Climate Change and its Impact on Health

Group No : 13

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Abstract

- Weather patterns across different geographic locations have different seasons which results in different weather parameters resulting in different possible diseases.

- Using this real-world evidence, the objective will be to analyze the data and predict the diseases or epidemic that might occur concerning a particular location and the associated weather patterns. This will help the individual user to make informed decisions and plan better.

- The proposed system will consist of an application where a user can create a login and enter any pre-existing symptoms. This health data will be juxtaposed along with input parameters provided by users like date, location to generate a personalized output detailing the different probabilities of different diseases possible along with some recommendations for the same.

Introduction

- This project aims to build a system that will predict diseases based on weather patterns with relatively high accuracy based on real-world data and provide the user with an application that is simple to use with a user-friendly GUI.

- The GUI will hide the complex working of the system beneath it to provide an easy to operate application and a richer experience for the users. The major role of the application would be to collect the inputs provided by the user and feeding them to the engine which is based on neural networks since they tend to provide better accuracy.

- The engine would do the processing task and return the results which would be then displayed in the application for the user. Also, the system will generate personalized output based on the user's symptoms, as entered in the application by the user.

Introduction

- Predictive analytics is a type of data analytics which is capable of predicting the current trend or patterns, such as the inclination of a large number of customers to a particular product.
- It takes into account the past or historical information as well as the current information for forecasting any behavioral trends or for some cases like estimating the buying patterns of customers.
- Predictive analytics involve the use of different statistical or machine learning algorithms for estimating the probability or likelihood of an event.
- Different variables are used by software applications performing predictive analytics that can be used to measure and analyze to predict the likely behavior of individuals, machinery or other entities.

LITERATURE SURVEY

1. **Weather and Health Symptoms**

Mihye Lee
Graduate School of Public Health, St. Luke's International University, Tokyo 104–0045, Japan.

- Depicts the effects of weather on the daily lives of individuals
- Used daily reports on health symptoms from 4548 individuals followed for one month in October of 2013, randomly sampled from the entirety of Japan.
- Logistic mixed effects model with a random intercept for each individual was applied to evaluate the effect of temperature and humidity on physical symptoms.
- Stratified analyses were conducted to compare weather effects by gender and age group.
- Joint pain was associated with higher temperature (1.87%, 95% CI = 1.15 to 2.59) and humidity. Headaches was increased by 0.56% per 1 ℃ increase in the maximum temperature and by 1.35% per 1 ℃ increase in dew point.
- Weather was associated with various physical symptoms.

2. **Health symptoms in relation to temperature, humidity, and self-reported perceptions of climate in New York City residential environments**

Ashlinn Quinn

Department of Environmental Health Sciences, Mailman School of Public Health, Columbia University, New York, NY 10032, USA.

- Monitoring has been conducted of temperature and humidity inside homes despite the fact that these conditions may be relevant to health outcomes.

- Here, they investigate associations between measured temperature and humidity, perceptions of indoor environmental conditions, and health symptoms in a sample of New York City apartments.

- Health outcomes of interest were: sleep quality, symptoms of heat illness (summer season), symptoms of respiratory viral infection (winter season).

- Perceptions of indoor temperature were significantly associated with measured temperature in both the summer and winter, with a stronger association in the summer season.

3. Big Data Analytics in Medicine and Healthcare

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- Mentions the use of Big Data Analytics in Healthcare along with the challenges, privacy and security of data in the healthcare field.
- Integration and analysis of complex data in large amounts such as various omics data (genomics, epigenomics, etc) for analysis in medicine and healthcare.
- Use of models based on Electronic Health Records (EHR) for providing personalized and preventive medicine. This would prove beneficial for the patients, clinicians and health policy makers.
- Data Mining techniques on EHRs which could help identify the different association rules in EHRs for disease monitoring and health based trends

4. **Predictive Analytics to Prevent and Control Chronic Diseases**

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- In this paper, effective mechanisms have been used for chronic disease prediction by mining the data containing historical health records.
- Experiment was conducted using two separate datasets from the UCI machine learning repository for the diagnosis of heart disease and diabetes.
- Different classifiers such as Naïve Bayes, SVM, Decision Tree and Artificial Neural Networks were used.
- This experiment found that SVM gives highest accuracy rate of 95.556% in case of heart disease and in case of diabetes Naïve Bayes classifier gives highest accuracy of 73.588%.
- The accuracy was determined based on four cases True positive, True Negative, False Positive, False Negative.

Existing System

- Currently there are only a handful of websites that give information about few diseases based on weather patterns.
- One of the websites is Accuweather.com. This website is able to provide weather forecast upto 30 days and can also foreshadow if the weather is suitable or not for certain diseases.

Proposed System

- The goal of this project is to build a system which will be able to collect details about weather parameters from weather sites & use this information along with user inputs such as location to predict any disease related to the change in climate. Based on the inputs and weather parameters, the app will predict the different diseases possible, along with what remedies should be taken.

- The app will show the previous searches of the user, which can be updated by an admin based on some external factors.

Data Collection	Symptom Prediction	Disease Prediction	Data Visualization
This step involves collecting location specific weather data such as temperature, humidity, precipitation, wind speed etc as well as disease outbreaks.	Based on the weather parameters & user inputs, the system can determine the symptoms that are probable.	A system will then determine the probable diseases from the predicted symptoms and order according to their probabilities.	A graph will be generated that will display the Top 3 disease along with its probabilities. It will also show possible remedies.

Software & Hardware Requirements

Software:

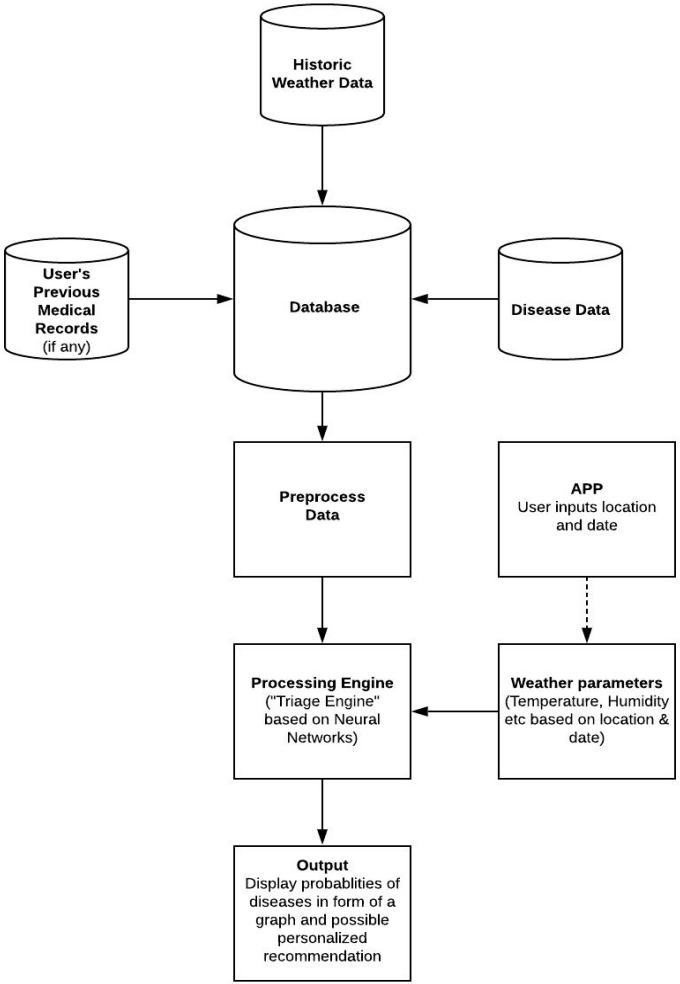
- Python 3.6 or above
- Java 1.8 or above
- Android Studio 3.5 or above
- Python Libraries
  - TensorFlow
  - Keras
  - Numpy
  - Requests
  - Sklearn

Hardware:

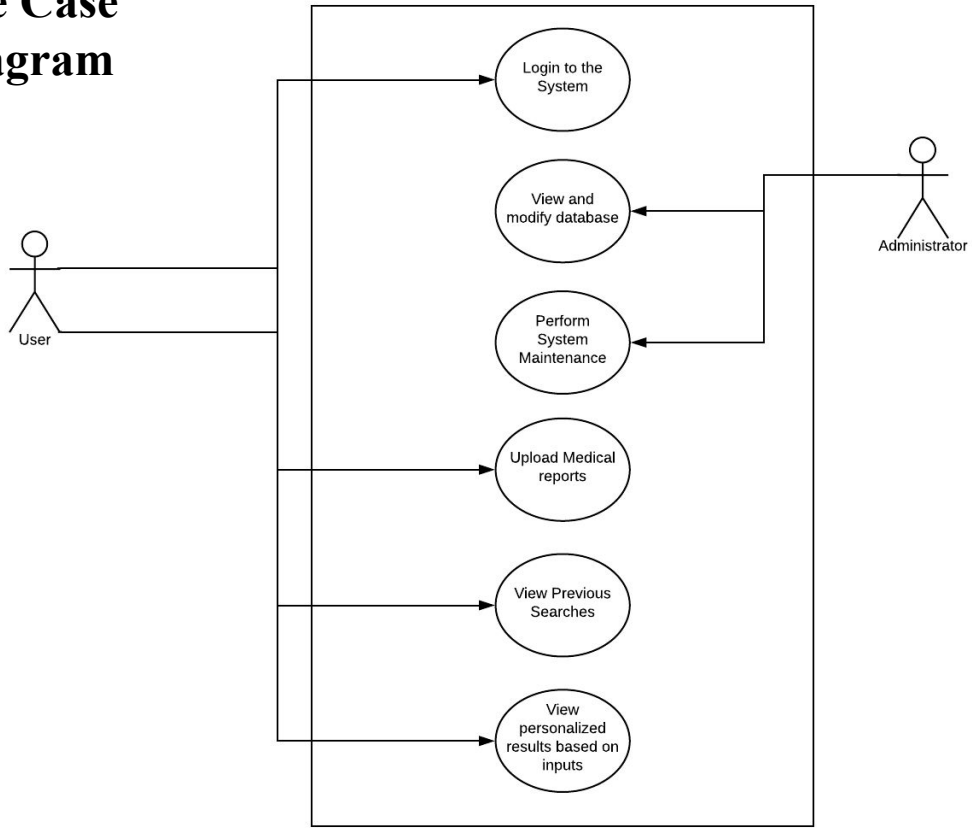
- Minimum 4 GB RAM
- CPU with 1.5 GHz or more frequency
- Graphic Card of 4GB or more VRAM

DESIGN OF THE SYSTEM

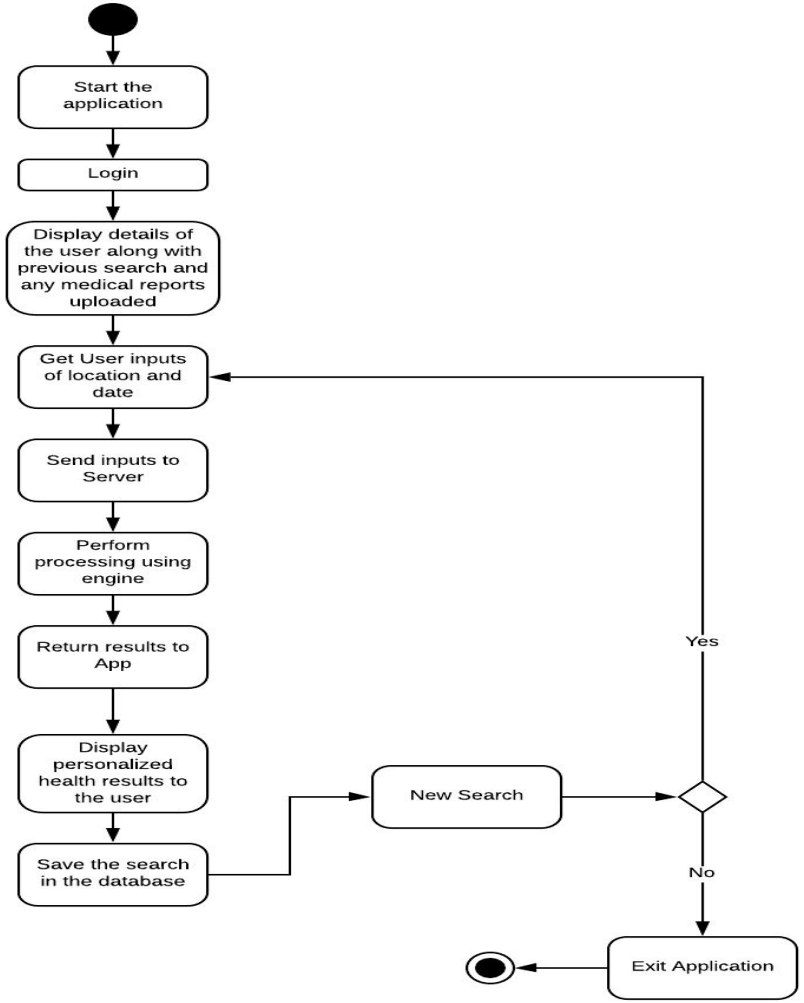
Block Diagram



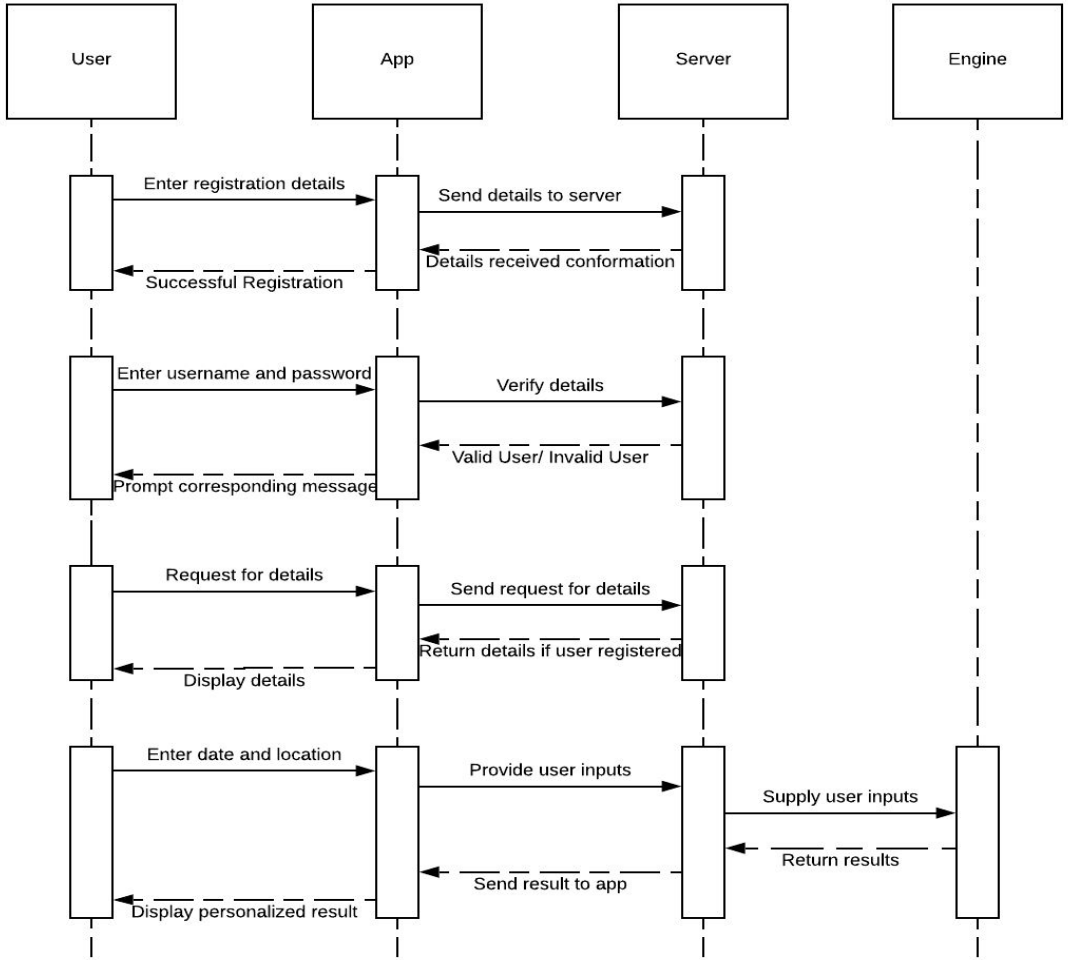
Use Case Diagram



Activity Diagram



Sequence Diagram



Approach

- Dataset
  - Obtaining data from weather sites
  - Sourcing disease related data
- Develop a model for predicting
- Build an App
- Develop System

Weather Sites

- Weather Data Sites:-
  - OpenWeatherMap.com(for forecast data)
  - DarkSky.com(for historic data)
  - Apixu.com(now weatherstack)
  - Wunderground.com
  - NOAA - National Oceanic And Atmospheric Administration

Dataset

- Disease Dataset
  - WHO
  - Dengue Prediction Contest

- Weather Dataset
  - Self-built dataset(based on disease outbreaks)

Retrieve Weather Parameters

- Based on the location and date, weather parameters will be retrieved using an API

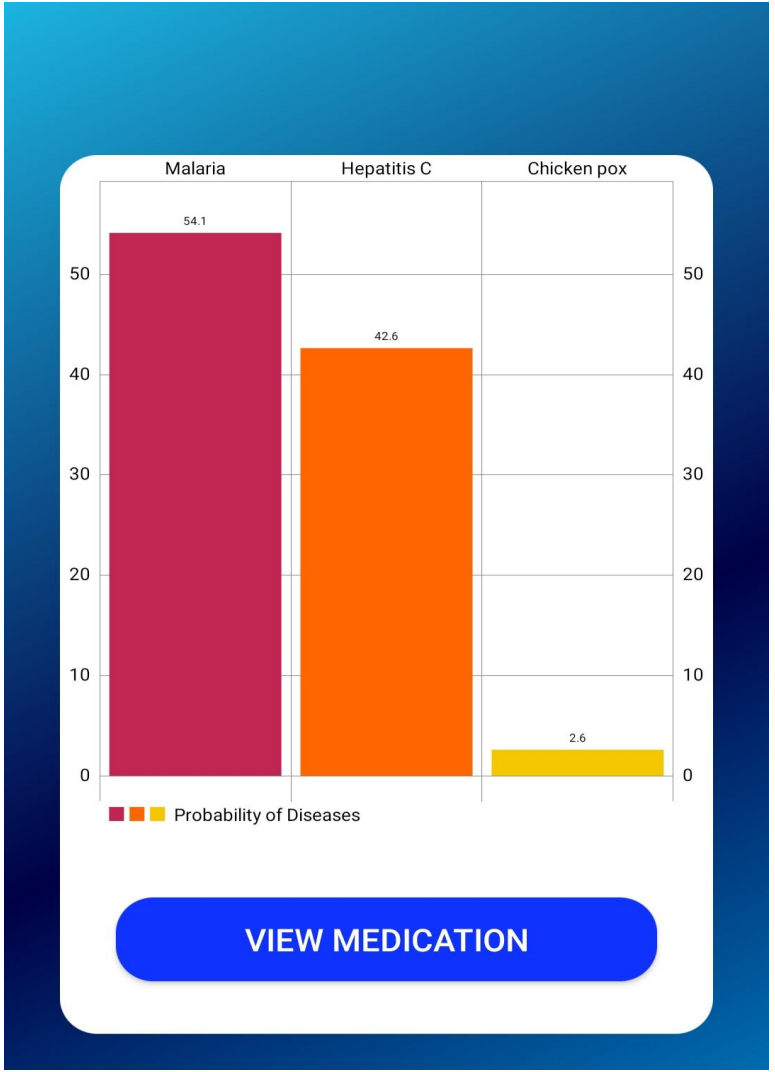
Model For Prediction

- Neural network model to predict symptoms based on weather parameters
- Neural Network model to predict diseases based on the predicted symptoms from the previous model

Result - 1

- The result from the server is sent back to the app in form a graph

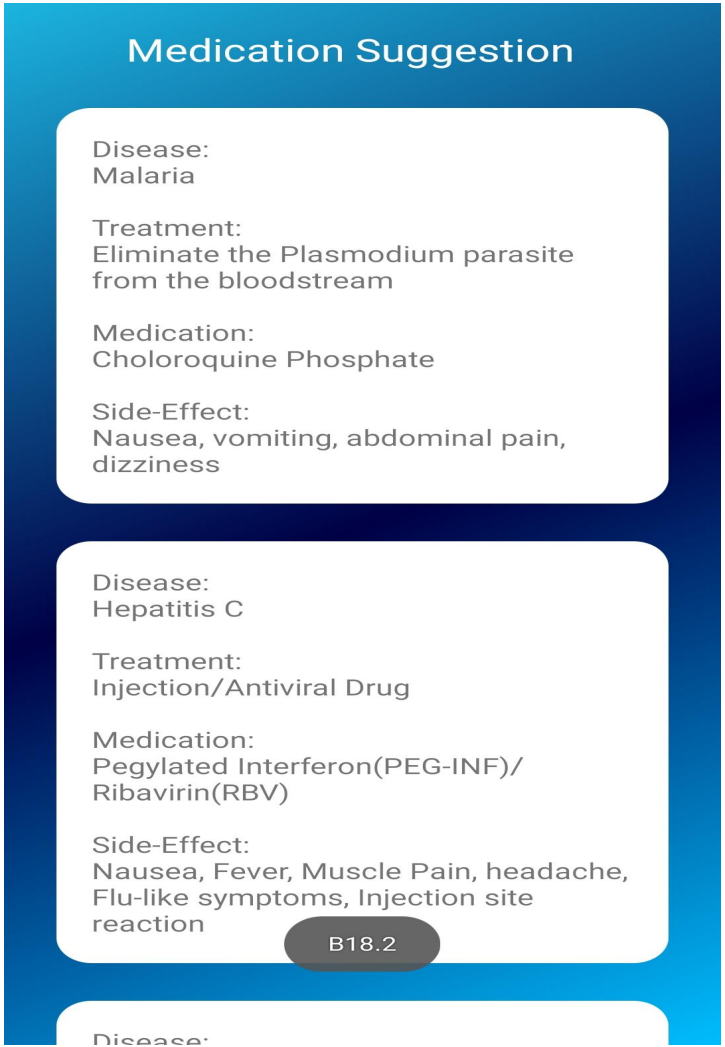
Probability Graph

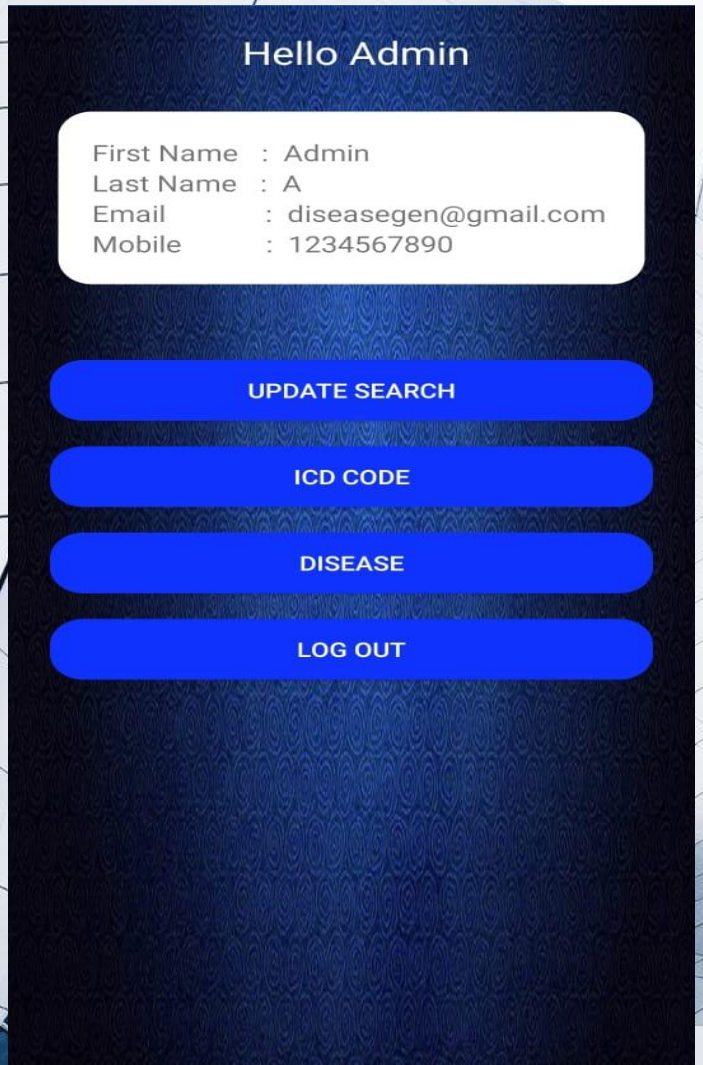


Result - 2

- Based on the predicted diseases, some suggestions are provided to the user

Medication Suggestion





ADMIN PANEL

- The admin can add data pertaining to disease, treatment, side-effects etc to the database
- The admin can also give additional input to the user search based on any external factors present

Testing Conclusions

- We are able to accurately predict disease from symptoms.
- Accuracy of prediction of weather to symptoms is not high as the data set currently present is not big enough for proper modelling.

Conclusion

- Currently, we were able to develop a system that can predict certain disease based on weather parameters of the region along with any symptoms experienced by the person.

- This application could be used by government agencies to better prepare for any disease that may occur. Also, it could help doctors as they can expect a high number of cases related to a particular disease. Tourists can also plan their journey if they suffer from certain conditions as the results given by the app are personalized. It will also be beneficial to people who suffer from a certain disease to prepare themselves accordingly.

- We could add more features to the application like append the user result to the database to make it more robust, also include parameters like age, gender to the database, make the app more intuitive, etc.

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THANK YOU!