, compatibility, performance, and security are tested throughout each phase of the project. Automated testing is done with Katalon Studio which executes predetermined actions on the website. User feedback includes input from our industry sponsor and other demographically accurate testers.

Developing an Algorithm to Generate Complex Soot Aggregates to Study the Effects of Soot in the Atmosphere

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The objective of this project was to produce a software application that allows researchers to generate complex soot aggregates and analyze the light absorption/reflection of these aggregates with minimal effort. An open-source fractal modeler, FracMAP, was utilized to generate fractal aggregates and ADDA (Amsterdam Discrete Dipole Approximation) to analyze light absorption/reflection on the fractal generated model. Both of these open-source applications consist of primarily C++ code. The main focus was to build the algorithm to generate an array of dipoles from the model of complex soot aggregates built by FracMAP. The resulting algorithm was tested extensively to confirm it was producing accurate output. This application can be bundled with FracMap and ADDA into a package that can be easily used by researchers.

The task of completing this project was more non-linear than most software projects due to its more experimental nature. Navigating the feature requirements involved researching different methods to address each problem before planning how we could implement the solution. Solutions didn't always work at first, so quick prototyping in Python allowed us to tackle an array of potential solutions quickly and effectively. The program was tested against input data with known outputs, such as single sphere and bi-sphere configurations. The algorithm was ran on a cluster to study how the algorithms behave with the larger datasets that researchers would most likely be working with. When the algorithm was first run on the cluster, the output indicated that our algorithm was not working correctly; however, with in-depth analysis and a strong line of communication with our advisors we were able to diagnose the problem.

Moving forward we would like to continue to expand the capabilities that are accessible from the user interface for efficient use by researchers. We would also like to continue to optimize our algorithm.

Visualizing and Designing Multi Agent Search Algorithms

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Various researchers have recently studied multi-agent search problems in geometric domains such as a closed disk, or a convex polygon. We present a new algorithm involving three unit speed mobile agents in a unit circular disk. The agents work cooperatively to find an exit hidden on the perimeter. In this model, the agent that finds the exit first may broadcast its location to the others. Among the three agents, two are designated to have "priority", and the third simply helps. The algorithm terminates when at least one of the priority agents reaches the exit, and the goal is to find an exit strategy that terminates as quickly as possible. We describe a strategy to find the exit in no more than 3.55 time units; we can also show that this time is fairly close to optimal. Multi agent search algorithms can be applied in real life situations, such as deploying robots to search and evacuate people from an area in the event of an emergency. We set out not only to study these theoretical analyses, but to also create an animation framework to test existing algorithms. Our current implementation is built using Javascript and the D3.js visualization library. We studied much of the existing literature and essentially developed a language of movement and communication primitives for multi-agent search algorithms; whereby we can implement existing and new algorithms as independent, high-level scripts for visualizing these agents. As well as helping us visualize, the data we collect from the application also enables us to find improvements. Specifically, our testbed collects information about agent trajectories, and uses that data to determine worst cases and verify correctness of any given algorithm: our algorithm for the priority search came from analyzing such data.

Gesture Recognition for Music Control

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New interface technologies that go beyond the keyboard-mouse modality have spawned interest in implementing natural gesture recognition to improve how we interact with computers and mobile devices. In the past, WIMP (window, icons, menus, pointer) has served as the standard GUI (graphical user interface) on our personal computers. Our quest has been to build an interface that allow us to use our hands and fingers to make gestures that communicate our intentions. After all, hand gestures are the most natural and intuitive way humans interact with others using body language. My interest to explore the use of gesture recognition for controlling a music player stems from this premise. The goal was to create a system that could track the joints of a hand and detect the corresponding hand gestures. The various gestures are recognized by comparing an incoming gesture to a set of prototypes in a database which was previously learned by the system. When a relevant gesture is recognized, it triggers the music player controls such as play, pause, next and volume. This system was developed using a Leap Motion hand tracking device and numerical computing environment, MATLAB. One of the more challenging decisions made in this research was the set of hand gestures that were chosen to control the music player. It was important that the hand gestures were not only intuitive to users, but also very distinct from one another. The hand gestures were categorized based on Euclidean distance which has been proven to be a reliable measure for this purpose. The two different gesture types used were: a trigger control for play, stop, and next functions and a continuous control used to manipulate the volume. This working prototype of the system suggests there are great potential and reason to investigate gesture recognition for music control systems.

PlanCatcher: A Daily Planner iOS App

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In the modern world, time management has been a significant part of everyone's day-to-day lives. Specifically, many people experience the pressure of having multiple deadlines and are not able to manage their time, prioritize their work, and keep track of their progress. In this research project, an iOS App entitled PlanCatcher was developed for the iPhone environment using the Swift programming language and XCode to help users track and monitor their daily, monthly and yearly plans and tasks. This App allows users to accomplish their tasks by tracking current progress, setting start and end times, organizing tasks by categories, managing repeating tasks, and ordering tasks based on priority. There are a few similar Apps available, however, most of them are overly complicated for users. These Apps also function more like professional work calendars rather than "To-Do-List Apps" that assist users to reach goals and monitor their progress. Moreover, PlanCatcher provides a more user-friendly interface leading to increased user interaction and engagement. Specifically, each page of the App is designed to be clear and simple allowing users to view their tasks and plan in a user-friendly layout. Through the theme selection setting of the application, users can select one of three color themes to customize the App to better fit their preferences. The purpose of this application is to help users to increase their daily productivity and to complete their daily tasks in a manageable and organized fashion, as well as to focus their attention on tasks of high importance. In January 2018, the PlanCatcher App was published in the Apple App Store with an aim to help people increase productivity and better manage their goals and deadlines.

Cognitive Tests with Data Visualization

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We have created a functional web-based testing tool to measure working memory, attention and malingering: Digit Span Backward, Digit Span Forward, Stroop, and Number Sequencing. This is a continuation of the project submitted to CCSCNE '18. Now, we have focused on adding the Stroop Test and adding data visualization elements to each of the tests. This test measures selective attention under two different conditions where the text presented is in the same color as reading the text (congruent) and when the text is presented in a different color as reading the text word (incongruent). The participant provides his/her answer by selecting from one of the four primary colors. The test measures his/her response time for each trial. The test then logs this response time, as well as the number of correct/incorrect responses, to our database. The response time indicates how quickly the participant attends to the text color and inhibits reading the actual text for meaning.

Our web-based tool provides immediate results stored in password-protected databases; thus, it is valuable for examining the participant's score relative to norms and tracking changes under experimental conditions. We use D3 to implement data visualization to provide a more understandable and friendlier display for the results in our database tables. D3 allows the binding of arbitrary data to a Document Object Model, where transformations can be made to a document. This transformation can come in the form of HTML tables or charts.

The web-based tool is built on the school server and is accessible by everyone on campus. The software includes HTML, CSS, JavaScript (with JSON format), PHP, MySQL, SVG, and D3. This adaptive tool now provides four tests for psychology students to use in their research with faculty and course projects.

The Metamorphosis of Stack Overflow Data: From Data Acquisition and Pre-Processing to Analytics and Visualization

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Data analytics is a thriving field seeking to extract meaning from the massive collections of data generated as a byproduct of online activity. This project presents the process of data acquisition and pre-processing, as well as results of analytical and visualization techniques, using a large open data set from the Stack Overflow Annual Developer Survey. Stack Overflow is an online community for developers to advance their skills and share knowledge. This annual survey is administered to users of the Stack Overflow community to assess the climate of their website and services, and gather information about users.

The data set is comprised of responses to over 100 questions from approximately 232,000 users spanning 2015-2018. Data were obtained from Stack Overflow in the format of a .csv files by year. Data were initially imported into Microsoft Excel to view and sort the records and fields, and aggregated across the years. We then started the pre-processing phase to reformat and prepare the data to account for inconsistencies across the data sets, removing null values and deleting extraneous data. Pre-processing enabled a clean data set that was used for subsequent evaluation and analyses.

After pre-processing, data were imported into RStudio, an open-source software suite that facilitates statistical computations using the programming language R. Using RStudio, we conducted analyses to discover correlations and evaluate regression equations for the variables under study, such as relationships between gender, salary, and job satisfaction. Data were also imported into Tableau, an interactive software suite for data visualization. Using Tableau, we developed intuitive and aesthetically appealing charts, graphs, and dashboards of the variables. We will demonstrate our process from data acquisision and pre-processing to analytics and visualization, displaying results of RStudio and Tableau and offering insight into trends embedded in the data.

EnablArm – The arm that learns from itself

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EnablArm is a prosthetic hand that is built on light weight 3D printing filament. Utilizing the ability of Myo wearable gesture control device, we are able to get an input from the arm in order to replicate movement in the prosthetic arm. With the combination of advanced Machine Learning algorithms and proper tools, it can be trained to do almost any task that an average human can perform, by just using simple wearable gadgets and Machine Learning algorithms.

This prosthetic arm only costs $40 to design but provides a measurable grip strength up to 14 Kg. Currently, EnablArm has been programmed with eight different human gestures including a grip to grab a bottle, to pick a key, to show wave gesture, fist gesture, open-hand gesture, any two simultaneously used fingers gesture, and thumbs up gesture. The use of Machine Learning makes it easier to train it so as to create new gestures, control its movements, and create features similar to human being's arm.

Although EnablArm is still in developmental stage, we are utilizing it to the fullest capabilities, rendering it in easier ways to integrate its usage in day-to-day life, especially for disable persons of the society. Features such as an in-built camera to recognize objects, to provide effective feedback, and ways to make it more functional are still being under investigation using A/B testing techniques on actual test subjects.

The scope of this scholarly project is to provide more functional ability to every human being including persons with physical disabilities so that their contribution could be fully accepted and appreciated in modern-world working environment.

CICS Assistant

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I present a chatbot (online assistant) to help guide incoming freshmen through the resources available in the College of Information and Computer Sciences (CICS) at the University of Massachusetts, Amherst. This online assistant's MVP will transform students' experience with advising. The initial purpose of the CICSBot is to help reduce the traffic of emails to the few advisors in the department and to increase awareness of the resources available. Live chats are more efficient than long email threads that answer repetitive questions and can help guide students faster to the right resources and correct people to talk to. Chatbots are one of the most powerful up-and-coming tools in technology today that are powered by artificial intelligence and machine learning that will listen and provide relevant material in return. I applied Natural Language Processing techniques to build the complex dialog using IBM Watson. The training data was created based on information gathered from the CICS course catalog database and suggestions from professors/advisors. To provide diversity in queries, I organized a group of testers with a random sample of the user base to trigger different keywords. Currently, I am developing the first release of CICSBot that will include the ability to answer questions about prerequisites, general descriptions, and overrides about any undergraduate course in the department. Further releases can include an integration with CICS careers to connect students with tips and expand to assist students in different ways. After every release, I plan to collect data from advisers in the department to report repetitive questions to add as features in the CICSBot. The goal of the assistant is to create a platform where students can have their questions answered promptly and correctly.

Visualizing Dynamical Systems with Haskell

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We present our efforts to visualize the behavior of discrete dynamical systems on the real line, specifically in the form of symbolic dynamics where real numbers are represented as binary sequences of zeros and ones. Such a systems often exhibit chaotic behavior and their unpredictability makes computerized visualization and simulation highly useful for the study of such systems, since we can try many functions and a very high number of iterations with minimal effort. Haskell was a natural choice for this project. The systems we are studying are often naturally recursive, as is the process of iterating functions over time, making a functional language with strong support for recursion practically necessary. Also it was vital to perform the iterations using rational number data types, because floating point errors compound very quickly in an iterated function. The choice of Haskell is also somewhat novel for creating a visualization, since the languages facilities for this purpose are immature. Using a binary representation for numbers also allowed us to study some novel functions and patterns that arise when concerning ourselves with binary maps. Aided by the visualization we found many interesting patterns and avenues for further study in dynamical systems using binary maps.

Rigid Structure Origami Printing

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Origami is a technique for folding paper native to Japan. We present a web-based tool called "Rigid Structure Origami Printing" that provides a method for drastically reducing the time of the folding process. Our process involves using a 3D printer to directly print onto the surface of paper. Whereas the folds in origami require movement and flexibility, the spaces in-between the folds remain untouched. Using this region, a thin layer of plastic is printed directly onto paper to maintain a rigid structure.

The creation of 3D models for these prints require a substantial investment of time when using conventional methods. "Rigid Structure Origami Printing" was created to reduce the time required to create a 3D model by taking advantage of existing origami patterns templates. To generate a 3D model, an origami fold template in the form of a png or jpg file is first uploaded to the website. The image can be adjusted with basic photo editing tools to pronounce the fold lines. A scalable vector graphic (SVG) tracing of the fold pattern is created in the second step. Sliders are used to adjust the width of the fold section. From the SVG, a 3D model is generated in the form of a stereolithography (STL) file. A 3D viewer appears, displaying the generated model. This file can be downloaded and printed via standard Fused Deposition Modeling (FDM) printers.

This technique has applications in rapid prototyping of new folds that can be used in new forms of packaging, robotics, satellite design, etc (for example, the folding of satellite meshes on launch and unfolding once in orbit). The website tool automates the process of 3D model creation, making it compatible with existing fold patterns or existing pattern generating software, such as Rhinoceros and Mathematica.

University of New Haven – Park Smart

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Finding parking on campus is a continuous problem at the University of New Haven. Students and faculty spend a lot of time driving around in circles trying to find open spots near their classes and offices. To support the campus community, we developed an application that helps alleviate this problem.

Our solution consists of three main components: Backend, Java sever and User Application. The Backend is a machine that uses machine learning image recognition through TensorFlow to identify moving and parked vehicles in order to keep track of parking space availability. The Backend has access to campus security camera video streams to analyze how many vehicles are in a given lot. This information is then sent to a Java server via https over TCP that will store the number of spaces available with a timestamp.

The User Application, based on an Ionics Angular 2 framework, will pull the data from the Java server via https requests over TCP to display to users if there is parking space availability in different parking lots on campus. The app will update on a fixed interval and can be accessed from a smart phone in order to offer an application that is user friendly, efficient, and compliments the needs/wants of students and faculty at the university.

Our project will be tested by manually cross checking the results of the TensorFlow output with the video footage from the cameras, as well as our own manual parking space count. We will also create test data to represent data pushed from the TensorFlow PC to the Java server and pulled from the Java server to the user application.

Cardiovascular Perfusion Simulator

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Perfusion is the flow of blood and fluids through the circulatory system. During procedures such as open heart surgery, a perfusionist operates a perfusion machine (a.k.a. heart-lung machine) to oxygenate and circulate blood throughout the body while the lungs and the heart are arrested. The goal of our project is to design and develop a software application that augments a heart-lung machine in a simulated setting to enhance the training and evaluation of perfusionist students. This application allows an instructor to create simulated scenarios, record student's actions, and later analyze them. The perfusion simulation capabilities we are developing could be significantly cheaper and more customizable alternatives to commercial perfusion simulators and will help prepare students to handle potentially catastrophic situations without having to risk human life. The perfusion simulation application is programmed in MEAN stack and uses sockets to provide real-time communication and updates. To evaluate the simulator, we conducted a usability test with 5 volunteering perfusionist students out of 15 in the Quinnipiac University cardiovascular perfusion program and obtained additional feedback from a perfusionist professor. During the usability test, we collected qualitative data via questionnaires and interviews. We also collected quantitative data, such as time for task completion and error rates during a simulation of an uncomplicated cardiopulmonary bypass scenario. The participants reported that the simulation application provided valuable learning experience and suggested improvements to the user interface. After completing the first few tasks and familiarizing themselves with the software application, most participants were able to complete the remaining tasks successfully and in a timely manner as the simulation continued. The instructor of the session commented that the perfusion simulator has all the correct parameters for cardiopulmonary bypass, and that the capability of an instructor to be able to manipulate those parameters gives the simulation validity.

DroidWare Injector: Automatic Android Background Service Attachment

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I present an investigation of automatic code injection into Android Package (APK) files. It is well know that APK files can be reverse engineered with ease, but heavy modification and addition of new functional code to already compiled applications requires specific attention and effort to be given to each. By using the metadata of the APK file, we can reliably find an entry point to inject code into the application. Injected code is written in smali (or converted from Java to smali). When decompiling an APK file, you can decompile it to Java for maximum readability or to smali for complete precision. When decompiling to Java, you will rarely get fully functioning code and cannot immediately recompile the application. Smali, on the other hand, is representative of the Dalvik bytecode that gets run by the Android device (NOTE: the Dalvik virtual machine was replaced by ART in Android 5.0, but all new Android versions still use the Dalvik instruction set). By identifying the same entry points that the Android OS uses to launch the application, we are able to inject smali code that adjusts application permissions and registers a background service, so that additional code may be run with stealth as part of a legitimate application. These entry points have proven to be reliable and allow for injection into APK files en masse.

Snap 'N' Go: A Prototype for Evaluating Task-Recommendation Mechanisms in Crowdsensing Platforms

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We present our experience researching crowdsensing algorithms during the 2018 Wellesley College Summer Science Center Research Program. Crowdsensing is a method to gather and analyze information about a topic of interest by asking a group of users to sense their surroundings using their mobile devices. Compared to a traditional sensor network which utilizes physical sensors, crowdsensing is often cheaper and more scalable because it takes advantage of existing mobile devices. However, it is often challenging to implement due to the dynamic nature of the individual users that need to be incentivized to participate. The goal of our research was to evaluate the efficacy of various task recommendation and incentive mechanisms and their effect on crowd mobility in such crowdsensing platforms.

To achieve this goal, we built our own crowdsensing Twitter-based application, Snap 'N' Go. Snap 'N' Go tweets tasks throughout the day, which simply ask users to submit a photo of a specified location on campus within a window of time in return for monetary compensation. Users can request any tasks they prefer by communicating with the application through Twitter. Additionally, Snap 'N' Go recommends bundles, or groups of tasks with additional compensations, to users when the app can predict the user's movement from one location to another.

By collecting and analyzing the data from the usage of our application, we tested four different incentive metrics, which are the compensation, location, and the timing of the task, as well as the reaction of users towards a recommended bundle of tasks with a higher associated compensation. In our poster, we describe our hypotheses on these metrics, as well as some of the preliminary results on the efficacy of these metrics. Furthermore, we describe the reasoning behind our design decisions, the challenges we faced, and the future directions for Snap 'N' Go.

IgualDistricts; Genetic Algorithm Redistricting

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I present my redistricting independent study in the Mathematics and Computer Science Department at Rhode Island College. The goal of my project is to create a program that the uses a multiobjective genetic algorithm to redraw the congressional districts for US states. Current redistricting programs use either single objective optimization or weighted sum algorithms. The chosen criteria for the algorithm are equal population, proportionality and minimal racial gerrymandering. The need for an objective nonpartisan method of drawing district lines is clear. As a result of the current system, where current office holders are allowed to redraw lines, opponents are *packed* in one district, reducing their influence in other districts, or are *cracked* among many districts where their numbers are so few they hold no power.

Study Abroad Web Application

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We present our experience creating a web application for the study abroad program in the Computer Science Department at Connecticut College. The goal of this web application is to make the process of finding a Connecticut College approved study abroad instution easier and more experiential. Over 90% of students at Connecticut College participate in a study abroad program; study abroad programs allow students to gain exposure to different places and cultures, cultivating global citizenship. During the first semester of our senior year at Connecticut College, we decided to take on a past student's project of creating a study abroad web application prototype and re-design the implementation using UX/UI Design Principles. We had numerous ideas to start with for this project, then we narrowed our design choices down through conducting student focus groups and A/B testing until they converged as the one final design. To start with, our goal was to find out what information students found important regarding specific study abroad institutions and their respective countries. We conducted focus groups to investigate which information students felt was most valuable to know when considering different study abroad programs. After solidifying which information was the most relevant, we examined different ways to visually convey this information. We experimented with Sketch, a prototype tool to create our mock-up designs, and Leaflet and MapBox, which are web-based map libraries to implement our application. We ultimately decided on using MapBox, as it allowed for a customizable and clean map interface. Our goal was to design an aesthetically pleasing, easy-to-use interface for students to interact with. We will discuss our reasoning for choosing our study abroad web application design, and the challenges we encountered during the project. The full description and implementation features of the application will be presented in detail.

Adaption of a Social Graph Benchmark

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We present our work on adapting an existing graph benchmark for use by our research group. LinkBench [Armstrong 2013] is a synthetic benchmark that was created for the purpose of testing and comparing the social graph storage systems at Facebook. This benchmark inserts graph data (represented as nodes and edges) to a MySQL database and generates requests for workload simulations. Our research group is studying the use of distributed file systems and distributed database systems for storing and querying social graph data. This poster describes two different approaches for adapting the LinkBench output for our group's use. The first adaptation was to transform the data from MySQL into comma separated text files that can be used as input for our project's performance tests. The process for this adaptation was dumping data from the MySQL database to comma delimited text files, and then reorganizing it with a Python script to conform to our project's schema. Two main challenges faced during this first adaptation were deciphering MySQL error messages and navigating user permission issues within MySQL. The second adaptation involves modifying the LinkBench code to channel output to the Apache Hadoop HBase distributed database directly. The challenges we faced during this adaptation included understanding the LinkBench codebase and its flow of control to identify changes that we need to make.

References:
[Armstrong 2013] Timothy G. Armstrong, Vamsi Ponnekanti, Dhruba Borthakur, and Mark Callaghan. 2013. LinkBench: a database benchmark based on the Facebook social graph. In Proceedings of the 2013 ACM SIGMOD International Conference on Management of Data (SIGMOD '13). ACM, New York, NY, USA, 1185-1196. DOI: http://dx.doi.org/10.1145/2463676.2465296

Locating Televisions in live video using deep learning

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Object recognition using deep learning has recently enjoyed considerable success. However, successfully identifying and locating a TV in an image is a difficult problem, as a TV does not have lot of identifiable features. Also, when a TV is turned on, the content dominates the appearance, which complicates matters for recognition. The image on the screen is considered part of the TV but from a learning perspective, it is more noise than a TV specific feature. Additionally, TVs look drastically different when they are off than they are on. To solve these problems, the training data needs to have a varied array of TVs with different backgrounds, random color images on the screen for TVs that are on and off TVs.

After scraping 3000+ photos of TVs from the Internet, these images were annotated by a bounding box around each TV. Three different neural nets were trained - on TVs, off TVs, and all TVs, which is the union of the two classes. The YOLO [1] framework was used for training, live object recognition and location detection. To avoid over fitting, the code runs IOU, precision and recall after the new weights are generated. The data is then analyzed to get the best performing weights. The net is a FCNN with 24 layers that treats image classification as regression problem.

The results are promising. The nets performed well at locating TVs and on TVs but did not do a great job at recognizing off TVs. That is because off TVs do not have distinct learning features other than being a black rectangle. The accuracy obtained on test data was 82.6% for TVs, 87.1% for on TVs and 37.4% for off TVs.

[1] YOLO: https://pjreddie.com/darknet/yolo/

Companion Robot

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For the Robotics Class at Siena College, I used the Robot Operating System to create a turtlebot that would follow AR markers. The goal is to give the robot a simple behavior that could prove useful in several ways as part of a larger system as, for example, the robot could help carry extra items around or serve as a companion. However, before it begins following AR markers, as a safety precaution, the robot must first see something green, which activates its ability to move until it sees something red, which will cause it to wait until it sees something green again. This way the robot can quickly be stopped if needed and will not accidentally immediately charge off upon turning it on. The robot accomplishes this through its camera, as within the image it sees the robot has a circle centered in the image from which calculates what the average color within that circle is, if the average color is green or red then this triggers the robot's "stoplight" functionality. Furthermore, the robot is continuously seeking AR markers to follow and measures their X, Y, Z position within its image. The robot will speed up, slow down, stop or backup dependent on the markers Z value. If the AR marker's X value is moving to the side of the robots FOV then the robot will begin to turn to follow the AR marker. The robot can either move in a direction and turn or turn in place based on its situation. This allows the robot to safely and effectively be used as a helper/companion that will follow anything equipped with an AR marker whenever it is required!

What do your smartphone apps know about you?

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We analyzed the descriptions and privacy policies of top mobile and mental health apps to understand how data is collected, stored and shared; we present our initial findings in this abstract.

Given the rise in mental health issues among college students, students' reliance on smartphones and the popularity of mental health apps, care should be taken to protect students' psychological data; one of the major potential risks of the disclosure of this data could be discrimination by insurance companies and employers. Prior research shows that even seemingly trivial metadata such as users' smartphone usage trends, location and call and text logs can reveal a user's emotional states [1] and can be used to passively assess whether they may be exhibiting symptoms of mental health disorders [2].

What can we learn from existing apps about mental and behavioral inferences that can be made using data collected by existing smartphone applications? Our preliminary analysis showed that 30 collected user's location information, 5 had access to read text messages. 52 out of the 60 apps shared information with third parties, out of which 9 health apps shared sensitive health information such as weight, pregnancy information and menstrual cycle. Only 43 apps described deletion policies.

References

[1] R. Wang, F. Chen, Z. Chen, T. Li, G. Harari, S. Tignor, X. Zhou, D. Ben-Zeev, and A. T. Campbell. Studentlife: Assessing mental health, academic performance and behavioral trends of college students using smartphones. In Conference on Ubiquitous Computing. ACM, 2014. DOI 10.1145/2632048. 2632054

[2] R.Wang, W.Wang, M. S. H. Aung, D. Ben-Zeev, R. Brian, A. T. Campbell, T. Choudhury, M. Hauser, J. Kane, E. A. Scherer, and M.Walsh. Predicting Symptom Trajectories of Schizophrenia using Mobile Sensing. In Interactive, Mobile, Wearable and Ubiquitous Technologies, volume 1. ACM. DOI 10.1145/3130976.

Computationally Modeling Axonal Guidance Cue Expression in the Developing Olfactory Bulb of the Brain

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Specialized neurons in the mammalian nasal cavity have protrusions called axons, which make connections to specific structures within the brain region called the olfactory bulb (OB). Guidance cues are molecules that help direct the axons to their target region during development. We want to investigate if there is a correlation between guidance cue locations and axonal connection locations within the OB.

We created a software application that displays a model of the OB using a set of 2D cross-section images of the developing mouse brain. It also displays the computed location of multiple overlapping guidance cues within the OB. Images and guidance cue location data come from the Allen Brain Atlas (ABA). The ABA's program, Brain Explorer 2, allows for the limited 3D visualization of guidance cue location data; however, this program does not allow users to easily visualize the overlapping guidance cue locations. Our application adds functionality by allowing users to clearly visualize the location of several cues simultaneously via superimposition.

To optimize visualization of multiple image sets, we aimed to improve the signal to noise ratio of the ABA guidance cue data. Because images from the ABA are stippled, we used color thresholding and density thresholding algorithms to computationally detect and filter guidance cue expression data. Using ImageJ, we determined color thresholds that distinguish cue location from the background of the image. The guidance cue data were filtered based on the density of pixels that showed guidance cue expression within a fixed radius. Methods for visualization of the superimposed cues were derived using the matplotlib and PIL libraries.

Our program provides a tool for investigating olfactory axon targeting, OB formation and related pathologies in mammalian models. This program can be adapted to examine guidance cue location for other regions of nervous tissue.

Capture the Flag as a Testing Platform

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As mentors in the National Science Foundation grant program, we are tasked with creating a final exam in form of a Capture the Flag (CTF)-style event. This event is part of the National Science Foundation CyberCorps: Scholarship for Service (SFS) program which is designed to increase the cybersecurity workforce by introducing security topics to high school-level students. Structured as a college-level course, students learn concepts in a lecture/lab environment that includes formal tests and quizzes—the final, of which, is made to be an engaging way to test their acquired knowledge.

Granted a disk partition on the college's server system, we used the space to host several virtual machines with one acting as a web server for the CTF interface and the remaining servers used as virtualized desktops (VDs) that students would remotely access and peruse for the flags. We spent several weeks creating and configuring the VDs—using such operating systems as Kali Linux, Ubuntu, Debian, and Peppermint—where part of this process involved terminal programming to place the flags and reformat the system settings to allow for remote access to the VDs. Once finished with initial setup, jeopardy-style test questions were entered into the CTF interface and the remaining flags were hidden.

Following the first CTF event, it was evident we created a highly interactive way by which to test the students' knowledge. Not only were they readily engaged with the activity, but they also appeared to display increased comprehension of the material at hand. While we came across issues as the event was ongoing, we recognize the need for improvements—like expanding the system overall and reconfigure flag placement—and its viability as a method by which to test students.

Robotinho

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The reason we created Robotinho is that we love soccer and also have a passion for a superstar named Ronaldinho whose last name end in -inho. We took one semester to build Robotinho on TurtleBot 2[1] and our software package was developed on Robot Operating System (ROS) system[2]. We implemented three main functions for Robotinho,

1. Speech recognition, we created a voice lexicon for pocketsphinx[3] to recognize our voice commands and convert them into text for Robertinho doing different drills. The performance of the recognition is around 70%, which is decent. One possible improvement is to add more training data for variant English accents.
2. Robotinho's score skill. We wrote a program to have Robotinho be able to do three soccer drill techniques, diamond, circle and weave. The first step is to make it do the right movement. Then we had it move while dribbling the ball. We did many tests to find a right speed for it to move as fast as possible without losing the control of the ball.
3. Goal. We programmed Robotinho able to recognize goal door based on the color (yellow) of door edge and shoot the ball to the middle of the door. After goal, it will dance and play music for celebration.

Everyone at our Roboshow (a celebration event open to the whole college at the end of 2018 F`all semester) seemed to love Robotinho and his soccer skills along with our NYCFC (Who went on to recognize us)[4] jerseys. In conclusion, our team project helped us gain a better understanding of the ROS system and a view into part of our computer science field that we haven't even thought of before we took robotics, it definitely gave us insight into what some of the common uses of robotics have and can become.

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[1] https://www.turtlebot.com/

[2] http://wiki.ros.org/

[3] http://wiki.ros.org/pocketsphinx

[4] https://twitter.com/NYCFC/status/1071117344435511298?s=19

Are digital overload reminders making you anxious?

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We present our initial findings from a survey of 230 undergraduate students to understand how they use smartphone app overload reminder tools and how the tools affect their emotions and their smartphone usage behavior.

Media is rife with articles regarding smartphone addiction and how digital overload may be harming children and young adults. However, as a response to the negative backlash about digital overload, Apple and Google released ScreenTime and Digital Wellbeing on iOS and Android devices to help users understand and control their smartphone usage. Prior research shows that nudging users about the time they spent on their devices helps them manage their smartphone use [1]. However, we expect that reminding users about their digital overload may have a negative effect, especially in undergraduate students, who are avid users of smartphones and are also already struggling with mental issues [2].

We conducted a survey to understand how students use digital overload reminder tools, what emotions they feel when they use an app with a time limit and when their time is up, how they respond to a digital overload reminder and how effective the reminders are in changing their app usage behavior.

Our initial analysis revealed that participants experienced negative emotions such as resentment, shame, and anxiety when the phone warned them that their time was up. 27 out of 30 participants went back to using the app despite the warning. However, most participants were happy with their daily app usage.

[1] Fabian Okeke, Michael Sobolev, Nicola Dell, and Deborah Estrin. 2018. Good Vibrations: Can a Digital Nudge Reduce Digital Overload?. In *International Conference on Human-Computer Interaction with Mobile Devices and Services (MobileHCI)*.

[2] Kadir Demirci, Mehmet Akgonul, and Abdullah Akpinar. 2015. Relationship of smartphone use severity with sleep quality, depression, and anxiety in university students. (2015).

Introduction and Complexity of Two Ended Selection Sort Algorithm

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The authors are pleased to present their research into searching algorithms, specifically their implementation and use in sorting arrays of data into sequential order. As any computer scientist knows, sorting algorithms are one of the most discussed topics in data science. We sought to understand and compare various sorting algorithms: specifically the insertion, selection, merge, and quick sort algorithms. Our goal was to understand the time complexity of each different algorithm for the best, worst, and average cases—regarding the initial state of the data—by observing the number of comparisons and data movements required to completely sort the data set. We also introduce a new sorting algorithm, the two ended selection sort. We wished to understand the most efficient algorithm for the most cases; how can we sort a set of randomly distributed data with the least number of comparisons? With the least number of data movements? What is the best time complexity, specifically in O() notation, that these algorithms can hope to achieve? And what is the best way of accurately measuring this time complexity? We chose to code our project in Java, and we used the Eclipse Photon IDE to code, test, and debug our project. We look forward to presenting the details of our project—should we be lucky enough to be chosen.

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Complete Binary Search Trees

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The authors are pleased to introduce a new search tree, which is also a complete binary tree. We call it a Complete Binary Search Tree (CBS). Binary trees are an incredibly useful data structure, therefore our goal was to research and understand the specific advantages to storing data in them. We sought to understand the mathematics behind identifying parent, child, and leaf nodes, specifically in complete binary trees that are of an absolute minimum height. We also sought to answer these specific questions: given a complete binary search tree, how can we insert or remove a new node into or from our tree while maintaining its height as an absolute minimum? What is the best method for implementing a complete binary search tree? What are the advantages and drawbacks of our specific implementation? And what are the principal differences between a complete binary tree and a complete binary search tree? We chose to implement our complete binary search trees as arrays of binary node objects. This allowed us to use the familiar storage structure of an array, to store objects for which we created our own instance variables and methods. The methods in particular contain the actual mathematical concepts unique to storing data in a complete binary search tree. Our project was coded in Java, and we used the Eclipse Photon IDE to write, test, and debug the code. We look forward to presenting our methodology in greater detail, should we be lucky enough to be selected.

Camera Mouse for Android

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"Camera Mouse for Android" has been developed to provide mobile device access for people with motor impairments. It is an application that can be utilized on any mobile device that runs on Android 6.0 or below. The software automatically detects and tracks the user's head movements using the frontal camera of the device and translates them into movements of a mouse pointer on the screen. When the mobile device does not feature a camera, the software can be configured to use a separate camera connected to the device via a wired or wireless connection. Also, to address those who can't perform wide head movements, the application allows personal customization based on a variable scaling factor. "Lack of communication ability does not equal lack of active minds." People suffering from Cerebral Palsy, Traumatic Brain Injury, Multiple Sclerosis, Spinal Muscular Atrophy or other affections that cause motor impairments have great difficulties using modern technology. Because it relies on hand movements, modern technology prevents disabled users to exhibit their thoughts, emotions, and intellectual potential. Over the last years, more and more resourceful companies and skilled professionals in the field of science and technology have turned their attention towards closing the gap between humans and computers. Their efforts have created a new sector in the industry called Assistive Technology. As off-the-shelf mobile devices featuring a camera are increasingly becoming more affordable, closing the gap between disabled people and technology will depend on software-based solutions. Camera Mouse system can make every camera-equipped mobile device accessible to people with special needs.

Organizational Strategies Used by College Age Individuals

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Our work focuses on creating a novel time management and organizational website geared towards non-neurotypical college age individuals. In particular, the focus of our work is on students with Attention-deficit/hyperactivity disorder (ADHD), as it tends to be associated with childhood and adolescence, and less attention is payed to the issues faced by adults with this condition. In order to achieve this goal, we conducted a survey with the goal of gathering data about the types of tools currently employed by our population of interest and the percieved effectiveness of the strategies these individuals employ. The work we are presenting here consists of our findings from this preliminary survey which was hosted through Qualtrics and was distributed through socal media and through various online message boards chosen to help us reach out to our target demographic. The survey used a mixture of multiple choice and short answer questions to ask about current tools used by participants. This included questions about the specific methods (ie. Calenders, to do lists, etc) and about websites and apps used. Partipants were also asked how well the strategies and tools they used worked for them. Currently, our participants report using over 40 different apps or websites to manage their time effiecntly. Initial analysis of survey results shows support for the claim that individuals with ADHD find the time management and organizational tools avalable to them to be less effective than individuals without ADHD. Furthermore, this survey has allowed us to gain a deeper understanding of what types of time management software are most popular and why individuals will sometimes choose physical tools over digital ones. Results from this survey are leading our current work which is builing a time management website for students.

Interactive Object Tracking

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I present my experience applying OpenCV object tracking methods to real life live tracking. This project was created during CSCI 262, Computer Vision taught by Professor John Magee. The project was created to research how the methods included in OpenCV such as SIFT, SURF and Template Matching could be applied to a real life situation of tracking an object in real time using a standard webcam. The intended application of this is to be able to apply it to a program to allow you to select an object on a screen and track it. My poster will show my results from this survey of methods as tested at different ratios and at different scales. This is an introductory project and can lead to a more comprehensive study on object tracking using simple, ready to implement methods in OpenCV.

EzConfig Parser – A Natural Language Parser and Database Application for Parsing and Simplifying the EzProxy Server System Configuration Files

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I present my work on the development of EzConfig Parser, an open-source Java application that takes in Configuration and Log files from a library remote-access management server system called EzProxy and provides an intuitive user interface for updates to be made by librarians. A detailed Software Development Life-cycle breakdown along with research into existing software in the scope of library technology tools will also be exhibited. The project is being undertaken with an initial use-case to help librarians at the State University of New York, the College at Oswego, navigate their remote-access server with greater simplicity and ease. In the future, the project is aimed to be made publicly available for libraries across all of EzProxy's 2500 user institutions.

EzProxy is a cloud-based middleware software solution and a web proxy server used by libraries to grant access to users from outside the library's computer network by authenticating users using their IP address. Currently, despite EzProxy's global popularity, there is a lack of a standard solution for librarians to add or edit multiple links that are loaded to the EzProxy servers on a daily basis. The EzConfig Parser application is meant to serve as an add-on tool that assists librarians in adding, editing and removing the URLs managed by their respective library's server systems.

Discussions were held with many librarians both at the Penfield Library of SUNY Oswego and the Drake Library at SUNY Brockport to evaluate the need for a software solution to better manage the EzProxy Config files with minimal manual effort. Multiple existing marketplace software for libraries were researched and a final software was developed to meet all the needs of the librarians using the EzProxy System. The full description of the software and its implementation features will be presented in detail.

Video Information Retrieval based on Emotion Patterns from Facial Features

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While it is feasible to manually perform content-based retrieval with a few hundred hours of video by skimming through scenes, it quickly becomes prohibitive as the size of a video collection increases. This research addresses the automated retrieval problem from a facial gesture and emotion standpoint. Specifically, the goal of this program is to implement a scalable solution that finds the most prominent emotion patterns in an arbitrarily large video collection by analyzing faces in video clips. These patterns could be transitions, oscillations between two emotions, sustained emotions, or fluctuations of a single emotion. They can be used to index video fragments, which would be otherwise opaque, to make this information searchable. This approach has a wide variety of applications including archival research, theatrical training, human-computer interaction analysis, and sentiment analysis. Affectiva's emotion recognition API is used to preprocess videos to quantify the degree of each emotion. The resulting CSV files containing the relative strength of seven basic emotions at 30-60 ms time intervals were fed into search algorithms written in MATLAB. The algorithms identify scenes where a particular emotion, chosen by the user, is strongest or where the strongest transition between two user-inputted emotions occurs. The final output will be an ordered sequence of video clips from the database where the best match to the query appears at the top. An automatically composed video is also produced by the program. In testing, five actors were instructed to sequentially act out eight basic emotion transitions. The program was 95% accurate when searching for positive to negative emotion transitions and 100% accurate when searching for negative to positive emotion transitions. When searching for specific pre-defined emotion transitions, the overall accuracy of the program was 52.75%, but the most accurate transition, sad to happy, was identified with 80% accuracy.

Deduplication & its Impact on Data Quality

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The issue of Homelessness in the United States is not one which is new, it has been an ongoing problem for many years and the process of fighting that issue is difficult as well. Many homeless shelters provide numerous forms of services to assist in helping at risk individuals get back on their feet. To protect the clients' privacy, these shelters usually do not share information, which caused a severe information silos. To solve this issue, Siena college collaborated with CARES, inc[5] tightly on a deduplication project to link all records from different shelters that belong to one person. Our contribution to this project is to merge all duplicate information, such as Name, Social Security Number, Date of Birth, Gender, Veteran status, etc., from the different shelters into one person profile. To do so, we implemented three methods,

1. Pick the most complete information from all candidates.
2. If candidates have conflict information, choose the piece with majority vote
3. If no majority vote, use the latest information that person using homeless system

After merging, repeating information belonging to one client was successfully condensed into a single row of data and the overall size of the dataset was decreased by 31%. The individual person's information in new dataset is more complete and the report to U.S. Department of Housing and Urban Development (HUD)[6] generated from the new data is more accurate. Our poster will describe the issues of current homeless services and our motivations, discuss the merging algorithm in details with examples, pictures and charts, and the contributions to data analysis by providing high qualified dataset.

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[5] http://caresny.org/

[6] https://www.hud.gov/