Forest Frames

Capstone Presentation

Mentor

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Problem Statement

Rural and more isolated parts of the world are more likely to experience degradation of its biodiversity due to a lack of conservation efforts.

- Less reported on areas due to a lack of funding or resources
  - Malaysia, Kenya, Colombia

- Citizens are not incentivized or lack resources to be collecting data themselves

Dr. Camille Gaillard

Dr. Chris Doughty

Solution Overview

Our solution is a mobile app that is easily available to citizens in these areas.

- Our app will allow users to upload gathered data to our server, where it will be verified through existing methods and stored in our database

- The app collects coordinates from the NASA GEDI Satellite to show acceptable areas for users to collect data. Users are guided to data collection sites using a built in map interface.

Dr. Duan Biggs

Dr. Jenna Keany

Key Requirements

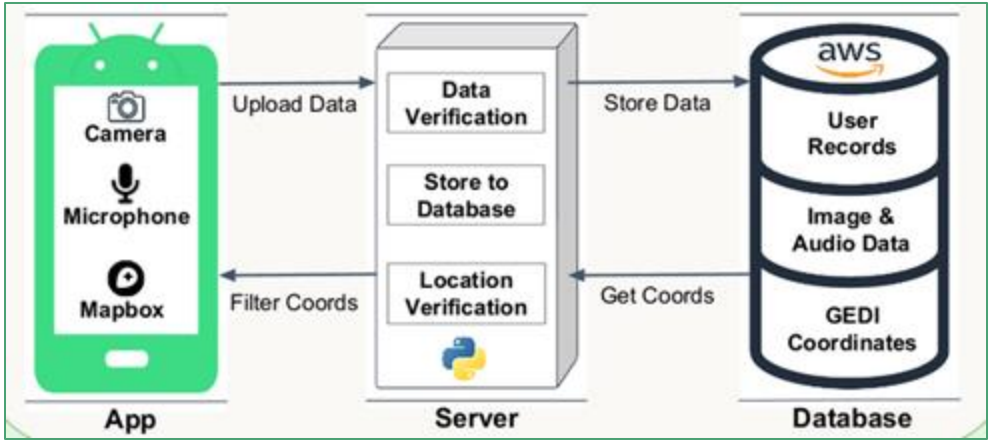
Map-Oriented:

- Provide coordinates for users to go to
- Help users navigate to a coordinate
- Verify location of user

Collection-Oriented:

- Allow user to collect specific data at a coordinate
- Verify images of animals through detection/classification
- Store user-collected data

Implementation Overview



- App - Frontend
  - Collecting data natively (Kotlin)
  - Offline mapping functionality (Mapbox)
  - User authentication
  - Simple and accessible UI
- Server & Database - Backend
  - Data processing (request handler, password encryption)
  - Verification of animals in image data (Pytorch Wildlife)
  - Database storage:
    - User info/login
    - User-collected data (images, audio, tree count)
    - Image verification statuses
    - Coordinate info

Demo


11:26
81%
Welcome testuser1000
Account/ Settings
Go to map
Upload/verify
Gather Data

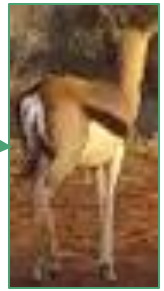
Implementation - Server

Animal Verification For Images

Wildebeest, 99.87%

Guineafowl, 51.09%

*Any percentage below threshold is deemed unverified



Gazelle (Thompsons), 95.12%

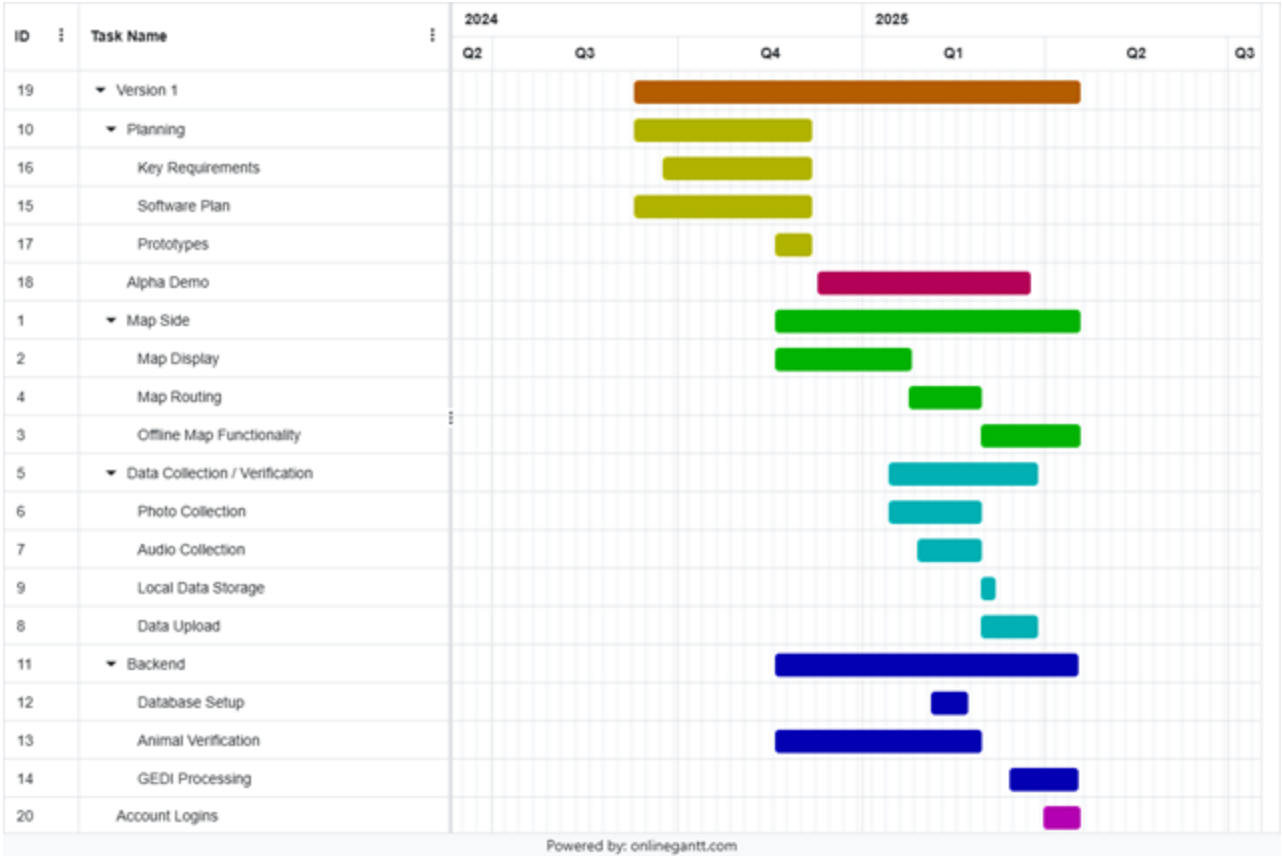
Wildebeest, 99.58%

- Module allows for new verification tools to be used and easily implemented

Implementation - Database

- Amazon RDS stores:
  - User data
  - Photo, audio, and tree metadata
  - Gedi coordinates
- Amazon S3 Bucket:
  - Stores all images and audio
- RDS and S3 are frequently updated and checked to be in sync with each other
- Each user has an id which allows the server to locate all data associated with them

Project Timeline



- Finished up version 1 development and integration testing
- Currently field testing before deployment and handoff in a few weeks

Testing Plan

- Unit Testing: App
  - Location authentication, image saving, coordinate display
- Unit Testing: Backend
  - Request handlers, animal image verification
  - Coordinate import, coordinate filtering, user creation
- Integration Testing
  - Using mock versions of app requests, server, and database
  - Test responses of the HTTP requests between the server and app
  - Ensuring proper data transfer between server and database
- Usability Testing
  - Unguided ease of use of app
  - Readability of backend logs

Handoff & Future Work

All code and app/server deployment management will be transferred to clients

Clients will be using this in the field and sharing with their colleagues to collect data

Future Work:

- Additional Verification
  - Animal Sound Verification, Plant Image Recognition (INaturalist)
- Streamline Data Sharing
  - Create an efficient way of providing researchers with our collected data
- Various Hardware Testing
  - Testing the app on different types of phone hardware

Closing

- Our app will improve the accessibility of ecological citizen science to many areas unable to participate in it previously
- Engagement with the app will result in conserving biodiversity in the regions that need it the most
- The team is currently conducting field testing before deployment and handoff

Thank you