Jan 5th, 12:00 AM

06. Computer Science

Northeastern State University

Abstracts from the 2016 Oklahoma Research Day

Held at Northeastern State University

05. Mathematics and Science

06. Computer Science

05.06.01 SquerylORM Code Generator

Harrington,Patrick *Northeastern State University*

Many Object Relational Mapping (ORM) software products include features that allow the programmer to specify database schema in the ORM code that can then be used to generate new tables in a database that did not previously exist. The problem with this is that it can lead to poor database design, especially because these features typically make using relational features like foreign keys very difficult or impossible. It is more desirable to design the database first and then establish ORM code. The purpose of this project is to create a program that will connect to a database and generate ORM code for an existing database using the Scala programming language. This project achieved its primary goal of generating ORM code using existing databases as the source. The end result is simple and effective.

05.06.02 A Wheelchair Tilt/Recline Guidance Application Associated with Fitness Trackers for Power Wheelchair Users to Reduce the Risk of Pressure Ulcers

Zeng,Wenxi *University of Central Oklahoma*

Fu,Jicheng *University of Central Oklahoma*

Unrelieved prolonged sitting pressure is a major causative factor of pressure ulcers (PUs), which significantly affects the life quality of power wheelchair users. To reduce the PU risk, wheelchair tilt and recline functions are typically used to relieve seating pressure. Unfortunately, most wheelchairs lack of a mechanism for measuring tilt or recline angles. Wheelchair users have to make adjustments according to personal perceptions and preference, which causes insufficient pressure relief. Our study aims to address this issue by using a fitness tracker (i.e., Microsoft Band in the current implementation) associated with a mobile and cloud system. First, wheelchair users conveniently place the arm wearing the Band on their upper body, thereby moving the Band along with the tilt and recline movements. Since the Band is easy to pair with a smartphone via Bluetooth, sensor data can be obtained in real-time. Next, based on sensor data, the angles are precisely measured by a novel algorithm employing advanced math and physics models. Particularly, hand-free operations are achieved by speech recognition and synthesis techniques. Hence, the mobile subsystem in the smartphone improves the effectiveness of Tilt/Recline usage. In addition, records of Tilt/Recline usage are transmitted to the cloud subsystem, where statistic information is generated for healthcare providers and wheelchair users. As a conclusion, our research will benefit wheelchair users and the clinical community.

05.06.03 A Novel Health Tracker for Power Wheelchair Users Using Microsoft Bands

Li,Fang *University of Central Oklahoma*

Fu,Jicheng *University of Central Oklahoma*

Our current research has already developed a mobile and cloud computing-based (MC) system, which uses a smartphone to collect and analyze wheelchair maneuvering data. The use of smartphones has some disadvantages, such as the dependence of smartphone holder, limited battery life, etc. Hence, we propose to use Microsoft Band as a substitution of smartphones for data collection. When being paired with a Microsoft Band via Bluetooth, the MC system will automatically use the Microsoft Band as its data logger. The sensor data will be transmitted and saved in the smartphone's SD card. Then, the data will be periodically uploaded to the Google Application Engine (GAE), where our cloud subsystem resides. Although there are many smartphone apps that can help people monitor their health status, no mobile applications are designed specifically for wheelchair users. Therefore, our project is very meaningful for wheelchair users to improve their quality of life.

05.06.04 A Class Project - A Multi-Feature SE School App for Android Devices

Su,Ming-Shan *Southeastern Oklahoma State University*

Pearce,Keith *Southeastern Oklahoma State University*

"The Multi-Feature SE School app" was envisioned as a class project that would help with recruiting students to and promoting SE. Nowadays, almost all students have a smartphone (e.g., an iPhone, Android/Windows phone, or Apple iWatch, etc.) and are almost never without it. They use their phone not only as a tool to communicate with their friends and family, but also as an essential miniature computer. SE does not have any school or campus guide related apps published on the Google Play Store or the Apple Store for anyone to download. Therefore, while teaching the Smartphone/Tablet app development class, I asked each student to develop a school app. I believe that a class project like a school app can help a student to learn how to promote a school and to reach more prospective students and encourage them to come to that school and learn how to submit an app to the Google Play Store. In addition, with the knowledge and experience learned from the project, a student can then apply his/her skills to develop apps for a city or company to promote the city or company to attract more visitors or customers after graduation. This school app provides information about the president, facilities, degrees offered, campus map, and class enrollment of SE and a user can use any of the multi-tabbing, swiping, and scrolling features to access this information.

05.06.05 Wanderlust: Android Application That Provides Useful Information for Tourists

Tavares Pereira,Diego *University of Central Oklahoma*

Gomes Dos Santos,Danianny *University of Central Oklahoma*

Campos Cardoso,Matheus *University of Central Oklahoma*

Felicio de Araujo,Danilo *University of Central Oklahoma*

Mobile applications changed the way people communicate and access information without using a desktop computer or a laptop, having several different purposes. From applications that help the user to practice exercise to bank applications, mobile applications promise to help the user in their daily lives, in several different areas. The Wanderlust app was developed to help people who are going to travel somewhere combining important tools in order to search for information on the Internet about cities and places to visit. Therefore, Wanderlust turns the task of searching for information easier than getting information in different sources or applications, even with a mobile device. Most information that is shown on the app was retrieved with the use of APIs, such as GoogleMaps API and Open Weather API. Those APIs provided JSON data that was parsed and used in order to show relevant information to the user. The application is able to give information about the weather, commercial places and places to visit of a city, either entered by an input from the user or using its current location, being also possible to mark cities as favorite. Combining these tools in a single application, Wanderlust turns the task of searching information easier than getting information from different sources, even with a mobile device.

05.06.06 One Life to Survive, a Mobile Game for Android Phones

Kovatana,Komes *University of Central Oklahoma*

Sung,Hong *University of Central Oklahoma*

This zombie-shooter game is a remake of a final project for Object-Oriented Programming class in Spring of 2014. You control a character who's goal is to stay alive as long as possible from the zombie hoard with 1 life. The game ends when you are hit by a zombie. The purpose of this project was to further develop skills for creating a mobile application on Android. Technical challenges include: overcoming the restraint of layout files, making the zombies move towards the player, spawning of zombies, and controlling the character. To avoid modifying layout files, I used the libgdx library to develop the game. The player can shoot n amount of bullets per second and is destroyed when it hits a zombie or goes off screen. Zombies have a chance to drop an upgrade to increase the player's fire rate. Zombies spawn from 1 of 36 slots that surround the outsides of the screen during 5 second intervals starting with 1 while incrementing. Their movement speed is increased at every quarter of 36. Once the count reaches a max of 36, we increase the movement speed instead. Zombies will home in on the player when they spawn. This is achieved by finding the directional vector from the zombie to the player every cycle. The result of this project is a newly acquired skill for mobile game development using Java and a better understanding of the libgdx library.

05.06.07 Siege Defense, a Mobile Game for Android Phones

Kovatana,Komes *University of Central Oklahoma*

Sung,Hong *University of Central Oklahoma*

This strategy game is the final project for Mobiles Applications class in Fall of 2015. You command a limited size army of 3 different unit types to lay siege upon the enemy base. The enemy tries to defend its walls with towers that shoot projectiles at your army. Your goal is to break down the wall before you run out of troops. The purpose of this project was to develop skills for creating a mobile application on Android. Technical challenges include: overcoming the restraint of layout files, unit creation, animation states, AI behavior, projectile homing. To avoid modifying layout files, I used the libgdx library to develop the game. Units can be upgraded between each round. During the round, units are created as copies of the upgraded units. Units have different states: standing, walking, attacking, dying. Their respective animation will play during these states. Units will walk toward the enemy base when spawned and attack it when within range. Towers will shoot projectiles at the first unit that falls into its attack range. The vector of a projectile is calculated using the position where the target unit will be one second later. The distance they travel is short and quick so precise calculations is unnecessary. The result of this project is a newly acquired skill for mobile game development using Java and a better understanding of the libgdx library.

05.06.08 Get Outta My Lair, a Computer Game Written in Java Using Libgdx

Kovatana,Komes *University of Central Oklahoma*

Stringfield,Virgil *University of Central Oklahoma*

McGuire,Cody *University of Central Oklahoma*

Nguyen,Don *University of Central Oklahoma*

Penning,Cole *University of Central Oklahoma*

Varghese,Joby *University of Central Oklahoma*

This turn-based strategy and dungeon crawler game was for a project in Software Design and Development class in Fall of 2015. It takes place during the Prohibition era in America. You play as a Beholder, a creature that would normally be a monster in this type of game. Our objective was to use an unusual protagonist set in a less used time period. Technical challenges include: creating a turn-based engine, skills, damage system, leveling, traps, inventory, and AI behavior. The player takes a turn by moving a square or using a skill. Skills will either deal damage, negate damage, or apply a beneficial effect followed by a unique animation. Damage is dealt by placing a damage entity on an occupied tile to be handled as a collision event. Perishing enemies grant experience to level up and improve the character as an award for progress. Items can be picked up and held in an inventory for later use. Traps trigger when the player lands in the same tile it occupies. Their effects include: damage, poison, reducing power, and loss of control. AI characters will seek out the player when within range to engage combat.

05.06.09 Network On-Line Traffic Policing

Qian,Lie *Southeastern Oklahoma State University*

On-line traffic, such as conversational call, live video, serves a large group of applications in the internet now days. An important feature of on-line traffic is that they are not pre-recorded and no exact information about each session's traffic is known before the traffic happens. S-BIND (Confidence-level-based Statistical Bounding Interval-length Dependent) traffic model was proposed to characterize such traffic for QoS admission (GammaH-BIND) and policing purpose. A state-dependent token bucket based statistical regulator was proposed to police the traffic using S-BIND parameters. However, if the source of the traffic understands the bucket's behavior, it can tune the traffic and cause significant violations in the regulator's output traffic. A new design of state-dependent token bucket for the regulator is proposed here to remove such potential problem and an optimization algorithm is given to improve the regulator's efficiency by removing redundant token buckets in the regulator.

05.06.10 Hestia: A real-time strategy game

Alrifai,Rad *Northeastern State University*

Wells,Kevin *Northeastern State University*

Hestia is a multiplayer real-time strategy game focusing on high-level strategic decisions. However Lower-level decisions such as battle tactics including individual unit control are performed by Artificial Intelligence (AI). Each player controls one civilization, which consists of a number of cities. Each city has a number of people living in it. People must eat to avoid starvation, which necessitates the collection of wheat. They may also collect wood, used to construct new cities. The actual planning of new city construction is handled by the player. There is a single victory condition called Conquest, which requires the elimination of all other civilizations. Hestia is compatible with Windows, OS X, and Linux computers, written in C++ and uses the Cheese Engine, previously developed by the author for the purpose of games development. Other programming libraries used are boost, libogg, libvorbis, zlib, libpng, SDL2, SDL2_image, SDL2_mixer, and RakNet.

05.06.11 Substitute Teacher Scheduling System

Alrifai,Rad *Northeastern State University*

Foreman,Andrew *Northeastern State University*

Substitute teachers fill in for regular teachers who are not able to work their regular schedule on a given day. This project was designed to create a Web site with hypothetical shift openings and teachers, based on actual schools in the Tulsa, OK school district. Substitute teachers can seek new jobs, and view their job assignments. The system requires all users to register before they can use the site. The project was developed using ASP.NET, HTML, CSS, C#, and MS SQL Server database management system.

05.06.12 Organisms! Exploring the Genetic Algorithm

Alrifai,Rad *Northeastern State University*

Grafton,William *Northeastern State University*

This project was built with the intention of exploring the genetic algorithm and to examine the possibilities that it provides. The Organisms! Is a simulation software that was designed to give individual "organisms" a life of their own and observe how they interact with each other and their environment? Each organism has a set of traits based off of its core "chromosomes." Each chromosome is modeled as a binary string that represents whether a trait is turned on or off, much like the genetic makeup of most organisms today. The simulation is intended to give each organism a chance to mate and "cross-over" their genetic makeup to the next generation. Each new generation has a chance of getting newer traits that would better aid them in procreation or surviving. The program itself supports the expansion of chromosomes representation from 16 bit binary strings to 32 bit binary strings, representing an even wider array of possibilities. Overall this project was developed for entertainment and to learn and understand the basic fundamentals of advanced AI and problem solving algorithms, such as the genetic and other evolutionary algorithms.

05.06.13 Oklahoma Android Storm Shelter System

Alrifai,Rad *Northeastern State University*

Hillis,Nathan *Northeastern State University*

Storm shelter databases are currently used in major cities throughout Oklahoma. A user can register through a web portal and the system stores the information in a database. The newly introduced Oklahoma Android Storm Shelter System, enables Android users to register their storm shelter information. This application provides a simple, user-friendly interface and alternate form of media to retrieve current weather information. This alternate registration via mobile application, could increase participation thereby helping to create a more accurate database of in-home storm shelters. The primary goal of this project is to provide a mobile-based registration system with built in weather data services for storm shelter owners that collects shelter location information and stores it in a database. This also alleviates the problem of needing to find an alternate form of media to retrieve current weather information.

05.06.14 A Web Application for creating and publishing Requests for Proposals

Alrifai,Rad *Northeastern State University*

Howard,Gregory *Northeastern State University*

The Traditional methods of creating and distributing Requests for proposals (RFPs) have several problems. They lack publishing methods that reach all potential suppliers and they lack uniform formats, making it difficult to quickly locate desired information. There also remains a need for a method to allow easy collaboration and editing during the entire process, including post publication. The primary goal of this project is to create a uniform format and a simple and publishing mechanism for RFPs. This project is meant for simple proposals that can be described in simple terms and for the beginnings of proposals to gage interest from suppliers. The online format is as simple as filling out a form and selecting the option to publish. While the method is simple, it provides everything needed to get an RFP into a public forum where suppliers can find it quickly and easily. The resulting RFP is searchable and can be published and unpublished by simply selecting a checkbox. No data is lost in the process and the RFP remains posted until the Author deletes it. Before beginning this project, I had knowledge of what RFPs were but little knowledge about the creation and publication process. Much of the research, for this project, involved finding accepted practices for what information an RFP should include and finding a common format that will work for most of them.

05.06.15 An Inventory Management and Purchase Order System

Alrifai,Rad *Northeastern State University*

Lopez,Christopher *Northeastern State University*

SaaSyPantry is designed to combine the workflows of Purchase Order and Inventory Management system with an automatic order processing mechanism. Currently, SaaSyPantry is designed to function as a standalone program; however, the eventual goal of SaaSyPantry is for it to be a member of a restaurant management suite of products that streamline the entire restaurant workflow. SaaSyPantry was developed in C#/WPF and SQLite. C# was chosen because it provides a programming library for Symantics3 API, which allows users to look up products information using UPC barcode. Also, the project uses SQLite to store inventory item and vendor information which gives users a personalized digital "pantry" and enables them to replenish stock from a number of vendors with a single click instead of lengthy phone calls.

05.06.16 Expansion of Multi-Sensor Aerosol Products Sampling System (MAPSS)

Phares,Dean *Southwestern Oklahoma State University*

Objective: Increase the accessibility of Space Based Sensor data through the development of automated sensor fusion tools implemented on High Performance Computing (HPC) assets. Thesis: Expanding the accessibility of NASA data enables a larger community to make observations about the significance of aerosol products to life on earth. This research enables improved scientific understanding of atmospheric aerosol phenomenon through remote sensing from space, sensor validation using ground-based and airborne measurements, multi-sensor uncertainty analysis, and applications to model evaluation. In addition, this research is a catalyst for growth in the HPC skills and capabilities at SWOSU and the state of Oklahoma. Methodology: This research extends the work of Charles Ichoku who developed a Multi-sensor Aerosol Products Sampling System (Petrenko 2012) to measure atmospheric aerosols and provide a combined aerosol observation. This tool has limited availability to the public and is not easily modified to facilitate further research. Providing access to this dataset and the algorithms to produce it outside of the NASA Goddard campus, more researchers at other campuses can examine and begin to analyze this valuable data set. Summary: Demonstrate Oklahoma undergraduates contributing meaningfully towards NASA research initiatives using HPC capabilities, and provide a useful dataset for further research in the field of aerosol product observations.

05.06.17 Increase the accessibility of Space Based Sensor data through the development of automated sensor fusion tools implemented on High Performance Computing (HPC) assets.

Saluja,Prabhjyot *Southwestern Oklahoma State University*

Expanding the accessibility of NASA data enables a larger community to make observations about the significance of aerosol products to life on earth. This research enables improved scientific understanding of atmospheric aerosol phenomenon through remote sensing from space, sensor validation using ground-based and airborne measurements, multi-sensor uncertainty analysis, and applications to model evaluation. In addition, this research is a catalyst for growth in the HPC skills and capabilities at SWOSU and the state of Oklahoma. This research extends the work of Charles Ichoku who developed a Multi-sensor Aerosol Products Sampling System (Petrenko 2012) to measure atmospheric aerosols and provide a combined aerosol observation. This tool has limited availability to the public and is not easily modified to facilitate further research. Providing access to this dataset and the algorithms to produce it outside of the NASA Goddard campus, more researchers at other campuses can examine and begin to analyze this valuable data set. Summary: Demonstrate Oklahoma undergraduates contributing meaningfully towards NASA research initiatives using HPC capabilities, and provide a useful dataset for further research in the field of aerosol product observations.

05.06.18 Expanding Accessibility of NASA's Space-Based Aerosol Sensor Data using Oklahoma State University's "Cowboy" Supercomputer

Vantrease,Amy *Southwestern Oklahoma State University*

Objective: Increase the accessibility of Space Based Sensor data through the development of automated sensor fusion tools implemented on Oklahoma Shared High Performance Computing (HPC) assets available through the OneOklahoma Cyberinfrastructure Initiative. Thesis: Expanding the accessibility of NASA data enables a larger community to make observations about the significance of aerosol products to life on earth. This research enables improved scientific understanding of atmospheric aerosol phenomenon through remote sensing from space, sensor validation using ground-based and airborne measurements, multi-sensor uncertainty analysis, and applications to model evaluation. In addition, this research is a catalyst for growth in the HPC skills and capabilities at SWOSU and the state of Oklahoma. Methodology: This research extends the work of Charles Ichoku who developed a Multi-sensor Aerosol Products Sampling System (Petrenko 2012) to measure atmospheric aerosols and provide a combined aerosol observation. This tool has limited availability to the public and is not easily modified to facilitate further research. The purpose of this research is to demonstrate how to expand a NASA supercomputing task to an Oklahoma Supercomputer. Summary: Oklahoma undergraduates contributing meaningfully towards NASA research initiatives using HPC capabilities in the state of Oklahoma to provide a useful dataset for further research in the field of aerosol product observations.

05.06.19 Central Chat: A SaaS Chat Service Powered by Android

Gutierrez,Ivan *University of Central Oklahoma*

We were tasked with developing a mobile application that runs on Android which would serve as an amalgamation of all the skills and techniques we gained during the Mobile Application Programming course. We decided to develop a Software as a Service (SaaS) based instant messenger similar to WhatsApp. With advancements made to android, developers are now more equipped than ever to take advantage of SaaS. It is our hope to use these tools to our advantage to create an instant messaging program which takes use of not only the android SDK but the Google Cloud Services as well. We went with a 2-tiered client/server network with the inclusion of Google Cloud Messaging (GCM). With GCM's ability to write and store client data, and its ability to automatically queue and pull messages sent by our server, it was a perfect fit. If a user is connecting for the first time, a unique identifying key is pushed into a database to ensure that each user name is unique at any given time. Together, all of these elements allowed users to communication without them having to understand how the server handles the messaging. Using a database allows us to retain a list of all connect users so that we can ensure user concurrency within the application. GCM then allows users to effortlessly send messages to other chat users.

05.06.20 CANNOT STOP

Driver,Callie *University of Central Oklahoma*

Song,Samuel *University of Central Oklahoma*

Bryan,Brendan *University of Central Oklahoma*

Zhao,Qing *University of Central Oklahoma*

This Android application was developed for researching mechanisms used when creating a fun and interactive mobile application game. Also, the research included learning how to implement version control when working with multiple team members. The state design pattern is one of the behavior design patterns implemented. The pattern permits an object to change its behavior or characteristics when its internal state is altered. The class will be changed by its object. Problems like relativity, keeping track of all of the different events going on in the game, and keeping the code formatted enough to easily make changes, were a big part of creating this application. For some objects being used in the game, we used the state design pattern to change the behavior of them and when they should be removed from the game. To combat the relativity issue, the sizes of the objects drawn on the screen were determined based off the width and height of the canvas using multiplication and division. For version control, we used Source Tree. This was to let us combine our work together with ease. As a result, adding design patterns to the game made modifying the behavior of objects very easy. It also reduced coupling. Also, with implementing relativity between all objects in the game, now the objects will not appear too big or too small for the user's screen and the game will play fairly between differently sized devices.

05.06.21 Using Persistent Memory of Small Scale Applications in Mobile Apps

Wu,Hanye *University of Central Oklahoma*

McLain,William *University of Central Oklahoma*

Due to its three writing systems: hiragana, katakana and kanji, learning to write and read Japanese is a difficult endeavor for even the most tenacious beginner. Our team has set out to make an Android mobile application, Kanaseur, to make the task more attainable. To shorten our developing cycle, we are seeking an easier way to deal with application data. In our research, we find that using persistent memory to store and parse user information will reduce developing time and enhance program functionality.

05.06.22 A 3D WHEELCHAIR EMULATOR

Zhao,Qing *University of Central Oklahoma*

Fu,Jicheng *University of Central Oklahoma*

Electric wheelchair is widely used, as it is fast, simple, and easy to manipulate. However, if a young child drives the wheelchair without any trainings, it becomes very dangerous. Since young children always want to try something new and exciting, if children can see the consequences of accidents, they will understand and choose to drive safely. We have developed a 3D wheelchair game to help young children with disabilities to improve their wheelchair driving skills. The Wheelchair looks and behaves likes a real electric wheelchair. The game has stationary or moving obstacles. Children need to avoid hitting them. We designed bonus and cute cartoon characters so that children will have more interests in our game. For example, we use a little rabbit as an instructor in the practice mode. The game data, such as bonus and times, will send to our web server. According the data, a doctor can make or revise the training plan for children.

05.06.23 Android Programming With REST APIs: Building a Magic Companion App

Conyac,Ryan *University of Central Oklahoma*

Renfro,Derek *University of Central Oklahoma*

Potvin,Victoria *University of Central Oklahoma*

The Magic Companion app was conceived as a tool to aid the avid player of Magic: The Gathering, a popular card based game. It was implemented with a desire to learn more about Android programming, especially the interaction between standard programming techniques and the use of outside APIs and frameworks. Major features desired were card search and deck-building capabilities, statistical deck analysis with an easy to understand display, rulings search, a built in copy of a rulebook, dice rolling, and a life counter. A major issue with apps of this type is the massive size of content; Magic has over 12,000 playable cards for which we needed accurate reference and pricing data. We knew we would have to heavily rely on outside APIs and frameworks, and we believed the Android framework would respond well. We found through the use of standard Android techniques, REST services, and a charting framework called MPAndroidChart that we were able to build a robust application that met our needs within a short amount of time. The only negative effect we found is the need for an Internet connection in order for the deck building part of the application to function. Yet the advantages are many: APIs means that the data adapts in real time, fragments allow for easy UI changes in the future, and self-contained API connector classes provide easier maintenance in the event the API needs to be changed.

05.06.24 An Experimental Study for Evaluating the Accuracy of a Smartphone GPS App

Wang,Yuxuan *University of Central Oklahoma*

Fu,Jicheng *University of Central Oklahoma*

We have developed a smartphone app for measuring wheelchair outdoor activities with GPS (Global Positioning System) under the Android platform. In order to balance the accuracy and battery consumption, the app uses Google Play Services as its main location entry instead of regular android method. This gives users a dynamic and alternative way to detect their current location. The distance is attained by updating the current location every second and accumulating each of such records. To improve location accuracy, we set permission as ACCESS_FINE_LOCATION and set the location update interval to 1000 millisecond, which gives us the highest frequency. The final positioning precision aims to locate users' positions within 10 meters error. Due to the GPS' intrinsic restrictions, this precision will enable us to conclude that our app can achieve accurate measurements for wheelchair outdoor activities.

05.06.25 A System Framework Based on Smart Mobile Device and Cloud for the Rehabilitation of Knee Injuries

Liu,Tao *University of Central Oklahoma*

Fu,Jicheng *University of Central Oklahoma*

Qian,Gang *University of Central Oklahoma*

Knee injuries (e.g. anterior cruciate ligament (ACL) injury) are one of the most frequent injuries in sports, which not only can cause a high medical cost, but also demand specialist assisted rehabilitation for more than 6 months. In order to decrease the cost in rehabilitation period, a patient may have to finish the protocol of rehabilitation by himself/herself, and report the progress later. However, this is obviously too subjective and may fail to accomplish due to personal preference. To address this issue, we are currently developing a system framework based on smart mobile devices and cloud computing. This system can remind the user to carry out the protocol required for rehabilitation, and capture the complete procedure by the inertial sensors in the mobile device, which is installed on the wounded leg of the patient. Then the captured data will be transferred to the cloud. Thus, the clinical specialists can know the details of the protocol fulfillment from the analysis results. As a result, the rehabilitation cost can be decreased. Currently, the preliminary experiment is still on going, but has already shown that it is possible and practical for the leg motions which were defined in the rehabilitation protocol to be clearly identified, and the captured data could be transferred to the cloud efficiently for statistics and future analysis.

05.06.26 Use of the Google Cloud Messaging Service in Android Application Development

Qian,Gang *University of Central Oklahoma*

Gravchikov,Stan *University of Central Oklahoma*

This presentation introduces the concept of the Google Cloud Messaging (GCM) Service. We will establish the idea of GCM and then provide a quick implementation of a client-server app that utilizes GCM as the primary mean for notification delivery. We will cover the main components of GCM that are required for client-server communication in Android application development.

05.06.27 Comparison of Data Transfer Performance between HPC LAN and Hard Drive

Qian,Gang *University of Central Oklahoma*

Adebayo,Ayodeji *University of Central Oklahoma*

With the advent of the InfiniBand network infrastructure for High Performance Computing (HPC), we are interested in investigating if transferring data into the memory can now be faster over HPC local area network than from a secondary storage device. The goal of this project is to compare data transfer performance between an HPC network and a hard drive. The project is implemented in C++; in particular, the network programming component was implemented using Boost Asio, a platform-independent library. We measure the amount of time needed to transfer a fixed amount of data based on a variety of networking scenarios and compare it with time it takes to transfer the same amount of data from hard drives. We report our findings in this presentation.

05.06.28 Expanded Accessibility of NASA's Space Based Sensor Data using Low-Cost Raspberry PI Clusters

Smoot,Devin *Southwestern Oklahoma State University*

Objective: Increase the utility of Space Based Sensor data using automated sensor fusion tools implemented on a Raspberry Pi Bramble. Thesis: Expanding the accessibility of NASA data enables a larger community to make observations about the significance of aerosol products to life on earth. This research enables improved scientific understanding of atmospheric aerosol phenomenon through remote sensing from space, sensor validation using ground-based and airborne measurements, multi-sensor uncertainty analysis, and applications to model evaluation. By lowering the threshold of this project to a low cost cluster, it opens the door for area high schools to do research using NASA data. Methodology: This research extends the work of Charles Ichoku who developed a Multi-sensor Aerosol Products Sampling System (Petrenko 2012) to measure atmospheric aerosols. This tool has limited availability to the public and is not easily modified to facilitate further research. Providing access to this dataset and the algorithms to produce it outside of the NASA Goddard campus, more researchers at other campuses can examine and begin to analyze this valuable data set. Summary: Demonstrate Oklahoma undergraduates contributing meaningfully towards NASA research initiatives using HPC capabilities, and provide a useful dataset for further research in the field of aerosol product observations.

05.06.29 Identifying Relevant Attributes for Child Obesity: A Preliminary Study

Wiechmann,Paul *University of Central Oklahoma*

Fu,Jicheng *University of Central Oklahoma*

Child obesity was found to affect 1 out of 12 children aged 2 to 5 years old in the United States in 2012. Children that are obese have been found to be more likely to be obese as adults and are at greater risk for obesity-related health problems such as cardiovascular disease, diabetes, and several types of cancer. Obesity has no single cause and is affected by many variables related to genetics, environment, and lifestyle. In this study, we apply a variety of data mining and analysis techniques, including feature selection and decision trees, to determine which variables from a large set are most relevant to child obesity. The survey data set is converted from its raw form into a format that can be used with the data mining and machine learning application WEKA. Because the number of variables is very large, related variables are separated into several categories and results are gathered for each.

05.06.30 Facilitating Undergraduate Research Using High Performance Computing

Gutierrez,Ivan *University of Central Oklahoma*

At the University of Central Oklahoma we have many professors conducting undergraduate research. The majority of their research projects could benefit from the use of High Performance Computing (HPC), but user inexperience with HPC prevents them from doing so. But by providing users with an easy to use interface we can help faculty and students learn how to use our HPC cluster effectively, and get more done in less time. In recent years, HPC has become more powerful and easier to use. But many people still believe that it is too challenging to use, so they avoid it. It is our goal to not only teach users how to perform HPC, but to try and simplify the process as much as we can. In order to reach our goal, we are currently having help sessions where we help faculty and students learn the basics and get them started. In addition to this, we are also using a tool called Equeue which allows users to submit jobs to the job scheduler through a modern web browser. This is done through the use of premade submission templates which makes job submission a breeze. Together, the combination of these tools will simplify HPC and increase the numbers of users we have. Our help sessions can help them learn the basics of HPC and break the stigma that HPC is hard. Then through the use of Equeue, they can submit their jobs easily without having to worry about how the scheduler works.

05.06.31 Expanding Accessibility of NASA's Space-Based Aerosol Sensor Data using Texas Advanced Computing Center's Stampede Supercomputer

Nagireddy,Varun reddy *Southwestern Oklahoma State University*

Objective: Increase the accessibility of Space Based Sensor data through the Texas Advanced Computing Center's Stampede Supercomputer available through the Extreme Science and Engineering Discovery Environment (XSEDE). Thesis: Expanding the accessibility of NASA data enables a larger community to make observations about the significance of aerosol products to life on earth. This research enables improved scientific understanding of atmospheric aerosol phenomenon through remote sensing from space, sensor validation using ground-based and airborne measurements, multi-sensor uncertainty analysis, and applications to model evaluation. In addition, this research is a catalyst for growth in the HPC skills and capabilities at SWOSU and in state of Oklahoma. Methodology: This research extends the work of Dr. Charles Ichoku who developed a Multi-sensor Aerosol Products Sampling System (Petrenko 2012) to measure atmospheric aerosols and provide a combined aerosol observation. This tool has limited availability to the public and is not easily modified to facilitate further research. The purpose of this research is to demonstrate how to expand a NASA supercomputing task to the Stampede Supercomputer. Summary: Oklahoma undergraduates contributing meaningfully towards NASA research initiatives using HPC resources through XSEDE to provide a useful dataset for further research in the field of aerosol product observations.

05.06.32 RX SOLUTIONS

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RX Solutions, an android application, was developed as a final term project to fulfill a markets need for local non-big chained pharmacies and their customers. A simple elegant easy to use for all ages, web like design with parse database was used to build this application. The motivation behind this project was to aid small pharmacies to stay competitive in mobile customer care market. RX Solutions provides pharmacy customers to login to the custom application to do the simple tasks they usually would do by taking a trip down to the physical location. This application can be adopted by any pharmacy and it is ready to be used by simply changing the few main configurations. The main platform of this app allows users and administrator to be in a vendor-customer like relationship.

05.06.33 Using Applied Machine Learning to Examine Childhood Obesity in the Latino Population

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This study aims to examine possible causes for a rising childhood obesity rates in Latino children using survey data gathered from Latino families. We will follow a multi-step heuristic process of applied machine learning techniques by preparing, analyzing, and refining the data using an Ensemble Method to combine trends and patterns made by multiple independent models, each driven by a unique learning algorithm. This will reduce possible bias and overfitting and will lead to accurate and applicable results that will aid in reducing the growing obesity epidemic and give direction for future studies.