CONTACT TRACING APPLICATION

GROUP 11

E/17/005 - M.I.Rishard
E/17/379 - S.P.D.D.S.Weerasinghe
E/17/327 - A.M.F.Shalha

REQUIREMENTS

Functional

- System should be able to trace close contacts of an infected person.

Mobile application

- Should get gps and bluetooth tracking permission
- Should be able to display covid 19 and CKDu updates.
- Should send alert notifications when risk detected
- Should be able to get disease status through the app

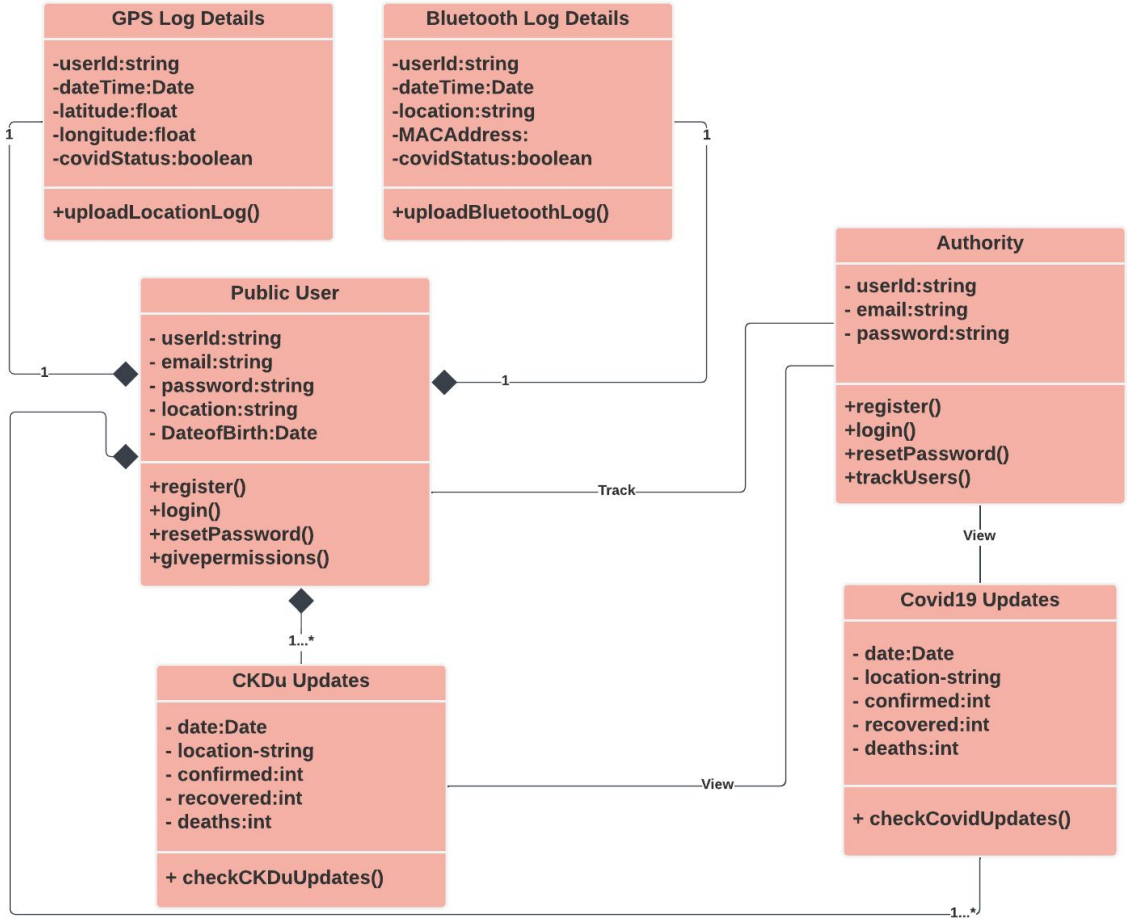
Web app

- Should allow authorities to track user details
- Should allow public users to check covid 19 and ckdu updates.

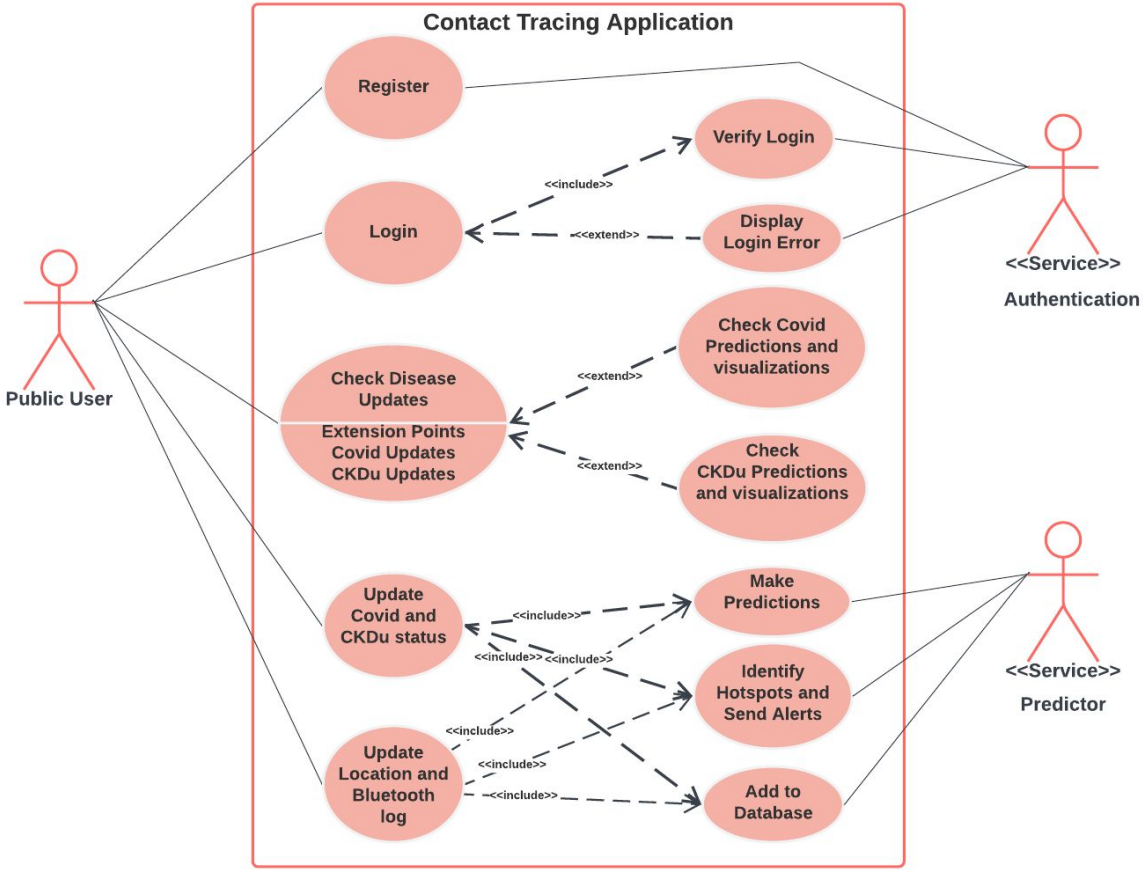
Non-Functional

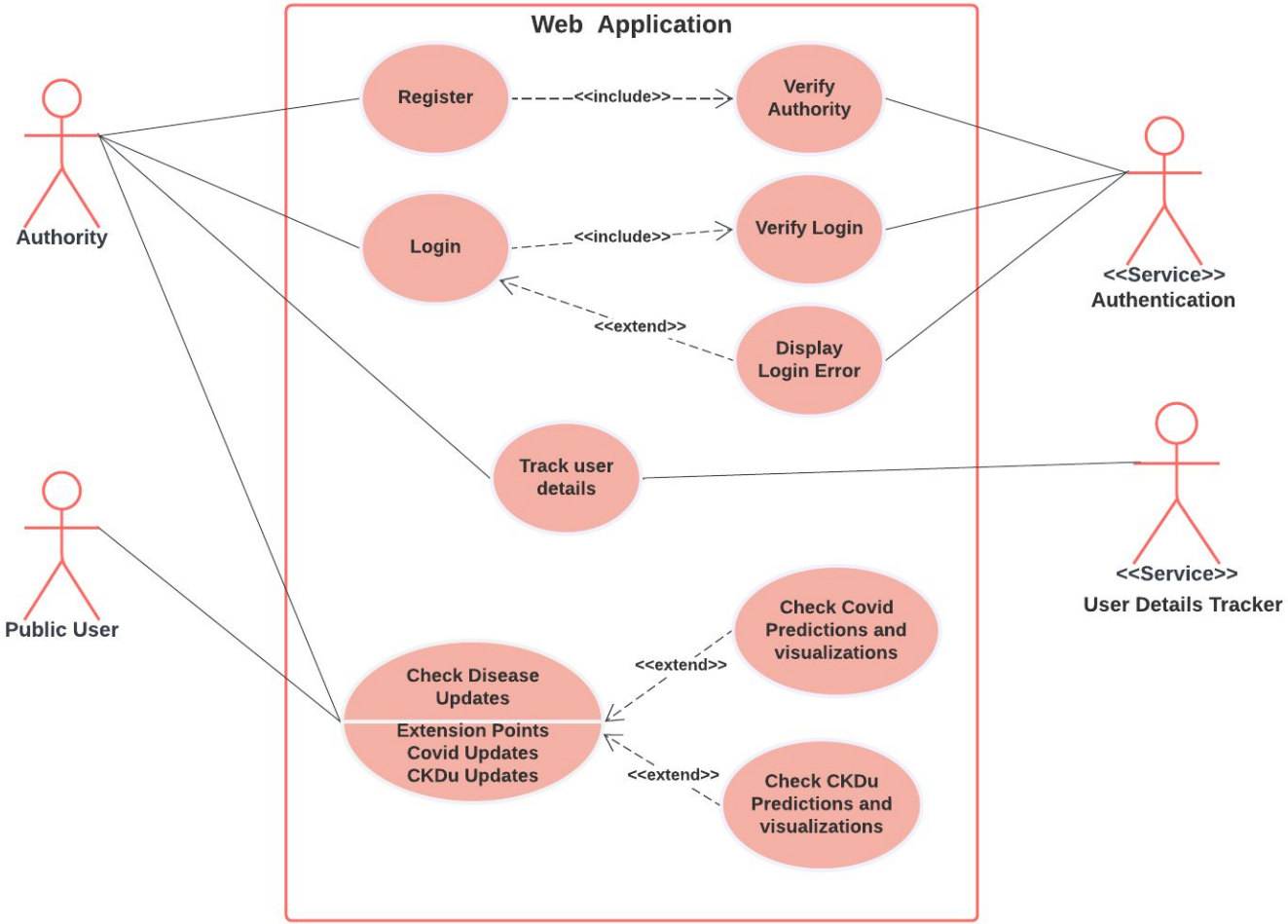
- Usability
  Responsive user friendly UI
- Reliability
  Tracks user locations for every 15 seconds
- Performance
  Realtime updates of maps and charts

UML CLASS DIAGRAM

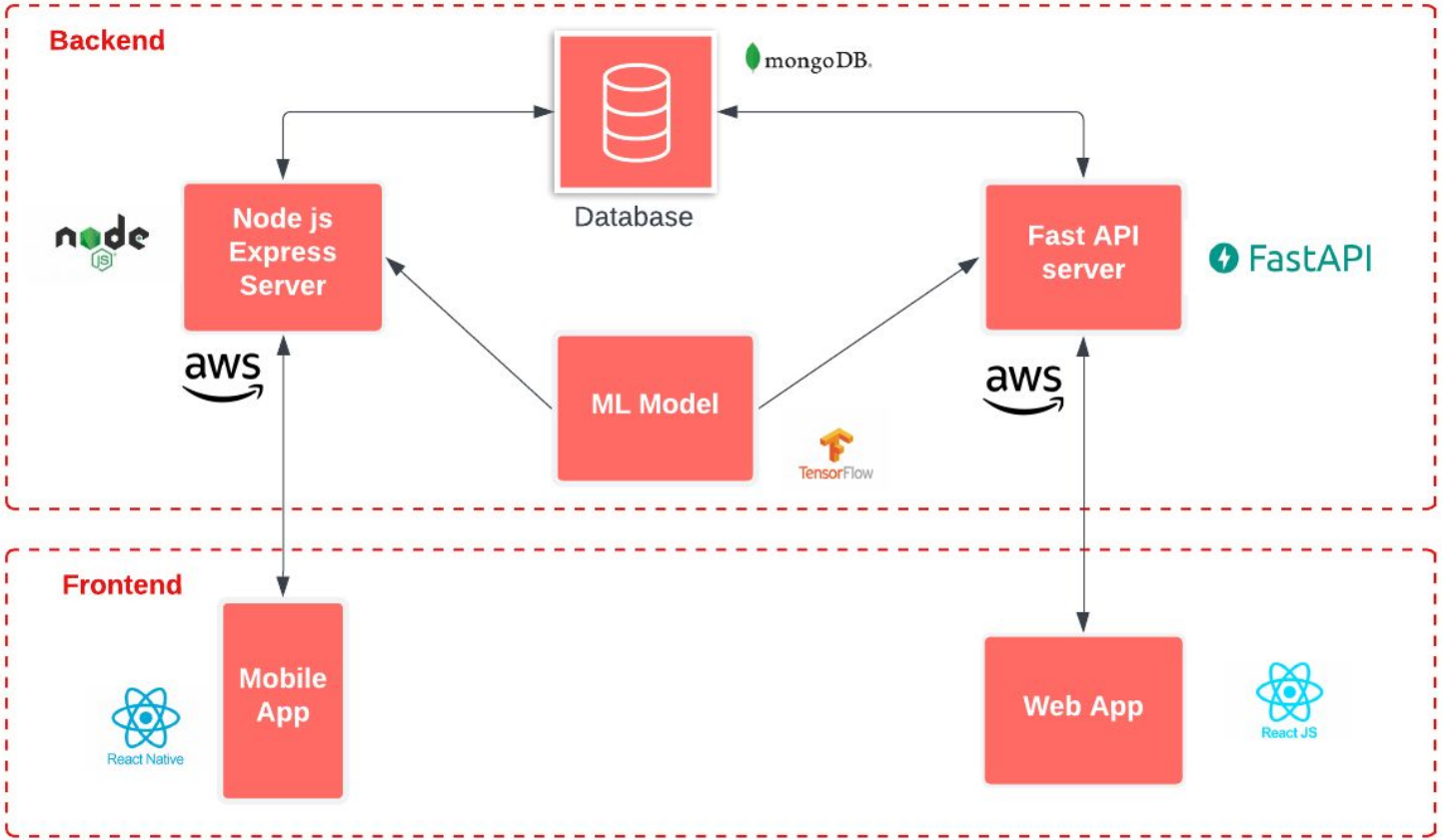


USE CASE DIAGRAMS

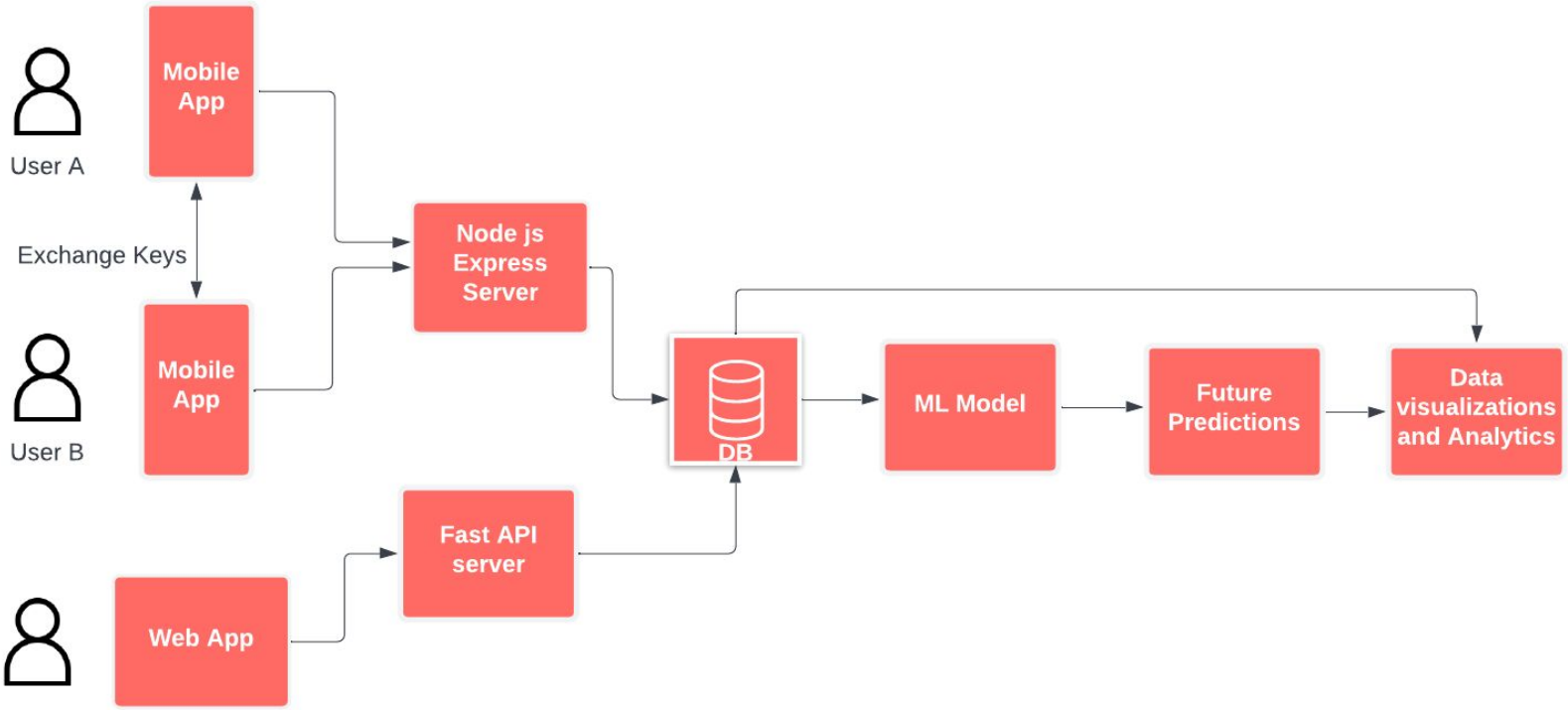



Web Application
Register
<<include>>
Verify Authority
Login
<<include>>
Verify Login
<<extend>>
Display Login Error
Track user details
Check Disease Updates
Extension Points
Covid Updates
CKDu Updates
<<extend>>
Check Covid Predictions and visualizations
<<extend>>
Check CKDu Predictions and visualizations
Authority
Public User
<<Service>>
Authentication
<<Service>>
User Details Tracker

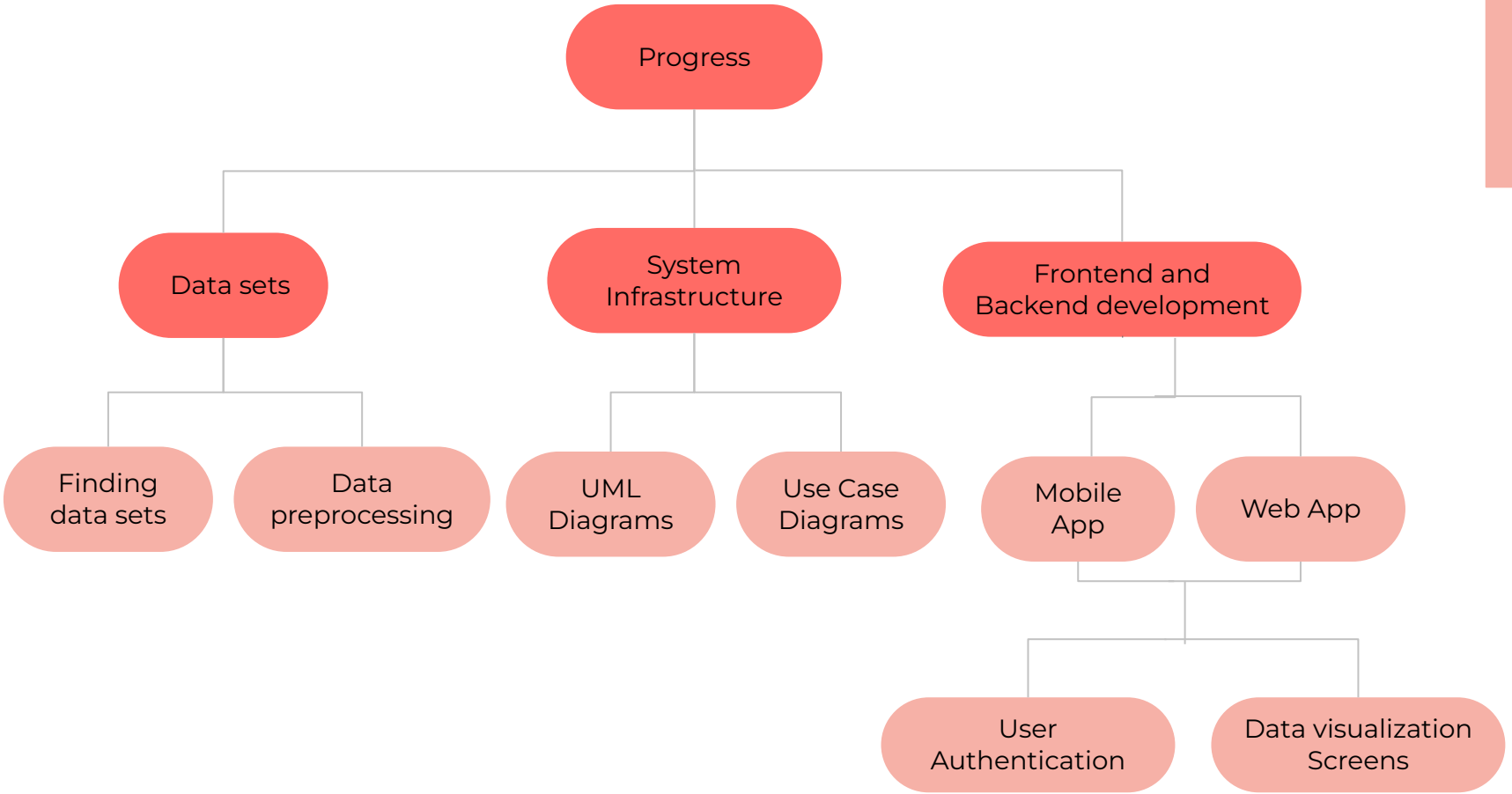
SOLUTION ARCHITECTURE

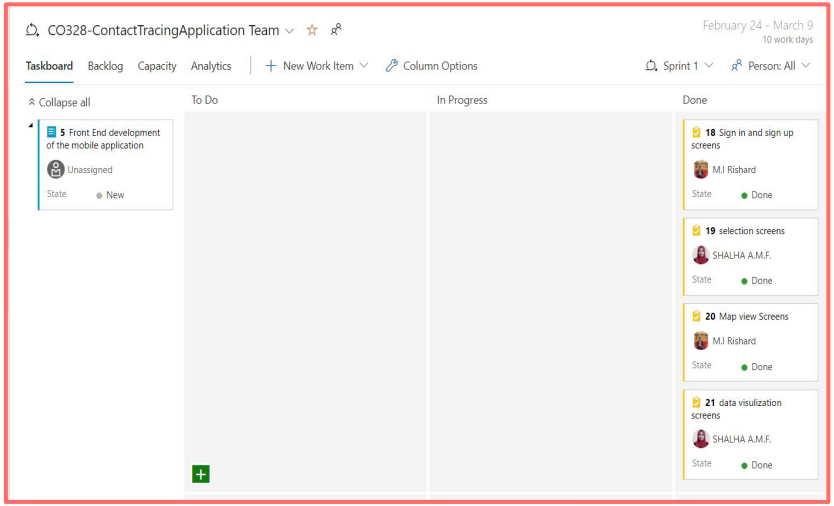


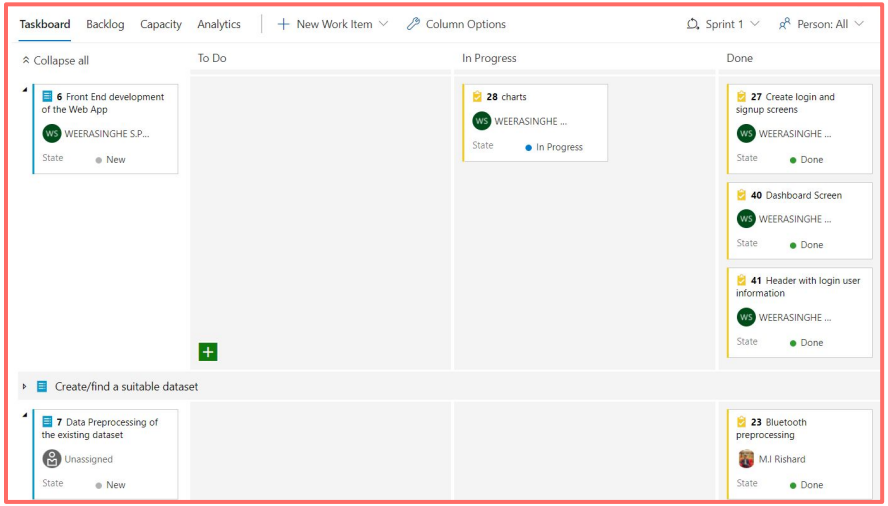
DATA FLOW

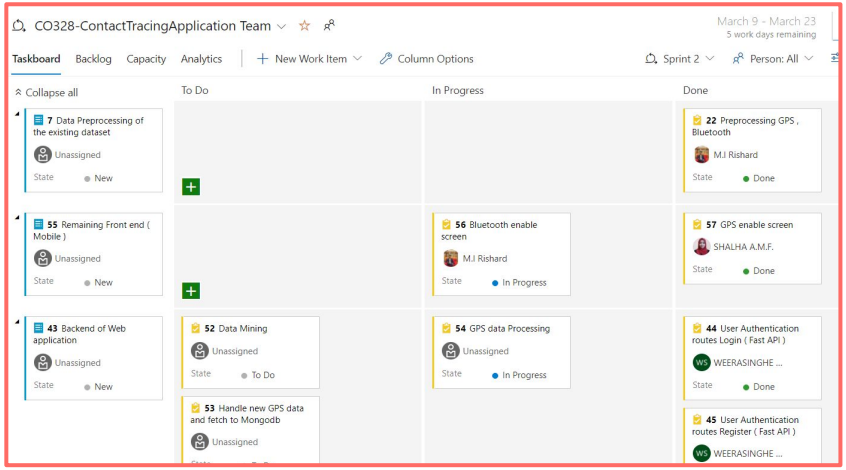

User A
Mobile App
Exchange Keys
User B
Mobile App
Node js Express Server
DB
ML Model
Future Predictions
Data visualizations and Analytics
Fast API server
Web App

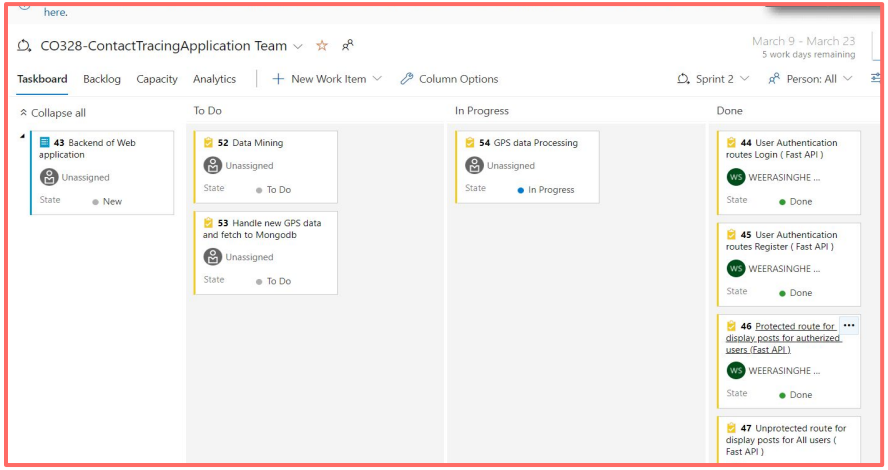
PROGRESS


Progress
Data sets
System Infrastructure
Frontend and Backend development
Finding data sets
Data preprocessing
UML Diagrams
Use Case Diagrams
Mobile App
Web App
User Authentication
Data visualization Screens

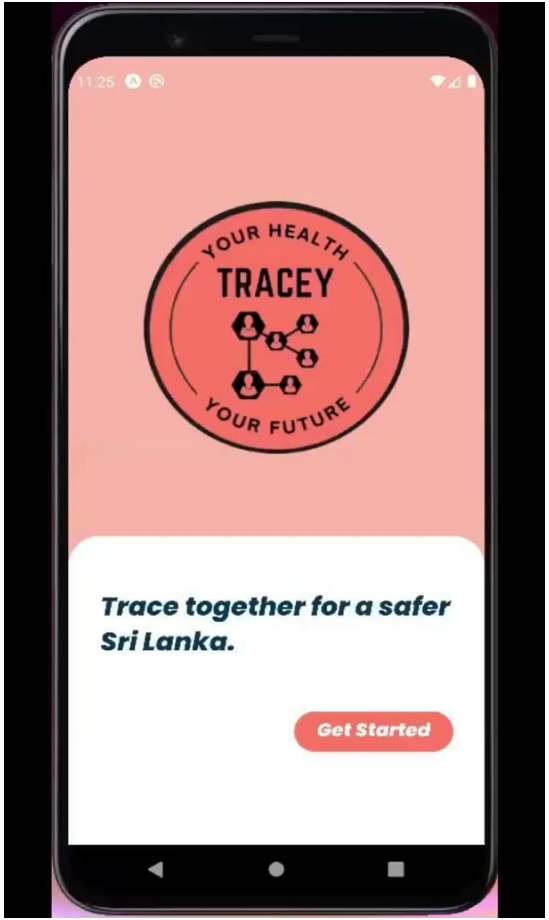

CO328-ContactTracingApplication Team
February 24 – March 9
10 work days
Taskboard
Backlog
Capacity
Analytics
New Work Item
Column Options
Sprint 1
Person: All
Collapse all
To Do
In Progress
Done
5 Front End development of the mobile application
Unassigned
State
New
18 Sign in and sign up screens
M.I Rishard
State
Done
19 selection screens
SHALHA A.M.F.
State
Done
20 Map view Screens
M.I Rishard
State
Done
21 data visulization screens
SHALHA A.M.F.
State
Done

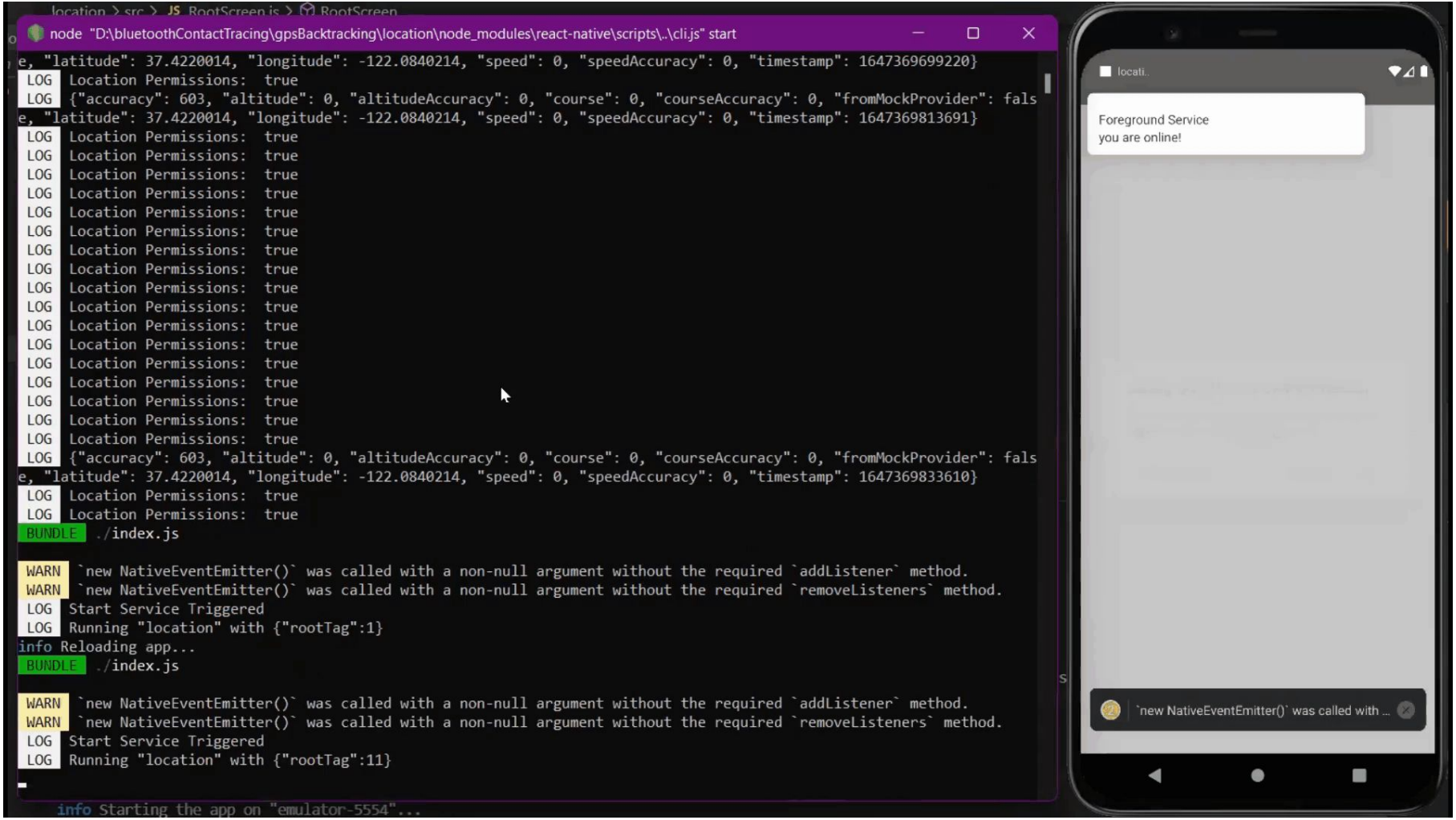

Taskboard
Backlog
Capacity
Analytics
New Work Item
Column Options
Sprint 1
Person: All
Collapse all
To Do
In Progress
Done
6 Front End development of the Web App
WEERASINGHE S.P...
State
New
28 charts
WEERASINGHE ...
State
In Progress
27 Create login and signup screens
WEERASINGHE ...
State
Done
40 Dashboard Screen
WEERASINGHE ...
State
Done
41 Header with login user information
WEERASINGHE ...
State
Done
Create/find a suitable dataset
7 Data Preprocessing of the existing dataset
Unassigned
State
New
23 Bluetooth preprocessing
M.I Rishard
State
Done


CO328-ContactTracingApplication Team
March 9 – March 23
5 work days remaining
Taskboard
Backlog
Capacity
Analytics
New Work Item
Column Options
Sprint 2
Person: All
Collapse all
To Do
In Progress
Done
7 Data Preprocessing of the existing dataset
Unassigned
State
New
22 Preprocessing GPS , Bluetooth
M.I Rishard
State
Done
55 Remaining Front end (Mobile)
Unassigned
State
New
56 Bluetooth enable screen
M.I Rishard
State
In Progress
57 GPS enable screen
SHALHA A.M.F.
State
Done
43 Backend of Web application
Unassigned
State
New
52 Data Mining
Unassigned
State
To Do
54 GPS data Processing
Unassigned
State
In Progress
44 User Authentication routes Login (Fast API)
WEERASINGHE ...
State
Done
53 Handle new GPS data and fetch to Mongodb
Unassigned
45 User Authentication routes Register (Fast API)

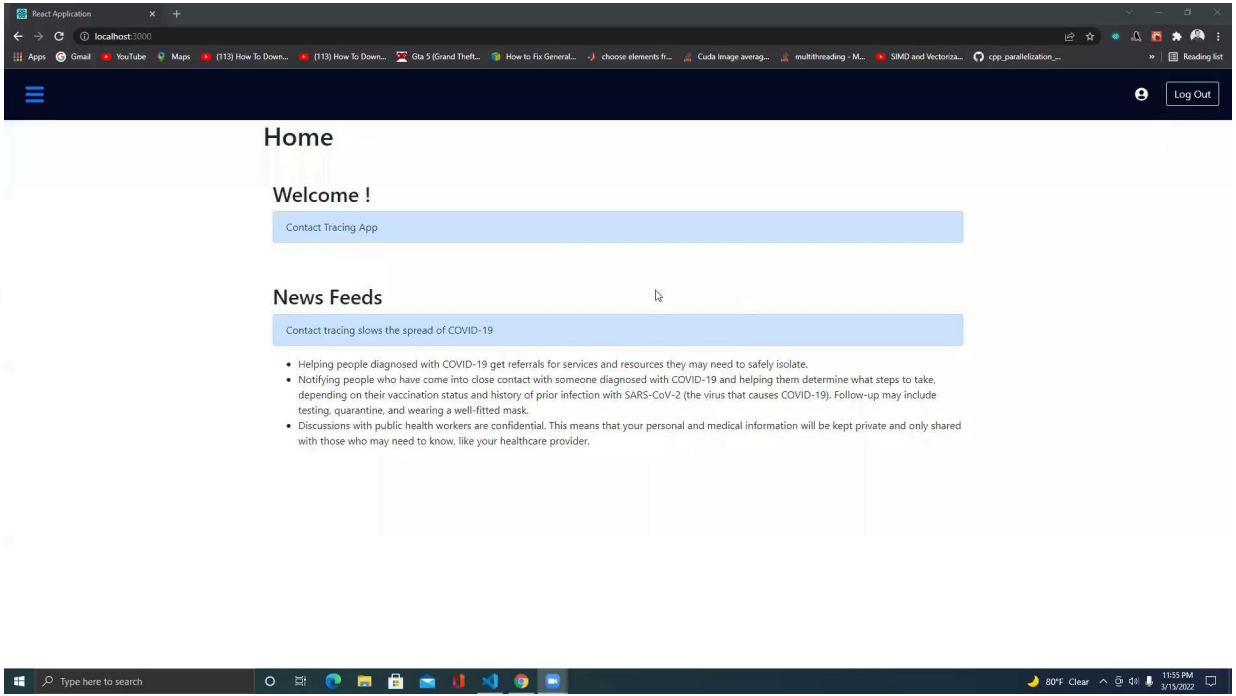

here.
CO328-ContactTracingApplication Team
March 9 – March 23
5 work days remaining
Taskboard
Backlog
Capacity
Analytics
New Work Item
Column Options
Sprint 2
Person: All
Collapse all
To Do
In Progress
Done
43 Backend of Web application
Unassigned
State
New
52 Data Mining
Unassigned
State
To Do
54 GPS data Processing
Unassigned
State
In Progress
44 User Authentication routes Login (Fast API)
WEERASINGHE ...
State
Done
53 Handle new GPS data and fetch to Mongodb
Unassigned
State
To Do
45 User Authentication routes Register (Fast API)
WEERASINGHE ...
State
Done
46 Protected route for display posts for authenticated users (Fast API)
WEERASINGHE ...
State
Done
47 Unprotected route for display posts for All users (Fast API)

MOBILE APPLICATION

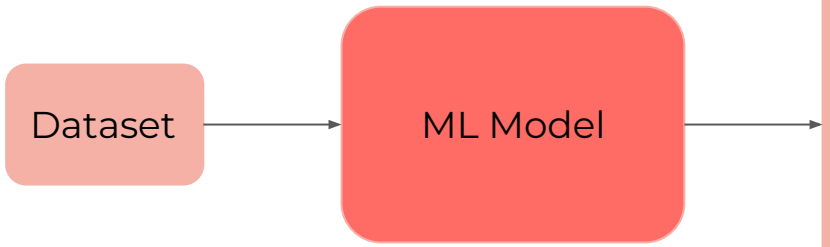



node "D:\bluetoothContactTracing\gpsBacktracking\location\node_modules\react-native\scripts\..\cli.js" start
e, "latitude": 37.4220014, "longitude": -122.0840214, "speed": 0, "speedAccuracy": 0, "timestamp": 1647369699220}
LOG Location Permissions: true
LOG {"accuracy": 603, "altitude": 0, "altitudeAccuracy": 0, "course": 0, "courseAccuracy": 0, "fromMockProvider": fals
e, "latitude": 37.4220014, "longitude": -122.0840214, "speed": 0, "speedAccuracy": 0, "timestamp": 1647369813691}
LOG Location Permissions: true
LOG Location Permissions: true
LOG Location Permissions: true
LOG Location Permissions: true
LOG Location Permissions: true
LOG Location Permissions: true
LOG Location Permissions: true
LOG Location Permissions: true
LOG Location Permissions: true
LOG Location Permissions: true
LOG Location Permissions: true
LOG Location Permissions: true
LOG Location Permissions: true
LOG Location Permissions: true
LOG Location Permissions: true
LOG Location Permissions: true
LOG Location Permissions: true
LOG {"accuracy": 603, "altitude": 0, "altitudeAccuracy": 0, "course": 0, "courseAccuracy": 0, "fromMockProvider": fals
e, "latitude": 37.4220014, "longitude": -122.0840214, "speed": 0, "speedAccuracy": 0, "timestamp": 1647369833610}
LOG Location Permissions: true
LOG Location Permissions: true
BUNDLE ./index.js
WARN `new NativeEventEmitter()` was called with a non-null argument without the required `addListener` method.
WARN `new NativeEventEmitter()` was called with a non-null argument without the required `removeListeners` method.
LOG Start Service Triggered
LOG Running "location" with {"rootTag":1}
info Reloading app...
BUNDLE ./index.js
WARN `new NativeEventEmitter()` was called with a non-null argument without the required `addListener` method.
WARN `new NativeEventEmitter()` was called with a non-null argument without the required `removeListeners` method.
LOG Start Service Triggered
LOG Running "location" with {"rootTag":11}
info Starting the app on "emulator-5554"...
locati..
Foreground Service
you are online!
`new NativeEventEmitter()` was called with ...

WEB APPLICATION



MACHINE LEARNING PROPOSAL



Expected Outcomes

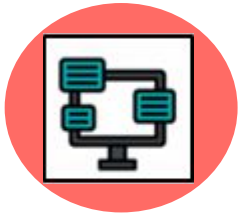
Communicable

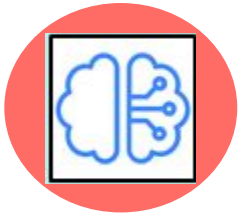
- Based on the covid infection,recovery and death counts future forecasting.
- Based on Geo-locations High risk zone identification and spreading rate prediction.
- Based on bluetooth data, cluster formation and spread of the cluster is predicted.

Non-Communicable

- Based on the infected , recovered and death counts of specific locations the trend in the spread of that location is predicted.

MACHINE LEARNING WORKFLOW





Step 1

Data Gathering

Step 2

Data Processing

Step 3

Model Development

Step 4

Model Evaluation and Validation

Step 5

Model Deployment

01.Data Gathering

Dataset

User details with covid status/CKDu status

Communicable

- GPS coordinates of the user gathered every 15 seconds.
- Bluetooth UUIDs of the close contacts of the user.

Non-Communicable

Locations of infected personals with infected recovered and death rates.

Proposed Mode of Data Collection

Covid/CKDu status : Signing up and routine questionnaires

Communicable

- Mobile Application collects the geo coordinates of the user in the foreground every 15 secs
- Mobile App collects the Bluetooth UUIDs when another device with the app comes in close proximity

Non-Communicable

PHI updates the infected,recovered and death counts with locations on a certain routine.

02.Data Processing

CKDU_Updates

	Location String	Infected Int32	Recovered Int32	Deaths Int32	Date Date	coordinates Object
1	"Anhui"	198	29	16	2020-01-21T18:30:00.000+00:00	{} 2 fields
2	"Beijing"	77	35	10	2020-01-21T18:30:00.000+00:00	{} 2 fields
3	"Chongqing"	70	20	9	2020-01-21T18:30:00.000+00:00	{} 2 fields
4	"Fujian"	4	70	34	2020-01-21T18:30:00.000+00:00	{} 2 fields
5	"Gansu"	29	11	44	2020-01-21T18:30:00.000+00:00	{} 2 fields
6	"Guangdong"	67	59	34	2020-01-21T18:30:00.000+00:00	{} 2 fields
7	"Guangxi"	186	34	24	2020-01-21T18:30:00.000+00:00	{} 2 fields
8	"Guizhou"	102	38	38	2020-01-21T18:30:00.000+00:00	{} 2 fields
9	"Hainan"	101	48	8	2020-01-21T18:30:00.000+00:00	{} 2 fields
10	"Hebei"	186	31	41	2020-01-21T18:30:00.000+00:00	{} 2 fields
11	"Heilongjiang"	103	18	16	2020-01-21T18:30:00.000+00:00	{} 2 fields
12	"Henan"	192	22	6	2020-01-21T18:30:00.000+00:00	{} 2 fields

CKDu

GPS_dataset

	_id ObjectId	idFile String	datetime String	lat String	lon String	covidstatus String
1	621c9d653bd5f0a4374a82ed	"tldata"	"2019-06-24 19:44:06.053999872"	"-0.1188907550088739"	"-0.0601952507197722"	"0"
2	621c9d653bd5f0a4374a82f3	"tldata"	"2019-06-24 20:51:30.670000128"	"-0.092431455008874"	"-0.0550300007197677"	"0"
3	621c9d653bd5f0a4374a82f6	"tldata"	"2019-06-24 21:39:30.752999936"	"-0.0388437550088739"	"-0.0674008507197641"	"0"
4	621c9d653bd5f0a4374a82fc	"tldata"	"2019-06-25 14:20:36.815000064"	"-0.0683407550088739"	"-0.059738950719776"	"0"
5	621c9d653bd5f0a4374a8300	"tldata"	"2019-06-25 14:28:40.039000064"	"-0.1154646550088739"	"-0.0657667507197743"	"0"
6	621c9d653bd5f0a4374a831f	"tldata"	"2019-06-26 18:12:11.828999936"	"-0.1182692550088739"	"-0.0681361507197664"	"0"
7	621c9d653bd5f0a4374a832c	"tldata"	"2019-06-26 20:22:50.805000192"	"-0.123444955008874"	"-0.0733670507197672"	"0"
8	621c9d653bd5f0a4374a834c	"tldata"	"2019-06-27 01:34:09.161999872"	"-0.0392671550088739"	"-0.067657950719763"	"0"
9	621c9d653bd5f0a4374a8352	"tldata"	"2019-06-27 02:33:25.540999936"	"-0.0513146050088739"	"-0.0682598507197695"	"0"
10	621c9d653bd5f0a4374a8353	"tldata"	"2019-06-27 03:37:40.288000000"	"-0.0510456550088739"	"-0.0650297507197734"	"0"
11	621c9d653bd5f0a4374a837b	"tldata"	"2019-06-29 19:27:22.000000000"	"-0.237152705008874"	"-0.0121737007197708"	"0"
12	621c9d653bd5f0a4374a838a	"tldata"	"2019-06-29 19:32:00.000000000"	"-0.250862755008874"	"-0.0023790507197674"	"0"

GPS

Covid19_Updates

	_id ObjectId	Date Date	Location String	Confirmed Int32	Deaths Int32	Recovered Int32
1	621c51e5c4f24f87f62d53f7	2020-01-21T18:30:00.000+00:00	"Beijing"	14	0	0
2	621c51e5c4f24f87f62d540f	2020-01-21T18:30:00.000+00:00	"Shanghai"	9	0	0
3	621c51e5c4f24f87f62d53f8	2020-01-21T18:30:00.000+00:00	"Chongqing"	6	0	0
4	621c51e5c4f24f87f62d5400	2020-01-21T18:30:00.000+00:00	"Heilongjiang"	0	0	0
5	621c51e5c4f24f87f62d5405	2020-01-21T18:30:00.000+00:00	"Inner Mongolia"	0	0	0
6	621c51e5c4f24f87f62d5413	2020-01-21T18:30:00.000+00:00	"Tianjin"	4	0	0
7	621c51e5c4f24f87f62d5420	2020-01-22T18:30:00.000+00:00	"Gansu"	2	0	0
8	621c51e5c4f24f87f62d5424	2020-01-22T18:30:00.000+00:00	"Hainan"	5	0	0
9	621c51e5c4f24f87f62d543d	2020-01-22T18:30:00.000+00:00	"Yunnan"	2	0	0
10	621c51e5c4f24f87f62d545b	2020-01-23T18:30:00.000+00:00	"Yunnan"	5	0	0
11	621c51e5c4f24f87f62d548c	2020-01-24T18:30:00.000+00:00	"Guizhou"	4	0	0
12	621c51e5c4f24f87f62d54a1	2020-01-25T18:30:00.000+00:00	"Zhejiang"	104	0	1

COVID 19

Bluetooth_dataset

	_id ObjectId	Date_Time Date	Location String	Anonimised_MAC_Address Int32
1	621c9c753bd5f0a43749961b	2018-08-09T18:40:00.000+00:00	"lamar_parmer"	26903
2	621c9c753bd5f0a4374996l7	2018-08-09T18:37:00.000+00:00	"lamar_parmer"	26903
3	621c9c753bd5f0a4374996g9	2018-08-09T19:02:00.000+00:00	"lamar_parmer"	48
4	621c9c753bd5f0a4374996ga	2018-08-09T19:04:00.000+00:00	"lamar_parmer"	26928
5	621c9c753bd5f0a4374996ca	2018-08-09T19:24:00.000+00:00	"lamar_parmer"	4266
6	621c9c753bd5f0a4374996g3	2018-08-09T19:28:00.000+00:00	"lamar_parmer"	26938
7	621c9c753bd5f0a4374996g9	2018-08-09T19:32:00.000+00:00	"lamar_parmer"	26939
8	621c9c753bd5f0a4374996a2	2018-08-09T20:18:00.000+00:00	"lamar_parmer"	26950
9	621c9c753bd5f0a4374996c0	2018-08-09T21:04:00.000+00:00	"lamar_parmer"	14301
10	621c9c753bd5f0a4374996d2	2018-08-09T21:15:00.000+00:00	"lamar_parmer"	9653
11	621c9c753bd5f0a437499705	2018-08-09T22:49:00.000+00:00	"lamar_parmer"	26986
12	621c9c753bd5f0a437499718	2018-08-09T23:08:00.000+00:00	"lamar_parmer"	7805

BLUETOOTH

03.Model Development

- Model development will be done separately for communicable and noncommunicable diseases separately.

- Binary classification algorithms will be used. (infected : (Yes/No))

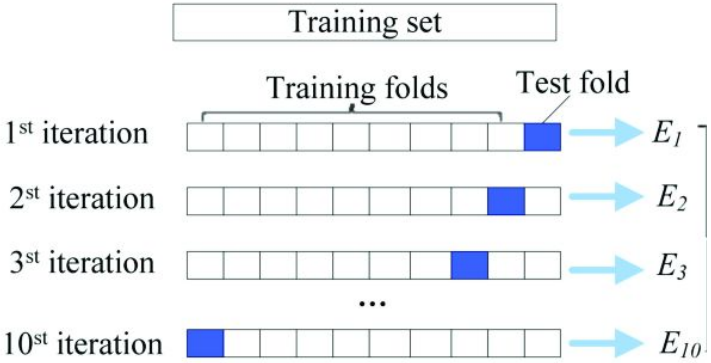
  - Logistic Regression
  - k-Nearest Neighbors
  - random forest (RF)
  - Support Vector Machine
  - Naive Bayes

- Model will be fine tuned

04. Model Evaluation and Validation

	Predicted 0	Predicted 1
Actual 0	TN	FP
Actual 1	FN	TP

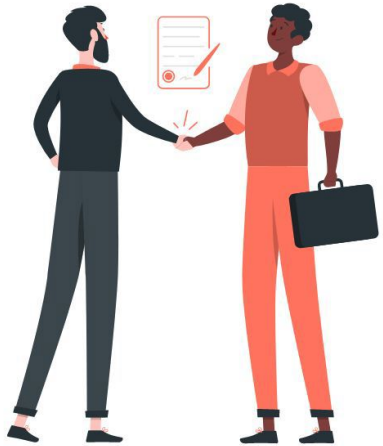
- Proposed metrics to use
  - Accuracy
  - Confusion matrix
- Proposed validation method to use
  - 10 fold Cross Validation



05.Model Deployment

- Predictions will be served via both the mobile app and web app.
- Performance will be monitored and maintained.

THANK YOU !



Q & A