



# COSC 4P02

Software Engineering II

## Progress Report

March 5th, 2023

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### Group Members

Parth Bhaveshbhai Patel	Product Owner/Developer	pp19oo
Akshar Patel	Product Owner/Developer	ap18zr
Naitik Hareshbhai Chovatiya	Scrum Master/Developer	nc18us
Aum Pandya	Developer	ap19xt
Anishka Shetty	Developer	as18cq
Darshakkumar Bambharoliya	Developer	db18hn
Sneh Patel	Developer	sp18oo

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## Introduction:

Museums are a center for showcasing a variety of artifacts proven to hold historical, cultural, or artistic importance. For many decades, these museums have provided the same general experience of visitors being able to walk around the center and view the exhibits on display. With the many evolutions in technology, our group found that a typical museum experience can be significantly improved, especially for newer generations by adding a technological aspect to the museum. Thus, leading to our project idea of creating an Augmented Reality app that allows visitors to scan the museum's artifacts and view a summary of the piece, additional information, and accessibility features such as speech all from their own device. This app would be especially of interest to newer generations as they are increasingly involved with technology, as well as people with disabilities who would benefit from the accessibility features. Overall, the main objective of our AR project is to improve the experience of visiting museums by adding a technological feature to correspond with the evolutions in technology to date.

Our team consists of seven Computer Science students holding different project roles including a Scrum master as well as product owners, developers, and testers. We are following the Agile method in developing the described product.

## User Stories:

- As a user, I want to be able to look at museum artifacts on my mobile phone so that I can have more information about the artifacts.
- As a user, I want to have audio descriptions of every object so it is easier for me to understand the history of that artifact better.
- As a user, I want to have a visually aesthetic user interface and simple app so that I can use it easily.
- As a user, I want to take pictures of what I see in the app so that I can see it afterwards and also share it with others.
- As the museum manager, I want the app to have a link to our museum website so that users can have more information about the museum and also donate to the museum's cause.
- As a manager, I want the app to be kids friendly and also usable by the older visitors so everyone can enjoy it.
- As a manager, I want the app to be accessible so everyone can feel inclusive.
- As a museum manager, I want the app to respect the user's privacy and follow the museum's ethical guidelines.
- As a manager, I want the app to be downloadable to all our visitors so everyone can enjoy the app.
- As a manager, I want the app to represent all events factually so that wrong information is not displayed to the users.

## Progress Summary:

Over the past few weeks, our team has made notable progress in developing the app for the NOTL museum. Initially, we focused on setting up the development environment and designing the flow of the app. In the first meeting/sprint planning meeting, we decided to work with React Native and ARkit. Thus in the first sprint, we bootstrapped the skeleton app and the team set up the development environment for React Native on their computers. We also set up our GitHub organization, Slack, and Notion workspaces during this week. Moving on to sprint 2, our team visited the NOTL museum to get a general idea and gather more information and user stories from the staff of the museum. Following the visit, we started creating a product backlog using Notion workspaces, our primary tool to manage our product/sprint backlog and user stories.

But following sprint 2, during the sprint retrospective meeting, after serious discussions our team realized that it is nearly impossible to implement the app as we planned using React Native and AR-kit. Thus, we decided to move over our development to Unity 3D. Using Unity 3D, we can utilize the power of Unity with AR Foundation, XR, and ARkit for iOS and make the development process faster and make the app more functional.

Moving quickly from React Native to Unity, we bootstrapped a skeleton AR app in Unity and had the development environment set up on every computer. We successfully integrated AR-kit and Unity to create a seamless AR experience for the app. In sprint 3, after setting up the development environment, each team member was assigned a task to get to know unity better and create an initial version of the app. We successfully created a main menu for the app and made some progress in the core functionality of the AR components of the app. There were some hurdles during this sprint which will be discussed further in the "Key Issues and Challenges" section of this report.

The following pages show the breakdown of our sprints and backlog completed/attempted during those sprints:

**NOTE: After working with React Native and ARKit, there were considerable issues with compatibility and integrability, so after careful consideration, the team decided to switch the development to Unity after sprint 2. Thus restarting the whole development from sprint 3.**

## Sprint 1

+ New	+ New	Tutorial - git/github Tutorial - React Native/TypeScript + New
+ New	+ New	Tutorial - git/github Tutorial - React Native/TypeScript Create and setup Notion workspaces Set up github Scan museum for trigger surfaces + New
+ New	+ New	Tutorial - git/github Tutorial - React Native/TypeScript + New
+ New	+ New	Tutorial - git/github Tutorial - React Native/TypeScript + New
+ New	+ New	Tutorial - git/github Tutorial - React Native/TypeScript Create UI mockup on figma + New
+ New	+ New	Tutorial - git/github Tutorial - React Native/TypeScript Create UI mockup on figma + New
+ New	+ New	Tutorial - git/github Tutorial - React Native/TypeScript Create a system diagram Setup slack for team communication Create and setup Notion workspaces Set up github Scan museum for trigger surfaces + New
+ New	+ New	Tutorial - git/github Tutorial - React Native/TypeScript + New

## Sprint 2

User	New Tasks	Completed Tasks
anishka shetty	+ New	+ New Tutorial - Unity
Akshar Patel	+ New	+ New Progress report 1 Tutorial - Unity Create product/sprint backlog Visit museum
Aum Pandya	+ New	+ New Tutorial - Unity Visit museum Put avatar in 3d scanned environment
Naitik	+ New	+ New Progress report 1 Tutorial - Unity Create presentation for meeting Visit museum
Darshak Bambharoliya	+ New	+ New Tutorial - Unity Visit museum
parth patel	+ New	+ New Progress report 1 Tutorial - Unity Create product/sprint backlog Visit museum Set animation boundaries and scaling based accessibility settings
Sneh Patel	+ New	+ New Tutorial - Unity Visit museum

## Sprint 3

**Anishka Shetty** 3 ... +

- + New
- Text-to-speech
- + New
- Popup card basic functionality - minimize, expand, open, close
- + New
- Create popup card template
- + New

**Akshar Patel** 5 ... +

- + New
- Battleground Scene - Create terrain for battle scene in unity
- + New
- ImageTracking Manager/Script
- Visit museum to get user requirements
- Gun Scene
- + New
- Set up development environment for Unity

**Aum Pandya** 2 ... +

- + New
- + New
- Create 1-2 basic poster ideas for the app
- Battle of Queenston Heights
- + New

**Naitik** 5 ... +

- + New
- Battleground Scene -Create 3d Models for soldiers for battle scene
- + New
- Visit museum to get user requirements
- Create 3d model
- Main menu/ UI for App
- Create markers and triggers on scanned 3d model
- + New

**Darshak Bambharoliya** 7 ... +

- + New
- Battleground Scene -Create 3d Models for soldiers for battle scene
- + New
- Visit museum to get user requirements
- Take photos of the museum
- Issac Brock Statue, Hat, display
- + New
- Create 3d model
- Teapot and Utensils
- Create markers and triggers on scanned 3d model
- + New

**Parth Patel** 7 ... +

- + New
- Battleground Scene - Create terrain for battle scene in unity
- + New
- Visit museum to get user requirements
- Take photos of the museum
- Issac Brock Statue, Hat, display
- + New
- Set up development environment for Unity
- Main menu/ UI for App
- Configure triggers for animation
- + New

**Sneha Patel** 2 ... +

- + New
- + New
- Create a startup animation and user-interaction script
- Create 3D Models for the Following Artifacts: Powder Flask and Horn, Canteen and Axe
- + New

## Sprint 4

The image shows a digital project board with the following data:

Team Member	Not Started	In Progress	Done
anishka shetty	0	2	3
Akshar Patel	2	0	0
Aum Pandya	2	0	0
Naitik	1	0	0
Darshak Bambharoliya	3	0	0
parth patel	2	0	0
Sneh Patel	2	0	0

Tasks listed on the board:

- anishka shetty:**
  - + New
  - Pop-up Cards for Artifacts (Mar 8)
  - Text-to-speech (+ New)
- Akshar Patel:**
  - + New
  - Battleground Scene - Create terrain for battle scene in unity
  - Gun Scene (+ New)
- Aum Pandya:**
  - + New
  - Pop-up Cards for Artifacts (Mar 8) (+ New)
- Naitik:**
  - + New
  - Battleground Scene -Create 3d Models for soldiers for battle scene (+ New)
- Darshak Bambharoliya:**
  - + New
  - Battleground Scene -Create 3d Models for soldiers for battle scene
  - Teapot and Utensils (+ New)
  - Issac Brock Statue, Hat, display (+ New)
- parth patel:**
  - + New
  - Battleground Scene - Create terrain for battle scene in unity
  - Issac Brock Statue, Hat, display (+ New)
- Sneh Patel:**
  - + New
  - Battleground Scene - Add Water/ rain and mud effects to the unity scene (+ New)
  - Create 3D Models for the Following Artifacts: Powder Flask and Horn, Canteen and Axe (+ New)

## Key Issues and Challenges:

- There was a big learning curve for everyone on the team, so a considerable amount of time was spent learning React Native/TypeScript in the initial sprint.
- After switching the development to Unity, there was another learning curve for all team members and more time was spent on learning Unity in sprint 3.
- All of the members are Computer Science majors with no prior experience in 3D art or animations which is a setback as the majority of the application requires us to create 3D art models of the museum's artifacts.

## Risks and Mitigation:

### Potential risk factors

#### Risk #1: Technical issues:

- Compatibility issues while developing the app on different devices and platforms.

#### Risk #2: Ethical issues:

- It is important to take care of the user's privacy and agreement. The goal of the AR app is to enhance the user's experience and engagement with the use of 3D artifacts; however, it is also important to consider supporting the museum's policies, goals, and regulations.
- As the AR app requires 3D scans of artifacts, we will make sure that the AR app follows the ethical guidelines of all artifacts that we are going to use for our app. We will also make sure that replicated artifacts (3D objects) represent the actual artifacts and their factual information, and attempt to avoid any misinformation.
- Our development method required the use of some online assets which require appropriate acknowledgement of intellectual property and citations.

### Mitigation

To mitigate the above risk factors,

- The AR app is not collecting any users' information without their consent. As developers, we are also making sure that we will not disrespect the museum's policies, guidelines, and agreements.
- Since we are working with museum artifacts, our app will follow the museum guidelines to represent the 3D model of the artifacts and use factual information.
- Additionally, we will make sure that the online 3D models we used (if needed) will be cited properly and acknowledge the original authors/creators of the model.

## Tasks Completed:

Aa Task name	Status	Assign	Due	Sprint
Create markers and triggers on scanned 3d model	Done	(N) Naitik (D) Darshak Bambharoliya		Sprint 3
Set animation boundaries and scaling based accessibility settings	Done	(P) parth patel		Sprint 2 (React)
Scan museum for trigger surfaces	Done	(P) parth patel (A) Akshar Patel		Sprint 1 (React)
Configure triggers for animation	Done	(P) parth patel		Sprint 3
Put avatar in 3d scanned environment	Done	(A) Aum Pandya		Sprint 2 (React)
Image Tracking for displaying 3D model	Done	(N) Naitik		
Teapot and Utensils	Done	(D) Darshak Bambharoliya		Sprint 3 Sprint 4
Battle of Queenston Heights	Done	(A) Aum Pandya		Sprint 3 Sprint 4
Basic Walking, Stopping, Waving 3D model	Done	(A) Aum Pandya		Sprint 3
Create 1-2 basic poster ideas for the app	Done	(A) Aum Pandya		Sprint 3
Create 3D Models for the Following Artifacts: Powder Flask and Horn, Canteen and Axe	Done	(S) Sneh Patel		Sprint 3 Sprint 4
Create a startup animation and user-interaction script	Done	(S) Sneh Patel		
Create presentation for meeting	Done	(N) Naitik		Sprint 2 (React)
Create product/sprint backlog	Done	(A) Akshar Patel (P) parth patel		Sprint 2 (React)
Visit museum to get user requirements	Done	(P) parth patel (A) Akshar Patel (N) I		Sprint 3
Take photos of the museum	Done	(D) Darshak Bambharoliya (P) parth p		Sprint 3
Visit museum	Done	(N) Naitik (A) Akshar Patel (P) parth		Sprint 2 (React)
iPad UI	Done			
Create UI mockup on figma	Done	(D) Darshak Bambharoliya (N) Naitik		Sprint 1 (React)
Create a system diagram	Done	(P) parth patel		Sprint 1 (React)
Setup slack for team communication	Done	(P) parth patel		Sprint 1 (React)
Create and setup Notion workspaces	Done	(P) parth patel (A) Akshar Patel		Sprint 1 (React)
Set up github	Done	(P) parth patel (A) Akshar Patel		Sprint 1 (React)
Set up development environment for Unity	Done	(A) Akshar Patel (P) parth patel		Sprint 3
Progress report 1	Done	(A) Akshar Patel (P) parth patel (N) I		Sprint 2 (React)
Popup card basic functionality - minimize, expand, open, close	Done	(A) anishka shetty		Sprint 3
Create popup card template	Done	(A) anishka shetty		Sprint 3

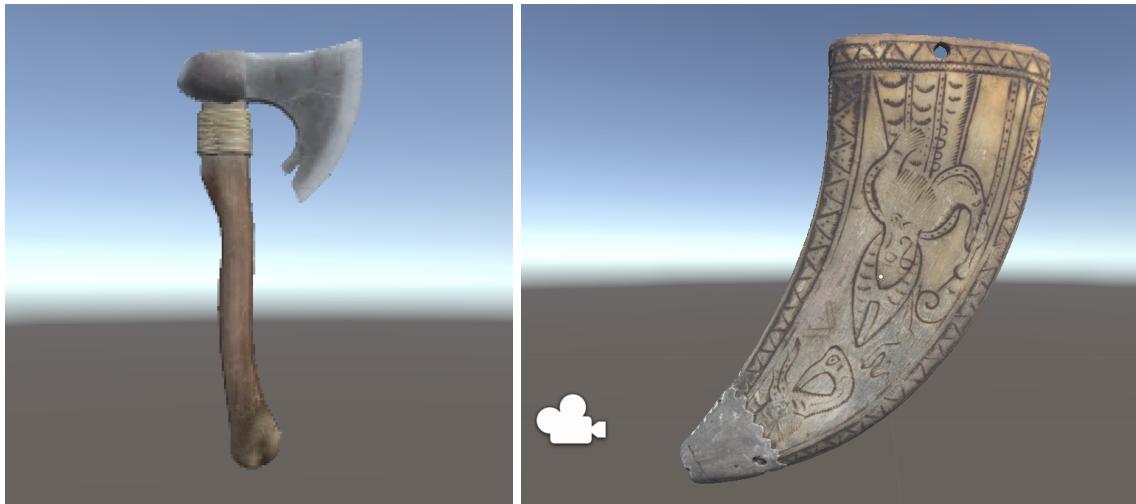
As we are now approaching our fourth sprint for this project, there has been significant progress made to date. Due to issues with our initial selection of tools including React Native and ARKit, our team had to restart the learning and development process in the third sprint as we switched to Unity. However, being aware of the deadlines and tasks required to be completed, we picked up additional work to catch up and get to the point we needed to be at. Key tasks completed to the date shown in the above screenshot are summarized below:

- Created the product backlog and set up Sprint deadlines and meetings
- Set up our individual development environments including completing software installations (Unity, Xcode)
- Figma mockups for user interface
- Learned to use the required tools and software (GitHub, Slack, Notion, Unity)
- Set up the AR app - Main menu, user interaction scripts, animation boundaries, and scaling based accessibility settings
- Visited the museum to determine user requirements and take photos of the artifacts needed

- Added object recognition to detect museum artifacts on the app - the basis of the app
- Created 3D Models for the artifacts including Powder Flask and Horn, Canteen, and Axe (using Blender, Agisoft, MeshLab)
- Created the template of the popup cards required to appear when an artifact is detected by the user's camera.

Screenshots from our app and the objects/models we plan to use in the app are shown below:





## Tasks in Progress:

A Task name	Status	Assign	Due	Sprint
Text-to-speech	In Progress	anishka shetty		Sprint 3 Sprint 4
Gun Scene	In Progress	Akshar Patel		Sprint 3 Sprint 4
Issac Brock Statue, Hat, display	In Progress	parth patel Darshak Bambharoliya		Sprint 3 Sprint 4
Pop-up Cards for Artifacts	In Progress	Aum Pandya anishka shetty	March 8, 2023	Sprint 4
Battleground Scene -Create 3d Models for soldiers for battle scene	In Progress	Darshak Bambharoliya Naitik		Sprint 3 Sprint 4 Sprint 5
Battleground Scene - Add Water/ rain and mud effects to the unity scene	In Progress	Sneh Patel		Sprint 4 Sprint 5
Battleground Scene - Create terrain for battle scene in unity	OPEN	parth patel Akshar Patel		Sprint 3 Sprint 4 Sprint 5

As a result of changing tools from React to Unity, many of our Sprint tasks have been carried forward to the Sprint 4, the current sprint. As shown in the above screenshot, we are currently working on an accessibility feature - text-to-speech, realistic displays of the gun scene, the battleground scene, as well as the individual pop-up cards for each artifact. Majority of these tasks are planned to be completed by the end of this sprint, with some being continued to the next.

## Future Work:

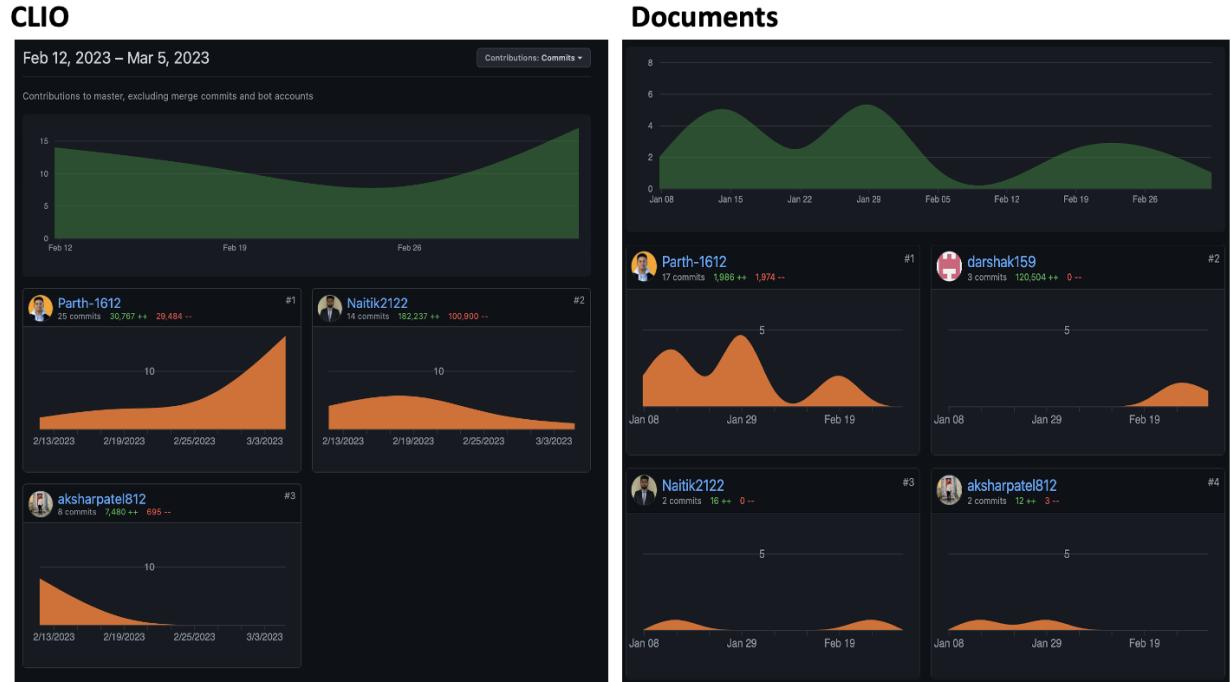
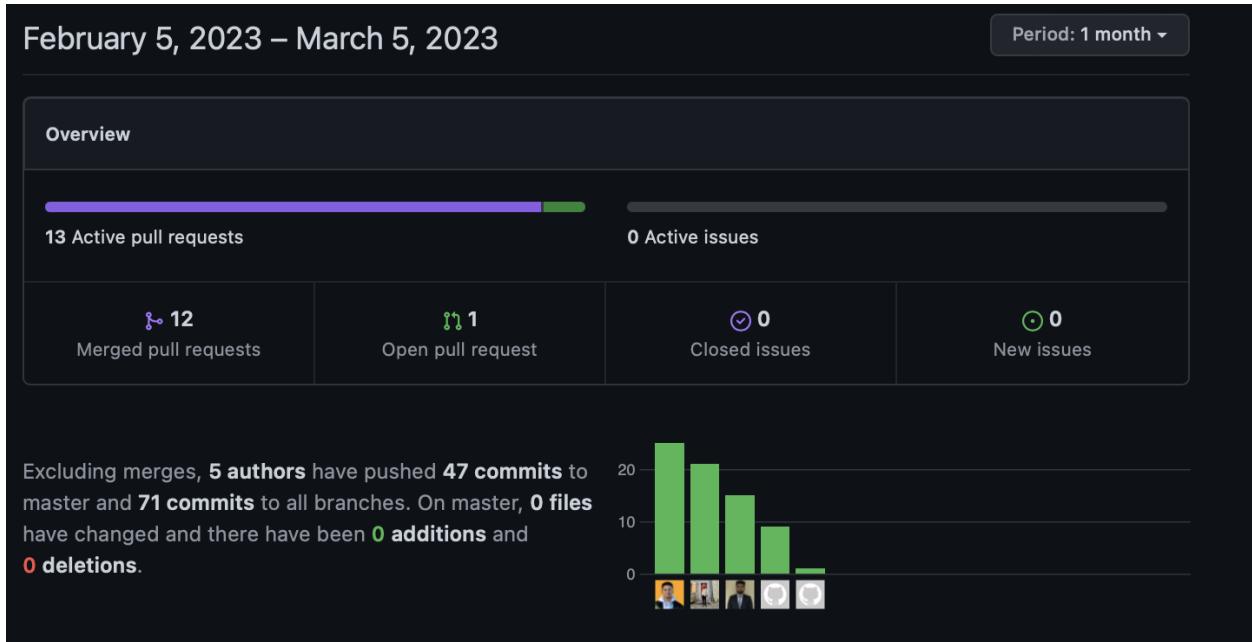
- Adding the following features:
  - Audio description/Text-to-speech
  - Museum map/navigation
  - Option to change font size/high contrast fonts
  - Option to take photos of the museum as they see it from the app (Including the AR objects)
- Take scans of all artifacts needed for the app and create 3D models
- Create a user feedback form and put it at the end of the tour, and create a way to utilize that data in order to improve the app in future.
- Create a voice model of the museum curator to use in the text-to-speech feature.

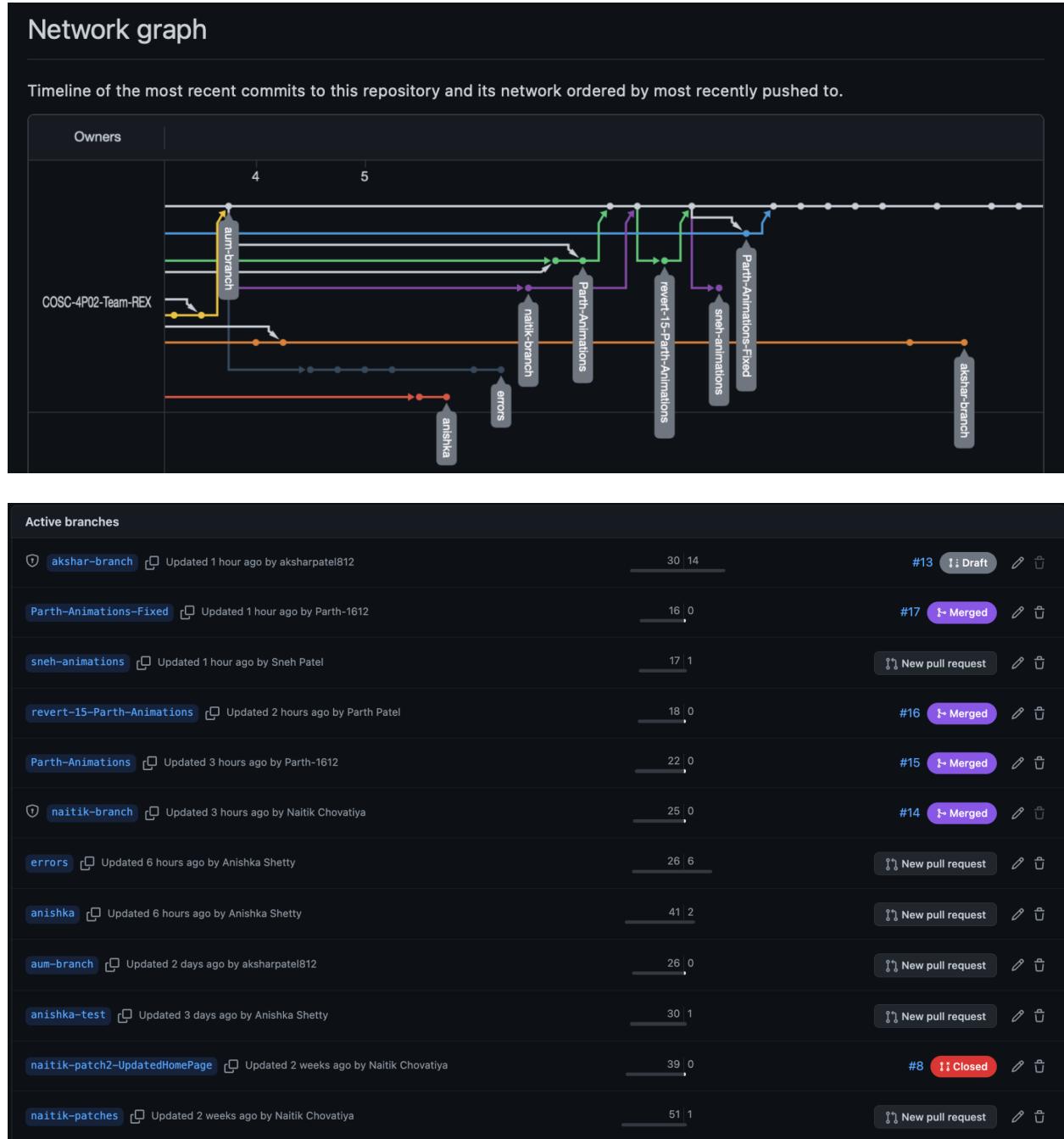
## Conclusion:

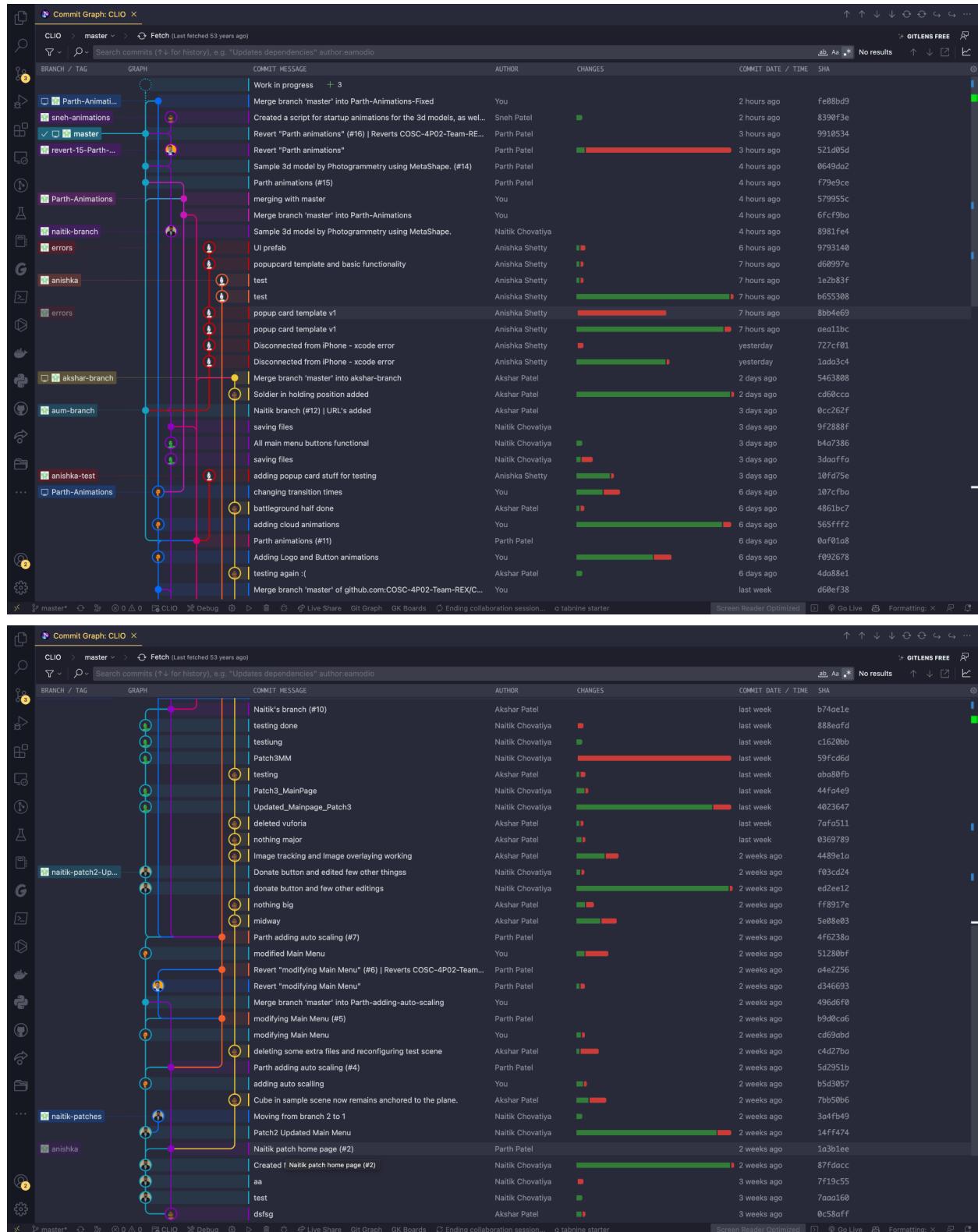
In conclusion, so far we have completed the majority of the UI (user interface). We have created a way for users to scan and track the artifacts in the museum using the ARKit in Unity. This allows us to recognize the different artifacts, where we can later add animations of 3D models of the artifacts. We have also started creating a few of the 3D models, and animations, as well as a way for users to interact with the models. This project's main objective is to create an app where users can scan the artifacts in the museum and bring the history to the present. We accomplish this by using AR technology to make the artifacts come to life on each individual's device. For future work we are going to focus more on the war of 1812, we want to create more models revolving around the war and create an animation to tell the story of Sir Isaac Brock by Sir Isaac Brock himself. We are also going to add voices for the artifacts for the people that have difficulties reading. In the future, we also want to expand the information provided by the museum. We plan on doing this by researching on our own to provide more insight into the artifacts.

## Github Logs:

Link for our Github Contribution: <https://github.com/COSC-4P02-Team-rex>







onishka						
	changing Builds	You	3 weeks ago	6dce795		
	changing Builds	You	3 weeks ago	1369982		
	Added Sample scene in Build Settings	Akshar Patel	3 weeks ago	977c4d8		
	added plane detection	Akshar Patel	3 weeks ago	6263289		
	testing1	Akshar Patel	3 weeks ago	a110b76		
	Added readme	Akshar Patel	3 weeks ago	69d4ada		
	Create_Setup_Instructions.md	Akshar Patel	3 weeks ago	5398add		
	Initial commit	Akshar Patel	3 weeks ago	a02e0db		