COVID 19 EXPOSURE ANALYSIS

Under the guidance of

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Submitted by

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INTRODUCTION

Coronavirus disease 2019 (COVID-19) is an emerging respiratory infection caused by a novel coronavirus called Severe Acute Respiratory Syndrome coronavirus 2 (SARS-CoV-2). The virus is a member of the coronavirus family that are zoonotic pathogens, that is viruses cause and transmit illnesses between human and several animal species such as cattle, camels, cats, and bats. The SARS-CoV-2 virus is similar to Middle East Respiratory Syndrome coronavirus (MERS-CoV) and Severe Acute Respiratory Syndrome coronavirus (SARS-CoV), which have their origins in bats. The COVID-19 disease was detected initially in late December 2019 in Wuhan, Hubei Province, China, and spread worldwide 2 months later. About 200 countries over the entire world have reported different numbers of cases; however, the disease has drastically expanded in the United States, Spain, Italy, Germany, France, China, Iran, the United Kingdom, and Turkey.

The symptoms of COVID-19 illness are fever, cough, headache, loss of taste, sore throat, difficulty in breathing and so on. Elderly persons and those suffering from co-morbidities like heart disease, lung disease and diabetes, are at higher risk of developing severe COVID-19 illness.

COVID-19 disease has negatively affected global economics. Furthermore, many healthcare systems have collapsed or nearly collapsed due to COVID-19. Therefore, it is very important to flatten the shape of the crest in case numbers as much as possible while communities experience an outbreak of COVID-19 to reduce the burden on the healthcare system.

Individuals who travel may be at risk for exposure to SARS-CoV-2, the virus that causes COVID-19, before, during, or after travel. This could result in travelers spreading the virus to others at their destinations or upon returning home. It is mutating so fast. New variants may be more harmful. Once it starts spreading, it grows very fast. That's why we need to break the chain of spreading by tracking the patient and their contacts.

Right now, a valuable piece of information we could add to the knowledge body is, who has been in contact with whom. With this data we can track users. We can trace transmission paths. Once we have that data, We can simply alert the users if they’ve been in contact with an infected person. Using a graph database to store this data will help us to form relationships and solve complex prediction problems.

PROBLEM STATEMENT

Covid 19 is spreading due to close contacts with the affected people. So we are developing a website which will take surveys and inform the user whether he/she has a risk of getting the disease. Our aim is:

- To monitor the spread of disease, district wise.
- To Inform the user if he/she has a risk of getting the disease or not.
- To help the Government to understand the transmission chains of the disease.
- To suggest whether to impose lockdown over a district.
- To suggest people, whether to visit a certain district or not.
- To Predict Hotspot areas.
- To monitor daily trends in covid cases over districts

DATASET

The dataset used is a dummy dataset which is created from many different sources.

- Pycristoforo: It is a python library for the generation of contextualized random coordinates. PyCristoforo takes in input a country name and it generates random coordinates, inside that country (not including the sea/ocean sections). https://github.com/AleNegrini/PyCristoforo#random-point-generation

- Mockaroo: A free test data generator and API mocking tool.Mockaroo lets you create custom CSV, JSON, SQL, and Excel datasets to test and demo your software. https://www.mockaroo.com/

- Shapefile of Districts in India: https://github.com/globalmaps/gmin20/raw/master/polbnda_ind.shp

Final Dataset : https://drive.google.com/drive/folders/1sonImwfhen-MGZv0RRODh7VoRkoI-uCV?usp=sharing

TECHNOLOGIES USED

- NodeJs: Node.js is an open source server environment. It allows you to run JavaScript on the server.

- ExpressJs: Express.js, or simply Express, is a back end web application framework for Node.js, released as free and open-source software under the MIT License. It is designed for building web applications and APIs.

- EJS: Express.js, or simply Express, is a back end web application framework for Node.js, released as free and open-source software under the MIT License. It is designed for building web applications and APIs.

- LeafletJs: Leaflet is an open source JavaScript library used to build web mapping applications.Leaflet allows developers without a GIS background to very easily display tiled web maps hosted on a public server, with optional tiled overlays.

- Bootstrap 5: Bootstrap 5 is a free open source CSS framework directed at responsive, mobile-first

frontend web development. It contains CSS and Javascript based design templates.

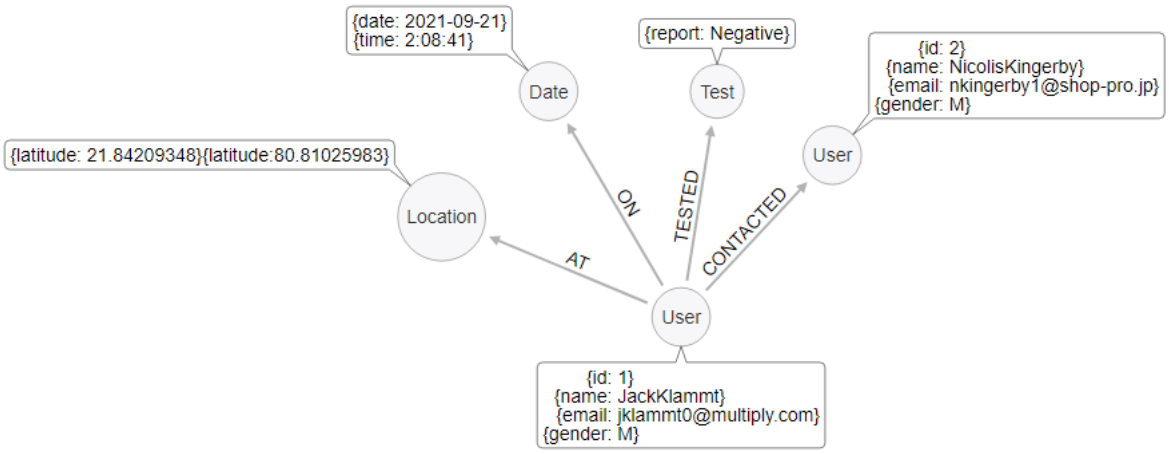
- PostgreSQL: PostgreSQL is a powerful, open source object-relational database system that uses and extends the SQL language combined with many features that safely store and scale the most complicated data workloads.

- Neo4j:Neo4j is a graph database management system developed by Neo4j. It has an ACID-compliant transactional database with native graph storage and processing.

DATA MODELLING

RDBMS

Graph data modeling is the process in which a user describes an arbitrary domain as a connected graph of nodes and relationships with properties and labels. A Neo4j graph data model is designed to answer questions in the form of Cypher queries and solve business and technical problems by organizing a data structure for the graph database.



Initial Prototype of schema

- There are four nodes: User, Test, Location, Date.
- A user node can form relationships from another User Node provided if one is positive and other should be negative.
- This relationship helps us to find the people that are at a risk of getting disease.

DESIGN MODELLING

Data design is the first design activity, which results in less complex, modular and efficient program structure. The information domain model developed during the analysis phase is transformed into data structures needed for implementing the software. The data objects, attributes, and relationships depicted in entity relationship diagrams and the information stored in a data dictionary provide a base for data design activity. During the data design process, data types are specified along with the integrity rules required for the data.

Covid Data file: *csv*

Sr.No	Attributes	Data Type	Constraints
1	id	Integer	Primary Key, Unique
2	first_name	Varchar	
3	last_name	Varchar	
4	email	Varchar	Unique
5	gender	Varchar	
6	date	Varchar	
7	latitude	Float	

8	longitude	Float	
9	geom	Geometry	

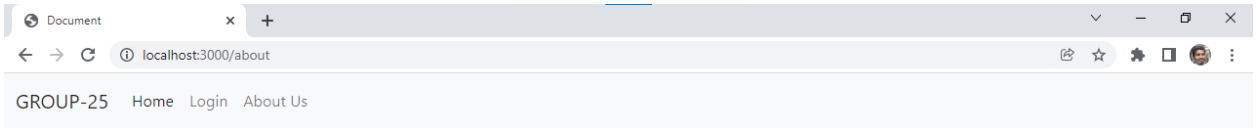
Districts shapefile : *polbnda_ind.shp*

Sr.No	Attributes	Data Type	Constraints
1	gid	Integer	Primary Key, Unique
2	f_code	Varchar	
3	coc	Varchar	
4	nam	Varchar	
5	laa	Varchar	
6	pop	Float	
7	ypc	Float	
8	adm_code	Varchar	
9	salb	Varchar	
10	soc	Varchar	
11	geom	Geometry	

USER INTERFACE

Home

About Us

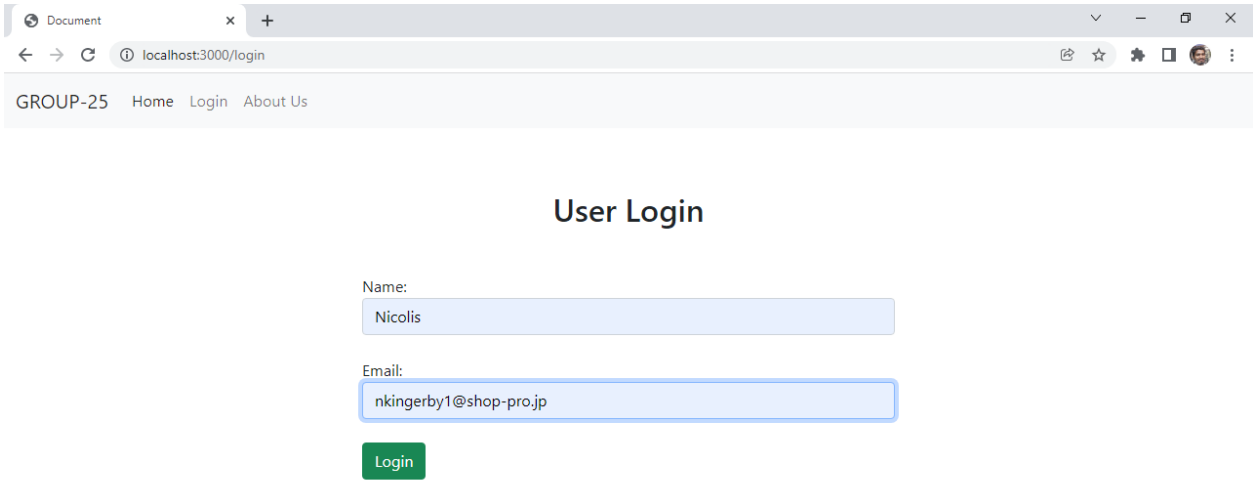


PRANAV AHER. ID:191080005

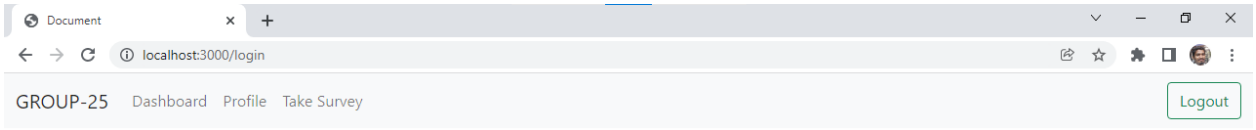
UTKARSH BESKAR. ID:191080011

PRASHANT BHALA. ID:191080012

Login

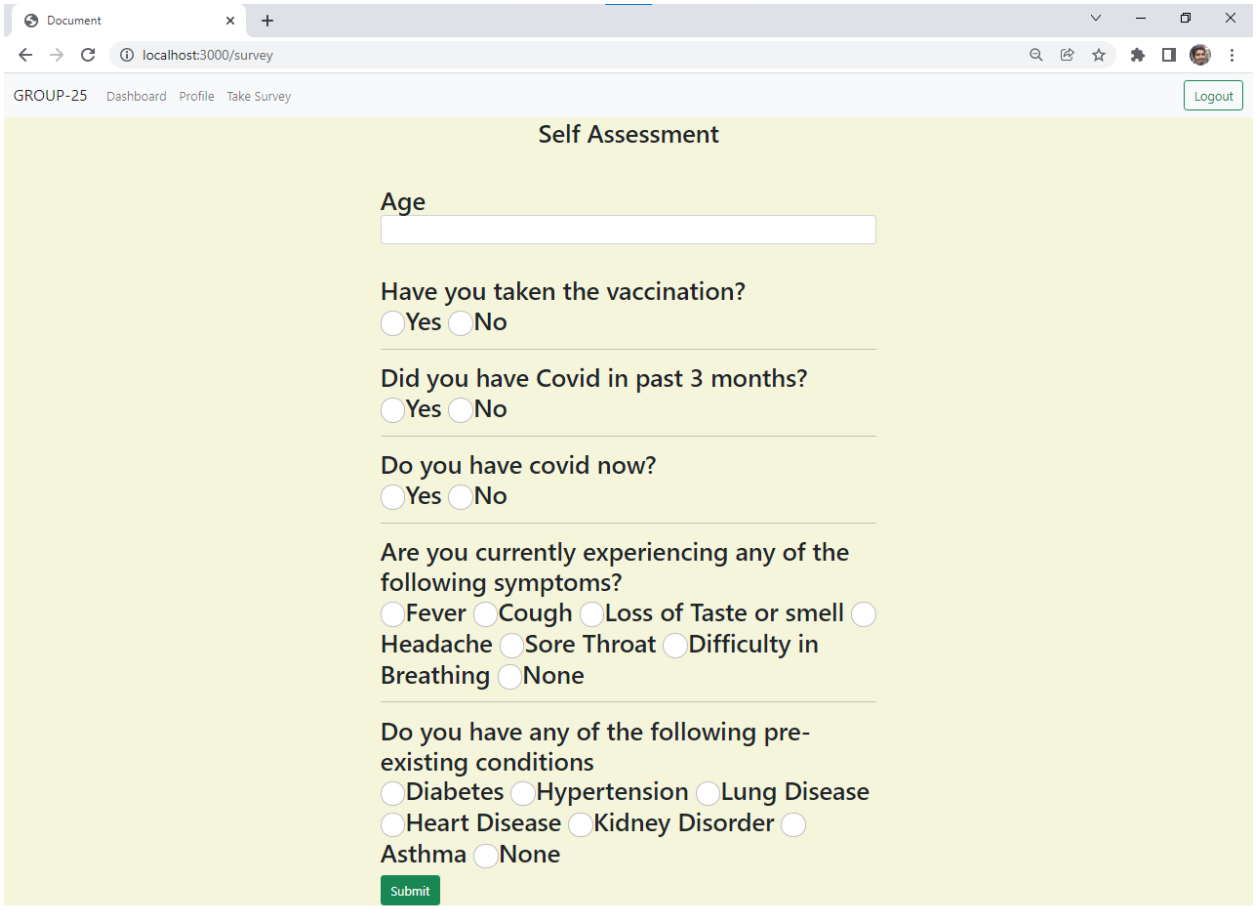

Document
localhost:3000/login
GROUP-25
Home
Login
About Us
User Login
Name:
Nicolis
Email:
nkingerby1@shop-pro.jp
Login

Profile

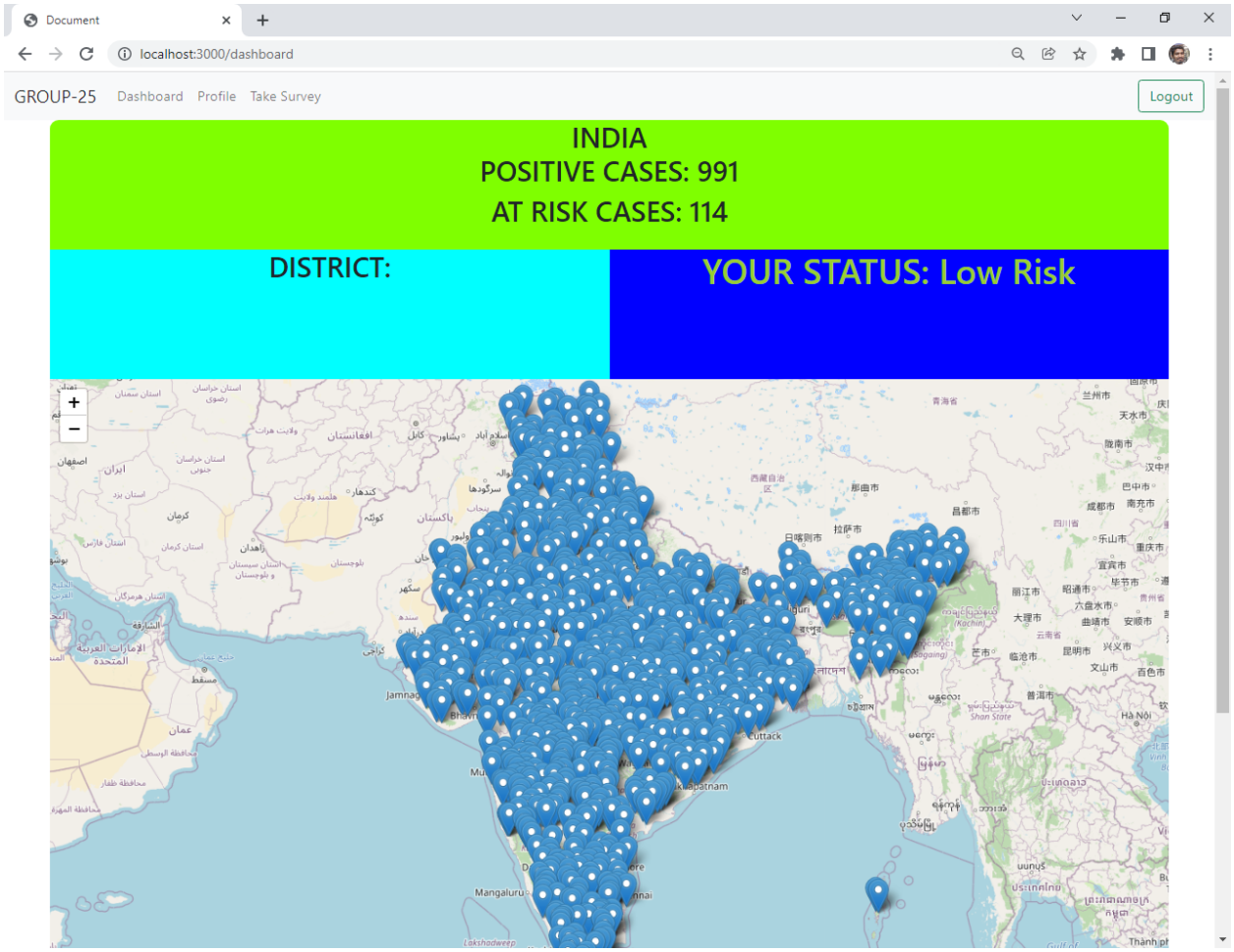


Name: Nicolis Kingerby
Gender: M
Risk Status: Low Risk
Present Covid Report: Positive
Updated On: Tue Dec 21 2021 00:00:00 GMT+0530 (India Standard Time)

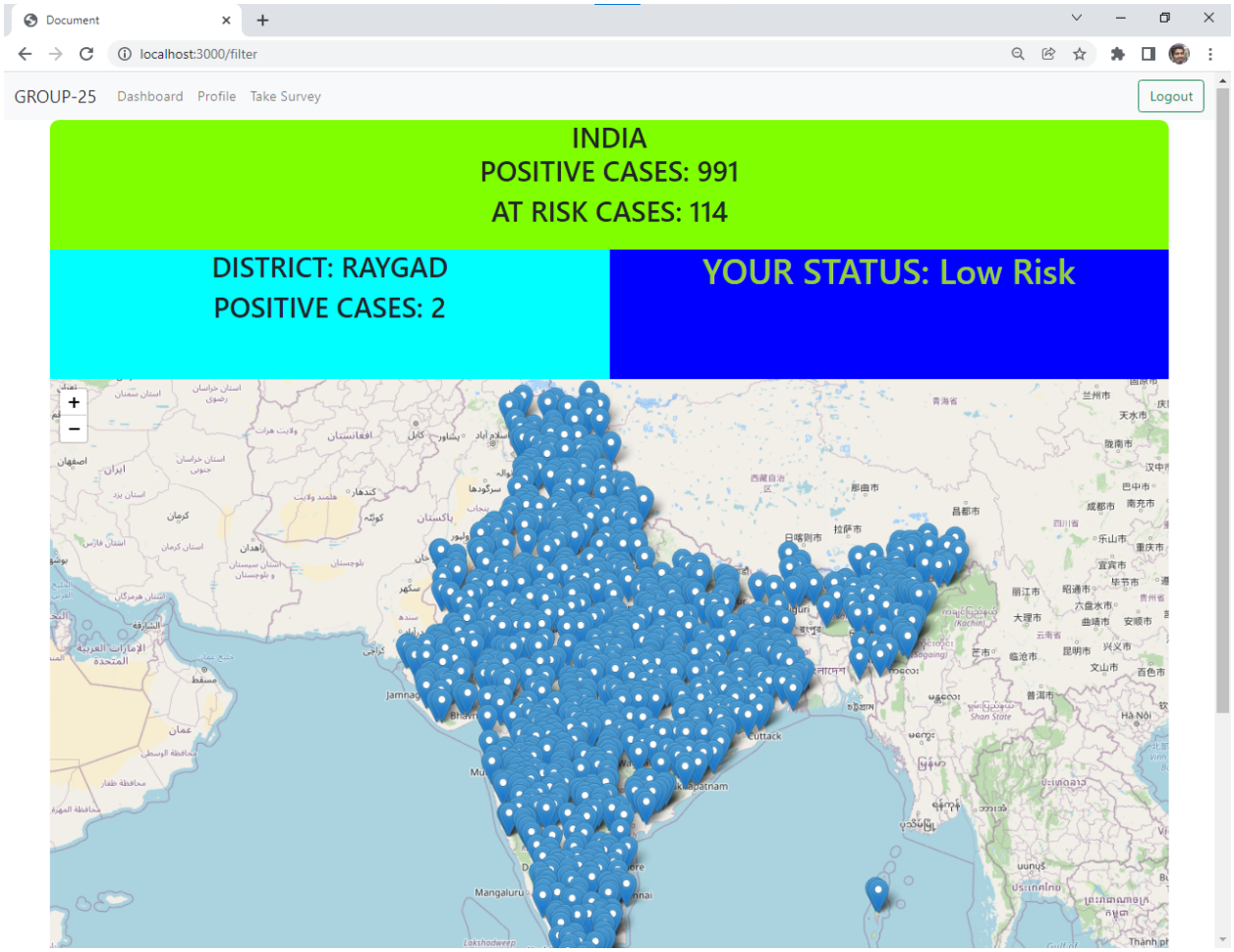
Survey


Document
localhost:3000/survey
GROUP-25
Dashboard
Profile
Take Survey
Logout
Self Assessment
Age
Have you taken the vaccination?
Yes
No
Did you have Covid in past 3 months?
Yes
No
Do you have covid now?
Yes
No
Are you currently experiencing any of the following symptoms?
Fever
Cough
Loss of Taste or smell
Headache
Sore Throat
Difficulty in Breathing
None
Do you have any of the following pre-existing conditions
Diabetes
Hypertension
Lung Disease
Heart Disease
Kidney Disorder
Asthma
None
Submit

Dashboard-1


Document
localhost:3000/dashboard
GROUP-25
Dashboard
Profile
Take Survey
Logout
INDIA
POSITIVE CASES: 991
AT RISK CASES: 114
DISTRICT:
YOUR STATUS: Low Risk

Dashboard-2(after selecting a point)



FUTURE SCOPE

Our future plan is to take this project towards Android and IOS apps, so that a user can easily carry it and also the OS compatibility will be attained.

We have static data, therefore we can just plot those point's static location. In the future we can make it work with dynamic data like live location.

We can develop complex algorithms to predict cases after certain days or weeks.

We can develop algorithms to predict the next covid wave. Also we can include the strain's data.

Vaccine booking can be integrated and the vaccination data will also be helpful for surveys.

Connectivity to smartwatch with bluetooth can be integrated for better tracking.

CONCLUSION

In this project we used two databases: PostgreSQL for spatial operations and Neo4j for contact tracking. We plotted all the coordinates available in the dataset to the map from postgres. We get all the people who contact a positive patient using neo4j's relations. The data used is dummy data Therefore the output might be different.

A survey form was provided which can be filled any time the user wants. This form gives the data to plot on the map. This form also predicts whether you are at risk or not, whether you can easily get covid or not. There are 6 pages: home, about, login, profile, dashboard, survey.

But developing this kind of project is always challenging. However we tried to make this project as realistic as possible. Everyone from the group contributed equally and enjoyed the development process. Although it would have been much more advanced and a much more realistic project, we didn't know many things and also the time constraints.