Quizzly - In-Class Clicker Software
USC Viterbi School of Engineering

Estimated Team Size: 4-5

Technologies Expected: ReactJS, React Native, NodeJS, EspressJS, MySQL, MongoDB, mobile app development

Background Requested: Current or aspiring full-stack web developers

Description: Quizzly is a web, iOS, and Android application that allows professors to create quizzes and then quiz students in class in real-time. Quizzly has many use cases ranging from simple attendance to full-blown quizzes. In addition to quizzes, Quizzly offers detailed metrics to users. Professors will be able to easily grade students and gain feedback on overall classroom understanding. Students will be able to use past quizzes as study materials for tests and papers.

Ultimately, Quizzly seeks to replace the old-fashioned and outdated clicker polling systems currently on the market through intuitive design, top notch user experience, and superior technologies. This is a continuation project from previous semesters.
**Summer Camp Registration System**  
*USC Viterbi School of Engineering*

**Estimated Team Size:** 4-5

**Technologies Expected:** Java web development (JSPs, servlets, MVC framework), PHP, MySQL, HTML, JavaScript, WordPress

**Background Requested:** Web development is a plus

**Description:** Programming has become a necessary skill for students to learn to be competitive in the world dominated by technology. The age at which students should learn to program has continued to get younger, and elementary school students are learning to program with tools such as MIT’s Scratch. USC runs a number of summer camp programs that teach students about science, technology, engineering, and mathematics. Other types of camps are going to be offered in the future, including robotics and different types of programming.

The current registration system at [http://summercamps.usc.edu](http://summercamps.usc.edu) needs to be improved. There are many features that need to be added, including the ability to add email addresses manually, create different email groups, allow emails to be sent and tracked from the system, social media integration, adding volunteer functionality, automatic picture tagging and emailing to parents, attendance functionality, tracking of person who picks up kids from camps, etc. The entire system needs to be replicated as well for redundancy. Many other features will be discussed in team meetings, so the team can decide which features sound most interesting to implement.

This is a continuation project from previous semesters. There is more work that needs to be done on the previous projects, and many new features to be added.
**P2P4Health**  
*Dentistry by Doshi*

**Estimated Team Size:** 4-5

**Technologies Expected:** iOS, Android, full stack web development

**Background Requested:** iOS, Android, and web development experience a plus but not required, interest in health apps

**Description:** P2P4Health is an application that allows healthcare professionals and regular professionals to interact seamlessly. By establishing an archive of communication, this application provides patients, doctors, insurance agents, and pharmacists with a more centralized method for providing service. It seeks to create a seamless platform for interaction among its clients that alleviates the stress and cumbersome processes associated with providing and receiving medical care. This app, along with its web portal, has a front end dashboard for users to organize their lifestyles around healthy living disciplines and on the back end, it is supporting multiple tasks intuitively-based on preferences and special circumstances. This app will help the user find the right provider, create an archive of communication, and seamlessly interact with pharmacy, labs, specialists, third party payers, billers, etc.

The app will build an intuitive protocol that helps predict potential challenges in future health care based on current life style habits. (For example: A habitual coffee drinker will be prompted to seek frequent dental care visits, a user with neck pain will be prompted to see a chiropractor and perhaps even suggest the closest location of a massage therapist using his current location.) What makes P2P4Health unique is that it will use filters to short list the search based on price point, online reviews, and eligibility and availability of providers. In other words, it will search for a doctor who is on the HC platform with highly-rated Yelp reviews and affordable price points who is already in-network with the user’s insurance carrier and is available to see the user in the preferred window of time set by user. Not only that, but it will facilitate Facetime, Skype calls, live chat to integrate the doctor/patient introduction via approved HIPAA standards.

The app is in its third development stage. The app is designed to help consumers search for healthcare providers, send data to the providers, communicate with them via texting, and to provide a crisis button in case of emergency.
Dental Practice Website
Dentistry by Doshi

Estimated Team Size: 3

Technologies Expected: full stack web development

Background Requested: web development experience a plus but not required, interest in health applications

Description: The dental practice has multiple specialties, and the site currently has features for allowing prospective customers to schedule appointments, fill out forms, make payments, etc. The current site has been live for 5 years and was not developed by programmers. Google Analytics have been incorporated as well. The main reason for this project is to get a more recent look, add more features, and make it more user-friendly. I would like my user to be able to have the following facilities from my website.

WEBSITE SHOULD BE ABLE TO LET USER MAKE AN APPOINTMENT, TAKE PAYMENT, ENABLE THE USER TO UPLOAD FORMS, CARDS, CONSENT FORMS.
1) User gets an automated email once they are have scheduled an appointment
2) User gets an automated email once they have made payment on site.
3) User gets an automated email once they have filled forms and uploaded their insurance benefit card.
4) User gets an automated email once they have signed the consent forms on the site.

WEBSITE SHOULD BE ABLE TO RUN A VIDEO FOR PARTICULAR PROCEDURES SUCH AS TEETH WHITENING, INITIAL EXAM, XRAYS, CLEANING, ETC.
5) User should be able to scroll from 40 different videos and play them as needed.
6) User should be able to watch the video for consent on the procedure with a digital signature (we need this for records)

WEBSITE WILL DISPLAY ALL SPECIALTIES AND ALL FACULTY WITH THEIR INTRO AND BIO
7) All providers need to be SEO enabled so when the search is made for ENDO, PERIO, O.S., Hygiene etc. the user is able to see that particular page.

WEBSITE WILL WORK ACROSS ALL PLATFORMS OR DEVICES
8) Any device when enters the website in their browser, it will load the site and will instantly make features available, iPhone, or Android or iPad or any tablet device.

WEBSITE WILL NEED TO DISPLAY A SCHEDULE FOR CERTAIN PROCEDURES THAT SYNC. WITH PMS (PRACTICE MGMT SOFTWARE)
9) User will be able to have access to the schedule on the site after payment is made for particular procedure.
10) User will be able to make an appointment on the schedule, and will receive an email stating the appointment is made.
**Baseball Team Statistics Website**

*Independent*

**Estimated Team Size:** 3-4

**Technologies Expected:** Spring Boot, Hibernate, JPA, SQL (MySQL), Jenkins, possibly Angular (or another mainstream front-end technology), possibly Docker

**Background Requested:** At least 1 front-end developer, 1 back end developer, possibly a technical analyst to help write user stories

**Description:** I have an existing website ([www.pcblroyals.com](http://www.pcblroyals.com)) that holds the statistics for my men's league baseball team. It's written in old technology (old Spring and Hibernate using XML configs, tomcat, jsp/static html), and it's becoming less and less maintainable. On top of that, there are new queries I'd like to run, but the architecture of the existing system makes it difficult.

**Requirement 1:** I'd like is to modernize the existing system - give it a facelift on the GUI side, update to Spring Boot and modern Hibernate on the back end, and create a new build system that will deploy it efficiently. The existing database will probably suffice for the first part of the project.

**Requirement 2:** I'd like to improve the administration portion - currently you can insert data, but there's no way to update or delete statistics without going into the database directly and issuing SQL statements.

**Requirement 3:** I'd like to add additional "reports", or stats pages. For instance, right now you can sort by "Most home runs career". It'd be nice to have a page that would show the most home runs in a season, and most in a single game, etc. I'd also like to come up with some formulas, like "MVP for a season", and list out the players who won that award each season. I'll define each of these new reports, but I'd like to design it in a way that creating new reports later is easy.

All requirements will need to take speed into account, since the database continues to grow every week, so inefficient queries won't cut it. Indexes only do so much when you're cross-referencing multiple tables and performing math on fields. Some intermediate-to-advanced SQL knowledge will be necessary. I'd like unit tests as well, with at least 60% test coverage (verified using a code coverage tool.) I'm also not opposed to using Docker for this, as long as the deployment process is documented for me to use in the future, but standard Jenkins would be fine as well. You should be able to develop this locally, but I'll provide a Google Cloud box for you to deploy to for integration and demos.
**Bitcoin Transaction Statistics Dashboard**

*Fund3*

**Estimated Team Size:** 4

**Technologies Expected:** Node.js, Apache HTTPD Server, Python, Grafana, Docker

**Background Requested:** Web development experience (full stack preferred)

**Description:** You will be setting up and extending the functionality of the Statoshi Dashboard (https://statoshi.info/) which monitors various statistics of the Bitcoin network. Specific extensions include:

a. Plotting of time series seasonality using Prophet https://github.com/facebook/prophet. Both sub-daily and multiplicative seasonality of transactions, fees, transactions, network hashrate and associated trend change points, uncertainty intervals are also of interest. *This can be a collaboration with, or handed off to, the other group working with prophet for other types of time series analysis. See ‘Cryptocurrency Timeseries Seasonality Analysis’ project for more details.*

b. Create python cron job scripts to automatically export statistics to a database. Historical data will also be exported once. Currently, the data used for the webapp is tightly coupled to the Bitcoin daemon and is stored as "buckets". Exporting data will make long term storage, access and backup much cleaner.

c. (stretch) Create functionality to create a new dashboard with configurable data source, visualization type, size, etc.

b. Dockerize project and provide documentation, quickstart, example, and guide how to extend
Cryptocurrency Timeseries Seasonality Analysis
Fund3

Estimated Team Size: 3-4

Technologies Expected: Python

Background Requested: Thorough understanding of statistics, machine learning (regression) background

Description: Investigate the seasonality of timeseries data (price, volume, volatility, sentiment) for Cryptocurrencies using Prophet [https://github.com/facebook/prophet](https://github.com/facebook/prophet). You will create visual reports using ipython notebooks with plots, code, and text explanation of the characteristics of the above described timeseries data. Specifically:

a. **Detect Trend Change points:** Did a change occur in the trend of the timeseries? Did more than one change occur? When did the changes occur? With what confidence did the changes occur?

b. **Modeling Holidays and Special Events:** Trading activity around holidays such as Christmas, New Years, and Chinese New Year has historically had a high impact on volatility. Such events will be investigated.

c. **Multiplicative Seasonality:** In a multiplicative timeseries, the components multiply together to make the time series (exponential growth). If you have an increasing trend, the amplitude of seasonal activity increases. For example, an underlying trend is an exponential increase in volume, but two years ago, the daily volume might vary ~$100M, but today varies ~$10B. Multiplicative Seasonality accounts for this. This will be compared to the additive seasonality of log features.

d. **Construct Uncertainty Intervals:** When working with stochastic processes, it's important to understand the uncertainty associated with a model at any given time.

e. **Seasonality at sub-daily time scales:** There is certain times of day when there is more trading volume, such as when traders in HK go to lunch. Other such phenomenon will be explored
Image Recognition Microservice using AWS Rekognition and AWS S3
Pure Focus, LLC

Estimated Team Size: 4

Technologies Expected: AWS Rekognition, S3, Data Pipeline, JSON

Background Requested: None provided

Description: Retrieve images and/or videos stored in AWS S3, analyze using Rekognition, output to JSON with text description of image/video attributes.

Phase 1 – Define and Scope:
Scope and define a microservice that ingests, tags, classifies, and categorizes images and videos – and outputs text descriptions (results) into a data warehouse (AWS S3 container).

Phase 2 – Design & Build:
Design, build, and integrate microservice to automatically retrieve, tag, process, and identify objects, facial attributes, sentiment, scenes, and activities found within the image or video.

Phase 3 – Test and Improve:
Compare results against test cases to continuously improve the quality of analysis and quality/confidence of each result.
Universal Social Data Extractor
USC Information Sciences Institute

Estimated Team Size: 4-5

Technologies Expected: Python, social media APIs, Git, Github

Background Requested: Python, familiarity with version control, familiarity with packaging Python

Description: Data generated by humans on social media is a gold mine for researchers interested in data science, social science, marketing and business analysis, security, political science and many other domains. Gathering and analyzing such data from different sources such as Twitter, Facebook, and Pinterest is a laborious task that involves learning and working with different APIs, each having a different standard. Moreover, storing and exporting the data to a format that is suitable for analysis tools such as Gephi, Cytoscape, or even Scikit-Learn is not a trivial task.

The goal of this project of is to develop and release a Python library that to extent possible provides a unified interface to APIs of different websites with social content. This library will let the user extract and store the data with modifying a few parameters across different social media platforms and subsequently export it to the formats necessary for one of the major data analytics tools. The project with consist of the following tasks:

1. Data Acquisition Interface
   This section includes identifying the social media sources, familiarizing with their data extraction APIs, designing a unified interface to call those APIs, and finally developing the scripts to call the APIs via the unified interface and extract the data from the internet to be stored in our framework. Potential platforms with social content include Twitter, Facebook, LinkedIn, Instagram, Youtube, Google+, Pinterest, Tumblr, Reddit, Flicker, and Snapchat. The social media resources will be prioritized based on interest and availability of the team.

2. Data Storage
   Most of the data acquired from social media sources can be generalized for storage purposes. This step of the project involved designing a data structure that is generalizable for all of the selected sources in the previous step and is also scalable. The data structure would be an interface that could be initially implemented using Python’s libraries such as Pandas, or later connected to a graph or other nosql databases such as Neo4j. Expansion of this part will be based on time constraints, project progress, and interest of the team.

3. Data Exportation
   The social data that was extracted and stored in the previous steps need to be provided to other tools for data analysis. Because most of the social data are graph based, Gephi, NetworkX, and Cytoscape would be the most suitable frameworks to visualize and perform initial analysis on them. The goal of this part would be to develop methods to seamlessly export the data from any of the selected social sources to any of the selected graph analytics frameworks.
**Homeowner Claims and Fraud Prevention**  
*LA County Assessor’s Office*

**Estimated Team Size:** 4-5

**Technologies Expected:** PHP, SQL, JavaScript, HTML, WordPress, HTML5, CSS3, Mobile Database technologies, JIRA, GIT, agile/scrum, AWS or Microsoft Azure, AI, IoT

**Background Requested:** None requested

**Description:** The Major Exemptions section for the LA County Office of the Assessor manages tax exemptions for churches, non-profit institutions, veterans, and homeowners. The department must ensure that over 1+ million homeowners are receiving their tax exemption for residing in their property. However, the Office of the Assessor does not have any method to track or prevent fraud for homeowners who claim multiple exemptions within its jurisdiction, have tax exemptions from other counties or states and owners who fail to report transfers of ownership. Existing claims for individuals are maintained through IBM Mainframe applications and do not have the technology to capture discrepancies and duplicate claims.

The student project will work closely with the software development team from the Assessor's Office to develop the product, which will include:

- Design and build a database to store over 1 million records from legacy systems, monitor history of exemptions between properties, homeowners, and track additional exemptions.
- Build a fraud monitoring system to notify of any irregularities of taxes exemptions which include multiple exemptions between spouses, untimely exemptions, and non-occupied properties.
- Create a method to interface with reports from other agencies to identify irregularities.
- Develop automatic correspondence letters to request additional information from taxpayers and to submit receipt confirmation.
- Remove data entry using existing information from other applications.
- Capability of the Application to be Ported in the field via iPhone or iPad or Android platform to perform Homeowners Fraud Prevention.
**MyNetwork**
*Pragmatic Strategy*

**Estimated Team Size:** 3-4

**Technologies Expected:** Cloud data storage, user security, data privacy, web and mobile front-end

**Background Requested:** At least one CSBA major, cloud data store builds, UX and mobile/web integrations, scalable systems

**Description:** To provide a closed network supporting alumni groups from corporations and universities that can scale as the networks grow with more people.

Digital Ecosystem (features for Phase 1) – REQUIRED:

- User discussions (ref: Slack)
- Dynamic Calendar (ref: Eventbrite)
- User Directory (ref: Outlook O365)

Bonus features to include in Phase 1 – OPTIONAL:

- Career support (ref: Ivy Exec, TheMuse, LinkedIn)
- Real-time language translation
- Real-time unit of measure translation
Leadership as an Artform  
*USC Marshall School of Business*

**Estimated Team Size:** 3-4

**Technologies Expected:** Cloud data storage, user security, data privacy, web and mobile front-end

**Background Requested:** Requesting developers to have overlapping skills with coding languages, back-end (cloud data store) builds, UX and mobile/web integrations

**Description:** Creation of an interactive web platform between an executive coach and an executive. The goal of the platform is to allow the coach to send out a regular/weekly prompt for the executive to complete. Ideally, the coach would be able to create two or three Likert-scale questions and then two or three free-response questions to be sent out. The answers from these questions would be stored on the cloud. The coach could then log on to view the data, upload answers to any questions, and look at cumulative data calculated on the back end.

The goal is to create a tracking platform where a coach and an executive could agree on a specific goal, and the platform would keep track of regular check-ins. Ideally the platform could be programmed to send out the questions automatically to the specific executives with minimal effort from the owners. The executive to monitor her/his own scores and responses when logging in to answer questions. It is a semi-journal, active management tool to help people be mindful of what they are trying to accomplish.
Quality Improvement Calculations and Formulas
Walden Family Services

Estimated Team Size: 3-4

Technologies Expected: To be determined by group

Background Requested: None requested

Description: Walden Family Services actively engages in internal performance improvement processes on a monthly and quarterly basis. This process is in part, to ensure compliance and evaluate processes to build service quality and effectiveness including adherence to agency standards, adherence to regulatory standards, client satisfaction, monitoring of service outcomes, monitoring of indicators of service quality, and ensuring contract requirements are met. Walden evaluates internally continuously, but on a quarterly basis, the Walden conducts an internal audit to review the program’s parent, youth and facility files. Subsequently, Walden implements strategic opportunities for growth based on the findings of the internal audit.

Your Role: As a student in the CSCI 401 class, we are seeking support to improve our ability to calculate/analyze the data available in our online case management database and found through our quarterly internal audit. As a group with the support of your professor and Walden, the anticipated deliverables will be: documents with prepopulated formulas and calculations pulling desired data from the online case management database, and documents with prepopulated formulas and calculations comparing the data from the internal audits of multiple quarters to draw comparisons.
inPhormed

Estimated Team Size: 4-6 (2 teams of 2 or 3)

Technologies Expected: MS Visual Studio, web frameworks, databases, repositories, Xamarin, C#

Background Requested: Web and app development, MVC, full stack development

Description: As long as markets continue the globalization path individuals in poverty will continue to leave their families in search of work to better their current circumstances. Unfortunately, many of those that are desperate enough to find overseas work end up trapped in modern day slavery. People need a safe way to root out exploitative recruiters in favor or ethical ones. inPhormed reduces human trafficking through a voluntary, community-informed website/app.

Our website/app utilizes crowdsourced reviews, similar to Yelp, Glassdoor, and Castlight Health. We want this information to be easily accessible to prospective Overseas Foreign/Filipino Workers (OFWs) looking for work abroad. We also plan to expand to other countries, beyond the Philippines, and empower the individuals and communities.

Since we are still figuring things out and we do not have professional web development experience, we’re open to any compelling ideas and suggestions that will contribute towards meeting our project’s mission statement.
Human-Robot Interaction Deep Learning & Perception  
USC Viterbi School of Engineering

Estimated Team Size: 6-10 (2 groups of 3-5 students)

Technologies Expected: Python, C/C++, Linux/Ubuntu, TensorFlow, OpenPose, OpenFace, OpenSMILE, OpenCV, Open Ear

Background Requested: Proficient in Python, C/C++, Linux operating system, and git version control. Strong communication skills and ability to design for scale. Exposure to TensorFlow, machine learning, computer vision, and robotics is a plus but not required.

Description: The Interaction Lab is a research lab at USC dedicated to developing socially assistive robotics (SAR); that is, robots that help people achieve some goal through social interaction. The students on this project will develop software and infrastructure for building multimodal and deep machine learning models of human-robot interaction, specifically with socially assistive robots in real-world settings.

The students will design a scalable data pipeline for each step of the machine learning process: (1) multimodal feature extraction using common libraries such as OpenPose, OpenFace, Open Ear, etc., (2) feature analysis and visualization using TensorFlow and accompanying Python libraries, and (3) machine learning model training and testing using TensorFlow. For each step in the pipeline, the students will give a demo to members of the Interaction Lab and receive usability feedback and design guidelines. The tools these students develop will become part of the lab infrastructure and potentially used for many years, so students will learn strong communication and design skills, as well as gaining experience in the research process.
Information Technology Inventory Database and Barcoding
LA County Public Defender

Estimated Team Size: 3-4

Technologies Expected: mobile app development, SQL, Database, Salesforce, browser-based apps, web development, barcoding

Background Requested: web developers, database, SQL, mobile app technology, Salesforce

Description: Develop a Salesforce database app to quickly capture and tag IT equipment through barcoding technology, mobile app technologies, and a web browser. It is important that technicians or anyone else can easily tag and barcode each piece of equipment that they find. When making a visit on site to deliver equipment or to make repairs, the technician should be able to easily barcode the equipment, to gather history about it, or to add information if necessary. Also, it would be helpful to be able to relocate the equipment quickly just by running the barcode if the equipment was moved. Lastly, feeding this information into a Cherwell or an Altiris system could also be necessary to provide additional information to a trouble ticket within the Cherwell system and to a software inventory system within Altiris.
**New PD Portal**  
*LA County Public Defender*

**Estimated Team Size:** 3-4

**Technologies Expected:** HTML, WordPress, PHP, MySQL, JavaScript, CSS, jQuery, SQL and DotNetNuke (DNN)

**Background Requested:** Front-end development and multimedia and graphic design is a plus. Previous WordPress experience preferred.

**Description:** Our current intranet needs to be improved. It’s a website that allows multiple users to access and change/update content with minimal to no technical experience and to be more agile with content and databases.

The new site will allow employees to quickly navigate for information, events, and latest. Also, will feature a staff directory and pop-message/alerts. It’ll be responsive/mobile-friendly and feature rich engaging content.

Students will gain knowledge on creating sites from configuring to customization in WordPress and how the use of plugins will extend the site.
Trucker Tracker
Pullin’ Freight, LLC

Estimated Team Size: 3-4

Technologies Expected: To be determined by the team

Background Requested: Web development, mobile development

Description: First, we need a website. There is not a great amount of content needed for the website. We have a few pictures and a video, but we want the website to be able to perform other important functions. We want other drivers, who we will refer to as “sub-haulers,” to be able to submit their application materials via a secure website. They should be able to apply online. From the documents they submit, we need a system that will organize and use some of that information to have the system generate alerts. So, for example, when a driver’s insurance or medical clearance, etc. are about to expire, somehow the administrator and the driver will receive a reminder via some type of alert system. In terms of dispatching drivers, we would like a system that allows drivers to login and receive dispatch/work assignments. The thought is that drivers will login, search for routes/shifts, and then accept the job. We need a driver portal. This would be an area of the website only hired drivers can access. This is where drivers will submit their invoices. The goal is for an app to be developed that works with the website (or however that works). The driver, who will be in the field will be able to take a picture of the freight bill/invoice and submit. The invoice will be read by the computer and the information entered into a spread sheet, similar to a receipt scanner. The information will create the monthly invoice which is submitted to customers for payment.

Company Description

Pullin’ Freight, LLC is a small, but growing, Los Angeles based, DBE/MBE certified trucking company founded in 2016. We use Super 10 Dump Truck to “move earth.” For example, we have and/or are currently working on projects such as Metro lines, airport construction, and various piers. At this point he is the sole driver of the one Super 10 dump truck he owns. While it has only been just over a year, Pullin’ Freight has a solid business plan and intent to acquire additional trucks and drivers so as to expand the business (fleet of trucks) and make Pullin’ Freight well known throughout the LA area.
**Power and Influence Gamification App**  
*USC Viterbi School of Engineering*

**Estimated Team Size:** 3-4

**Technologies Expected:** Up to the group

**Background Requested:** Mobile app development

**Description:** This project involves putting the content of a power class that is taught at USC Marshall into an app that would gamify the activities that lead to power. It will be vaguely similar to this app: https://www.superbetter.com/ only with different content and different types of quests etc.

In particular, there will be “Activities” and “Milestones” for each of the six practices of power that will need to be included in word and picture form, which include: 1) Find your purpose; 2) manage the self; 3) see the situation; 4) build your network, 5) influence others; and 6) make it stick.

As an example, for “Find your purpose,” following is an initial list of some activities and milestones that could be added:

**Daily activities**
- Spent 5 minutes journaling about my purpose
- Had a conversation with another person about my purpose
- Checked my purpose “elevator pitch” and made necessary changes
- Conducted an alignment test with one of the other practices to make sure my actions are in line with my purpose

**Milestones**
- Elevator pitch/mission statement developed
- Shared pitch with 10 people

For further indication of what we would like this to look like, you can go to this page: https://www.superbetter.com/how_it_works and check out the "my challenge" chart on the left. Then check out the video on the right. No need to listen to the pitch, but if you pause it and look at screen shots at 0:50, 0:54, and 0:57 you can see what the app looks like (especially in combination with the chart).
**Dial: Your Work Phone, Reinvented**

*11F*

**Estimated Team Size:** 3-4

**Technologies Expected:** React Native, Android, iOS, server, database

**Background Requested:** Strong experience developing web applications. Familiarity with either mobile platform is not expected, but the React Native implementation will require team members to learn how to build to Android and iOS devices

**Description:** Dial is a supercharged phone for teams that replaces the stock app on work devices. Dial does everything your stock app does, plus a whole lot more:

- Connect with teammates using Dial’s powerful **Directory** feature, with always up-to-date contact cards that are seamlessly synced across your team’s devices.
- Find the right time to call with Dial’s automatic **Timezones** feature. View local time for everyone on your team and get reminded when you’re trying to call outside of work hours.

This project will be focused on shipping an MVP for the Dial mobile app. Broadly, the feature set can be broken down as 1) Parity w/ Stock, 2) Directory, and 3) Timezones. Just like stock, Dial will support making calls, CRUD contacts, and call history.

Our team at 11F will provide product specs and mockups for the mobile app. We anticipate the project will involve both a client-side React Native piece as well as a server-side implementation of some sort (REST API, Firebase, etc) to handle user info and sync. However, we’d like to leave it to the team to decide on specific implementations. I will also be available to the team for regular sync ups and calls, as needed.
**Improving Census 2020 Response Rates for Underrepresented Populations of Los Angeles County**  
*LA County Assessor*

**Estimated Team Size:** 3-4

**Technologies Expected:** Up to team to decide

**Background Requested:** None requested

**Description:**
In the past, there have been areas in Los Angeles County with low responses. Indications are that in 2010, many individuals were not counted for various reasons. Although the County is not directly responsible for doing the census count, opportunities exist to conduct outreach to these communities and encourage participation. The objective of this project is to explore the demographic and market segmentation variables toward accomplishing several related goals which support the mission, vision, and values of Los Angeles County:

1) Determine which characteristics are most predictive to differentiate low response areas from high response areas (based on prior census data and parameters relating to these communities).
2) As feasible, develop a statistical model, tool and/or script to process and report the data efficiently. (R or Python Scripts are preferred.)
3) Cross-reference the data to the Esri Tapestry data to understand how these communities can be most effectively engaged through outreach and marketing campaigns.
4) Provide a report of the findings and marketing recommendations for the most common low response communities/market segments.

**Student Work:**
Through the use of data, strive to support the acquisition of additional federal funding by identifying each previously unaccounted individual in order to aid in ongoing efforts to improve the lives of previously unaccounted for, at-risk individuals across Los Angeles County.

1. Develop an approach for how to define high Low Response Score (LRS) areas (census blocks/blockgroups):
   - Analyze LRS and 25 variables in 2018 Census Planning Data.
   - Determine the best cut-off point for high LRS.
   - Prioritize geographic area(s) for outreach; census blocks/blockgroups/communities.
2. Develop a methodology to define/describe high LRS area:
   - Review Esri Tapestry segmentation at various geographic scales.
   - Develop and parameterize an optimized model drawn from the available demographic variables into several groups to provide input on outreach.
3. Provide suggestions on how to engage residents in high LRS areas and to improve their response rates in the 2020 Census Survey (using characteristics from the Esri Tapestry data):
   - Provide a report with suggestions for outreach approaches most relevant to each segment.
   - Provide recommendations for methods to test and evaluate the success of the recommendations (following 2020 Census, e.g., to determine if LRS numbers have been significantly reduced, cost/benefit, etc.).
Hyperspectral Imagery Science Data System for addressing Coal and Surface Mining Impacts on American Lands

Independent

Estimated Team Size: 2-4

Technologies Expected: Java, Python, XML, Docker, Linux Administration, Apache Solr, GUI Development using established frameworks e.g. AngularJS, etc.

Background Requested: Knowledge of Open Source Software Development, Competency in the above technologies but willingness to learn new ways of applying them to bridge the gap between science and technology.

Description: Coal and Open-pit Surface Mining Impacts on American Lands (COAL) (https://capstone-coal.github.io) is a Python library and science data system for processing hyperspectral imagery from remote sensing devices such as the Airborne Visible/InfraRed Imaging Spectrometer (AVIRIS-C/AVIRIS-NG). COAL provides a suite of algorithms for classifying land cover, identifying mines and other geographic features, and correlating them with environmental data sets such as hydrology. COAL is Free and Open Source Software and has been developed over a number of years via previous Capstone initiatives and Google Summer of Code. This time around, we are looking to build an end-to-end, fully automated Science Data System (SDS) which will provide services related to data acquisition, cataloging, ingest, archive, processing, workflow management and resource management such that COAL SDS can be run in a cloud computing environment. Additionally, we are looking to provide a blazing-fast search interface for users to query and retrieve GIS products generated by the COAL system. This will provide the first ever environmentally correlated GIS database such that users can access geospatial correlations between mining activity and hydrological features.
Autism Society Inland Empire Resource Guide and Apps

Autism Society Inland Empire (ASIE)

Estimated Team Size: 2-3

Technologies Expected: Up to team

Background Requested: Experience with app development

Description: The Autism Society Inland Empire (ASIE) is a non-profit organization dedicated to provide various services and support to people on the Autism Spectrum. Over the years, they have created an online resource guide for everything from dentists sensitive to individuals with Autism Spectrum Disorder (ASD) to equestrian lessons. Unfortunately, most people prefer to access information via apps on their cell phones, so potential users ignore this valuable resource.

Over the last 2 semesters project teams have created apps using native iOS for the iPhone and native Android developer for Android phones. ASIE needs your expertise to activate the apps and integrate them with their online resource guide. Since teams have had difficulty accessing the word press version of the resource guide, the team will probably need to convert the guide to something that will easily connect to the apps and can also be updated from the ASIE web site. When the online resource guide is updated, it needs to be reflected in the information accessed by the apps. Here is a link to their resource guide web page: [https://www.ieautism.org/resources/](https://www.ieautism.org/resources/)
Islands Telecom – Corporate Social Responsibility (CSR) Simulation for the Marshall School of Business Experiential Learning Center (ELC)
USC Marshall School of Business Experiential Learning Center

Estimated Team Size: 3-5

Technologies Expected: Up to team

Background Requested: Familiarity with designing graphic game interfaces and design principles. Possible experience with ASP

Description: Several years ago, Professor Nathan Bos shared his CSR simulation with us since he had changed universities and it was no longer actively housed at his old site. It is written in an old programming language, ASP, and would need to be rewritten in a new language. We have all the old code, but it will take a team willing to dig into it and transform it into something more interactive.

This will be a unique challenge since Beth, the primary contact, has only read academic articles about the game and has never played it. She is dependent on the team to translate from the old code and create something fun and engaging. She will supply the team with all the information that professor Bos shared.
**Changing the Tutoring Sphere**

*iTutorU*

**Estimated Team Size:** 3-5

**Technologies Expected:** ReactNative, Wix website building, video producing

**Background Requested:** iOS and Android coding via ReactNative, website building, experience with animated video producing software

**Description:** iTutorU was initially created in 2015 to provide high quality, educational aid to K-12 students throughout Southern California. We noticed that as we were servicing our clients in Southern California, we would get calls from potential clients in places where we did not have a local tutor on staff. However, these parents provided very valuable feedback, indicating that that they wanted to find our caliber of tutoring in their local area at our very affordable price points. In order to meet these specific needs, we developed the concept of a mobile application, specifically designed to streamline the process of matching highly qualified tutors with parents/students in their respective local areas. At the present time, iTutorU would like to collaborate with USC, as the Founder and CEO is a USC Alumni and student.

**Current Product Development Status**

The mobile application was already coded in Spring 2018. There is a guide that was left for the new group of students to follow by the previous team. However, there are some loose ends that need to be tied up/some things that we never got the chance to finish. Additionally, a new website needs to be designed with our existing Wix server/web address in order to educate the public about our mobile application. With that said, an informational video is something we would also need to create as well, embedded into the app (step by step process of use).
Neutralize Me App  
USC Center for Excellence in Teaching

Estimated Team Size: 2-3

Technologies Expected: iOS and Android

Background Requested: App development; interest in diversity, equity, and inclusion

Description: There is need for an app that can “translate” a gendered word into a gender-neutral one to help people learn and use gender-neutral language. For example, if the user knows the word they want to use is gendered and would like the gender-neutral alternative, they enter “policeman” and receive the result “police officer”, “mankind” to “humankind”, “husband” or “wife” to “spouse”. For users who cannot recognize if a word they want to use is gendered, the app also includes a searchable reference list feature for them to look it up and check. The target market for this app is 1) those re-learning vocabulary words that have become an institutionalized part of their culture, as is the case for older generations, and 2) those learning gender-neutral terms for the first time, as is the case for younger generations and international students studying English.

Currently, tools like “MyWriterTools” promise to remove sexist language from your documents, but are way too complicated http://www.mywritertools.com/gb.asp#MYGB. This attempt at a Google Chrome extension returns too many errors https://mic.com/articles/51361/this-is-what-a-gender-neutral-google-looks-like#.DHQwVSFql This predictive text app is geared mainly toward young girls using empowering language http://thegovlab.org/predictive-text-app-helps-reverse-gendered-language/
**MoveTV App**  
*USC Center for Excellence in Teaching*

**Estimated Team Size:** 2-3

**Technologies Expected:** iOS, Android, television-to-phone signaling, motion sensors

**Background Requested:** App development; interest in promoting physical health and fitness

**Description:** Given the rise in child and adult obesity and related health problems like diabetes, in part stemming from leading more sedentary lifestyles, there is need for a responsive motion-detecting app that will turn off the television if the user stops moving while viewing. This requires the user to hold or wear their smartphone while watching television. A user will not be “allowed” to continue watching television (or whatever else might be projected on screen, such as a game) unless they keep their phone in motion. This app attempts to promote healthier lifestyles for users who opt-into moving (exercising, dancing, etc.) while watching television, which is typically a sedentary activity. Once the user begins to move again, the television will turn back on. The user can also set a timer.
Digital Children’s Book Series: Global Adventures with Cam E. Leon
USC Center for Excellence in Teaching

Estimated Team Size: 3

Technologies Expected: coding, open educational resources (OER), Google Books or similar digital book publish platform

Background Requested: interest in child education, art/graphic design, publishing, marketing

Description: The author has so far created a 3-story, didactic, multicultural children’s book series with more stories in the series under development. The author requires assistance putting the 3 stories/books (both text and illustrations) online to create digital books, possibly open source or app-based. Ideally, the digital books are also interactive in that they are coloring books. A much larger than normal color palette of shade/tone options for skin color will be required for children to choose from. A plush toy prototype is also in the works as part of the book series’ merchandising. Input is also sought from students with business experience for bringing a toy to market.
**Google Next Billion Users (NBU) and UNESCO-Pearson Initiative App**  
*USC Center for Excellence in Teaching*

**Estimated Team Size:** 3-4

**Technologies Expected:** iOS and Android, offline app development, Google UX design offline app requirements, UNESCO guidelines on designing for digital inclusion

**Background Requested:** experience living in a developing country/emerging market strongly preferred; interest in designing to reach the next billion users

**Description:** According to Google’s Design for Offline, part of the Next Billion Users project, “Nearly 1.6 billion people around the world live outside the range of mobile internet networks. Millions more bounce in and out of network connectivity when on-the-go. Wi-Fi access may also be scarce, or the cost of mobile data prohibitive. In Uganda, for example, internet access can cost nearly 11% of monthly expenses. People living in areas with high-priced networks regularly turn off mobile data to control costs. From our research, we see that people around the world regularly go offline, whether in Lagos or Los Angeles, intentionally or unintentionally. Offline states are essential components of today’s digital experiences. Because the field of offline design is new, designers have room for innovation and creativity.”

Students will create a mainly offline app for teachers in developing countries so they can access regular teaching tips and resources for students from their phones. App design will adhere to highest standards set by Google and UNESCO-Pearson.

Students must be familiar with Google UX Design for the Next Billion Users (NBU) [https://design.google/library/ux-next-billion-users/](https://design.google/library/ux-next-billion-users/) See also Designing for Offline, Designing for Global Accessibility I and II.

“The next billion people coming online will be diverse in every respect: their location, cultural experience, computer expertise, connectivity access, and the kinds of devices they use.” [https://developers.google.com/web/billions/](https://developers.google.com/web/billions/)

Students must ensure design also adheres to UNESCO-Pearson Initiative for Literacy: Guidelines for Digital Inclusion [https://en.unesco.org/themes/literacy-all/pearson-initiative/about](https://en.unesco.org/themes/literacy-all/pearson-initiative/about)
**iLegalSelfHelp**

**iLegal**

**Estimated Team Size:** 3

**Technologies Expected:** iOS, Android

**Background Requested:** iOS or Android development

**Description:** Continuing the development of the first non-profit self-help app for both Android and iOS, this app will allow millions of Angelinos to search, fill, and file court documents within the Los Angeles County. This project is a continuation of a previous 401 project. The app is already built with the ability to upload and generate fillable PDFs.

Continuous development of a self-help webpage. This webpage should resemble both iOS and Android apps (previously created).

This web page will allow millions of Angelinos to search, fill, and file court documents within the Los Angeles County, including marginal legal advice.

I am looking to incorporate all features necessary to run a web page. This will include back end work and design, also:

- Upload all available legal forms
- Include California statues
- Include links to a couple of web pages
- Payment method, including tax deductible donations
- Child support calculator
401 Project Platform  
USC Viterbi School of Engineering

Estimated Team Size: 3-4

Technologies Expected: full stack web development

Background Requested: None, but experience with web a plus

Description: In CSCI 401, there are many aspects to the class. First, I have to communicate with potential stakeholders and get them to submit projects. Not all projects are appropriate, so there is a review process that takes place. After finding appropriate projects, students can then rank the projects based on their own preference. Students are then assigned to projects, where they will receive their stakeholder’s contact information.

While working on the project, students submit weekly status reports to the professor, as well as upload their deliverables through Blackboard and send them to their stakeholders. Stakeholders then approve the deliverable by sending an email directly to the professor, who then updates a spreadsheet and ultimately Blackboard.

Peer reviews in the class are handled as a separate program through Google Forms or Qualtrics. Grades then have to be manually entered into Blackboard.

The final presentation is reviewed similarly, through Qualtrics, and grades are then entered into Blackboard manually.

The purpose of this project is to streamline this entire process in a single portal, hopefully reducing the amount of manually intervention. In addition, some new features, such as allowing students to review stakeholders, would be nice to have.
Letter of Recommendation Generator
USC Viterbi School of Engineering

Estimated Team Size: 3-4

Technologies Expected: full stack web development

Background Requested: None, but experience with web a plus

Description: In academia and industry, writing letters of recommendation is a very important task. Many faculty and professionals have a standard template that is merely customized for each request. Others may ask the person to write the recommendation himself, then verify it is accurate before signing. Although this may work, it would be much better if the person requesting the recommendation could help structure the recommendation.

This project will allow a person requesting a recommendation to submit all of the information he wants included through a form, and the person writing the recommendation can then automatically pull that information into a template that he has created. After the letter has been generated, the recommender can download it and ensure it is accurate. After the recommender approves it, the original person can also download the electronic version of the letter.

Many additional features can be added to this project, and hopefully the group can help to come up with other features after the core functionality has been implemented.
Autonomous Drone Control
Raytheon

Estimated Team Size: 3-4

Technologies Expected: OpenWRT, Ozone Widget Framework (OWF), WiFi, iOS, Android

Description: A drone engineered to autonomously seek out, hack, and wirelessly take full control over other drones within wireless distance.

This method to autonomously seek out and take control of other drones via RF interface within the RF range of the quadcopter allows for greater flexibility in tracking the target drone, allows for maintaining a greater range from the target, to avoid detection, and allows the operator to maintain a safer distance. The key is to develop methods and processes to scale up results to other platforms

Tasks:
Task 1 – Vulnerability Research - The quadcopter is controlled using a 5.8GHz remote. Telemetry and live video preview is available through the DJI Vision app (iOS/Android), which connects to the Phantom through a WiFi-network provided by a device called the Range Extender. Range Extender is a small Linux system based on OpenWRT. Document findings.

Task 2 – Exploit Development - Use OpenWRT application to reveal vulnerabilities and develop exploits for those vulnerabilities. Document findings

Task 3 – Deliver Exploit - Use Wifi Pineapple to exploit OpenWRT and provide Situational Awareness (SA) to the Ozone Widget Framework (OWF). Drone detects the wireless signal sent out by a target drone, injects WiFi packets into the target’s connection, de-authenticates it from its real controller and then authenticates it to the master drone. Document vulnerability and payload delivery system.

Although the project description is specific to a drone, the project may use a different IoT device.
TB16: Retro Console Hardware Emulation
Hyperkin

Estimated Team Size: 3

Technologies Expected: UI/UX, FPGA – Spartan, Assembly, VHDL, Verilog, audio interpolation, GUI development

Background Requested: Familiar with gaming hardware released between 1985-1994

Description: TB16 is a hardware project with a clear objective to emulate the TurboGrafx-16/PC-Engine from its original state with modern day features expected in the gaming community. The TurboGrafx-16 utilized a proprietary storage medium for gaming software called HuCards/TurboChips, a 38 pin storage media equivalent to a credit card in size. The console consisted of an 8-bit CPU and 16-bit video encoder, the GPU was capable of outputting 482 colors.

TB16 will require new features to be incorporated, such as save states and video filtering (i.e. scanlines). The project would involve reverse-engineering CPU/GPU functions from original hardware to run at correct clock speeds with accurate color/audio representation. A GUI will be incorporated to help navigate modern features described above.
**Branja – iOS App**

*Independent*

**Estimated Team Size:** 3-5

**Technologies Expected:** iOS development (Swift, Xcode) OR React Native for development across iOS and Android (with push notifications), user-oriented database management (including registration, login, profile editing capabilities, sessions, network relationships), MySQL or GraphQL or PostgreSQL, Google Maps API (+ geolocation), Instagram API (login/user authorization and user data), potentially other technologies that the students see as needed.

**Background Requested:** Interest in socially oriented tech products, experience with mobile app development, Amazon web services, web scraping (in particular from Facebook), academic experience with social networks, artificial intelligence (related to recommendation systems to users based on past behavior). This opportunity is especially fit for those who want to have experience with launching an iOS app on Apple's app store.

**Description:** Branja is a map-oriented event platform, allowing users to search for and be invited to events based on their interests and social circles (Branja is the term for a large group of close friends via Urban Dictionary). Examples of events: birthday parties, kickbacks, neighborhood sporting events, etc.

Branja is a response to the decline of in-person socializing among younger generations. Platforms such as Instagram, Facebook, and Snapchat have quieted the need of catching up with friends in person and increased screen time at the expense of face time. Branja is meant to complement one's social life with the end goal of bringing people together.

Facebook's events platform is currently the leader in socially oriented event platforms, but is foreign to Branja's target demographic (teenagers) since Facebook is widely unpopular among younger generations.

The app will be built with three main users in mind:
- Attendees, who can search for and find out about events/gatherings
- Hosts, who create events and invite others
- Businesses, who want to advertise to their target demographic (example: alert about local events or promotions)

You will be working with an experienced designer who will provide direction with UI, UX, and visual design. In case the product will be ready for user testing before end of semester, it will be tested by the target demographic (high school students), and may require progressive updates based on feedback gathered from user tests.

A basic MVP has been built for the team's reference alongside preliminary market research and user research/interviews for idea validation.
Gathering Curricula and User Preferences to Maximize the Participation of Underrepresented Students in Undergraduate Engineering
USC Information Sciences Institute

Estimated Team Size: 2-4

Technologies Expected: Python, d3.js, Web scraping/crawlers, Elasticsearch, Kibana, NLTK (Python Natural Language Toolkit), Docker

Background Requested: web development experience, understanding of data processing pipelines

Description: The focus of this project is to broadening participation of women and minorities in engineering programs. The characteristics of engineering curricula that effectively attract and retain underrepresented groups are not currently well understood. Computational analysis and visualization will allow us to investigate user preferences for these characteristics. This research will also help us understand preferences of students within engineering programs and beyond. The typology and recommendations generated from this research will provide guidance to instructors, researchers, and curriculum developers on designing more inclusive engineering curriculum.

The tasks of this project include the development of an open-source toolbox for data capture and analysis of national engineering curriculum. The toolbox will provide core tools for automating the process of data gathering via web crawls, as well as mechanisms to enable data mining, machine learning, and analytics. More specifically, we target the analysis of engineering curriculum contents (e.g., syllabus) to identify relations across similar courses developed as part of the engineering curriculum.

It is expected that the students’ group will develop a Python-based toolbox for scraping syllabus from universities engineering courses in the US (when available, i.e., open access), and use an NLP Python library to structure the information as JSON documents. These documents should then be automatically stored in an Elasticsearch database that should be navigable via a Kibana interface. It is also expected the development of a custom Kibana plugin (dashboard), which will provide customized visualization of the gathered data – graphs will be built using d3.js.
SE2KG: Scientific Experiments as Computational Knowledge Graphs
USC Information Sciences Institute

Estimated Team Size: 2-3

Technologies Expected: Java, RDF/JSON, Semantic Web technologies (Jena, SPARQL, Limes, SILK), Entity recognition software.

Background Requested: Java, HTML, JSON

Description: Knowledge Graphs (KGs) use Semantic Web languages and technologies to represent rich knowledge about entities of interest. In recent years, an increasing number of Open Knowledge Graphs (OKGs) have been made available in the Web, representing facts from domains like biology (e.g., Protein Data Bank), geography (e.g., GeoNames), or general knowledge (e.g., Wikipedia). OKGs are an important resource as they offer machine-readable information and work at very large scale, enabling search engines to provide better results and answer questions from users more precisely.

The goal of this project is to use KGs to improve the representation of scientific experiments that involve data analysis and computations. We represent all the computational steps and the resulting data as a Computational Knowledge Graph (CKG). The students from CSCI 401 will work together to extend CKGs to links the data resulting from scientific experiments to entities in existing OKGs. Through this project, the students will learn advanced Web concepts, will develop infrastructure using Semantic Web technologies, and will acquire critical skills on how to enable users to interact with KGs and use their content.
**Mountain Counseling Website Redesign**  
*Mountain Counseling*

**Estimated Team Size:** 3

**Technologies Expected:** Up to group to decide

**Background Requested:** None requested

**Description:** Mountain Counseling is revamping their web site to achieve a consistent look and feel. We want to integrate Google Adwords, Salesforce, and Google Sites in a more streamlined manner. The current site is at [http://www.mountaincounseling.org](http://www.mountaincounseling.org). Additional specifications will be coming once a group is assigned.