# MPS Project Proposals

Welcome MPS students!

Below is a list of project proposals for INFO 5901. Please read over each of these proposals carefully. Many of them have subtle details that are not immediately obvious, but make the projects really exciting! When reading over the proposals keep in mind the skills and experience you currently have and the skills and experience you would like to develop. After you have read over all of the proposals, please fill out the Project Preference and Skills survey: <https://goo.gl/forms/ZyD9xapKciRBkKZn2>.

We will try to assign projects based on your preference. However, we will also factor in your skills and experience when making our decisions. Please be aware that due to these constraints you may not get your top choice for your project.

Please note we have anonymized the project proposals by removing all sponsor information. Your MPS project experience is designed to help you develop new skills and improve existing ones. You should select projects that you believe will help you learn rather than by how important you perceive the sponsor to be.

If you have questions, please email the course staff via [info5901-prof@cornell.edu](mailto:info5901-prof@cornell.edu).

I look forward to meeting all of you on the 28th!

Kyle Harms

# Important Dates

Friday August 18, 2017: Project proposals sent to students.

Thursday, August 24, 2017: Project Preference and Skills survey due by 12:00 EST.

Monday, August 28, 2017: Project assignments given to students on first day of class (16:30-17:30 Upson Hall 142).

# Project List

Project A: <<Anonymized Course Management System>> UI implementation

Project C: <<Anonymized Docker Platform>> Json generator

Project D: <<Anonymized Weather Research Group>> User Interaction/User Experience (UI/UX) Research

Project E: RF Signal Recognition with Machine Learning

Project F: Create an <<Anonymized>> Intervention in the Context of Social Media Messaging Platforms

Project G: <<Anonymized>> Usability and Adoption Study

Project H: <<Anonymized Research Platform>>: Social Media for Research

Project I: Course Demand Planning in the Modern Age

Project J: New Media Discovery: The How, When, and Why?

Project L: <<Anonymized Collaboration Tool>> Widget UX

Project M: Step into Strength: a Virtual Personal Training Solution

Project N: Development of a distance measuring sensor

Project O: Development of a tracking system for telepresence robots

Project P: Flow Logs Analysis Web Interface

Project Q: Customized Coding Experiences for Your Customers

Project R: Customer product usage behavior: characterization, analysis and prediction

Project S: Create an Ecommerce Data Product

Project T: Sales and Marketing Optimization Using Machine Learning

Project U: Designing a playful chatbot for remote groups

Project V: Implementation of a humorous robot to promote positive emotions in groups

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| **Project Code** | A |
| **Project Title** | <<Anonymized Course Management System>> UI implementation |
| **Project Goal or Description** | |
| A new UX/UI has been designed for the <<Anonymized Course Management System>> course management system that is used by many courses in the sponsor’s organization, including support for small mobile devices. The implementation was started in spring but is not complete. The goal of this project is primarily to finish the implementation and to get the system into shape so we can deploy the new UI in spring 2018 for use by thousands of students | |
| **What activities are necessary to achieve the project goal?** | |
| Refine design of staff-side UI.  Complete implementation of staff-side UI.  Test and bullet-proof staff-side and student-side UI.  Updating online documentation to reflect new UI. | |
| **What outcome would determine that the project is a success? What is the specific deliverables?** | |
| A successful outcome will be making it possible to deploy the system in the spring. All software needs to be checked in to the existing git repository. | |
| **What skills will be needed to accomplish the project?** | |
| Some UI design experience. The design is largely complete but opportunities to do design will come up.  HTML, CSS, JavaScript programming.  Comfort with Java (most of the programming will not be in Java but there is some JSP code embedded in the pages)  This is a good project for 2 or 3 students. | |

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| **Project Code** | C |
| **Project Title** | <<Anonymized Docker Platform>> Json generator |
| **Project Goal or Description** | |
| In order to deploy modules (docker container images) to a docker environment on a device, now the user needs to construct a raw deployment.json file. The deployment.json file illustrates the module entities and the relationship between modules, for example, what’s the input and the output from module A to module B. Having the users writing the json file is not a good user experience. We want to have a tool so that they can drag, link, add, remove the elements to build a picture of the ideal module relationships. And then the user can hit one button to generate the json file.  A similar product would be NODE-RED:  https://www.google.com/search?q=nodered&tbm=isch&source=lnms&sa=X&ved=0ahUKEwick\_iB\_7vVAhVW\_mMKHWrSCacQ\_AUIDCgD&biw=1920&bih=1070&dpr=1#imgrc=k4PjaQT9lZLghM: | |
| **What activities are necessary to achieve the project goal?** | |
| 1. Read through Azure Hub documentation. <https://azure.microsoft.com/en-us/services/iot-hub/> 2. Understand Azure Edge <https://azure.microsoft.com/en-us/campaigns/iot-edge/> 3. Sign up the azure portal and try out the IOT Hub section. | |
| **What outcome would determine that the project is a success? What is the specific deliverables?** | |
| A professional responsive looking UI that fits our company style.  A working tool that is implemented by Javascript, html and css.  You can use open source tools under MIT license. But please talk to me before you use any open source tools.  I will discuss the deliverables with the students depending on their experience. | |
| **What skills will be needed to accomplish the project?** | |
| Graphic design  Strong Javascript  Html  CSS | |

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| **Project Code** | D |
| **Project Title** | <<Anonymized Weather Research Group>> User Interaction/User Experience (UI/UX) Research |
| **Project Goal or Description** | |
| In the near future, major upgrades to the <<Anonymized Weather Research Group>> website will be implemented. Prior research done by <<Anonymized Research Group>> shows that fruit and vegetable growers (primary users) want <<Anonymized Weather Research Group>> to be accessible from any computer, laptop, tablet or smart device. This upgrade involves conversion of the current <<Anonymized Weather Research Group>> website, built using information from a 2007 grower survey and launched in 2009, to a modern responsive design. The static layouts currently in use contain a wealth of information but are not device friendly.  Before a responsive website architecture for <<Anonymized Weather Research Group>> is implemented, a well-researched UX/UI strategy is needed. The current website is very good at delivering critical crop management information and data, as attested by the growth from 50 to 550 stations since the current web launch. With a new design, the value of <<Anonymized Weather Research Group>> tools as currently built must not be lost in translation. A responsive <<Anonymized Weather Research Group>> website, and grower tools contained within, must deliver the same critical information while retaining or gaining value compared to what is currently available on the static website.  Exploratory UI/UX research was initiated during summer ’17 to better inform this MPS student project proposal: 1) developing protocols for person-to-person and remote interviews (via Zoom platform), 2) conducting user experience interviews with a cross-section of primary and secondary NEWA website users and 3) summarizing UI/UX results gathered to date. Lastly, a large-scale online survey to be launched in August ’17 will be available as a source of additional information to MPS students.  The goals of this project are 1) to continue with primary user experience interviews (growers who use <<Anonymized Weather Research Group>> for management), 2) use relevant UX/UI methods for research and analysis of data gathered from primary users and 3) summarize findings of research and data collection by providing responsive web design recommendations for organization of the <<Anonymized Weather Research Group>> website. | |
| **What activities are necessary to achieve the project goal?** | |
| 1. **Review and discuss the current** <<Anonymized Weather Research Group>> **website.** MPS students will need to consult with <<Anonymized Weather Research Group>> to learn about <<Anonymized Weather Research Group>>, various stakeholders and different user groups early in the semester before significant work has been completed. 2. **Conduct primary user experience interviews.** Key groups of primary website users will need to be interviewed either in person or online, using appropriate protocols. Secondary user groups, including researchers, extension educators and IPM staff interviews have already been completed (N=~16-20 secondary user interviews). 3. **Collect primary and secondary user data for UI/UX analysis.** MPS students will evaluate existing interview materials collected summer ’17 as well as new material gathered during fall ’17 primary user interviews. Additional user data will be available from an online Qualtrics survey running from August to November ’17. 4. **UI/UX research and development.** MPS students will synthesize useful new user information into a <<Anonymized Weather Research Group>> website redesign, using relevant UI/UX methodologies. 5. **Reporting.** MPS students will share outcomes and recommendations with a small group of <<Anonymized Weather Research Group>> stakeholders via a written report and a discussion session with presentation of design ideas (with Q and A) at semester’s end. | |
| **What outcome would determine that the project is a success? What is the specific deliverables?** | |
| Deliverables will include  1) a project report that describes methodologies used and research conclusions in this project,  2) a presentation and discussion session that provides an adequate opportunity for <<Anonymized Weather Research Group>> stakeholders to understand project outcomes in depth, and  3) mock-ups or wireframes to provide possible design ideas for a responsive website redesign, with an emphasis on new ideas and concepts not considered on the current <<Anonymized Weather Research Group>> website. | |
| **What skills will be needed to accomplish the project?** | |
| Teamwork and prioritization of tasks in a group setting  Group communication  Person to person communication  Data compilation and management  Project management and organization  UX/UI design skills  UX/UI research methods  Technical writing  Presentation skills | |

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| **Project Code** | E |
| **Project Title** | RF Signal Recognition with Machine Learning |
| **Project Goal or Description** | |
| The goal of this project will be for students to investigate how to detect, recognize, and characterize unknown radio frequency (RF) communications signals by leveraging machine learning techniques. This is an important step towards the development of future cognitive radios that are able to autonomously establish a communications link and determine the best parameters to communicate in a congested electromagnetic spectrum, as well as providing an ability to monitor the electromagnetic spectrum and determine what other systems are operating in it. Advances in machine learning and software defined radio (SDR) have shown promise towards being able to solve this problem.  This project will ideally be a collaborative effort between Master’s Degree students in the Computing & Information Sciences Department and Electrical & Computer Engineering Department, with CIS students implementing machine learning approaches to partner with ECE students implementing the signal processing techniques for signal detection and modulation recognition.  An optional addition to this project is for the student team to develop an Android app to visualize the electromagnetic spectrum, signals of interest within it, and allow for a user interface/display for information from the machine learning algorithm and results. | |
| **What activities are necessary to achieve the project goal?** | |
| A library of RF signals with different types of modulation, bandwidths, and frequencies will either be generated or provided to the student project team. The team will be responsible for determining an approach to identify and characterize the different signals across an operating frequency band, and then implement that approach in software of their choice, such as MATLAB or Python. The team will develop and implement machine learning techniques to automatically detect and classify the signals. One set of known signals will be used for training the machine learning algorithms. A second set will then be used for testing how well the approach works on unknown signals.  Depending on the size, experience, and interests of the team, the project scope can go in a couple directions. One option is to use software defined radios (SDRs) to generate the library of RF signals, and actually send and receive RF signals as part of the data generation and collection. Another option is that MITRE can provide a recorded set of signals for the student team to use as the training set and unknown testing set.  An optional addition to this project is for the student team to develop an Android app to visualize the electromagnetic spectrum, signals of interest within it, and allow for a user interface/display for information from the machine learning algorithm and results. | |
| **What outcome would determine that the project is a success? What is the specific deliverables?** | |
| The expected deliverables for the project will include a final presentation, project report, and delivery of the code developed for the project.  Since this is a challenging problem, it is not expected that the student team will fully solve it and be able to accurately identify and characterize all unknown signals at the end. The goal is for the team to methodically develop and demonstrate approaches that show incremental improvements, and highlight areas worth investigating further in the future as well as lessons learned. | |
| **What skills will be needed to accomplish the project?** | |
| This project requires 2 broad skillsets. The first is in the area of machine learning, which will require the ability to understand, implement in software, train, and test different techniques. Students in the Computing & Information Sciences Department will ideal for this skillset.  The second skillset needed is an understanding of signal processing, signal modulation techniques, and how to distinguish between different signals across an operating frequency band of interest. Students from the Electrical & Computer Engineering Department will be ideal for this skillset. If signal recordings are used for the project, then then signal processing and analysis work can all be done in software. If students have experience or are interested in working with software defined radios, then actual RF signals can be generated and received with them. | |

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| **Project Code** | F |
| **Project Title** | Create an <<Anonymized>> Intervention in the Context of Social Media Messaging Platforms |
| **Project Goal or Description** | |
| <<Anonymized>> currently offers a suite of condition-specific digital interventions. Mechanically they are essentially evidence-based health surveys delivered over automated SMS and/or phone calls. So far, we have found great success in the interventions, both in the patient aspect (engagement with the intervention, clinical outcome improvement) and the provider aspect (better care delivery, reduced workload, fast reaction to patient exacerbation). With the emergent social media message platforms such as Facebook (FB) Messenger, <<Anonymized>> is looking to explore digital interventions delivered via these alternative channels. In essence, we are looking to create a message intervention on FB Messenger that targets a specific condition (likely diabetes) and helps users better manage their own health. Ideally the intervention should take advantages of the FB Messenger channel over SMS/phone call - rich media messages, contextual awareness, and etc. For example, instead of text-only prompts, we can make use of images in questions. In addition, gamification/education in order to achieve better self management should be part of the feature set. Optionally, machine learning models to guide message frequency as well as outcome prediction (<<Anonymized>> can provide data on similar interventions that are in use) will be nice, but not required. On the other hand, a foundation in clinical evidence is still expected, so drawing clues from past literatures is necessary. | |
| **What activities are necessary to achieve the project goal?** | |
| * Research on past literatures on the novel, electronic programs to engage, education, and help better manage the conditions for diabetic patients * Planning meeting to determine the scope of the project and the exact features, translated into quantitative, smart goals * Compose a full featured message flow diagram, identifying all the message branches/variations * Technical proposal on the implementation of the messenger backend * Program the messenger backend * Pilot planning * Conducting a pilot with a group of users targeting one or more specific outcomes, perform evaluations | |
| **What outcome would determine that the project is a success? What is the specific deliverables?** | |
| * A detailed technical proposal of the project * A fully functional prototype, published on the messenger platform * A pilot with a non-trivial group of users * Post pilot evaluations | |
| **What skills will be needed to accomplish the project?** | |
| * Coding skills, experience in interacting with third party APIs * Some experience in server side programming, ideally in one of the rapid prototype languages like Node.js, PHP, Python, or Ruby * Decent writing skills, know how to compose languages targeting non-technical users * Some knowledge in statistics and machine learning (if chooses to pursue the machine learning aspect) * Research skills, ability to draw on past literatures as well as to design trial to prove certain outcomes | |

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| **Project Code** | G |
| **Project Title** | <<Anonymized>> Usability and Adoption Study |
| **Project Goal or Description** | |
| <<Anonymized>> is an automated sms-based service that asks a patient questions about the symptoms of a medical problem he or she is experiencing and recommends to the patient where to seek care for their current ailment (e.g. Emergency Room, Urgent Care, Primary Care Physician.) On the back end, the service employs an algorithm built on validated differential diagnosis APIs to process the patient input and make the clinical decision. The system is akin to a chat-bot, which asks the users a series of questions about their symptoms, medical history, and other pertinent health information to reach the above goal. The purpose of this sms-service is to minimize healthcare system overutilization and maximize quality of care. We are looking for help in making the service coveted and easy to use.  Objectives:   1. Derive the language of automated questions and responses of <<Anonymized>> that maximizes usability and encourages repeat use. 2. Explore ways to reach end patient audience to maximize adoption and utilization | |
| **What activities are necessary to achieve the project goal?** | |
| User studies, AB studies, literature searches, professional interviews, elementary data analysis. | |
| **What outcome would determine that the project is a success? What is the specific deliverables?** | |
| A report with specific measurable outcomes, explicitly argued via observational user studies, interviews, or literature citations. Specific deliverables TBD. | |
| **What skills will be needed to accomplish the project?** | |
| Skills that are useful: experimental design, communication, ingenuity, time management, planning, execution, interpersonal skills.  Experience that is useful: Human Computer Interface, Design, Health. | |

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| **Project Code** | H |
| **Project Title** | <<Anonymized Research Platform>>: Social Media for Research |
| **Project Goal or Description** | |
| <<Anonymized>> has been developing a research platform (codename: <<Anonymized Research Platform>>) for testing theories of online behavior and communication. In its current form, it’s a “social media site” where participants in social psychology-related research studies can interact with each other or with artificial “bot” users in a controlled environment. The current iteration of the experiment platform is optimized for a certain study. The goal of this project is to adapt this platform so that it can be used by any communication or psychology researcher without technical skills to run their own research studies. | |
| **What activities are necessary to achieve the project goal?** | |
| * Collect user requirements from researchers and develop use cases for new functionalities that are required for use by researchers. * Design and implement new front-end structure and UI for end users to create their research studies and study materials. * Write user documentation for end users to build, deploy and use the tool. | |
| **What outcome would determine that the project is a success? What is the specific deliverables?** | |
| A successful outcome would be a finished platform that will include an interface that allows researchers to choose their variables of interest to alter the site to meet their research needs. Other outcomes/products could include a review of user requirements (including interviews/user tests with researchers). | |
| **What skills will be needed to accomplish the project?** | |
| Current tools that are being used for the project are: Node.JS, Express, MongoDB, jQuery, and other modern front-end development tools (javascript, HTML/CSS, semantic UI, etc). Students are encouraged to develop their skills over the course of the project.  The project will also involve requirements-gathering, UI mockup creation, user testing and documentation writing. | |

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| **Project Code** | I |
| **Project Title** | Course Demand Planning in the Modern Age |
| **Project Goal or Description** | |
| The goal of this project is to create a modern desktop or mobile application that will redefine the way that institutions will visualize and plan for their upcoming course offerings. The students will be able to select whether they want to work on desktop or mobile depending on their interest. Within this project, students will experience firsthand what it’s like to work with Product Managers and User Experience designers in an industry setting. They will also get experience with designing prototypes and conducting user testing. | |
| **What activities are necessary to achieve the project goal?** | |
| In order to meet the project goal, we will guide our students in the weekly meetings to ensure that they are on track to complete the project. The students will learn the principles of Agile development and the importance of iterating based on feedback from user studies and customers. The students will find suitable users for their testing. They will also work with a Product Manager who will help answer their functional questions as they build out the application. Students will not connect to a live database and will work with us to create acceptable dummy data for the purpose of the project. | |
| **What outcome would determine that the project is a success? What is the specific deliverables?** | |
| * Complete working version of the application on desktop or mobile on a preferred technology * A review of the UI/UX on the product | |
| **What skills will be needed to accomplish the project?** | |
| * Ability to think outside the box * UI/UX design skills * Iterative UI/UX and product feature design * Good project management skills to allow for good agile practices * Desire to learn basic full stack application development | |

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| **Project Code** | J |
| **Project Title** | New Media Discovery: The How, When, and Why? |
| **Project Goal or Description** | |
| As <<Anonymized>> combines its assets with <<Anonymized 2>>, we are challenged with making sure video content from all of our networks are easily discoverable. This project is helping us solve the challenge of how to improve video content discovery and increase user engagement within the <<Anonymized>> + <<Anonymized 2>> ecosystem.  We’re interested working with Cornell to uncover the video content discovery supply chain and emerging active discovery trends.  We hope this project can initially paint the picture of the avenues of video discovery (both active and passive) and then try to better understand the behaviors surrounding video consumption.  Are they more active in the mornings at home, or more passive in the evenings, we want to understand how people discover, consume, and share content. | |
| **What activities are necessary to achieve the project goal?** | |
| * Perform ethnographic research on millennial video consumers * Quantitative surveys on millennial video content consumption and preferences * Persona Creation and User journey maps   As we try to better understand our content consumers, we have a few ideas of how to best get into the minds and lives of content consumers and here are a few   1. Ethnographic research: Example - Recording a millennial as they use their social media accounts to understand what piques their interest, what they click on, and why. By watching what videos they watch and how did they find those videos, we can better understand the typically user journeys. 2. Surveys: Student will work closely with our strategy team to craft surveys that they can share on campus and we can share with our research pool to get quantitative answers on video content consumption and user preferences.   The students discover new market research techniques in the course, we are open to testing new techniques with this project. | |
| **What outcome would determine that the project is a success? What is the specific deliverables?** | |
| A comprehensive report of how millennial users discover, consume, and share video content and recommendations on the best opportunities to insert new content discovery moments | |
| **What skills will be needed to accomplish the project?** | |
| * Market research/analysis * UX/UI experience * Product design | |

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| **Project Code** | L |
| **Project Title** | <<Anonymized Collaboration Tool>> Widget UX |
| **Project Goal or Description** | |
| <<Anonymized Collaboration Tool>> is an open source collaboration tool we are building to serve as an ‘intranet’ page for the <<Anonymized Platform>> project. It will serve as a single place project contributors can get information on everything they’re involved with, as well as a consistent interface across project members and teams within <<Anonymized Platform>> that will make it much easier for new contributors to onboard into the project and get useful and fulfilling work done right away.  For this specific MPS project, we propose the goal of designing and prototyping – from the ground up, starting with initial user research – a new widget for the <<Anonymized Collaboration Tool>> application to support a <<Anonymized Platform>> contributor workflow. | |
| **What activities are necessary to achieve the project goal?** | |
| Necessary activities to achieve project goal:  1) **Remote user research:** Conduct remote user research on a particular <<Anonymized Platform>> project workflow (the marketing, social media, or community operations teams would be good to work with). This can be achieved via scheduling remote contextual interviews with screen sharing on Google Hangouts. The output of the research should be a brief report of the findings and summarizing the participants’ backgrounds. Notes should be taken during each interview (conducting in pairs is a great idea so there’s a lead and a notetaker.) Analysis of data can be via affinity mapping on an actual whiteboard with post-it notes or using a tool like realtimeboard.com. (technique: <http://gamestorming.com/affinity-map/> )  2) **Brainstorm a new widget to support the users’ workflow:** Brainstorm an idea for a widget to support the workflow of those users who participated in the research you conducted using a design thinking methodology, analyzing the research results and following some of the games in the book *Gamestorming* by Dave Gray, Sunni Brown, and James Macanufo.  3) **Mock up an interface design to demonstrate the widget’s functionality:** Mock up the widget design and (if skillset allows) stub out / build the widget in <<Anonymized Collaboration Tool>> (skills involved include html/css, python, python flask). My team has developers who are happy to bootstrap the students in getting our dev environment up and running (pretty easy, since I can do it ;-) ) and getting them started with python flask if needed. Ideally the students would check in with their interview participants, sharing their designs / prototypes with them along the way to sanity-check whether or not the designs would help support their workflows. | |
| **What outcome would determine that the project is a success? What is the specific deliverables?** | |
| If the project is a success, the outcome would be a set of documented designs as well as documented user research that the <<Anonymized Collaboration Tool>> team can use to completely build and implement the new widget and <<Anonymized Collaboration Tool>> users would find the completed widget useful.  The deliverables we would expect:  1) **User research report and notes:** summary of who they spoke to and basic demographics, their individual workflows, problems-to-solve, etc., and high-level findings + raw notes from interviews  2) **Mockups and specifications for widget design:** the mockups, editable files for mockups (we prefer SVG / Inkscape), and written specifications / explanations of design so that we could begin implementing it.  3) (If skillset / time allows) **Code / patches to add the widget to the** <<Anonymized Collaboration Tool>> **codebase:** This would be bonus / extra, but if the team skillset allows, we’d like to see a start at implementation of the code against the <<Anonymized Collaboration Tool>> codebase (<<Anonymized Link>>) | |
| **What skills will be needed to accomplish the project?** | |
| 1) Ethnographic research / contextual inquiry – scheduling users (identified by Red Hat) for interviews, conducting those interviews over video chat, note taking during those interviews, analysis of the data gathered in interviews, writing up research report  2) Brainstorming ideas to solve user issues – identifying user problems and workflow inefficiencies in the research, brainstorming ways the application could help solve those problems / inefficiencies.  3) Basic prototyping / mockup skills – white boarding / sketching interface ideas, drawing out design ideas in a prototyping application like Inkscape or Basalmiq, documenting design ideas, working out how to handle potential error conditions,  4) (optional) Web development skills - git, html/css, python, python flask, bootstrap | |

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| **Project Code** | M |
| **Project Title** | Step into Strength: a Virtual Personal Training Solution |
| **Project Goal or Description** | |
| Live fitness training is important for driving motivation, preventing injury, and addressing the unique fitness needs of an individual. Unfortunately, live training can often be inconvenient for people due to travel or family matters. Rather than traveling to a gym for personal training or finding a babysitter for the kids, we propose a virtual training solution to enable persons to work out in the convenience of their own home. For this project, we seek the development of a cross-platform app for iPhone and Android that can support virtual personal training. The virtual personal training will be supported through the use of video conferencing.  For the project, students will design, prototype, and user test a cross platform app. The app should be developed as a web app using HTML5/CSS/Javascript using a tool like Apache Cordova (preferably) or PhoneGap. For the virtual training, students will need to integrate Zoom (<https://zoom.us/>) video conferencing into the app using Zoom’s REST API (example: <https://github.com/Biz4Solutions/cordova-zoomplugin>). | |
| **What activities are necessary to achieve the project goal?** | |
| * Work with us to understand our requirements and the needs of our trainees. * Design an app that supports both trainers and trainees. For trainees, this includes account sign-up, payment, browsing training options, and class registration. For trainers, this includes setting up their training profile and scheduling classes. For both, this includes live video conferencing for virtual training sessions. * Prototype the front-end design in HTML5/CSS/Javascript using a tool like Apache Cordova. The prototype should also integrate Zoom video conferencing. * User test the prototype with trainers and trainees and make changes as necessary. * If time permits, develop an initial back end for authentication and data storage (for user accounts, scheduling classes, trainer reviews, etc) using Ruby on Rails (preferred) or similar technology. | |
| **What outcome would determine that the project is a success? What is the specific deliverables?** | |
| The best outcome would be a working prototype that works on both iOS and Android that is well designed and intuitive for both trainers and trainees to use. | |
| **What skills will be needed to accomplish the project?** | |
| Students should be familiar with front end (and to some degree back-end) development. They should have some familiarity with web based programming (HTML5, CSS, and Javascript).  Through this project students will learn and improve their design, development, and user testing skills. | |

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| **Project Code** | N |
| **Project Title** | Development of a distance measuring sensor |
| **Project Goal or Description** | |
| Description of the system: Telepresence robots provide the opportunity for users to interact with others who are not in the same physical location as they are via video chat. Additionally, the robot is mounted on wheels and a remote user (also called pilot) may control the telepresence robot and move around a separate location. In this study we use the Beam robot which is one of the many different kinds of available telepresence robot. (For more details about the Beam see the manufacturer’s website: [www.suitabletech.com](http://www.suitabletech.com)). Our lab owns two beams which will be available for use by MPS team.  The goal of this project is to explore how people interact with a telepresence robot and to compare this interaction with face to face interaction. More specifically, we are interested in the informal communication in the context of a workplace where people engage in conversations with coworkers in the hallways or other shared areas. Due to the spontaneous and unplanned nature of these interactions, unobtrusive measures would be more suitable for studying informal, spontaneous interactions. One of the useful measure is the distance of people to the beam. When people talk to the remote person via beam, similar to face to face interactions, both sides of the interaction negotiate the proximity and therefore people decide how far from the beam they want to stand. Measuring this distance would be very insightful on how people perceive their interaction with the beam robot. To this end, we have proposed the idea of a sensor which would provide data regarding this distance.  More details about the sensor is discussed in the following sections. Overall, this would be a fun project for a team to work on. The team would benefit from the design and development of the sensor by improving coding skills and technical skills. Testing the sensor with potential users would give the team some insights on user testing skills. As a result, the team would go through a complete cycle of developing and testing a system and will gain experiences that would be applicable to other projects as well. | |
| **What activities are necessary to achieve the project goal?** | |
| The MPS students must help construct a sensor designed to measure distance of the person who is talking to the remote person from the beam. The project would entail building the sensor itself from a microcontroller along with a Sonar attachment and PIR attachment. The sensor would also need to be wirelessly enabled to stream data real time or be able to save data with time stamps to see how far the telepresence robot is from humans. The sensor must be housed entirely in a simple 3D printed case (or any other case) and be battery powered in order to be mounted on the telepresence robot. Any other useful data collecting sensors that could be added would be an additional benefit but is not required. In addition, a manual of sorts would be very helpful to be created. This would allow those unfamiliar with the sensor to be able to run and use the sensor to collect data. | |
| **What outcome would determine that the project is a success? What is the specific deliverables?** | |
| expected outcome:   * The project would be determined a success upon successful completion of the sensor. The team is responsible for building the sensor, mounting the sensor on the robot, and testing the sensor. * Another requirement would be the creation of a user manual so that someone inexperienced with the creation of the sensor would be able to use the sensor to gather data. | |
| **What skills will be needed to accomplish the project?** | |
| * Required: C/C++ coding skills, Experience with Arduino and Arduino IDE or any form of microcontroller * Recommended: Mechatronics Experience, 3D printing skills, technical writing skills | |

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| **Project Code** | O |
| **Project Title** | Development of a tracking system for telepresence robots |
| **Project Goal or Description** | |
| Description of the system: Telepresence robots provide the opportunity for users to interact with others who are not in the same physical location as they are via video chat. Additionally, the robot is mounted on wheels and a remote user (also called pilot) may control the telepresence robot and move around a separate location. In this study we use the Beam robot which is one of the many different kinds of available telepresence robot. (For more details about the Beam see the manufacturer’s website: [www.suitabletech.com](http://www.suitabletech.com)). Our lab owns two beams which will be available for use by MPS team.  The goal of this project is to explore how people interact with a telepresence robot and to compare this interaction with face to face interaction. More specifically, we are interested in the informal communication in the context of a workplace where people engage in conversations with coworkers in the hallways or other shared areas. Due to the spontaneous and unplanned nature of these interactions, unobtrusive measures would be more suitable for studying informal, spontaneous interactions. One of the useful measures is the path of the beam during an specific time window (e.g., one hour). Although a researcher can follow the beam and take notes of all the hallways and rooms that the beam visits, we believe that this observation might affect other people’s interaction with the remote person. Therefore, we propose the idea of a system which can monitor or record the beam path.  More details about this system is discussed in the following sections. Overall, this would be a fun project for a team to work on. The team would benefit from the design and development of the tracking system by improving their coding and technical skills. Testing the system with potential users would give the team some insights on user testing. As a result, the team would go through a complete cycle of developing and testing a system and will gain experiences that would be applicable to other projects as well. | |
| **What activities are necessary to achieve the project goal?** | |
| The MPS team should design a system of tracking the telepresence robots throughout their environment. This could be accomplished in whatever manner the MPS team feels possible. An example of one possibility would be through the use of iBeacons to determine the location of the telepresence robot. Another possibility could be the use of RFID tags. The project would be open-ended with different avenues to success based on what the team feels comfortable implementing. Once implemented, the MPS could create a technical guide for the tracking system. | |
| **What outcome would determine that the project is a success? What is the specific deliverables?** | |
| expected outcome:   * Deliverables would include the final telepresence tracking system when implemented.   The team is responsible for designing, developing and implementing the system in the Communication department (Mann library 4th floor).   * In addition, a written guide on how to use the tracking system is required. | |
| **What skills will be needed to accomplish the project?** | |
| * Required: Java/Python coding skills * Recommended: Swift coding experience, Mechatronics Experience, technical writing skills | |

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| **Project Code** | P |
| **Project Title** | Flow Logs Analysis Web Interface |
| **Project Goal or Description** | |
| The goal of this project is to create a web interface for answering questions about how our servers are communicating with one another internally.  <<Anonymized>>operates many servers inside a Virtual Private Cloud (VPC), an Amazon Web Services (AWS) product.  One of the features of a VPC is that you can specify “security groups”. These security groups have rules associated with them regarding which ports can be accessed by other groups. A single machine can be a part of many security groups and security groups can apply to many machines.  Another feature of a VPC is that it produces what are called Flow Logs. These flow logs are JSON records that contain metadata about traffic between hosts inside the VPC.  This project will combine the information in the Flow Logs with our security group definitions to provide a web interface to answer questions. For instance, we would like to be able to ask: Has this security group been exercised recently or is it obsolete? What security groups do I have that are redundant? Which ones could be tightened up to fewer hosts or fewer ports? | |
| **What activities are necessary to achieve the project goal?** | |
| We will be providing sample VPC logs and security group definitions. The students will need to parse these logs and  definitions and create a prototype of a web interface for exploring the data.  The web interface will be written using React in order to be interoperable with other front­end components. The interface needs to surface information to answer the questions we have specified, but how it does that will be up to the students to determine and iterate on. Any server side component should be written in Go or Ruby.  The students may also decide it is beneficial to put the data into a SQL database to make accessing and querying the data easier. We use Amazon Redshift internally for problems similar to this, but it will be up to the students to decide if they think a database is beneficial and if they want to use Redshift or another database.  Students will be provided access to compressed logs which should be manageable on a personal computer. They will also be provided access to raw logs which they will have the option of processing with a distributed job on Airflow (python or Scala). | |
| **What outcome would determine that the project is a success? What is the specific deliverables?** | |
| A successful project would have a web application that we could feed our logs on an ongoing basis and use it to take action to improve our infrastructure. | |
| **What skills will be needed to accomplish the project?** | |
| Some past coding experience is required, but language is not important.  The following skills will be developed through the project work. Prior experience would be helpful, but it is not a pre­requisite:   * ●  Frontend JavaScript development * ●  Data visualization * ●  Parsing and ingesting large amounts of JSON data * ●  Potentially database management depending on how the team wants to approach the data handling | |

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| **Project Code** | Q |
| **Project Title** | Customized Coding Experiences for Your Customers |
| **Project Goal or Description** | |
| Today there are many JavaScript libraries for accomplishing just about anything you want on the web, but it’s not easy for non-developers (your customers) to harness the power of these libraries. For example, augmented reality is all the rage, but not easy to get started with. In this project, you’ll create a programming environment for a domain of your choice, using the <<Anonymized Novice Programming Environment>> (Anonymized Link). Example domains include:   * **Survey**: build a survey that is dynamic in nature, requiring conditional control-flow; * **Chat bot:** create a chat bot using <https://dev.botframework.com/> * **Business workflow**: encode business rules as a program; * **Formula designer**: generate web apps to compute simple equations.   The web site <https://ar.pxt.io/> shows a <<Anonymized Novice Programming Environment>> a graduate student created over the summer of 2017 to allow programming of music-making applications based on augmented reality. | |
| **What activities are necessary to achieve the project goal?** | |
| 1. Find a JavaScript **library** or **web service** that aligns with your domain/interests (1 week); 2. Describe a simplified Application Programming Interface (**API**) for this library/service using TypeScript ([www.typescriptlang.org](http://www.typescriptlang.org)); 3. Configure a new <<Anonymized Novice Programming Environment>> **editor** to surface your API as visual blocks (<<Anonymized Link>>); 4. Write an **interpreter** that brings your API to life in the web browser;   Deploy your <<Anonymized Novice Programming Environment>> **web app** and test with your customers. | |
| **What outcome would determine that the project is a success? What is the specific deliverables?** | |
| A working <<Anonymized Novice Programming Environment>> web app with a set of domain-specific APIs and a simulator that allows end-users to code and execute small programs. | |
| **What skills will be needed to accomplish the project?** | |
| HTML, CSS, JavaScript, Node.js. You will learn these technologies during the project. | |

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| **Project Code** | R |
| **Project Title** | Customer product usage behavior: characterization, analysis and prediction |
| **Project Goal or Description** | |
| The students would analyze (and automate the analysis of) a few diverse data sets, both on product usage and customer feedback. The students would then identify and extract features from the dataset that are most useful for building machine learning (classification and predictive) models for analyzing and identifying significant patterns of usage and building categories of customers based on usage.  For this purpose, historical product data would be used to train and validate the model, and the accuracy of the models built would be demonstrated at the end of the project on product usage data spanning the time period of the project. The model(s) should ideally suggest the set of features to be used for training and describe the conditions used.  Some of the questions that would be answered with this model are:   1. What are the patterns of usage that differ between prolific/experienced and non-prolific/new users of the product? 2. Can we characterize usage patterns and feature usage during the first few months of the customer’s lifetime that would help us predict whether they become prolific users (or not)?   Using text analysis on the customer survey feedback, | |
| **What activities are necessary to achieve the project goal?** | |
| 1. ETL (Extract, Transform, Load) of the data sets and creating training and test data sets. 2. Building the classification and predictive models and testing them. 3. Visualizations of the results and presentation. | |
| **What outcome would determine that the project is a success? What is the specific deliverables?** | |
| A body of code (in Python and/or R; Python preferred) that can build the models using the data and generate the required visualizations. | |
| **What skills will be needed to accomplish the project?** | |
| 1. Programming skills (esp. R and/or Python) 2. Foundation in data analysis 3. Basic understanding of core machine learning concepts and text analysis   Ideally, the student should already have a background in programing skills and data analysis (basic statistics background, if possible). Skills in R/Python and machine learning/text analysis can be learnt during the course of the project. | |

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| **Project Code** | S |
| **Project Title** | Create an Ecommerce Data Product |
| **Project Goal or Description** | |
| I want the team to develop a new offering for ecommerce stores to buy and then let them have a go at testing it in the market with real data, real customers, and seeing hot to put the idea (that they will come up with, with some help) out there for sale.  An ecommerce store is an online store. Think a t-shirt shop, or a specialty food store online or anything you can sell really. The ones <<Anonymized>> typically works with are on the Shopify platform and make between $250k – 2.5M in revenue per year and are in the lifestyle health industry. Examples of stores are: [www.thewisp.com](http://www.thewisp.com) or [www.buymustard.com](http://www.buymustard.com) or [www.gochomps.com](http://www.gochomps.com)  What makes customers buy the tool or service we will build?  What gets glossed over and how can we address that to make the product or service more attractive?  A current tool we have in the market calculates and helps customers analyze the lifetime value of customers (that buy from their store). Our customers can navigate down numerically to see what makes the best customer (and it’s not just cause they spend the most.) Or we have another tool that helps stores get people that “almost bought” back in their store to buy.  We are going to think of, create and go try and sell another tool. | |
| **What activities are necessary to achieve the project goal?** | |
| Students will need to learn and gain an understanding of ecommerce. The basis of this is that people buy things, and certain things like marketing, information, research, and a variety of other factors shape their views before they buy.  See and learn the ins and outs of the web based and data systems that are in place within our solution that help the stores we work with do their jobs better. They will see how things flow for actual customers today.  Understand how events happen, how data gets created and triggers other activities to happen that are interesting to look at.  Tools we use are email marketing ([www.activecampaign.com](http://www.activecampaign.com)), online ETL ([www.blendo.com](http://www.blendo.com)), ecommerce ([www.shopify.com](http://www.shopify.com)), SaaS reporting tool ([www.klipfolio.com](http://www.klipfolio.com)), automation tools ([www.zapier.com](http://www.zapier.com) and [www.IFTTT.com](http://www.IFTTT.com)), back end database (Microsoft SQL Server on Azure).  Understand how data formulates the story of and profile of every customer each of our stores caters to.  Be creative about where you can pull data and information in general from to meet a new-product creation kind of goal.  An open mind about how to approach things. As it’s pretty undefined. | |
| **What outcome would determine that the project is a success? What is the specific deliverables?** | |
| Ideal is they make a sale of a product they come up with and make a prototype of it.  Success is also determining a new idea but figuring out where it may have gone south in the process of getting it to be sellable.  A failure here is certainly not a failure at all. | |
| **What skills will be needed to accomplish the project?** | |
| In order of importance SQL (Microsoft SQL), SaaS tool use and custom configuration, ActiveCampaign marketing tools, webhook and open to other SaaS and API calling/receiving technologies. | |

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| **Project Code** | T |
| **Project Title** | Sales and Marketing Optimization Using Machine Learning |
| **Project Goal or Description** | |
| The goal of the project is to leverage company data to optimize sales and marketing processes. Using existing sales and marketing campaigns, results and data, the company can improve its message and enhance results. The students will work directly with stakeholders to conceive, build and implement a working mobile-first, web-based prototype that will easily input data and output actionable results.  A user will input specific data related to a sales call including type of business, industry, age of owner, size of business, type of sales pitch, etc. and the result of the sales call (is the person a new user or not). The inputted data will be added to the database which will update the probabilities of certain characteristics which lead to success. Essentially, we will be utilizing past data to identify tendencies, identify new potential customers and then personalize marketing messages and sales pitches for those specific potential customers. | |
| **What activities are necessary to achieve the project goal?** | |
| Necessary activities:   1. Take given requirements and write user stories with associated wireframes 2. Create minimum viable product using an interactive tool such as Figma, Sketch, Balsamiq, etc. 3. Evaluate data to build statistical models 4. Evaluate user experience   Provide path forward from findings | |
| **What outcome would determine that the project is a success? What is the specific deliverables?** | |
| Successful project deliverables will be an interactive minimum viable product using a design sketch tool. Essentially, we are looking for a model “version 1.0” of the product built to represent a mobile first, cross platform web application. Concurrently, we are looking for the students to help <<Anonymized>> determine what the most innovative tools and environments will be for the best user experience. | |
| **What skills will be needed to accomplish the project?** | |
| The student must have interest in prototyping/interaction design and have a basic understanding of user research and visual design. They must have the expertise, skill and ability to communicate with our designers and stakeholders to choose necessary systems to build the prototype then explain why those systems were chosen.  Experience/proficiency in prototyping tools such as Figma, Sketch and/or Balsamiq, statistical analysis, data mining and predictive modeling. Automation of the process is the end goal.  Recommended is the participant have interest in entrepreneurship (start-up experience preferred) and care about small businesses. | |

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| **Project Code** | U |
| **Project Title** | Designing a playful chatbot for remote groups |
| **Project Goal or Description** | |
| The goal of this project is to design a chatbot for playful group interactions. Play and humor can be powerful tools for facilitating positive group interactions; however people are not always comfortable initiating such play in groups, especially when the groups are relatively unfamiliar. As a result, we will be designing and implementing a group chatbot to initiate these types of positive/playful interactions. Chat agents may be unique in the type of play they can leverage compared to human participants, so this project will seek to explore multiple design solutions for intiating play in a serious group task. | |
| **What activities are necessary to achieve the project goal?** | |
| Team members will be design and build a chatbot that can function autonomously in group interactions to engage in play and humor. This will require teams to select an appropriate platform (E.g., Slack, Skype, etc.) that supports these interactions and then build a chatbot that functions on this platform. Teams will need to generate and implement a number of design solutions for how this chatbot might engage playfully (e.g., does it tell jokes, share memes, etc.?) | |
| **What outcome would determine that the project is a success? What is the specific deliverables?** | |
| The specific deliverable(s) for this project is a chatbot that functions autonomously in a group interaction and facilitates a playful environment with teams. Specifically, teams should deliver a chatbot, or chatbots, that can enact 3-5 playful actions that appear relevant and meaningful in the group (i.e., it should be able to reference and playoff of ongoing team communication real time). | |
| **What skills will be needed to accomplish the project?** | |
| Because teams will be choosing the platform they identify as being most appropriate or useful for this specific implementation, they may bring a variety of experiences to the project, but they should have coding experience of some kind as this is likely to be a code heavy project. Additionally, a design background may be helpful in considering specific behaviors and characteristics of the playful chatbot. Creativity and willingness to explore multiple design solutions is a must. | |

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| **Project Code** | V |
| **Project Title** | Implementation of a humorous robot to promote positive emotions in groups |
| **Project Goal or Description** | |
| The goal of this project is to provide a technical solution for implementing a humorous robot in groups interactions. This robot will interact with groups engaged in conflict. The purpose of the robot is to mediate the conflict and promote positive emotions between people via the expression of humor. | |
| **What activities are necessary to achieve the project goal?** | |
| Team members will work with a pre-selected toy robot (Keepon) and develop a technical solution for its remote operation. The toy is relatively simple, so teams will be tasked with implementing an Arduino or similar system to control movement and audio. Teams may need to build an audio sound board where various scripts and sounds can be accessed and implemented real-time in interactions. | |
| **What outcome would determine that the project is a success? What is the specific deliverables?** | |
| The specific deliverable expected at the end of this project is a working robot that can be operated remotely (Wizard of Oz technique) to interact with groups. The robot will need to appear autonomous (i.e., participants who interact with it should not be aware that it is being controlled by a human). The robot should have audio capablilities to verbally interact with multiple people. The robot’s movement and gesturing must also be controllable remotely. Teams should keep in mind that the end product should be user friendly in that the controls should be intuitive and accessible to users without a technical background of skill set. | |
| **What skills will be needed to accomplish the project?** | |
| Students should have some coding ability and have working knowledge (or at least a willingness to learn) of the Arduino platform. They must also be self-motivated to research a range of technical solutions as they will likely encounter technical hurdles that I as the client with limited technical background will not be able to help with. This project may require research skills to determine industry best practices for human-robot interaction (e.g., who should a robot move and speak?). | |