

UTD Asthma Risk Prediction

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Abstract

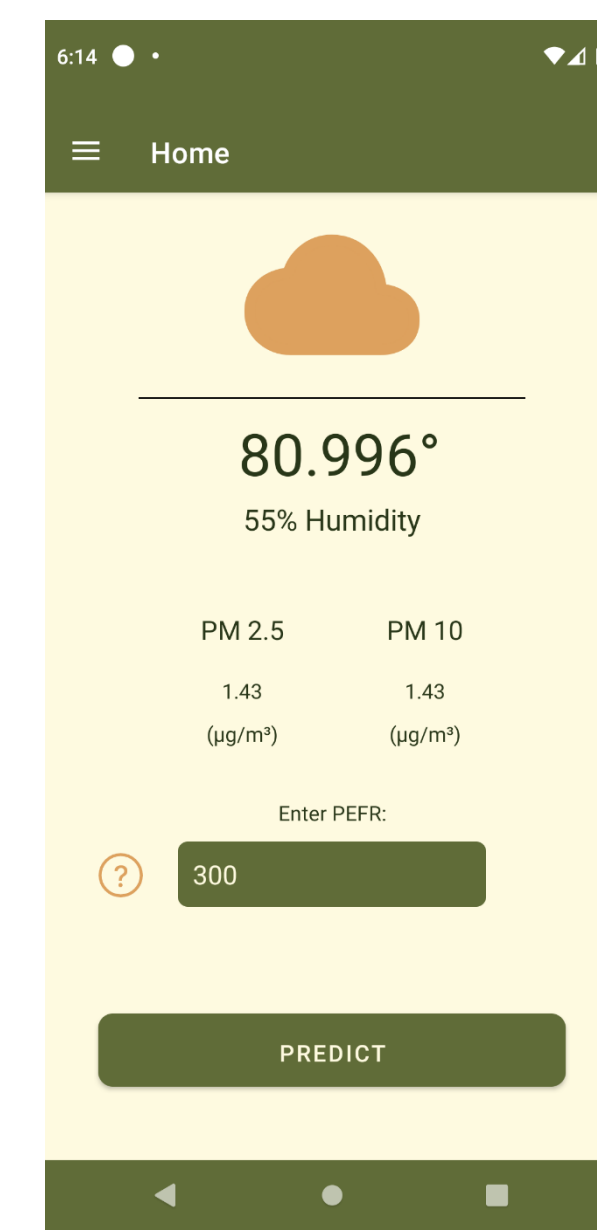
The goal of this project is to create an android app using Gradle that takes information from the user's devices and resources, taken in via Internet-of-Things (IoT), such as an air quality sensor and a personal pocket spirometer, as well as local weather data, and uses a machine learning (ML) algorithm to alert the user in their app when they will become ill and need to take any medication for it. Our team will build a fully functional app interface which will show the peak expiratory flow rate (PEFR), weather conditions, and other air quality determinants to inform the user of risk to their Asthma.

Keywords: Internet-of-Things (IoT), Machine Learning (ML), Peak Expiratory Flow Rate (PEFR)

Results



The user will see this screen when opening the app.



The user gets weather information and PM (Particulate Matter), measure of air pollutant, and enters PEFR value to get predictions.

Architecture

Client application

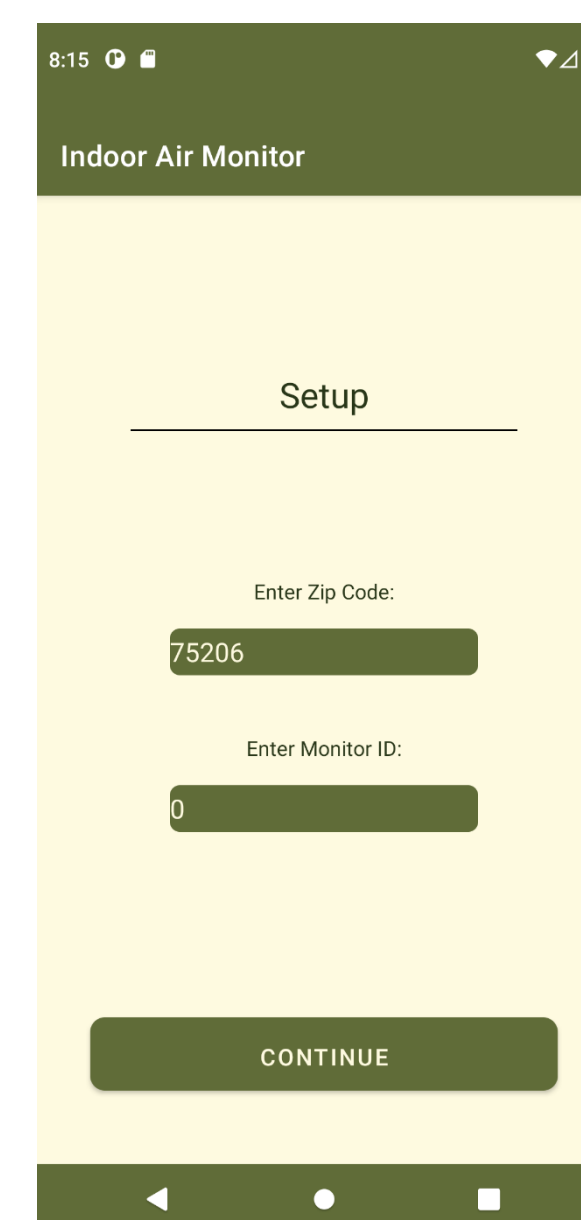
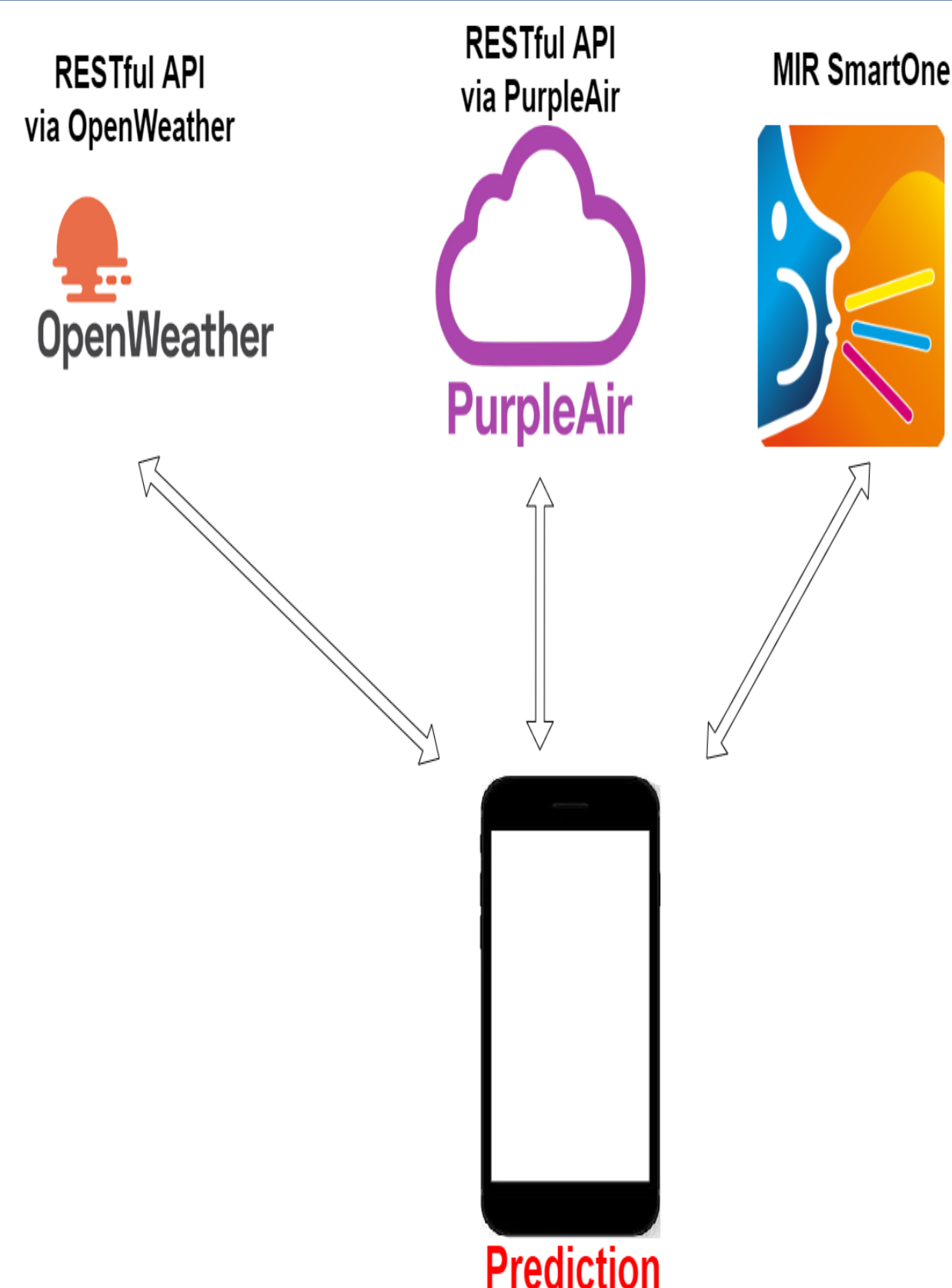
Kotlin application is used to predict Asthma risk for patient. The user is prompted to enter monitor ID, zip code, and PEFR values. The user is allowed to set default for determinants.

Restful API via Open Weather and Purple Air

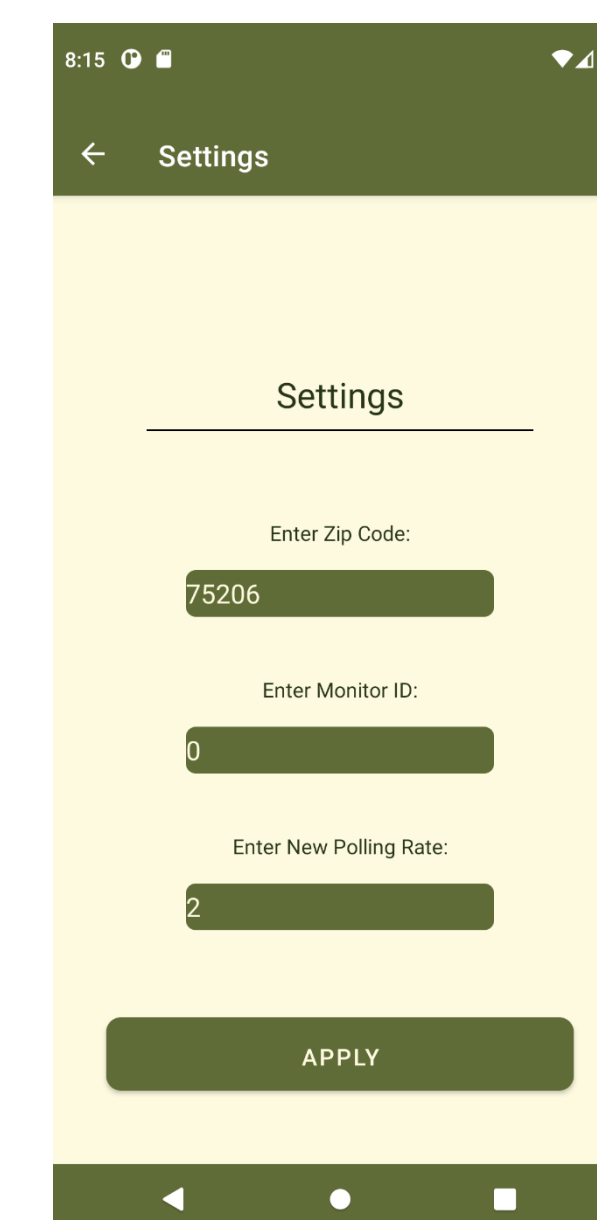
The backend API is built using the web framework for JS. The APIs use RESTful calls issued in JSON format.

SmartOne application

The APP will connect via Bluetooth to a Medical spirometer device. The APP can measure PEFR directly on client's smartphone.



The user enters values for Zip Code and Monitor ID and presses the continue button.



The user updates values for Zip Code and Monitor ID and presses the apply button.

Impact

- User can connect their medical device to the application and receive predictions whether they need medical help to prevent health problems
- Model uses predictive learning to continuously improve behavior and become more efficient and handling illness flare-ups
- Full backend implementation and integration with android mobile applications

Summary

- Implemented a MVVM to improve design and overall clean architecture for the app which helps developers build onto the app with ease
- Developed a functional UI for the app which shows relevant data needed and retrieved from the device
- Installed and registered Purple Air device to measure air quality in an environment
- Integrated Purple Air API to connect and retrieve from the monitor devices
- Updated Open Weather API to collect local weather data that is need for predicting Asthma risk
- Integrated Machine Learning Model into the app for predictive learning

Performance

- Able to predict Asthma risk in less than 1 second
- Objective of updating the app with latest API's and new features was accomplished
- Faculty mentor feedback: goals were met and pleased with work performed this semester
- Weekly task completion rate: 90%
 - Some features were not completely implemented