CS Senior Design Showcase



December 13, 2019



FROM THE CHAIR



The Department of Computer Science is thrilled to welcome you to our third fall Senior Design Showcase. Featuring 11 projects developed by 39 students, this showcase allows project teams to present significant real-world solutions for large, small and new organizations. I'm confident that you will find they've carefully maneuvered the software engineering process and designed some really neat projects.

Amit Jain Chair/Associate Professor Computer Science

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OISE STATE UNIVERSITY COLLEGE OF ENGINEERING

Nobile App for Android and iOS

ation built for iOS and Android devices that facilitates the peer-to-peer renting of physical self-storage. The om scratch to the specification of the sponsor with implementation details chosen by the members of the ramework, we were able to develop a product for iOS and Android devices using the s single codebase. With user has the ability to create or reserve a storage space listing. A user can create a listing detailing the ace that they wish to offer for other users to reserve. These listings will then be available in a collection that based on appropriateness for their storage needs. Upon selecting a listing that a customer finds appropriate, ave to reserve the physical space offered at a pay rate based on a daily or monthly price.



#1 - TRAVEL PROCESSING APP

DEPARTMENT: Computer Science

TEAM MEMBERS: lan Hooyboer Jason Smith Nathan Steele Justin Stiffler

SPONSOR: Ramona Martin

PROJECT ADVISOR: Shane Panter

MENTOR: Matthew Gillikin This project seeks to simplify the lives of administrative assistants and faculty on campus. We intend to do this by bringing a wealth of information that was previously kept in various digital and analog locations to one convenient application. From the proposal's submission, to correspondence between travelers and their home department, and finally reimbursements of receipts upon return, we aim to encapsulate the lifecycle of a trip in a lightweight and cross-platform manner.

Our development stack so far consists of a Laravel-powered PHP application deployed to Apache web server that lives on a virtual machine hosted by the Boise State Department of Computer Science.

This initial product should be considered a prototype of a much larger project, as the scope of the spec is impressive. We have implemented the first portion that consists of aiding a campus department's administrative assistant in gathering information related to the creation and submission of a travel proposal.

#2 - CONTAINERIZE TA TICKETING

DEPARTMENT: Computer Science

TEAM MEMBERS: Bob Clampitt

Ron Lowies Ryley Studer Bethany Weaver

SPONSOR: Benjamin Peterson PROJECT ADVISOR:

Shane Panter

MENTOR: Benjamin Peterson

#3 - GIT-BACKPACK

DEPARTMENT:

Computer Science

TEAM MEMBERS:

Mike Blowers Cavan Cook Erik Corrington Ashlee Milton

SPONSOR: Shane Panter

PROJECT ADVISOR: Shane Panter

MENTOR: Shane Panter TA Ticketing is a web application that assists in efficiently helping students in need. The web application was created in the Spring semester of 2019. The website is functional however implementing new features or repairing discovered issues can prove difficult without a development environment. In order to verify functionality of the application prior to an update being customer facing the TA ticketing team was asked to create a testing environment. We were given full control as to how we wanted to go about approaching this project. For this we decided to implement a container using Docker technology. The Docker Container will need to support certain dependent technologies such as PHP, MySql, and Apache. Once the Docker container is fully implemented then a reliable testing environment can be built efficiently and quickly to verify functionality of the website prior to being released to the public.

Our project was to create a web-based interface for computer science students early in their academic careers, that would allow them to set up GitHub repositories for their computer science classes.

Using GitHub repositories would replace the need for students to use the current git server called "backpack" which can be confusing and overwhelming to new students. Instead, they would simply need to provide information through the interface about their existing GitHub account and class they are using this for and our program will setup the needed linking for them to turn in their assignments.

We set out to create an easy to use interface that authenticates Boise State University students, creates a repository for them with the correct naming convention, and store this information to allow for our sponsor to use GitHub as the medium for pushing assignments and pulling for grading. This will replace the need for the local git server "backpack" and give the students a GUI to interact with rather than the command line

#4 - SCHOOL BUS ROUTE PLANNER & OPTIMIZER

DEPARTMENT: Computer Science

TEAM MEMBERS: Noah Barnes Matt Castrigno Kris Veruari

SPONSOR: Predictable Ryde

PROJECT ADVISOR: Shane Panter

MENTOR: Matt Vuturo This project is a cloud based school bus route planning and optimizer. This proof of concept project utilizes and integrates custom code and existing open source route planning services. The application will accept input parameters including: the number of buses, student address information, rider pick up & drop off rules rules. The application will output files that include: the optimized bus routes that can be looked at on a map (a polyline), turn-by-turn instructions to see exactly where to turn (narrative), bus stop information (coordinates) including time, location, and students.



#5 - ONLINE GAME

DEPARTMENT:

Computer Science

TEAM MEMBERS:

James Davison Keaton Gillihan Rhett Hancock Cesar Loya Taylor Robert

SPONSOR: Micron

PROJECT ADVISOR:

Shane Panter

MENTORS:

Chris Stewart, Glen Purnell, Amanda Moore We have developed a Crossword for Micron's Global Quality department (GQ). Micron GQ is the guardian of the Micron brand. They are creative problem solvers responsible for strengthening systems and processes and investigating and solving complex engineering problems. The department deploys quarterly activities to engage the company in fun quality-related activities. The goal was to connect with people in fresh, exciting ways that surprise them and help them better understand our department's mission and how it relates to them, no matter what role they are in. They were looking for a successful crossword game that will provide an easy user experience and a back-end structure that can be modified and replicated for future educational/training activities. In other words, they wanted the project to have



longevity beyond our deployment. We took inspiration from the New York times crossword puzzle. From that we utilized one team members, Rhett Hancock, strong UI design skills to adapt it to fit Micron.

#6 - NATURAL COMMUNICATION WITH ROBOTS

DEPARTMENT:

Computer Science

TEAM MEMBERS:

Ben McAvoy Sarah Nielson James Souder Hunter Thompson

SPONSOR:

Speech, Language &Interactive Machines

PROJECT ADVISOR: Shane Panter

MENTOR: Casey Kennington As robotic devices become more prevalent in today's society, so too does the number of interactions humans have with them. In order to ensure that these interactions are pleasant for both parties, research into human computer interaction must be performed. For this research to occur at an efficient rate, software must be created which facilitates the operation of these devices. Our team worked to develop said software for the Misty II platform developed by Mistyrobotics for use by the Speech Language & Interactive Machines (SLIM) lab at Boise State University. We not only navigated the entirety of Misty's REST API to provide documentation on it's affordances, but also to provide a means to interact with said API. While there existed well documented methods of leveraging JavaScript to work with Misty, an easy to use Python based client had yet to be created. Over the course of the development of this



Python client, we tested a range of Misty's features from onboard facial recognition to sound localization. Our team also worked to incorporate extra features including emotion recognition and object detection.

#7 - CREATING AN ECOLOGICAL DATABASE TO UNDERSTAND THE PAST, PRESENT, AND FUTURE OF THE SAWTOOTH MOUNTAINS

DEPARTMENT: Computer Science

TEAM MEMBERS:

Peter Henggeler Brenna Leonard Seema Marahatta Alex Simons

SPONSOR: US Forest Service

PROJECT ADVISOR: Shane Panter

MENTORS: Cathie Olschanowsky, Kelly Hopping When ecologists are working in the field, they often record their data by hand. This hard-won information then tends to remain trapped in physical copies of datasheets or else becomes lost in a proliferation of unwieldy Excel files, thereby preventing further analysis. The U.S. Forest Service, for example, has valuable information about historical environmental conditions that could be used to help track how ecosystems have changed over time, but getting this information out of the filling cabinet and onto a computer in a format that can be queried andanalyzed remains a key constraint to this type of research.

The goal of this project was to develop a relational database populated with environmental

monitoring data from around Sun Valley, Idaho. This work was in collaboration with the Sawtooth National Forest, which has collected decades of data on historical vegetation and soil conditions. This database will also serve as the foundation for future work to



create an app that scientists can use to collect these same data today. By making nearly a century of environmental data ready for statistical analysis, this project will allow Forest Service and BSU scientists to answer important questions about how some of Idaho's most spectacular landscapes have been affected by climate change, sheep grazing, and natural resource management decisions across areas and timeframes that were previously impractical to tackle.

#8 - BRONCO FUEL APP

DEPARTMENT:

Computer Science

TEAM MEMBERS: Bryant Barreto Davis Plumlee Tyler Smith

SPONSOR: Boise State University Athletics

PROJECT ADVISOR: Shane Panter

MENTOR: Tyler Smith In stage 2 of the Bronco Fuel app, we've added more features to the existing Boise State athlete nutrition application such as NCAA supplement information, healthy choices for local restaurants on and off campus, as well as adding more information to existing recipes and resources for student athletes. For recipes we've added images to help athletes visualize what the completed meal looks like by referencing image addresses that can be updated utilizing an excel sheet that acts as one of our database tables. We've included



restaurant information through the ionic list component and it can easily be updated by admins by inserting information tailored for the athletes by Boise State's athletic trainers into another excel sheet. In addition, we've also included the primary on-campus dining hall, Boise River Cafe's, daily menu that can be viewed in the application. The athletes using the Bronco Fuel app gain easy to access information regarding the best choices for their diet.

#9 - MOTION SENSOR REWARD SYSTEM

DEPARTMENT: Computer Science

TEAM MEMBERS:

Garret Allen Nick Chapa Alex Esplin Mike Martin

SPONSOR:

Boise Brewing

PROJECT ADVISOR: Shane Panter

MENTOR:

Collin Rudeen

Our project fills the need of Boise Brewing to be able to count customers, and then offer a reward to a customer after a certain threshold is reached, e.g The 150th customer of the day gets a free beer! This allows Boise Brewing to not only have a rough estimate of the people coming in, but reward those that do.

Using a combination of PIR and Ultrasonic sensors in conjunction with a Raspberry Pi and a small touchscreen, we have built a configurable reward system that uses the number of people entering the bar to determine when a reward is given out. The system can be configured using



a touchscreen driven UI. The system can be set to a custom number of customers before a reward is given, with a skip feature, a reset button and the ability to turn the system on or off. When a reward is triggered, the Pi sends a signal to a buzzer and LED signal light.

#10 - SPEED OF LIDAR

DEPARTMENT: Computer Science

TEAM MEMBERS: Brandon Echols Jason Egbert

Ariel Marvasti SPONSOR:

Adapt Data Flow Opimizations Lab

PROJECT ADVISOR: Shane Panter

MENTOR: Cathie Olschanowsky This semester our team is working to improve the execution time of AdaptLidarTools. AdaptLidarTools is a toolset used to process full-wave form data. Scientists use this data to gather information on vegetation, such as leaf area index. When the wave form data is transformed into a georeferenced 2D raster, scientists can correlate field-based observations against the original waveforms. One of AdaptLidarTools main uses is converting wave form data into a raster image or a .tiff file. Our team's primary focus this semester is to improve the time the toolset takes to convert a .pls file, a file in PulseWaves format, to a .csv file or a .tiff file, the georeferenced raster. To convert the .pls file, each pulse is read, computed one at



a time, and written to the file with the target format. Our goal is to explore solutions that would put the computing of each pulse into parallel. We are also exploring serial improvements to the AdaptLidarTools code base as a whole.

#11 - INTELLIGENT GROUND VEHICLE COMPETITION

DEPARTMENT:

Mechanical and Biomedical Engineering

TEAM MEMBERS:

Nathan Regner

SPONSOR:

Boise State University College of Innovation and Design

PROJECT ADVISOR: Shane Panter

MENTOR: Steve Swanson The Intelligent Ground Vehicle Competition (IGVC) is a yearly competition put on at Oakland University, Michigan. The competition is intended for university students and includes Cyber Security, Self-Drive, and Auto-Nav challenges.

For the last two years, Boise State has participated in the IGVC's Auto-Nav challenge. For this challenge, teams must build a fully autonomous robot that is capable of navigating an outdoor obstacle course. The robot must be able to avoid obstacles, drive between painted lanes, and follow GPS waypoints. In addition to the navigation component, teams must document their design in a written report and give a 10 minute oral presentation.

This year, the IGVC project is in the prototyping stage. We hope to iron out the challenges so we can get a full team of Seniors working on it next semester. The goal is to implement more robust lane detection, mapping, and path planning techniques before the June 2020 competition.



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