CS 30700

Sprint 1 Planning Document

Team 17

Ethan Ling

Leo Gu

Matthew Sigit

Nicholas Song

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1. Sprint Overview

Sprint Overview

During this sprint, we aim to build a minimum viable product (MVP) to accomplish the main goal of our project, which is to allow users to use our machine-learning model in order to find out character details. On the Machine Learning side, this MVP will involve implementing, training and wrapping a machine learning model to be able to fulfill user requirements. On the web application side, this MVP will involve implementing and hosting a usable interface that allows users to send and receive requests to and from this model. This will also require implementing and testing a robust database with normalized data storage that can handle all web requests.

Sprint Details

Scrum Master: Matthew Sigit
Meeting Plan: Sundays @ 3:00pm

Risks and Challenges

Because our project can be categorized into multiple parts (i.e. the Web-App and the Machine Learning Model), a potential issue we may run into is having issues in connecting these components in our limited time frame. This is because, although our Minimum Viable Product will require the integration of these parts, the Web-App and Machine Learning Model will be implemented on separate timelines, which could set back progress in our project.

Another challenge that we may run into is the training of our Machine Learning model – since the training process for Machine Learning is often expensive and/or time consuming, this could pose a problem for meeting our sprint deadlines. To this end, we have requested funding / potential compute nodes from the university, and we will also prioritize getting the model training earlier to avoid this pitfall.

2. Current Sprint Detail

User Stories to be Added This Sprint

Functional Requirements:

1. As a user, I would like to be able to register an account on Annix.
2. As a user, I would like to be able to login into my account on Annix.
4. As a user, I would like to be able to change critical information about my account like my password, username, email, and profile picture.
6. As a user, I would like to seamlessly upload an image and obtain a response according to the image that is accurate.
13. As a user, I would like to be able to use the product without signing in.
16. As a user, I would like to be able to tell the model if it has misidentified a character, as well as send the correct character if I know it.
17. As a user, I would like to be able to delete my account and all of the information Annix has stored in it.
18. As a user, I would like to be able to easily disable search history and other data collecting functions on Annix.
21. As a user, I would like to be able to seamlessly go between profile, service and data pages as well as other function pages.
30. As a user, I would like to identify different characters by image with an accuracy of at least 80%.
31. As a user, I would like to identify different characters by image regardless of the sizing of the image or the type of the image.

Account Management (User Stories 1, 2, 4, 17, 18)

#	Task Description	Estimated Time	Owner
n/a	Create, setup and sync environments for the front-end framework.	3 Hours	Matthew, Nick
1,2	Research front-end framework, database framework and set up mongoDB database and integration with current front-end frameworks.	7 Hours	Matthew
1,2	Create account registration and login functionality front-end buttons + popups + redirection pages and logic for unlogged accounts.	5 Hours	Matthew
4	Create profile and settings page, account detail display and account modification functionality.	4 Hours	Matthew
17	Create a safe way to delete accounts, interact with deleted database entries and create the associated front-end components.	4 Hours	Nick
18	Create functionality for disabling/anonymizing data entries, and create the associated front-end components (buttons and request parsing).	3 Hour	Matthew

Acceptance Criteria:
[1 – As a user, I would like to be able to register an account on Annix.]

1. Given the user is on the registration page, when a user enters a username and password, the Web-app will write the information to the database and the user will be logged in.
2. Given the user is on the registration page, when a user registers an account with an email, the Web-app will write the information to the database and the user will be logged in.
3. Given the user is on the registration page, when a user attempts to register an account with a username or email that already exists in the database, the Web-app will prevent the registration.
4. Given the user is on the registration page, when a user attempts to register an account with an invalid username password combination, the Web-app will prevent the registration.
5. Given the user is on the registration page, when a user attempts to register an account with an invalid email, the Web-app will prevent the registration.

[2 – As a user, I would like to be able to login to my account on Annix.]

1. Given the user is on the login page, when a user enters a valid username and password after registering, the Web-app allows access to the account and functionalities.
2. Given the user is on the login page, when a user enters an invalid username and password after registering, the Web-app denies access.
3. Given the user is on the login page, when a user enters a username/email that hasn't been registered, the Web-app denies access.
4. Given the user is already logged in, when the user tries to navigate to the usual log-in page, it will instead have a sign out button.
5. Given the user is already logged in, when the user signs out, the Web-app will sign out and revoke access to previous account permissions.

[4 – As a user, I would like to be able to change critical information about my account like my password, username, email, and profile picture.]

1. Given the user is on the account settings page, when a user changes their username, the Web-app updates the account information.
2. Given the user is on the account settings page, when a user changes their password, the Web-app updates the account information.
3. Given the user is on the account settings page, when a user changes their email, the Web-app updates the account information.
4. Given the user is on the account settings page, when a user changes their profile picture, the Web-app updates the account information.

[17 – As a user, I would like to be able to delete my account and all of the information Annix has stored in it.]

1. Given the user is on the account settings page, when the user chooses to delete their account, the Web-app deletes their account.
2. Given the user is on the account settings page, when verification is required, the Web-app completes the deletion after successful verification.
3. Given the user is on the account settings page, when the user decides to cancel the deletion, the Web-app cancels the deletion process.
4. Given the user has deleted an account, when the user tries to create a new account with a deleted email or username, the Web-app allows the creation.
5. Given the user has deleted an account, when a user tries to access any information, then the user should not be able to see information or should see anonymized information.

[18 – As a user, I would like to be able to easily disable search history and other data collecting functions on Annix.]

1. Given the user has disabled the storage of search history and other data, when the user does any functions that would usually involve these features, then they should not see any stored search history and other data.
2. Given the user has disabled the storage of search history and other data, when the user re-enables the storage of search history and other data, then their future searches and data should show up when viewing involved functions.
3. Given the user has disabled the storage of search history and other data, when the user re-enables the storage of search history and other data, then they should be able to see the previously stored data (unless the user has deleted the information by other means).

"Find My Character" Functionality (6, 13, 16, 30, 31)

#	Task Description	Estimated Time	Owner
6,31	Set up file navigation and image upload fields and other front-end elements for The "find my character" page.	5 Hours	Nick
6	Set up integration and JSON requests to/from the desktop after uploading images, generating the new page and parsing relevant information.	10 Hours	Nick
6	Compile Existing Datasets and Clean, Resize, and Balance Data for the Machine Learning Model.	3 hours	Leo
6, 30	Make web scraper to compile images for more recent characters to train Machine Learning Model to recognize newer characters.	7 hours	Ethan
6, 30	Label, clean, resize web scraped data	5 hours	Leo
6, 30	Add image paths to csv, make dataset zip, shuffle image set for training	3 hours	Leo
6, 30	Develop model using pretrained CNN with fine-tuning as a backup	14 hours	Leo
6, 30	Tweak and improve learning rates, schedulers, loss functions, model types, and optimizers	3 hours	Leo
6, 30	Develop data pipeline for triplet loss model	5 hours	Leo
6, 30	Create base triplet loss model in pytorch	10 hours	Leo

6, 30	Create a system that would help automate storing images uploaded by the user and implement scripts to tokenize said images with UIDs.	14 hours	Ethan
6, 30	Create a an application to grab animated characters' faces from online to store inside the application	3 hours	Ethan
6, 30	Create a pipeline for the model to access the storage application and receive the proper response.	6 hours	Ethan
13	Set up logic for signed-in and non-signed-in users including history fields and database parsing.	4 Hours	Nick
16	Set up misidentified characters fields, transferring user input to database and new front-end elements for misidentified characters.	5 hours	Nick
31	Make sure image upload works with different sized and different format images (including common formats like HEIC, PNG, JPEG etc) and set up conversion.	4 hours	Nick

Acceptance Criteria:

[6 – As a user, I would like to seamlessly upload an image and obtain a response according to the image that is accurate]

1. Given that the user is on the page with the searcher, when the user presses the button to upload an image, the user will be prompted to select a file from their computer.
2. Given that the user has been prompted to select a file, when the user selects a valid image and clicks upload, the user should receive an appropriate response in an appropriate amount of time with data returned from the model. More specifically,
3. Given that the user has been prompted to select a file, when the user selects a file that is not an image and clicks upload, the user should receive an error and prompt to enter a valid image file.
4. Given that the user is on the page with the searcher, when the user drags/copies an image into the upload image area, the image will be processed as normal.

[13 – As a user, I would like to be able to use the product without signing in.]

1. Given that a user has opened the application, when they click the button to use guest mode, they should enter guest mode.
2. Given that a user has logged in, when they log out, they should be prompted to use the application in guest mode.
3. Given that a user is using guest mode, when they choose to use guest mode, they should be able to access the rest of the application without being prompted to sign in
4. Given that a user is using guest mode, when they click on their account info, they should be prompted to log in.

[16 – As a user, I would like to be able to tell the model if it has misidentified a character, as well as send the correct character if I know it.]

1. Given that a user has received an incorrect result from the application, when they find out it is incorrect, they should be able to click a button and fill out relevant details to report the incorrect result.
2. Given that a user has received an incorrect result from the application, when they click the button to signify a wrong result, they should receive a response that tells them that their feedback will be used to retrain the model.
3. Given that a user has received an incorrect result from the application, when they click the button to signify a wrong result, the Webapp should reprocess the image and display new results.

[30 – As a user, I would like to identify different characters by image with an accuracy of at least 80%].

1. Given an image of a character featured in an anime with more than a million streams, if the user tries to upload that image, the character will be in the compiled dataset.
2. Given a large set of user inputted images, if we were to evaluate the model on accuracy, the output will be the actual image's character at least 80 percent of the time.
3. Given a large set of user inputted images, if we were to evaluate the model on accuracy, the output will be within the model's top 5 confidence characters at least 90 percent of the time.

[31 – As a user, I would like to identify different characters by image regardless of the sizing of the image or the type of the image].

1. Given different sets of arbitrarily sized images, if the users uploaded different resolution images then the accuracy would not be drastically different.
2. Given the user has unconventional resolution images, when the user uploads the image the Web-app will accept it and return an appropriate response.
3. Given the user has any commonly accepted image format (PNG, HEIC, JPEG), when the user uploads the image the Web-app will accept it and return an appropriate response.
4. Given the user has an uncommonly accepted image format, when the user uploads the image the user should get a response or error response after the Web-app tries to convert the image to a common format.

User Experience (21)

#	Task Description	Estimated Time	Owner
21	Set up navigation bar for desktop and hamburger menu for mobile.	5 Hours	Matthew
21	Set up routing for said pages and other buttons.	1 Hour	Matthew
21	Set up logged-in logic and logged-out logic and access permissions.	2 Hours	Matthew
21	Set up a way to get screen size / type for proper proportions on mobile and desktop.	1 Hour	Matthew

Acceptance Criteria:

[21 – As a user, I would like to be able to seamlessly go between profile, service and data pages as well as other function pages.]

1. Given the user is on a desktop, when they navigate to any page then there will be a navigation bar present at the top.
2. Given the user is on a desktop with a navigation bar, when they press buttons in the navigation bar then they will navigate to the pages that the buttons describe.
3. Given the user is on a desktop, when they are logged in then the navigation bar will contain the profile as a potential page to navigate to.
4. Given the user is on a desktop, when they are not logged in then the navigation bar will contain “sign up” or “log in” as replacement buttons for what are usually profile functions.
5. Given the user is on a mobile device, when they navigate to any page then the web-app will open with the correct proportions for the mobile device and have a hamburger menu in place of a navigation bar.

3. Backlog

Functional Requirements

A Colored/Bolded user requirement represents that it is planning to be finished in the first sprint.

1) **As a user, I would like to be able to register an account on Annix.**
2) **As a user, I would like to be able to login into my account on Annix.**
3) As a user, I would like to be able to link and unlink my account to an email address.
4) **As a user, I would like to be able to change critical information about my account like my password, username, email, and profile picture.**
5) As a user, I would like to be able to change my profile picture to a recent search.
6) **As a user, I would like to seamlessly upload an image and obtain a response according to the image that is accurate.**
7) As a user, I would like to know if the application is unsure of my requested character.
8) As a user, I would like to add example images and descriptions of characters that I would like added.
9) As a user, I would like to be able to reset my password if I have forgotten it with security questions and an email sent to my inbox.
10) As a user, I would like to have the security to login using a 2-factor authentication service.
11) As a user, I would like to be able to access a guide to use this application.
12) As a user, I would like to see the functionality of each button when hovering the mouse over it.
13) **As a user, I would like to be able to use the product without signing in.**
14) As a user, I would like to have a method of exporting a backlog or history of previous images uploaded and their corresponding characters.
15) As a user, I would like to be able to know where to watch the show that a character I've searched appears in and have the links to the services where the show is hosted.
16) **As a user, I would like to be able to tell the model if it has misidentified a character, as well as send the correct character if I know it.**
17) **As a user, I would like to be able to delete my account and all of the information Annix has stored in it.**
18) **As a user, I would like to be able to easily disable search history and other data collecting functions on Annix.**

19) As a user, I would like to know generalized data about the user base such as most commonly recognized characters, shows, and hosting services.
20) As a user, I would like analytics specific to me like characters frequently searched.
21) As a user, I would like to be able to seamlessly go between profile, service and data pages as well as other function pages.
22) As a user, if the search function is unable to find my character, I would like to request a fellow user to recognize my character.
23) As a user, I would like to be able to help other users if they request the details of a character that I recognize.
24) As a user, I would like to be able to help improve the model by labeling data if I feel the service is lacking.
25) As a user, I would like to know statistics about my usage, such as characters searched, images recognized, people helped, etc.
26) As a user, I would like for the app to automatically switch from light and dark modes depending on my system settings, and I would like to be able to switch it back if I choose to do so.
27) As the user, I would like a button on the application to review it if I am satisfied with its performance.
28) As a user, I would like to be able to request new features.
29) As the user, I would like a button on the application to send constructive criticism to the developers if I would like a certain aspect of the application to be improved.
30) As a user, I would like to identify different characters by image with an accuracy of at least 80%.
31) As a user, I would like to identify different characters by image regardless of the sizing of the image or the type of the image.
32) As a user, I would like to not only identify characters from their source material but also fan-made versions of them as well.
33) As a user, I would like to be able to recognize characters, even if they are slightly edited with filters or Photoshop.
34) As a user, I would like to receive some form of rating or ranking system dependent on how many users I have accurately helped.
35) As a user, I would like to be able to see top ranked helpers based on time increments.
36) As a user, I would like to know the exact source of the image I uploaded displayed in the model.

37) As a user, I would like to know if I uploaded the wrong image i.e. a non animated character.
38) As a user, I would like to be able to easily replace an image if I realize I uploaded the wrong one.
39) As a user. I would like to know what personal data Annix has stored and how it is being used.
40) As a user, I would like to be able to see Frequently Asked Questions for any features I don't understand.
41) As a user, I would like to be able to see a Contact Us page to contact the developers if I find something wrong.
42) As a user, I would like to be able to see a quick summary of how the model works.
43) As a user, I would like to be able to apply to be a moderator.
44) As a user, I would like to be able to join a discord of like minded users.
45) As a user, I would like to be able to search for characters and see details about the characters.
46) As a user, I would like to be able to search for other users and see details relating to ranking, account status and more.
47) As a user, I would like to be able to filter my search depending on use time, ranking, or date of profile creation.
48) As a user, I would like to be able to see related items to the characters I've searched.
49) As a moderator, I would like my moderator status to show on my profile.
50) As a moderator, I would like to be able to verify any responses in the help section.

Non-Functional Requirements

Machine Learning Application

At this project's core is the image recognition machine learning model. This model has two main hurdles to its success: getting proper training data and high accuracy.

Data

To train a high accuracy model, we would like a minimum of 100,000 images that covers the most popular animated characters in the last 15 years. In this project, our training data will be obtained from a few major sources. First are publicly available online datasets. These datasets don't perfectly fit the data wanted for our model type, in this case being triplet loss data, but can be reformatted through python packages or through a data pipeline made in tensorflow. The other major source of data is going to come from web scraping. This is going to require us to write a web scraping script to extract images from sources like memes, show review sites, and other pages and deposit them in a database. To conduct this efficiently, we will require a way to obtain clean and labeled triplet loss data.

Our main solution for obtaining this is a proper data pipeline. Triplet loss data comprises of three images: an anchor, a positive, and a negative. The anchor and positive have the same label, which allows the model to learn to differentiate between different labels. We can build a pipeline which inserts triplets into our model from our dataset in the appropriate format (anchor, positive, negative) such that the anchor and positive images have the same label and the anchor and the negative have different labels. This only requires us to have properly labeled images, and many of the open source datasets are clean and have accurately labeled images. However, these datasets are often not up to date and don't include more modern characters or renditions of characters.

This is where web scraping comes in, as the internet has plenty of images with the latest characters and shows. However, these images are hard to label from every context and the data source may not have the most accurate metadata or information to label the image. For this we propose manual labeling, either through us or by creating a system such that other people can help us label. This would be a lot of work, but it is necessary to keep our labels properly diverse, relevant and accurate. All of these solutions would allow us to get great training data for our model.

Model Accuracy and Other Problems

For our model to be deployed on a publicly available service, we would like our model to have an accuracy above 80 percent. To achieve this, we selected one of the foremost models for facial recognition, triplet loss. We plan to implement a triplet loss model using Tensorflow and Keras, which we are going to follow the many papers written on the subject as well as see many of the pretrained triplet loss models that exists such as FaceNet, ResNet 50, or other models that we can find on TFHub and other services. Ideally, we would like to build this model from the ground up and we will attempt to, but if the accuracy on real world images does not match a high standard (e.g. 80 percent for us), then we would have a fall back.

Other problems that could face our model include overfitting, underfitting, and poor generalization, but these can be solved through tweaking the training process, dataset, or the layers of the model itself. Through this, we know given enough work, we can make a proper image recognition model with a good accuracy.

Web Application

For our Web Application, we are planning to use a REST API model of communication, in which clients' devices will send requests to a server and receive back information in a standardized representational state. For our back-end, we plan to use MongoDB and Flask for the purpose of storing information in a relational database and coding the functions to utilize and distribute said information.

In terms of our front-end, we plan to use ReactJS to hold a framework in HTML and CSS. The user will have a button to upload an image file and a button to generate the information required. There will also be a login page and a statistics page.

Systems and Architecture

The goals of a good system is scalability, data consistency, and timeliness. The primary host of most of our services will be through AWS. AWS allows us to have accurate responses in a timely manner and also has a great auto-scaling feature that allows for our system to handle differing amounts of users with a CDN. The overall architecture would consist of Route 53 or some other CDN paired with a EC2 layer that contains the frontend. That frontend would route to another EC2 that contains our backend written in Flask that can communicate with our DB, S3 Buckets, or our ML App. First of all this adds an extra layer of security because all of our data will be on a virtual network and also allows us to decentralize our model and handle thousands of users. The cost of this won't even be too bad with student credits. Overall, AWS allows us to pair a bunch of features with our application which can allow us to reach our functional goals.