CMSC451 - CS22-308
Project Proposal

Real-time data collection for effective post-pandemic mobility management

Problem Statement/Introduction

1. The goal of this project is a pandemic management architecture that would model the uncertainty in human behavior, by leveraging the multimodal socioeconomic, demographic, clinical and epidemiological data at our disposal. To be effective, its recommendations must be customized to the audience. For instance, the law-enforcements would be notified about the timing, extent and logistics for travel policies and resource allocation, whereas the citizens would receive timely, personalized advice on mobility, immunization, etc. There is little doubt that COVID-19 is not the last pandemic of our lifetimes, and its management is intrinsic to future public policymaking, in order to guard against the horrors of mass suffering and deaths the world has witnessed since 2020.

Business and Functional Requirements

1. A mobile app that tracks its user's location, allows the user to define their infection status, and visualizes the gathered data, and recommends a route that minimizes contagion, utilizing machine learning algorithms.
2. A webpage that visualizes user location data in the same fashion as the app.
3. Mobile app communicates with an external database to store user data.
4. A server hosting RL/Clustering algorithms using user latitude and longitude data to make clusters and designate safe locations and routes of travel.

Discussion

Work on the project will be conducted Agile-style; tasks and deliverables will be assigned or revised at every regularly scheduled meeting.

Adam Harms and Joshua Burroughs will be collaborating to program and deploy the application portion of the project. The app will be written using the React Native JavaScript framework and the Expo development framework. It will be available both on IOS and Android and will record location data at user-specified intervals and store this data in an external database using Firebase.

Smeet Ghelani and Pratham Choksi will be implementing Clustering and Relational learning using Python and algorithms worked on by Roy and Preetam to build an accurate route that is safest for travel to avoid infection. This will be used in conjunction with the app to visually show the user where they should go to avoid spreading infection and avoiding infection.

Application Portion Milestones:

- External database hosted and successfully integrated with the mobile app
- Secure background-location tracking permissions
- App circulated among small group of users for beta-testing
- App successfully hosted on the Apple App Store and Google Play store
- Implementation of Clustering and RL to accurately determine safe areas and routes of travel

Stakeholders

Costs

- 1-2 Apple Developer Subscriptions (99$ each)
- Time
    - Working prototype expected by December 2022
    - Revision and optimization planned from January-March 2023
    - Demo planned for April 2023
- Potential database storage subscription cost
- Potential web hosting cost

Resources

Personnel:

Preetam Ghosh: pghosh@vcu.edu
Satyaki Roy: satyakir@unc.edu

Equipment:

Personal computers
(For development, an Apple Macintosh machine is specifically required to push beta testing releases with Xcode.)

Conclusion

The app will use a combination of location tracking and machine-learning clustering algorithms to offer mobility scheduling that minimizes contagion in a pandemic scenario. Users can view their location data at any time via the mobile app and can freely modify the app's location tracking settings. A webpage offering data visualization will also be created. The mobility scheduling will come from the Clustering and RL algorithms and will effectively work with the app to provide the safest routes of travel.

Contacts

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