POP
COVID Detection - Team 06

Overview

Due to the impact of the novel coronavirus (COVID-19), everyday actions like shopping for groceries, visiting the library, and going to restaurants have taken on a new level of risk. In response, the market has created a number of tools to help people navigate the new way of life onset by the virus, including contact tracing phone applications, grocery store delivery services, and even sensors that alert people when they're about to touch their face. While tools like these provide services and tips on how people as individuals can stay safe, those efforts are undermined and minimized by the unsafe actions of others. With severely limited information about how others publicly behave amid the pandemic, how can anyone make smart decisions about their outings?

We created POP to serve as a one-stop shop for all things COVID-19, where we pull data from established sources and users alike to provide the best and most accurate information wherever and whenever you need it. POP consists of five primary features: the COVID-19 Forecasting Dashboard, the Population Density Tracker, the U.S. State-wise Policy Checker, the COVID-19 Daily News, and Help Resources. Using these tools, users can learn about the current safety of states, counties, and even businesses to inform their daily decisions.

Team Members

Alex Peterson (Rising Third-Year, Computer Science & Professional Writing @ Purdue)
Alex worked with Nick to bring maps to the Population Density Tracker in POP, offering the safety reporting system and search capabilities. He also guided user testing for POP and wrote the abstract on behalf of the team.

Nick Ceglio (Rising Junior, Computer Science @ Ball State)
Nick hails from Indianapolis, IN and worked with Alex to develop the map functionality of POP. Nick was also tasked with recording and editing together the group's presentation.

Erica Gregg (Rising Junior, Applied Mathematics & Computer Science @ Purdue)
Erica has been responsible for creating the contents in the About Us, Find a Testing Center, Health, and Contact tabs in the menu bar. She also came up with POP's name and logo. As the project manager, Erica has been in charge of scheduling and leading team meetings as well as contributing to the Environmental Analysis and Customer Profiles.

Connor Krehbiel (Rising Senior, Biomedical Engineering @ IUPUI)
Connor is from Fishers, IN and worked with Erica and Sudip to develop the Value Proposition Map, Business Model Canvas, and the Environmental Analysis for this project. Connor was also involved in the development of the slide deck used for the final presentation.

Moya Zhu (Rising Senior, Applied Statistics & Data Science @ Purdue)
Moya comes from Beijing, China and she developed the Policy Checker by collecting states' social distancing policy and visualizing it into interactive geomaps. Moya also created the base user interface template for the app and implemented all features into the app.

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Sudip Padye (Second-Year Grad Student, Data Science @ Indiana University, Bloomington)
Sudip hails from Mumbai, India and has been working on the COVID-19 forecasting by analyzing statistical trends in the Indiana counties. He created the COVID-19 News feature where he used web-scraping to display headlines with the Google News API. In addition, Sudip also provided insights in the go-to-market meetings by designing the business plan and model.

How did you decide on this customer segment, problem, and solution?

After conducting an environmental analysis on industry, market, and macro-economic forces, we decided that we wanted to target a wide group of customers by tackling a problem that many are facing. While we had considered the idea of creating a mobile app, this idea did not go far because we did not want to limit our potential user base to one variety of phone. In order to create a product that is easily accessible to many people, we decided on pursuing a web-based product so that it could be accessed from computers and mobile devices alike.

With the style of our application in place, our team began thinking about what problems we could alleviate. We knew that we wanted to address a common problem to again not limit our user base to those facing highly specific issues. This meant we had to think broadly, and our team came up with the following issues:

- It is hard to know when you've encountered someone who has tested positive for COVID-19, especially if that person is a stranger.
- Many new products and solutions task others with risking their health to cover the necessities of those sheltering in place (grocery shopping, restaurant orders, etc).
- In case of a reason to leave, it is difficult to know if the destination is safe or if recent visitors have been adopting strong safety practices.

Our team settled on determining the safety of businesses and locations in the area. What eventually became POP started as an idea for a population density tracking application that could potentially use Bluetooth for mobile contact tracing. We found that we liked the population density tracking idea, but that a contact tracing product of that style was maybe beyond our development timeframe and that we might want to pursue other options, which led us to our iterative design process.

How did your team build and iterate on the solution?

POP development began with simple prototypes for the component all created separate from one another. Our team met together to critique the ideas conveyed through the low-fidelity prototypes to brainstorm ways to take the idea and integrate it into our progressive web application. This process repeated as the features developed, just with increasingly higher-fidelity versions of those same implemented features.

For example, while POP originally started as a population density tracker, we decided to expand our horizons by adding COVID-19 forecasting. The forecasting feature began as a picture of Indiana with labeled counties and a drop-down menu that allowed the user to select the name of their desired county, pulling up graph information for the next-day forecast. We iterated upon this idea several times, beginning by forecasting the number of COVID-19 related deaths by county, the number of tests administered by county, and a forecast that looks five days ahead for each category. Further

along in the development process, we found the interface to be clunky and, in response, implemented an interactive map of Indiana by county that allows the user to tap or hover over each county to get relevant forecasting information, making the information more palatable and easy to navigate. By combining user feedback and developer testing throughout the entirety of the iterative design process, our team was able to implement intuitive adjustments to make the app more simple to navigate. The same process was applied to the other components included within the app.

Key Metrics
Customer and User Feedback:
- 7 User Tests
- 4 Customer Interviews
- 100% User Experience Rating from User Tests

Forecast Network:
- Epochs Trained: 1500
- Neural Network Accuracy: ~95%

Technical Architecture
The repository for POP can be found at https://github.com/peter536/Product_Team06. Specialized information about the app and its features can be found in the README in the repository.

Progressive Web Application Architecture Diagram for POP:
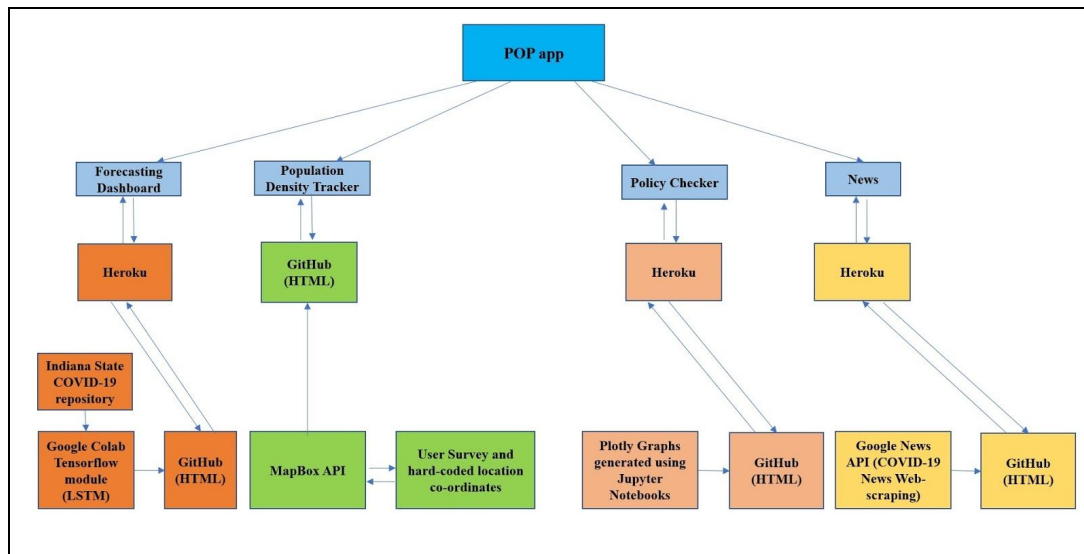
Key Tools, Libraries, and Frameworks
- **Google News API** - We chose Google News API for our COVID-19 Daily News feature because our team found that it's one of the best options available for filtering news articles for the purposes of our feature. This tool allowed for us to quickly and easily implement our Daily News feature, allowing us to focus on our other areas without as much distraction.

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- **MapBox API** - Cost was the primary factor our team took into account when building off of a map API. Google Maps is rather costly, while MapBox is free to use until we hit a relatively high number of API requests. This made it excellent to develop and prototype with.
- **Plotly** - This tool allowed for us to make readable and clear graphs for our COVID-19 Forecasting on the Dashboard and Policy checker. Our developers were already familiar with this tool, so we used that familiarity to help our efficiency.
- **Tensorflow 2.0** - Tensorflow 2.0 is a standard neural network library for Python. A couple of our developers have experience with Tensorflow 2.0, so we used that familiarity to more efficiently construct the models for the forecasting feature on the Dashboard.
- **Materialize** - Materialize was used to style the pages of our progressive web app more easily.
- **Bootstrap** - Bootstrap was used to format and transit templates in our app fluently.
- **Google material.io** - We use this icon library for our menu bar icons.
- **Heroku** - Heroku is a hosting service that allows us to run our application through their cloud, and we used it because it's free for our purposes and allowed us to integrate some trademark features of POP.

If you had another 5 weeks to work on this, what would you do next?

Our team has ambitious plans for future development of both the product end and the business end of POP.

Future development ideas for the product end include:

1) Population Density Tracker
   a) Implement a backend using frameworks like Django to connect the front end of our Population Density Tracker with the location safety reporting system.
   b) Remove the search limits from the prototype and build the reporting system into an existing map search API.
   c) Expand the Population Density Tracker to allow for searches across all of Indiana, and then if given more time, to allow for searches across all U.S. States.
2) COVID-19 Forecasting Dashboard
   a) Expand forecasting from just counties in Indiana to counties in all U.S. States.
   b) Change the interface to become more intuitive to handle the addition of predictions for 49 states' worth of data.
3) Policy Checker
   a) Add more policy branches such as health action and telehealth policy.
   b) Implement a display for policies of regions like counties within each state.
4) COVID-19 Daily News
   a) Change the display of aggregated news sources based on user needs (allow the user to categorize their news feed to news relevant to Students, Medical Professionals, Business Owners, etc).
5) Additional Features/Ideas
   a) Implement language flexibility for POP (translate the app to other common languages spoken in the U.S.)
   b) Implement a section to navigate charities that focus on COVID-19 research or relief
   c) If time permits, revisit and implement the Bluetooth-based contact tracing feature to have running in the background of mobile devices.

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Future development ideas for the business end include:
1) Contacting potential stakeholders to gather letters of intent and investments
2) Implement sponsored promotions in the Population Density Tracker and ad space for increased revenue
3) Develop and execute marketing plans to attract more stakeholders or potential customers
4) Find other uses for the technology used in POP to create a product sustainable after the pandemic, and market the app that way.
5) Use funds to feed back into development and management costs for POP to improve the quality of our services.

Checklist of Completed Items
(by checking the boxes below, you are verifying that the following documents are submitted)

Item	Confirmation of Submission	Explanation if not submitted
Environmental Analysis	✓	
Business Model Canvas	✓	
Value Proposition Canvas	✓	
Customer Persona(s)	✓	