GONZAGA UNIVERSITY
School of Engineering and Applied Science
Center for Engineering Design and Entrepreneurship

PROJECT PLAN
<Insert Date>

Facial Recognition Neural Network

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Design Advisory Board Member	Project Sponsor/Liaison

1 Project Overview

1.1 Project Summary

Provide a clear and concise two-paragraph summary of your project. The first paragraph of the summary must provide a high level description of your project's "why" (i.e., the problem the project is trying to address) and the second paragraph your project's "what" (i.e., how your project is going to address the problem). The summary should be written for someone who is unfamiliar with the project domain (including jargon used within the domain).

Over the past decade, many major companies of have been hit with massive hacks that have resulted in hundreds of millions of people's private information to be stolen. The old method of username and password are far too susceptible to hacks, and just simply aren't good enough to keep people's private data private. Vulnerabilities, such as the reuse of password or the use of weak passwords, are hard to exploited regularly by malicious agents and it is hard to enforce policies on users that protect them. Another problem with passwords is that if you are smart and have many different passwords, it can be almost impossible to keep track of all of them. Because of these problems with usernames and passwords we think that the only way forward is biometric security. What we are proposing to use your face as your password. Advances in machine learning have made it possible for computers to recognize faces with a high degree of accuracy, opening the door for a secure and easy to use credential policy system.

We plan to build a Google Chrome extension to allow people to save their usernames and passwords in our service, and then automatically access these usernames and passwords when they pass a facial recognition test. Our software will be easy to use and free, with the goal of attracting as many every day users as possible. We also want to make sure that our software can work on any computer that has a camera on it, something that existing software doesn't do.

1.2 Project Objectives

Provide a description of the major project business objectives (i.e., business goals/desired outcomes of the project). Be sure each objective is concrete, specific, measurable, and has been vetted with your project sponsor/liaison.

The primary business objectives of this project are

- To improve web browser security by at least 30% over a year which is measured by reducing the number of unwanted people using websites logged on as someone else by 30%.
- Have at least one small business use our product by the end of the school year
- Have at least 100 downloads of our security extension by the end of the school year

1.3 Project Stakeholders

Provide a brief description of the main stakeholders of the project. This should include yourselves as developers, your project sponsor and liaison, your faculty advisor, your design advisory board members,

and the target user communities you are building your product for (note that there may be multiple potential user communities being targeted). For each concrete project stakeholder, be sure to include their affiliation (organization) and their role in the project. Describe your target user communities in enough detail to give the reader confidence you understand the needs of these groups relevant for your project.

Developers:

We as developers are in charge of the development and implementation of this project as well as communicating our progress to our sponsor/DAB member.

Sponsor/DAB member:

Our sponsor/DAB member will help keep the developers in check by making sure we are making steady progress and will fit the DAB requirements as well as inform us if our product will be something that a business will find useful.

Faculty Advisor:

Our faculty advisor, like our DAB member, will help keep us on track but a bit more on the side of documentation as well as implementation. She will also keep us on a good pace to finishing and completing our project.

Target User Communities:

Our target user communities are businesses and cautious web users. Businesses often face issues with computer security and it is common protocol for employees to have to lock their computers or close their web browsers upon leaving their computers, and using our product would implement that extra level of security that prevents unwanted users from using an exposed web browser. Our product would also be easy to install on commercial machines for users that value their privacy highly.

1.4 Project Deliverables

Our primary deliverable for this project is an API that a developer could plug into their website to add facial recognition to their website. The API needs to be simple enough for a programmer to use. And the interface with the actual users needs to be simple enough from someone who doesn't know how to program to use. We want the users to be able to manage passwords though the already existing Google Credential software. Another deliverable is that the API needs to have minimal false positives in order to protect the users information. The program also needs to automatically input the credentials when the facial recognition has been passed.

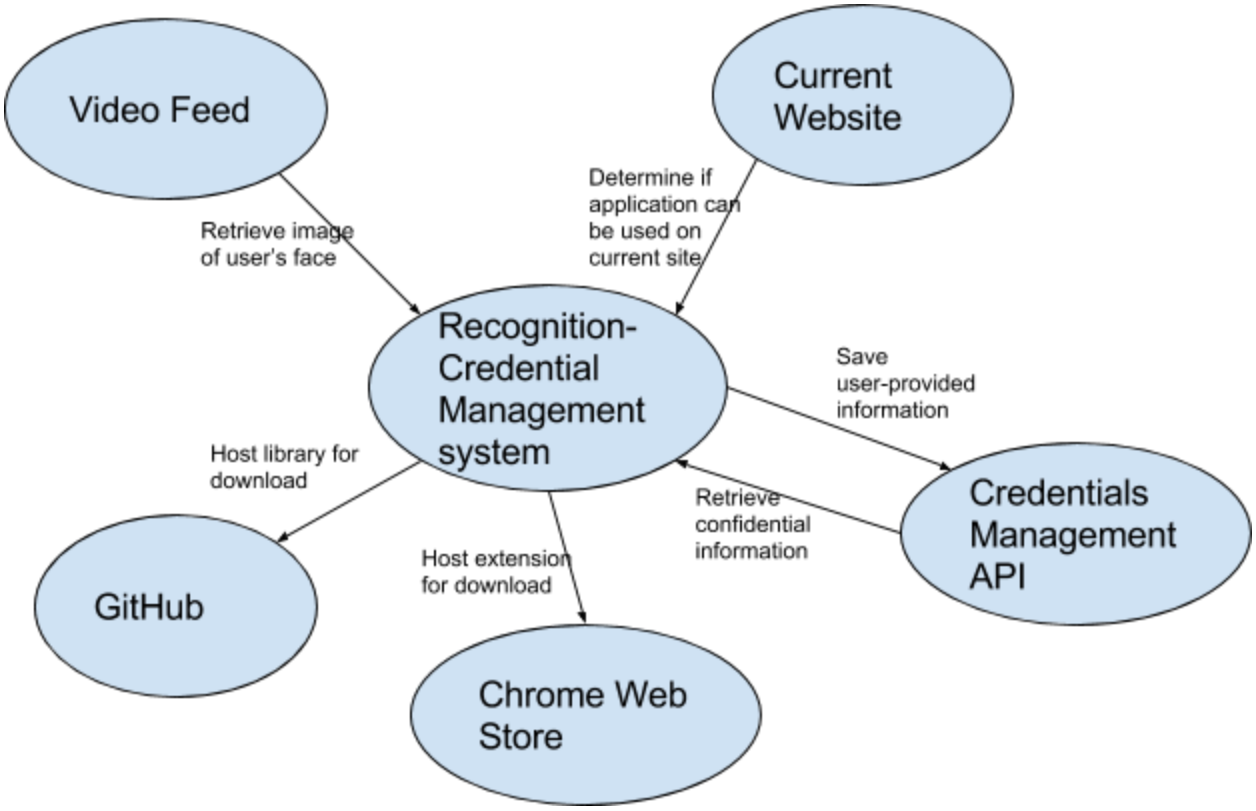
1.5 Project Scope

Provide a brief description of the project scope that states what aspects of the project already exist (out of scope) versus what aspects you will be developing from scratch (in scope). Your description must be

accompanied by a high-level context diagram, highlighting the components that are outside of the scope of your project and how they will generally interact with your system.

One out of scope component of our project is Google's Credentials Management API. We will be using (but not implementing) this API to securely store our front-end user's usernames and passwords. This will greatly simplify our task because we won't have to implement complicated security measures to keep our user's confidential information safe. Another is the video feed and the current website, both of which will provide information as to what state our system should be in. The former will inform our application whether or not to autofill the credentials based on the user's face, while the latter will determine whether the website the user is on has credential fields that our application can fill out. Additionally, we will need some external services to provide our product to the public. Since we are developing a software library as well as an extension that uses that software library, we will need to use two different services. We will place our extension in the Chrome Web store and we will place our library on GitHub.

The main component that is in-scope to our project is the neural network. We will need to develop a specific architecture that will suite our needs, namely a small training set size and the need for accurate classification. We will be able to use some external API functionality to give us some direction on how our recognition system should be developed, but the majority of this component of our project will be developed in-house. Additionally, we will need an in-scope component that can identify password fields on the current website and fill in the credential information appropriately. This component should be relatively easy to implement. Also, we will need to develop a user interface for the extension. It is our aim to keep this interface relatively simple, with the ability to add/remove passwords as its chief functional role.



1.6 Related Work

Provide a description of existing systems and/or approaches that try to solve a similar problem as yours. Identify and describe the system most-closely related to the one you are planning on building, discussing both the similarities and the differences between this system and yours. Additionally, summarize the major similarities and differences of those less related, but still similar to your project. The goal of this section is to show that you have looked at and understand the product landscape and have a clear idea of the needs of your project and how they are similar and different to the current systems/approaches available. Provide a link or reference to each system you describe.

In the field of facial recognition there is already an unbelievable amount of work. There is software that is designed to recognize distinct and software that can recognize emotions. We are going to focus on recognizing faces. The fact that there is thousands of projects already on facial recognition gives us a great base to build off of. In the field of facial recognition to replace passwords there is a lot of work already done as well. Most notably the new iPhone will have facial recognition software on it, to allow people to log into their phones. Other companies such as TruKey have created downloadable software to allow you log into websites using your face or fingerprint. How we plan to differentiate ourselves is to create a Google Chrome extension to do the work, which hasn't been done. The reason we believe this is

the best way to do this is because of its simplicity. Everything can be done within your browser, which is ideal for the average person who has no desire to mess around with software.

Additionally, much of the recognition software appears to simply use static facial features to determine the identity of the user. We are hoping to make our system more robust and secure by incorporating time-series analysis into our network. Some potential time-series data we have considered training our network on include: emotions, reactions to images, skin reflectivity with light differences. Incorporating this more sophisticated analysis into our software will not only make our system more secure, but also differentiate us from competitors. On the front end side, all of the related work looks very elegant and pleasing. This can be attributed to such companies having teams of designers and artists guiding the development of their user interface. As such, we will be taking inspiration from the related work we identified (such as the Iphone X, TruKey, and FaceVault among others) to guide our user interface development.

2 Project Requirements

2.1 Major Features

Provide a description of the major features that must be implemented for a viable and useful product. Major features include broad feature areas, constraints that must be met, and other major items that must be completed for the project to be considered successful. The major features should be identified in consultation with your project sponsor and target user communities. The major features described here should also be listed in the major features checklist, which must be approved by your sponsor and faculty advisor. Each major feature should also have rationale for inclusion. This subsection should also discuss major features that were considered nice to have but were not included as targets for your project and a discussion of why they were not included. Describe the process your team used to determine the major features, which should be determined through discussions and feedback from your target users as well as your project sponsors. Provide a summary of the major features in a table as follows (again, the table should match the items given in the major features checklist).

Table 1: Major Features

Feature	*Description*
Access webcam	Request and obtain access to webcam to get in video/image feed.
Identify password prompt*s*	Given a website, tell whether there is a password prompt on the site. This will tell us whether or not our application is applicable to this site or not.
Populate password fields	Given the identified password prompt, fill in the element with the password. This is vital to the operation of our extension.

Identify user with high accuracy	We would like to have greater than 95% accuracy in recognizing an individual. Because of the confidential nature of the application, false positives are worse than being unable to identify a known user.
Allows users to customize passwords	The user shall be able to add/remove/modify their list of passwords. This can give the user more control over which websites have facial recognition functionality.
Visual indications of software in operation/success	The application gives some visual cue to the user that it is attempting to autofill/recognize, and then indicate whether this attempt is successful or not.
Storing webcam images for neural network usage	Be able to store images for training the neural network. Keep the files locally.
Additional help for user to capture their image (pop up a box that displays the camera)	The recognition task can sometimes be faulty, especially if the input image is noisy. Therefore, there will be a visual tool to help obtain clear images from the user.
Add additional users per site	Be able to have more than one user for gaining access to a site.

2.2 Initial Project Backlog

Provide a description of the essential project requirements (features, characteristics, constraints of the system) that must be developed for project success. Your requirements must have unique names/titles; have priorities and estimates; be clear, concise, free of jargon, and consistently worded; be specific (each requirement should capture one aspect of the system); and be measurable (i.e., clearly state what "done/completed" looks like). Include a brief description of your priority and estimate scheme.

Note that high priority requirements (typically requirements you will start on right away or soon after) should be well defined and more precise but lower priority items can be fuzzier and less precise at this point. You can state your requirements as user stories, however, you should also include requirements for non-functional aspects of the system as well (as needed). Note that the requirements in this subsection should elaborate upon the major features listed in the previous subsection. Summarize your requirements in a table as follows.

Table 2: Initial Product Backlog

Requirement	*Description*	*Major Feature*	*Priority*	*Estimate*
Chrome Extension that the user can install	The product must be a chrome extension	From Table 1	high	

User can access webcam through extension	The chrome extension must access the webcam		high	
User can take pictures of themselves to increase security/train the net	The webcam must store images taken to train the neural network		middle	
User can open a website, and have the extension recognize them	The user can have the extension secure their websites		high	
The program can't be tricked by a picture of a person.	The security model should be able to detect whether what is in front of them is a picture or an actual person		high	
The recognition process must be faster than simply typing in the password	The process must be efficient		middle	
Must be able to recognize faces despite day to day changes (haircuts, glasses)	The neural network must be able to recognize based solely on facial features and not be changed by temporary aesthetics like haircuts or glasses		middle	
Never produces a false-positive	Must never give access to unauthorized individuals		high	
Extension autofills their password	The extension must autofill		high	
There needs to be a place where the user can manage their passwords/usernames	A management interface for the users to decide what passwords they want		low	
Minimally intrusive for the users web browsing experience	Must not disturb the user		low	

2.3 Additional Features

2.3
Some stretch goals we have discussed are the ability add new users to your personal facial recognition. This means that a husband and wife could both use facial recognition to access the same bank account.

Another stretch feature is using time series data of the user moving their head so that the software could detect whether it is looking at a 2-D or 3-D object. This would be an excellent feature because it would stop someone simply showing an image of someone's face to access their credentials.

Another way to verify whether the image in 3-D or 2-D is to use artificial flash from the laptop screen to detect whether light bounces off the face naturally unnaturally.

3 Design Considerations

3.1 Initial User Interface Design

Provide a description of the general user interface layout, including a set of initial user interface design mock-ups. Your text should provide a general description of how each mock-up will function. Each mock-up should be put into a separate figure (with a caption). Your mock-ups can be hand-drawn or digitally formatted, but must be clear and easy to follow. Your mock-ups must also be vetted with your project sponsor/liaison. Relate your interface designs to your project's major features (e.g., state what features each mock-up will accommodate and how). State the process you used to arrive at the mock-ups, focusing on how the mock-ups have been vetted by your target users, your sponsor, and other project stakeholders, and the feedback you have received.

3.2 Initial Software Architecture

Provide a description of the initial architecture of your application, focusing on the major components of your system and how they will interact. You must also include a corresponding architecture diagram highlighting the components and their interactions.

4 Project Risks

Provide a list of the major risks that are associated with your project. For each risk, you must clearly and concisely describe: (1) why it is a risk to the project (e.g., what will the potential impact be to the project); (2) what actions you will take to prevent the risk from happening; (3) how you will monitor the risk; (4) what events/situations will trigger the need to mitigate the risk (i.e., when will you know to switch to "plan B"); and (5) what you will do if the risk does becomes a reality (i.e., what is your "plan B", "plan

C", etc.). It is not enough to just list your risks; you must also have a plan to prevent, monitor, and mitigate each risk.

5 Initial Product Release Plan

5.1 Major Milestones

Provide a description of the major milestones of your project. For each milestone, clearly describe the milestone (e.g., what features will be implemented) and when the milestone must occur by. You must also describe the rationale for the order of your milestones. Summarize your major milestones in a table as follows.

Table 3: Major Milestones

Milestone	*Description*	*Target Completion Date*
MilestoneName1	Brief summary describing what will be accomplished in the milestone and the significance (as appropriate).	First week of December
MilestoneName2	...	Third week of January
MilestoneName3	...	Second week of February
MilestoneName4	...	Third week of March
...	...	...

5.2 Initial Sprint Releases

Provide an initial plan for the work you will complete and demo at the end of each sprint for the entire year. Your initial sprint plan should connect the major milestones with your project backlog and major features. Thus, e.g., your release plan should coincide with your project milestone schedule above.

For each sprint, state what requirements will be worked on and concretely what you will demo for your target users and sponsor at the end of the sprint. Note that you will need time in your release plan for system and usability testing as well as system deployment and documentation. Be sure to clearly state when usability testing, deployment, and documentation will be performed.

Summarize your sprint plan in a table as follows. Note that it is expected that the sprints for the rest of this semester are more precise than those towards the end of the year and that your plan may change. However, you must demonstrate that you have spent time thinking about the high-level release plan for your project.

Table 4: Sprint Release Plan

Sprint Date	*Spring Goal*	*Backlog*	*What we will demo*

4th Week in Oct to 1st week in Nov	Brief summary of the overall goal of the sprint	Requirements from Table 2 that will be finished	What aspects will you show users/sponsor to get feedback on
2nd Week in Nov to 3rd Week in Nov	...	...	...
4th Week in Nov to 1st Week in Dec	...	...	...
...		...	...

6 Maintenance Considerations

Provide a brief description of maintenance issues regarding the system you develop. In particular, discuss whether there is an identified group that will provide maintenance of the system (and what their level of expertise is), what parts of the system may require maintenance, how you plan to develop the system to support future maintenance, what level of expertise will be required to perform maintenance on the system, and any other issues concerning maintenance of the system you develop.

7 Project Management Considerations

Provide a brief description of how you plan to organize yourself as a team to complete the project deliverables. Minimally, this should include where and when your weekly team meetings will be, when/where you will meet with your project sponsor (for standing meetings), and how you will update your sponsor, primary DAB member, faculty advisor, and other stakeholders of your progress. Also include a description of how you are planning on breaking up the work for your project among team members. Each team member must be responsible for some concrete aspect of the system. Finally, list any additional tools you plan to use to communicate your progress and/or elicit feedback from your sponsor, liaison, and end users.

Appendix

Provide additional supplemental information in an appendix as necessary.