



VIT[®]

Vellore Institute of Technology

(Deemed to be University under section 3 of UGC Act, 1956)

SOFTWARE ENGINEERING (CSE3001)

Topic: Covid Vaccine Enrolment

J COMPONENT

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SLOT: L31+L32

Submitted to

AKILA VICTOR (SCOPE)

ABSTRACT:

Our project is built to solve the current logistical problem of Covid vaccination. People can use our platform to book vaccination slots from hospitals. Our website partners with the hospitals to display the number of available vaccines in each hospital, so that the people can book a slot according to their convenience. Our platform also takes into consideration the vulnerability of senior citizens, people with comorbidities to covid and prioritises their vaccination above others, by the use of our ML Algorithm.

AIM:

Our aim is to create a website to solve the current logistical problem of Covid vaccination. People can use our platform to book vaccination slots from hospitals. Our website partners with the hospitals to display the number of available vaccines in each hospital, so that the people can book a slot according to their convenience. Our platform also takes into consideration the vulnerability of senior citizens, people with comorbidities to covid and prioritizes their vaccination above others, by the use of our ML Algorithm.

OBJECTIVE:

Right now the world is facing a pandemic, and the number of vaccines to treat the people is limited. Thus, it is very important to distribute the vaccines to the people who need it the most. Our web application's objective is to help the people to enroll for the vaccination and allot the vaccine based on who's most vulnerable. This way the most vulnerable people would get vaccinated first and would lead to lesser fatalities.

SCOPE:

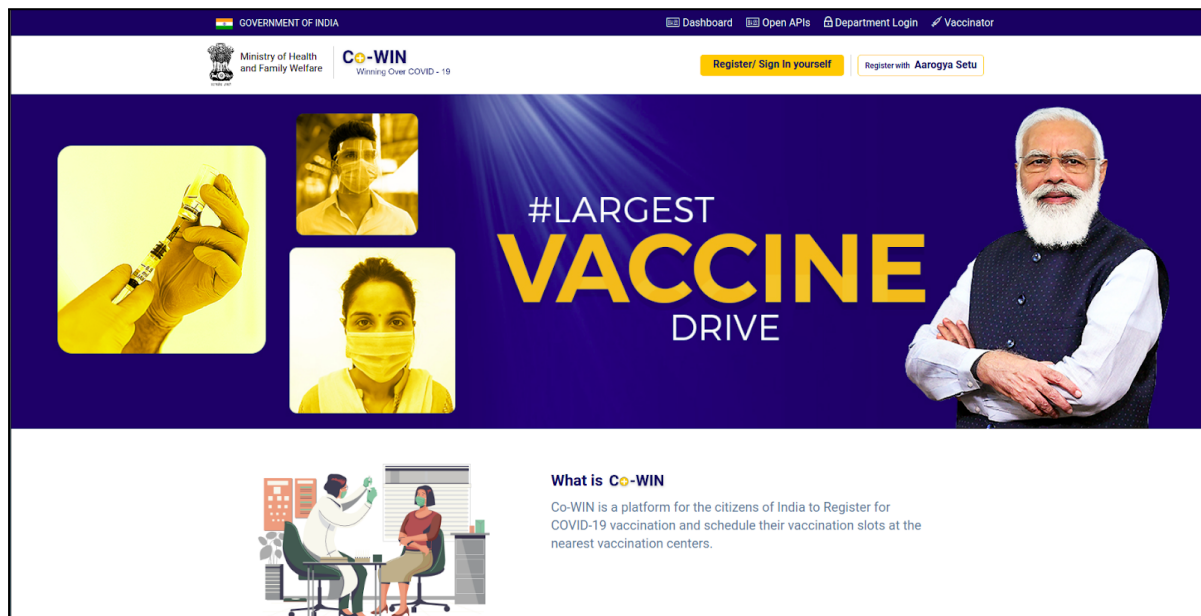
Our project is built to solve the current logistical problem of Covid vaccination. People can use our platform to book vaccination slots from hospitals. Our website partners with the hospitals to display the number of available vaccines in each hospital, so that the people can book a slot according to their convenience. Our platform also takes into consideration the vulnerability of senior citizens, people with comorbidities to covid and prioritizes their vaccination above others, by the use of our ML Algorithm.

INTRODUCTION - PROBLEM:

Right now the world is facing a pandemic, and the number of vaccines to treat the people is limited. Thus, it is very important to distribute the vaccines to the people who need it the most. Our web application's objective is to help the people to enroll for the vaccination and allot the vaccine based on who's most vulnerable. This way the most vulnerable people would get vaccinated first and would lead to lesser fatalities.

EXISTING WORK:

The government of India has created a similar portal that allots covid vaccines purely based on the age. Currently, only people above the age of 45 can enroll for the vaccination. It is purely based on first-come first-serve and does not rely on any other method to allot the vaccines.



PROPOSED METHODOLOGY

Algorithm

User's perspective:

1. The user first comes to our website and registers with us
2. After the user is registered he's then redirected to fill a form based on his symptoms.
3. After he fills the form he is then allowed to choose the vaccination slot from his nearest hospital.
4. Based on the availability he then gets a confirmation of his vaccination slot, else he is put in a queue based on his priority.

Functioning methodology:

1. When a user enters our website, if he chooses a hospital where the vaccine is immediately available he is allotted a slot immediately.
2. If the vaccines are not available in a hospital he is put in a queue and given a priority based on his symptoms.
3. Our ML algorithm will determine the severity of a patient based on the data of previous patients and is accordingly given a priority.
4. When the hospital receives a fresh batch of vaccines, the patients at the top of the queue will be allotted vaccination slots.

Hospital perspective:

1. The participating hospitals enter their location, contact details, etc., in our database. This in turn
displayed to the user, so that they can choose a hospital based on their convenience.
2. The hospital also displays the total number of available vaccines to the user.
3. After a user gets allotted a vaccination slot in a particular hospital, the hospital is informed and the number of available vaccines is reduced by 1.
4. Once the available vaccines of a particular hospital drops to 0, it stops accepting user requests.
5. The hospital gets a list of all enrolled vaccination participants.

Implementation:

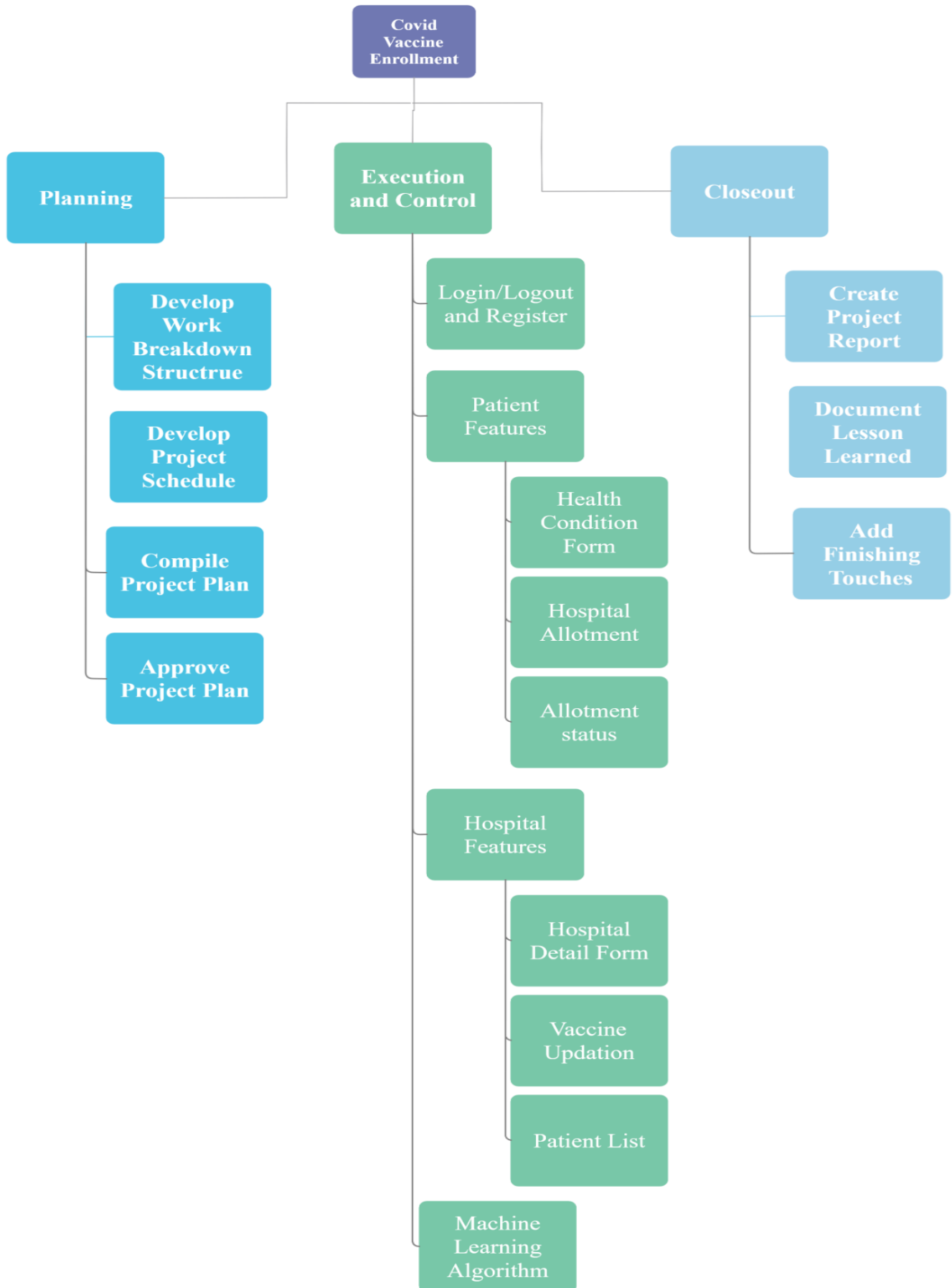
1. Django: It is a python web-framework which we're using to create and maintain our website
2. Frontend: HTML5, CSS3 and JavaScript for design work and making the website more dynamic in nature
3. Database: SQLite3 is used to store the details of users, hospitals, allotment status, etc.
4. ML: pandas,scikit-learn
5. Dataset in the form of a csv file

Process Model (Exploratory Development Process Model)

Our project's basic objective is to effectively allot vaccines to people who need it the most so that there are minimal casualties. As we're very new to this kind of situation we only have a basic understanding of our requirements and hope to work with our patients and improve the final product. This will help us to build a more user-friendly website by adding features that are realised in the later stages by the consumer.

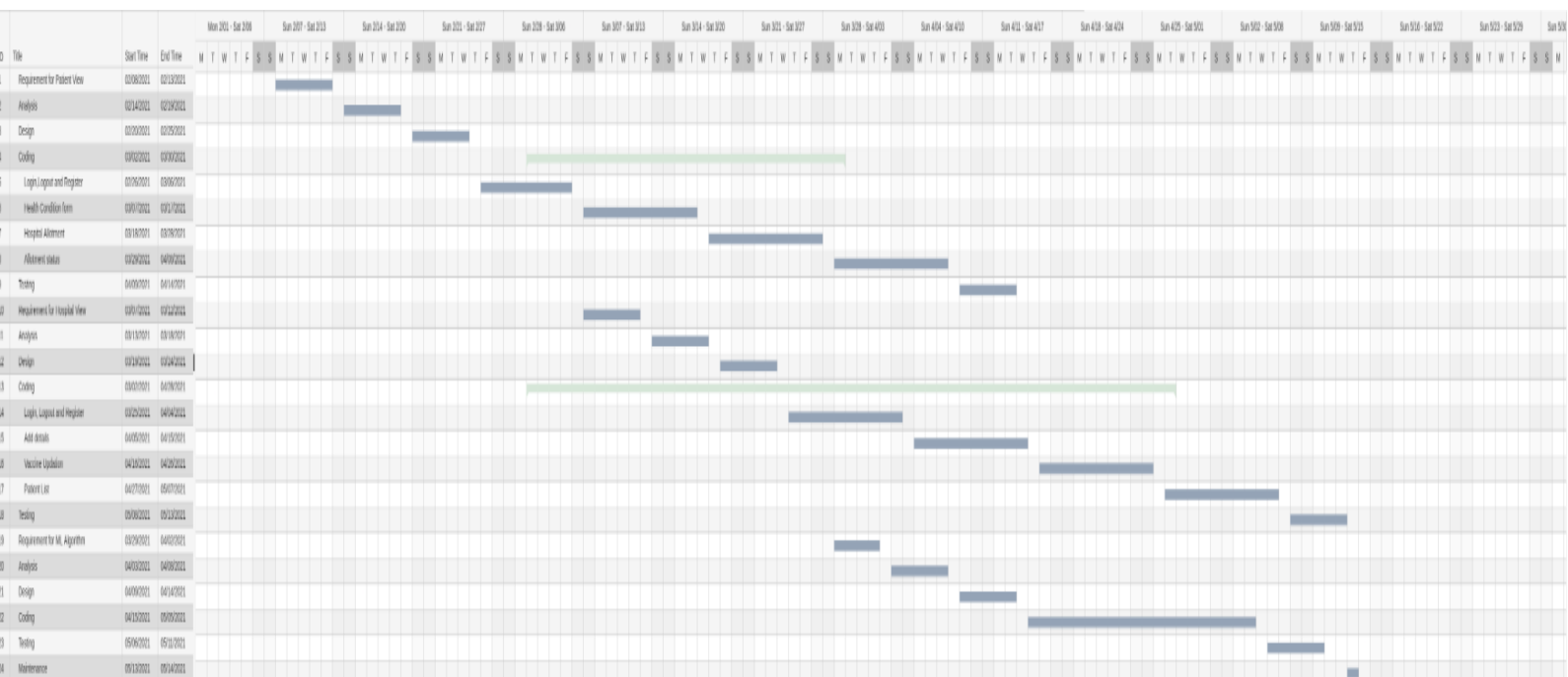
WORK BREAKDOWN STRUCTURE

PHASE BASED WORK BREAKDOWN STRUCTURE



GANTT CHART

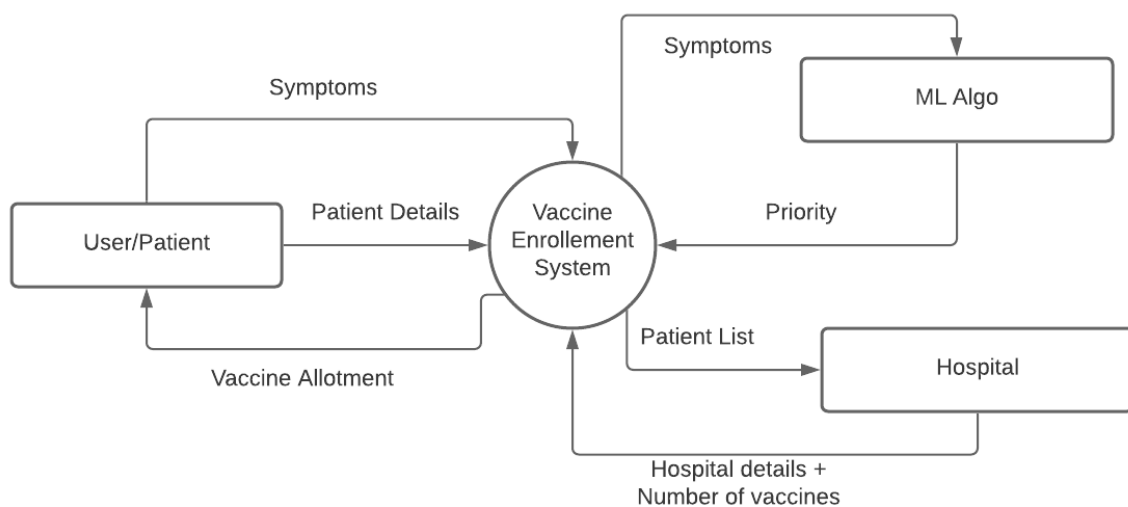
ID	Title	Start Time	End Time
1	Requirement for Patient View	02/08/2021	02/13/2021
2	Analysis	02/14/2021	02/19/2021
3	Design	02/20/2021	02/25/2021
4	▲ Coding	03/02/2021	03/30/2021
5	Login,Logout and Register	02/26/2021	03/06/2021
6	Health Condition form	03/07/2021	03/17/2021
7	Hospital Allotment	03/18/2021	03/28/2021
8	Allotment status	03/29/2021	04/08/2021
9	Testing	04/09/2021	04/14/2021
10	Requirement for Hospital View	03/07/2021	03/12/2021
11	Analysis	03/13/2021	03/18/2021
12	Design	03/19/2021	03/24/2021
13	▲ Coding	03/02/2021	04/28/2021
14	Login, Logout and Register	03/25/2021	04/04/2021
15	Add details	04/05/2021	04/15/2021
16	Vaccine Updation	04/16/2021	04/26/2021
17	Patient List	04/27/2021	05/07/2021
18	Testing	05/08/2021	05/13/2021
19	Requirement for ML Algorithm	03/29/2021	04/02/2021
20	Analysis	04/03/2021	04/08/2021
21	Design	04/09/2021	04/14/2021
22	Coding	04/15/2021	05/05/2021
23	Testing	05/06/2021	05/11/2021
24	Maintenance	05/13/2021	05/14/2021



Data Flow Diagram (DFD)

Level-0 DFD

Our project is built to solve the current logistical problem of Covid vaccination. People can use our platform to book vaccination slots from hospitals. Our website partners with the hospitals to display the number of available vaccines in each hospital, so that the people can book a slot according to their convenience. Our platform also takes into consideration the vulnerability of senior citizens, people with comorbidities to covid and prioritizes their vaccination above others, by the use of our ML Algorithm.



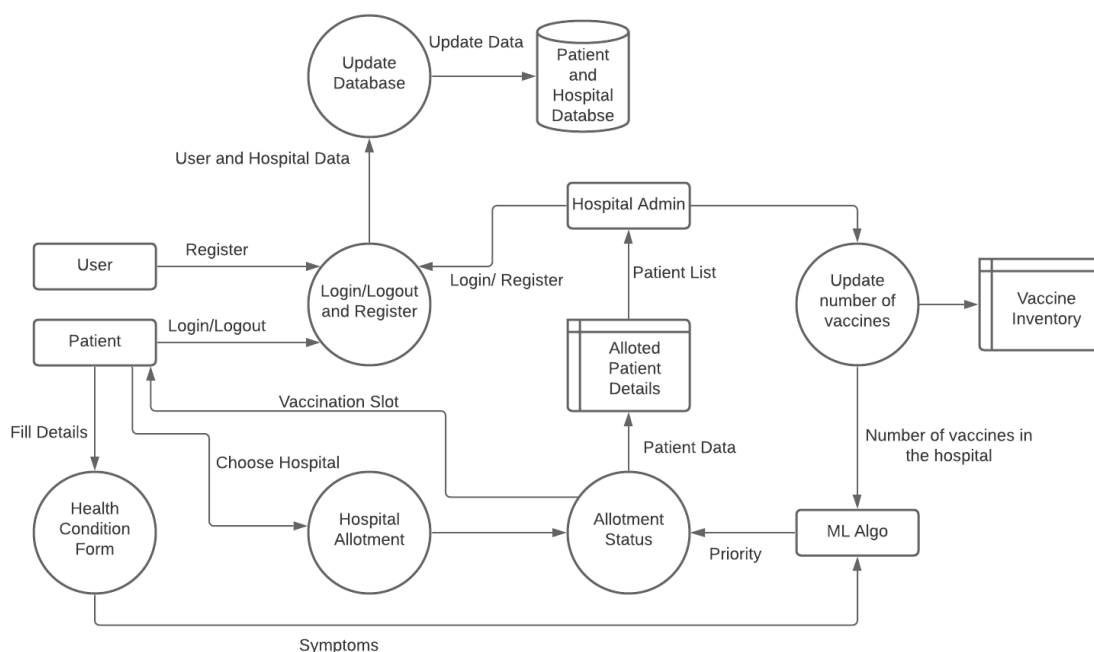
Level-1 DFD

User's perspective:

1. The user first comes to our website and registers with us
2. After the user is registered he's then redirected to fill a form based on his symptoms.
3. After he fills the form he is then allowed to choose the vaccination slot from his nearest hospital
4. Based on the availability he then gets a confirmation of his vaccination slot, else he is put in a queue based on his priority.

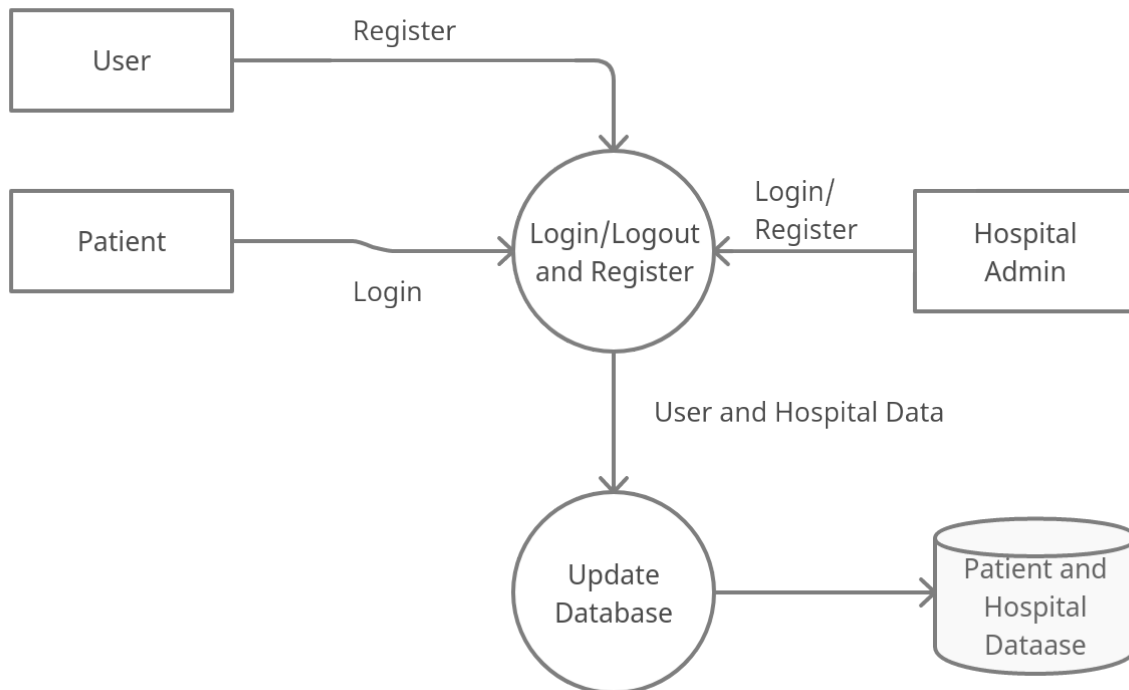
Hospital perspective:

1. The participating hospitals enter their location, contact details, etc., in our database. This in turn is displayed to the user, so that they can choose a hospital based on their convenience.
2. The hospital also displays the total number of available vaccines to the user.
3. After a user gets allotted a vaccination slot in a particular hospital, the hospital is informed and the number of available vaccines is reduced by 1.
4. Once the available vaccines of a particular hospital drops to 0, it stops accepting user requests.
5. The hospital gets a list of all enrolled vaccination participants.



Level-2 DFD

1. Login/Logout and Register:



This is the first step for any user who wants to use our website. So, a first time user will register with us and from there on he will be able to login to our website.

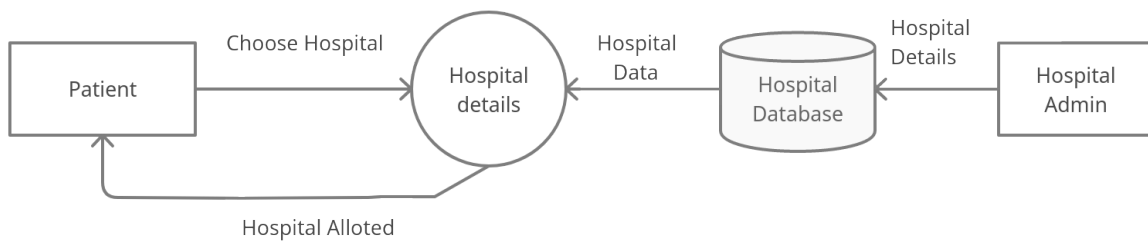
2. Health Condition Form:

The patient has to fill a form declaring his current medical issues and symptoms. This will be used by us to calculate the priority of a patient in the allotment queue. (This priority will be calculated by our ML module).



3. Hospital Allotment:

After filling his health condition form, the patient will be allowed to choose a hospital of his/her convenience. Our website will display the availability of vaccines in each and every hospital as the number of patients in the queue, if the number of available vaccines is 0. This way our patient is allowed to make an accurate decision.



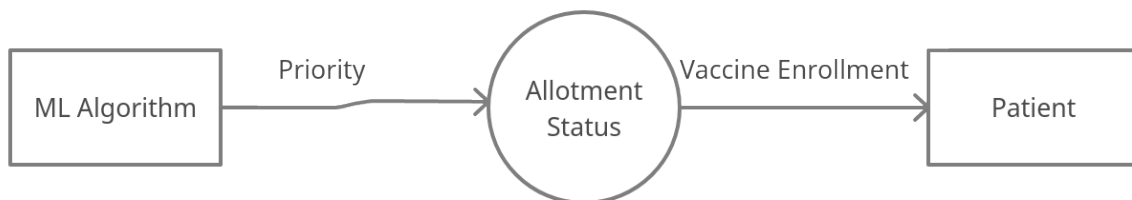
4. Allotment Status:

Case 1:

If the hospital chosen by the patient has available vaccines then the patient is allotted his vaccine-slot.

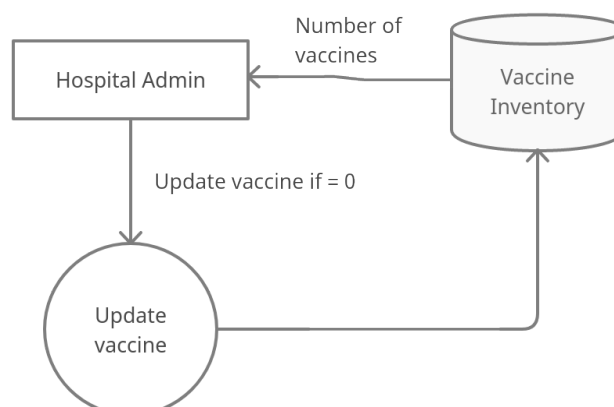
Case 2:

If there are no available vaccines in the hospital chosen by the patient, the patient is put in a queue based on his priority calculated by our ML algorithm using his symptoms. Thus, a patient in more vulnerable condition is placed in front of the queue. Thus, this queue automatically updates itself after every user enrolls itself. Once the vaccines are available, he will be allotted slots based on his current position in the queue.



5. Vaccine Updation:

Whenever a hospital receives a fresh batch of vaccines, they'll have to update it here. When they update it the patients who are in the priority queue will be allotted a vaccine.



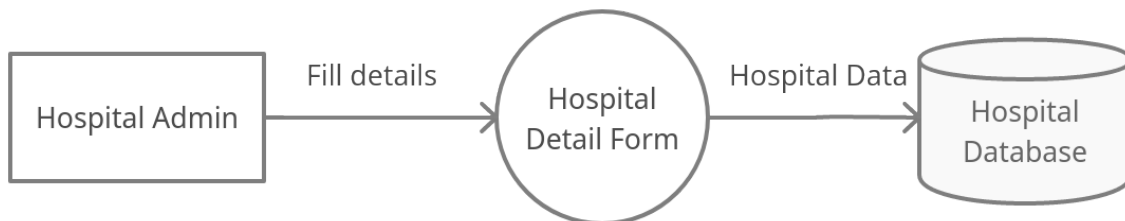
6. Patient List:

The hospital admin will be able to view all the patients who've been allotted to that hospital.



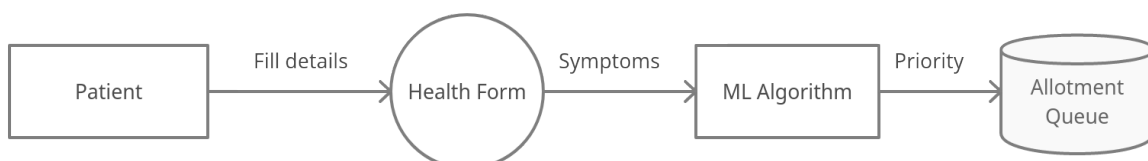
7. Hospital Detail Form (For first-time admins):

The admin will have to give all the details about his hospital as well as the number of available vaccines.



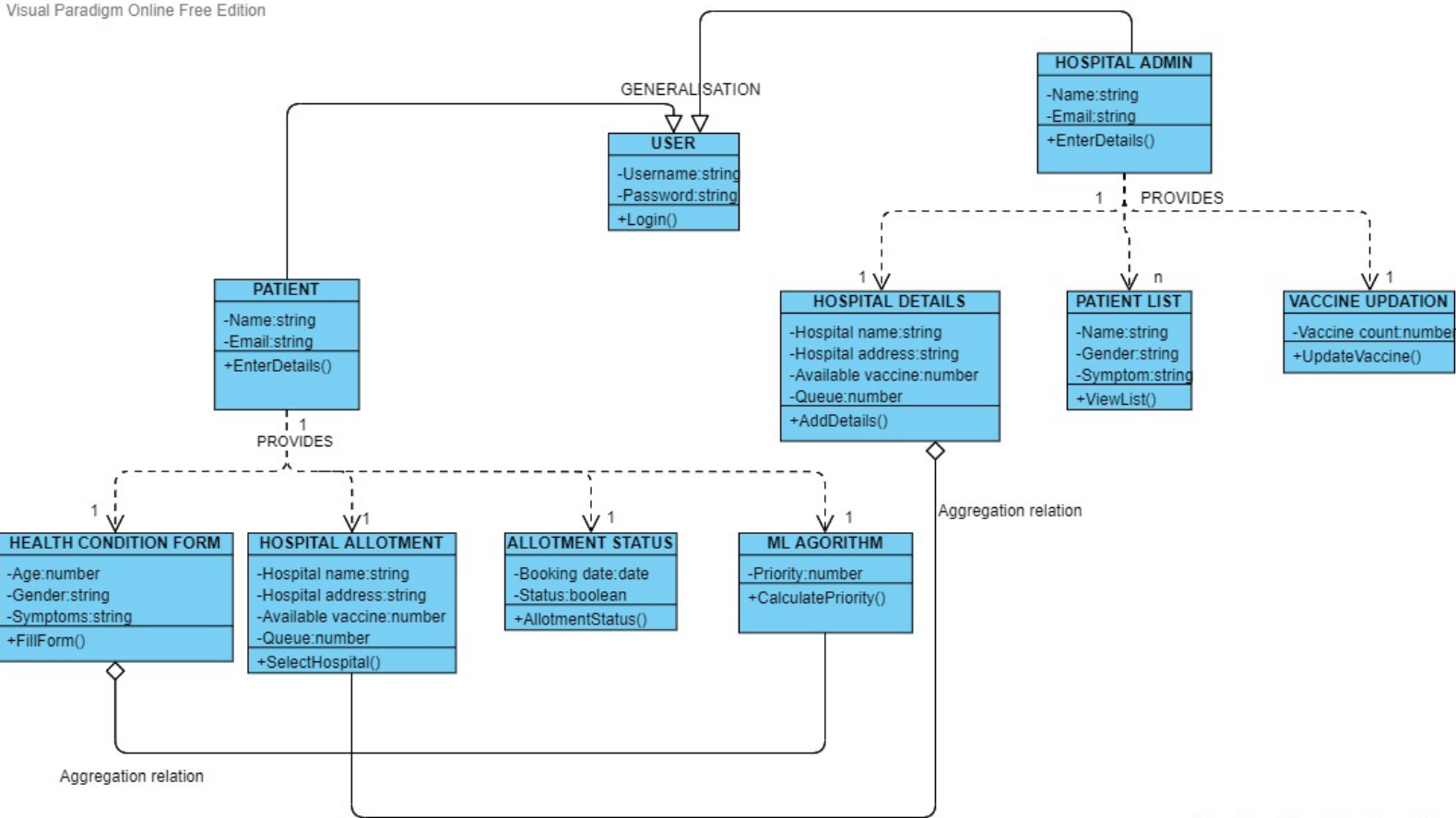
8. ML Algo:

In our project we will make use of Random-Forest Regressor to train our model using existing data of Covid patients and assign a priority based on seriousness and condition of the patient from the symptoms declared by the patient to us. This priority will be used in our queuing process.



1)Class Diagram:

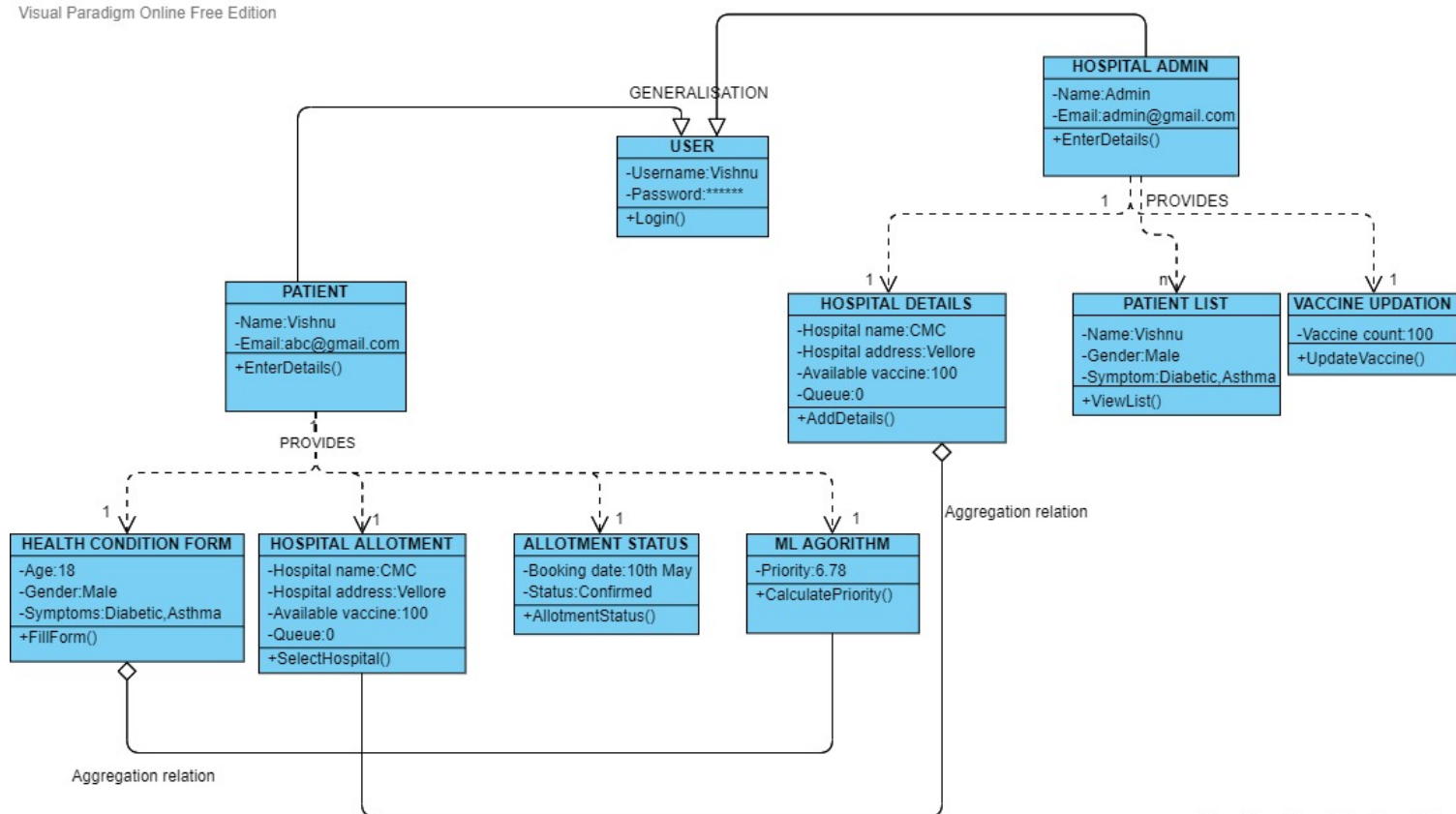
Visual Paradigm Online Free Edition



Visual Paradigm Online Free Edition

2)Object Diagram:

Visual Paradigm Online Free Edition

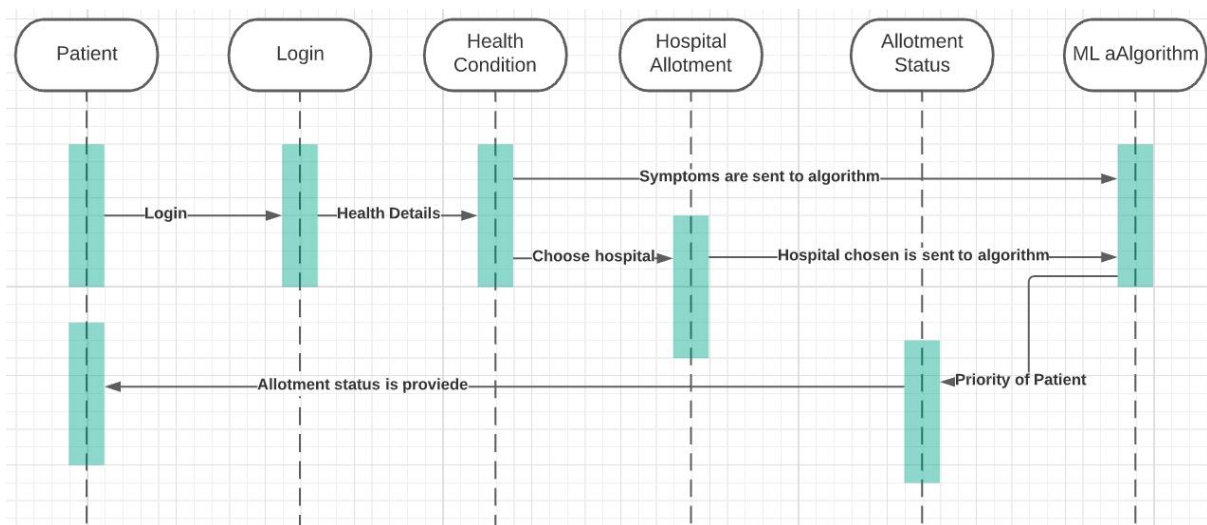


Visual Paradigm Online Free Edition

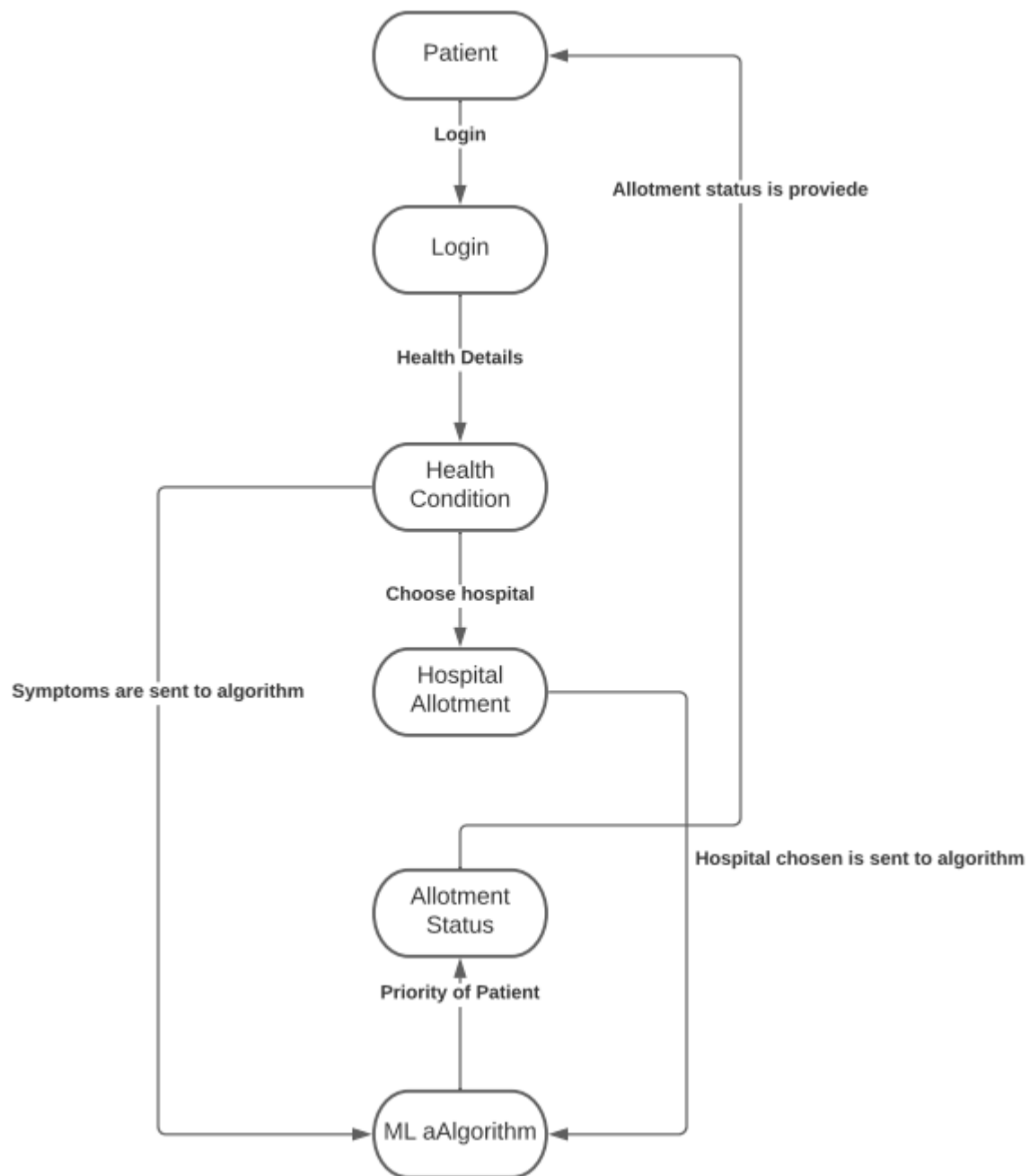
3) Use case:



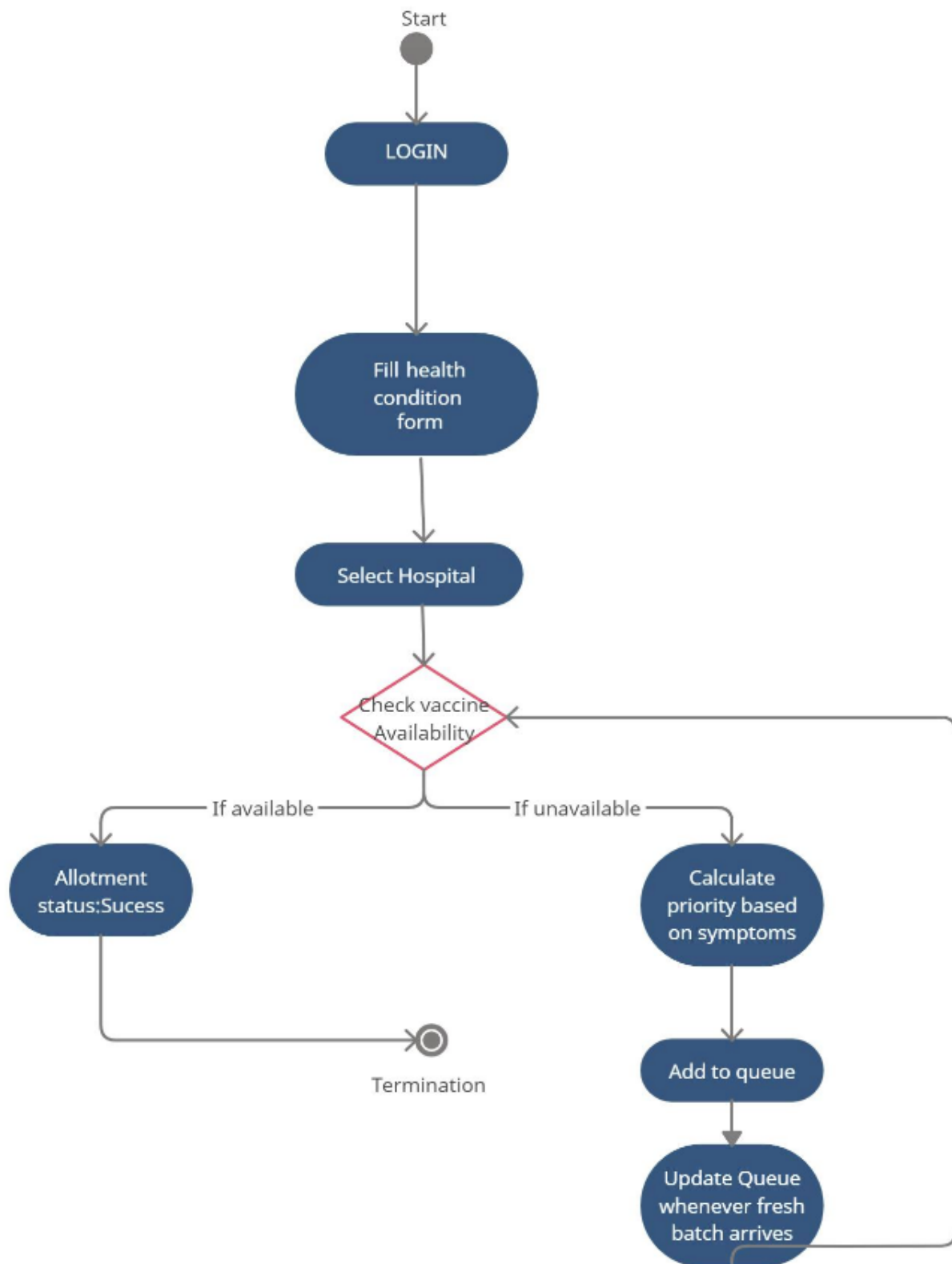
4) Sequence Diagram:



5) Collaboration Diagram:

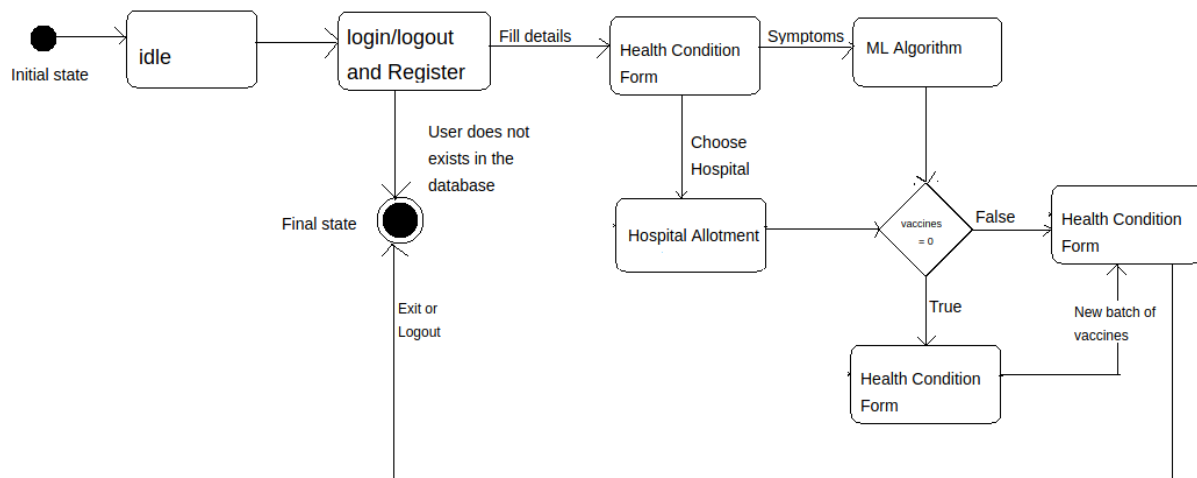


6)Activity Diagram:

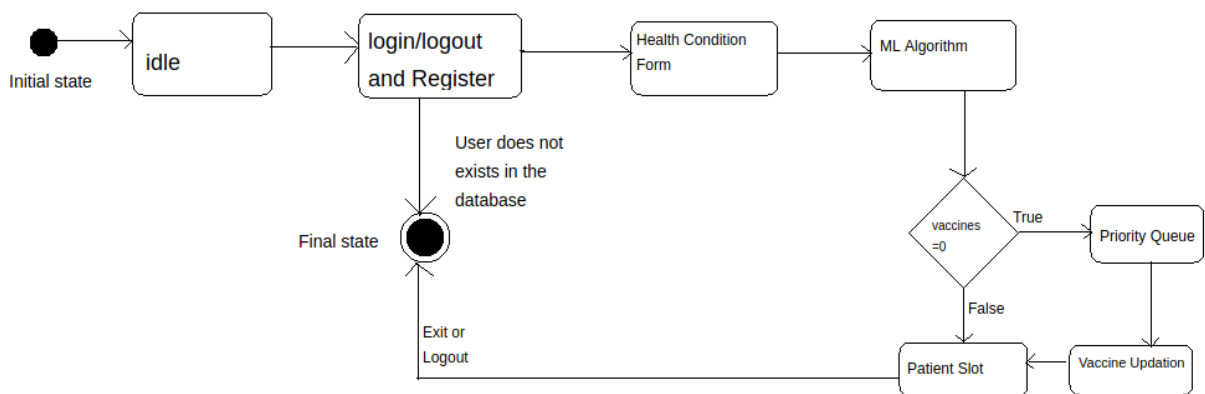


7)State Chart Diagram

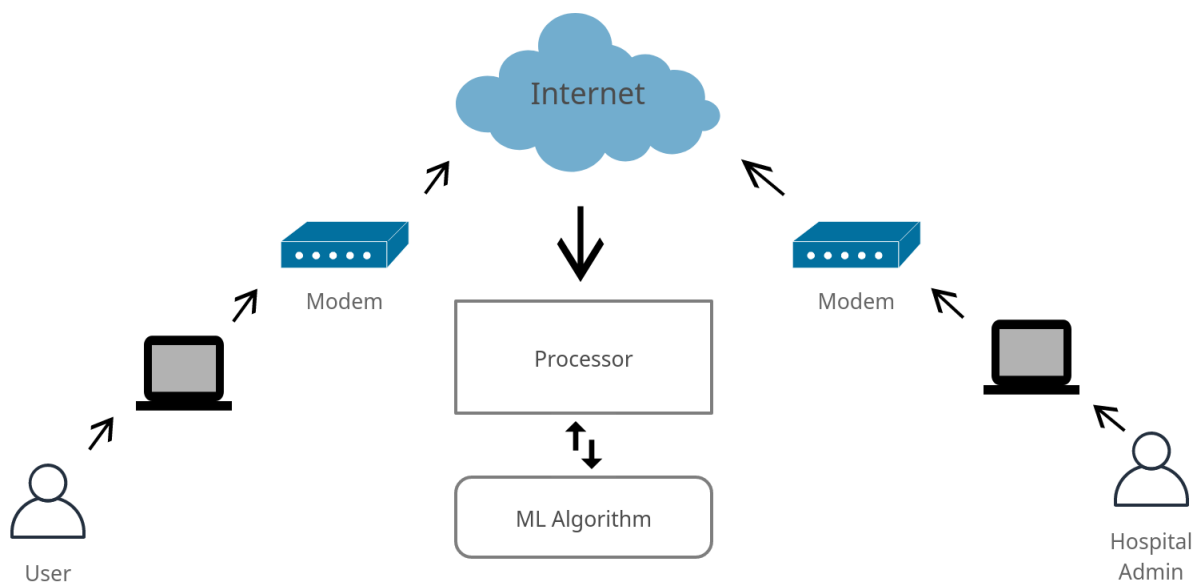
User's Perspective:



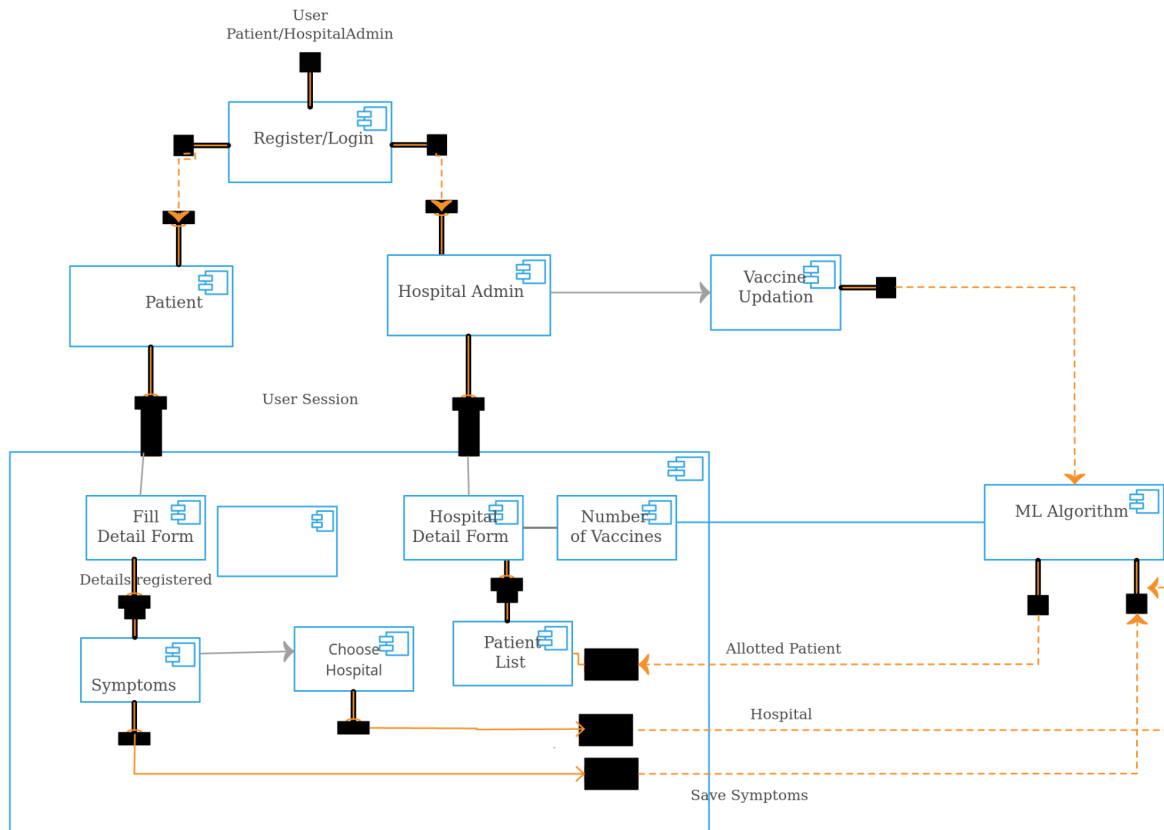
Hospital's perspective:



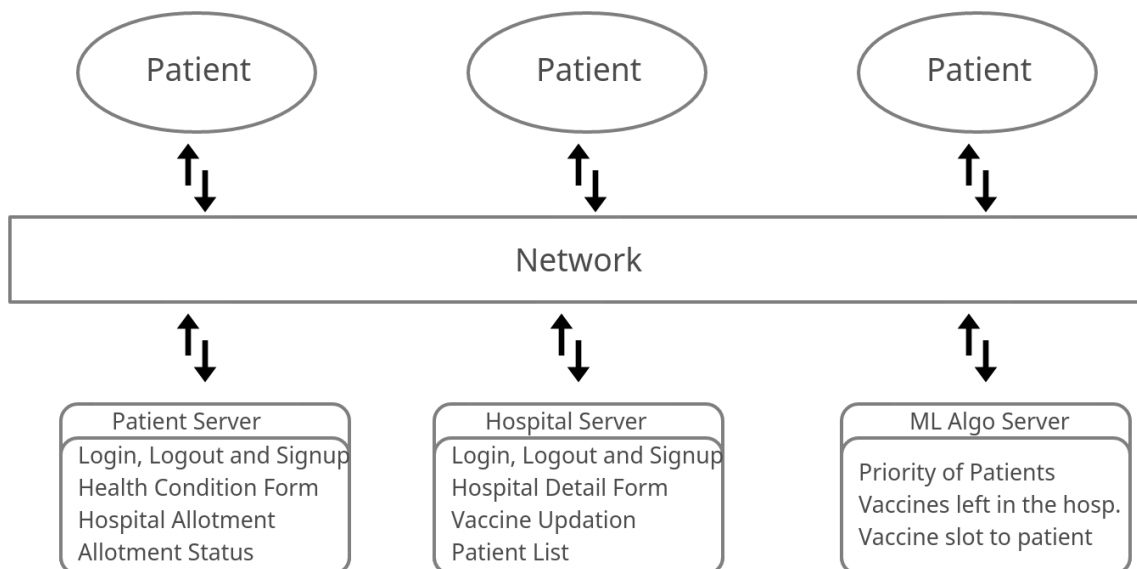
8)Deployment Diagram:



9)Component Diagram:



10)Client Server Architecture:



Test Report

ID	SCENARIO	TEST CASE	PRE-CONDITION	TEST STEPS	EXPECTED RESULT
1.1.1	Verify the Home Page	Click on the different buttons	The user needs to be on the home page	1) Views Home Page. 2) Click on Login button. 3) Click on Register button. 4) Click on Contact us button.	Correct redirection to the page.
1.1.2	Verify the Home Page	Logged in user clicks on the different buttons	The user need to login	1) Views Home Page. 2) Click Logout	Login and Register is not visible. Logout is visible.
1.2.1	Verify Sign In	Enter Invalid Username and Password	Needs a Valid Gmail account	1) Enter Username 2) Enter Password 3) Click on Sign-In	Successful login
1.2.2	Verify Sign In	Enter Valid Username and Password	Needs a Valid Gmail account	1) Enter Username 2) Enter Password 3) Click on Sign-In	Email and Password do not match.
1.3.1	Verify Sign Up	Enter Valid Username, First Name, Last Name, Email , Password, Password Confirmation.	Needs a Valid Gmail account	1) Enter Username 2) Enter First Name 3) Enter Last Name 4) Enter email 5) Enter password 6) Confirm Password 4) Click on Sign-In	Successful Sign Up
1.3.2	Verify Sign Up	Enter Valid Username,	Needs a valid Gmail account	1) Enter Username	1) 150 characters or

		First Name, Last Name, Email , Password, Password Confirmation.		2) Enter First Name 3) Enter Last Name 4) Enter email 5) Enter password 6) Confirm Password 4) Click on Sign-In	fewer required. Letters, digits and @./+/-/_ 2) Email is not valid 3) Passwords are too similar to personal info, password must contain at least 8 characters, password can not be entirely numeric. 4) Confirm password not matching entered password
1.4.1	Verify Health Condition Form	Enter Invalid Age(negative values)	Needs an Account with our website	1) Enter Age 2) Enter Symptoms 3) Click on Submit.	Age is invalid
1.4.2	Verify Health Condition Form	Enter valid Age	Needs an Account with our website	1) Enter Age 2) Enter Symptoms 3) Click on Submit.	Successful form
1.5.1	Verify Hospital Allotment	Click on Hospital with queue	Has to fill health condition form	1) Click on Book Button	To be allotted a vaccination slot directly
1.5.2	Verify Hospital Allotment	Click on hospital with no queue	Has to fill Health Condition form	1) Click on Book Button	Placed in a vaccination slot queue
1.6.1	Allotment Status	To check whether	Allotted a vaccination slot	1) View the status	Booking date and time for

		proper status message is displayed or not		2) Choose booking time and date	vaccination confirmed
1.6.2	Allotment Status	To check whether proper status message is displayed or not	Not allotted a vaccination slot (in a queue)	1) View status	Wait for vacant slot
2.1.1	Verify Hospital Form	Enter Valid Name,Address,Phone, Available Vaccine.	Needs an Account with our website as an Admin	1) Enter Name 2) Enter Address 3) Enter Phone 4) Enter available vaccine 5) Click on save	Successful hospital details updation
2.1.2	Verify Hospital Form	Enter Invalid Name,Address,Phone, Available Vaccine.	Needs an Account with our website as an Admin	1) Enter Name 2) Enter Address 3) Enter Phone 4) Enter available vaccine 5) Click on save	1) 20 alphabets or less. 2) Phone number should contain 10 digits starting with either 7,8 or 9. 3) Vaccine should be > 0.
2.2.1	Verify Patient List	Patient allotted with a slot	Fill Hospital Form	1) View the patient details	Should be able to view the patients
2.2.2	Verify Patient List	Patient has not been allotted a slot	Fill Hospital Form	1) View the patient details	Not able to view the patients
2.3.1	Verify Vaccine Updation	Enter positive number of vaccines	Fill Hospital form	1) Enter the number of vaccines 2) Click on Update button	Successful updation
2.3.2	Verify Vaccine Updation	Enter invalid number of vaccines	Fill Hospital Form	1) Enter the number of vaccines. 2) Click on Update button	Enter a valid number of vaccines

CODE

Patient home page

```
<style>
.index-container {
  margin: 100px 0;
  width: 100%;
}
.card-wrappers {
  display: flex;
  margin-top: 50px;
}

.btn-primary, .btn-success, .btn-warning {
  position: absolute;
  bottom: 25px;
}
</style>
{% extends "app/base.html" %}

{% block content %}
{% if user.is_authenticated %}
<div class="index-container">
<h5 class="display-2">
  Welcome,
  <small class="text-muted">{{user.first_name}} {{user.last_name}}</small>
</h5>
<div class="card-wrappers">
  <div class="col-sm">
    <div class="card" style="width: 20rem;">
      
      <div class="card-body">
        <h5 class="card-title">1) Fill in the Form</h5>
        <p class="card-text">Help us know understand your health condition better before
proceeding</p><br>
        {% if filled_form %}
        <span style="color:green;text-align:center !important;">
```

```

        <i class="fa fa-check-circle fa-3x" style="text-align:center !important;"></i>
    </span>
    {% else %}
        <a href="{% url 'enroll' %}" class="btn btn-primary">Fill Form</a>
    {% endif %}
</div>
</div>
</div>
<div class="col-sm">
    <div class="card" style="width: 20rem;">
        
        <div class="card-body">
            <h5 class="card-title">2) Request a slot in preferred hospitals</h5>
            <p class="card-text">Select a hospital based on your convenience and
distance</p><br>
            {% if booked_hospital %}
                <span style="color:green;text-align:center !important;">
                    <i class="fa fa-check-circle fa-3x" style="text-align:center !important;"></i>
                </span>
            {% else %}
                <a href="{% url 'book' %}" class="btn btn-warning" style="color:white
!important;background-color:gold !important;border-color:gold !important;" >Browse
Hospitals</a>
            {% endif %}
        </div>
    </div>
</div>
<div class="col-sm">
    <div class="card" style="width: 20rem;">
        
        <div class="card-body">
            <h5 class="card-title">3) Vaccine allotment</h5>
            <p class="card-text">We will allot a slot for your vaccination in your preferred
hospital based on availability and priority!</p>
            <a href="{% url 'final' %}" class="btn btn-success" style="color:white
!important;background-color:green !important;border-color:green !important;">Check
Allotment</a>
        </div>
    </div>
</div>

```

```
</div>
</div>
{% endif %}
</div>
{% endblock %}
```

Machine Learning Algorithm

```
import pandas as pd

dataset = pd.read_csv('ML/covidfinal1.csv')
X = dataset.iloc[:, :-2]
y = dataset.iloc[:, 14]
from sklearn.preprocessing import StandardScaler

sc = StandardScaler()
X = sc.fit_transform(X)
from sklearn.ensemble import RandomForestRegressor

regressor = RandomForestRegressor(n_estimators=100, random_state=0)
regressor.fit(X, y)

def
priority(breathing,pneumonia,age,pregnant,diabetes,copd,asthma,immsupr,hypertension,other,ca
rdio,obesity,renal,smoker):
    y_pred =
regressor.predict([[breathing,pneumonia,age/100,pregnant,diabetes,copd,asthma,immsupr,hyper
tension,other,cardio,obesity,renal,smoker]])
    return y_pred
```


RESULTS AND DISCUSSION

BENEFITS:

- Bridges the gap between the hospitals and the patients.
- User-friendly design, easily accessible, hassle-free registration, zero fee registration.
- The primary advantage of our website over the governments is, our allotment algorithm gives importance not only to the age but also to the symptoms.
- Our algorithm makes use of the data of previous covid patients to accurately predict the vulnerability of a person to covid, thereby, allocating vaccines to those who need it the most.
- Provides live allotment status of a patient.

DRAWBACKS:

- The effectiveness of our algorithm depends on how sincerely the patient enters his symptoms in our webpage.
- The hospital's cooperation is a must, the admin must be active and update the number of vaccines as soon as they receive a fresh batch.

CONCLUSION

We have successfully achieved the aim of our project by making an easy to use covid vaccine enrolment website. We have successfully implemented a platform that also takes into consideration the vulnerability of senior citizens, people with comorbidities to covid and prioritises their vaccination above others, by the use of our ML Algorithm. This way the most vulnerable people would get vaccinated first and would lead to lesser fatalities. In the future, we hope to approach the hospitals to convince them to use our website.

FUTURE ENHANCEMENTS

1. API integration.
2. Approaching hospitals to use software.
3. Deploying software on the internet.
4. Payment Gateway.