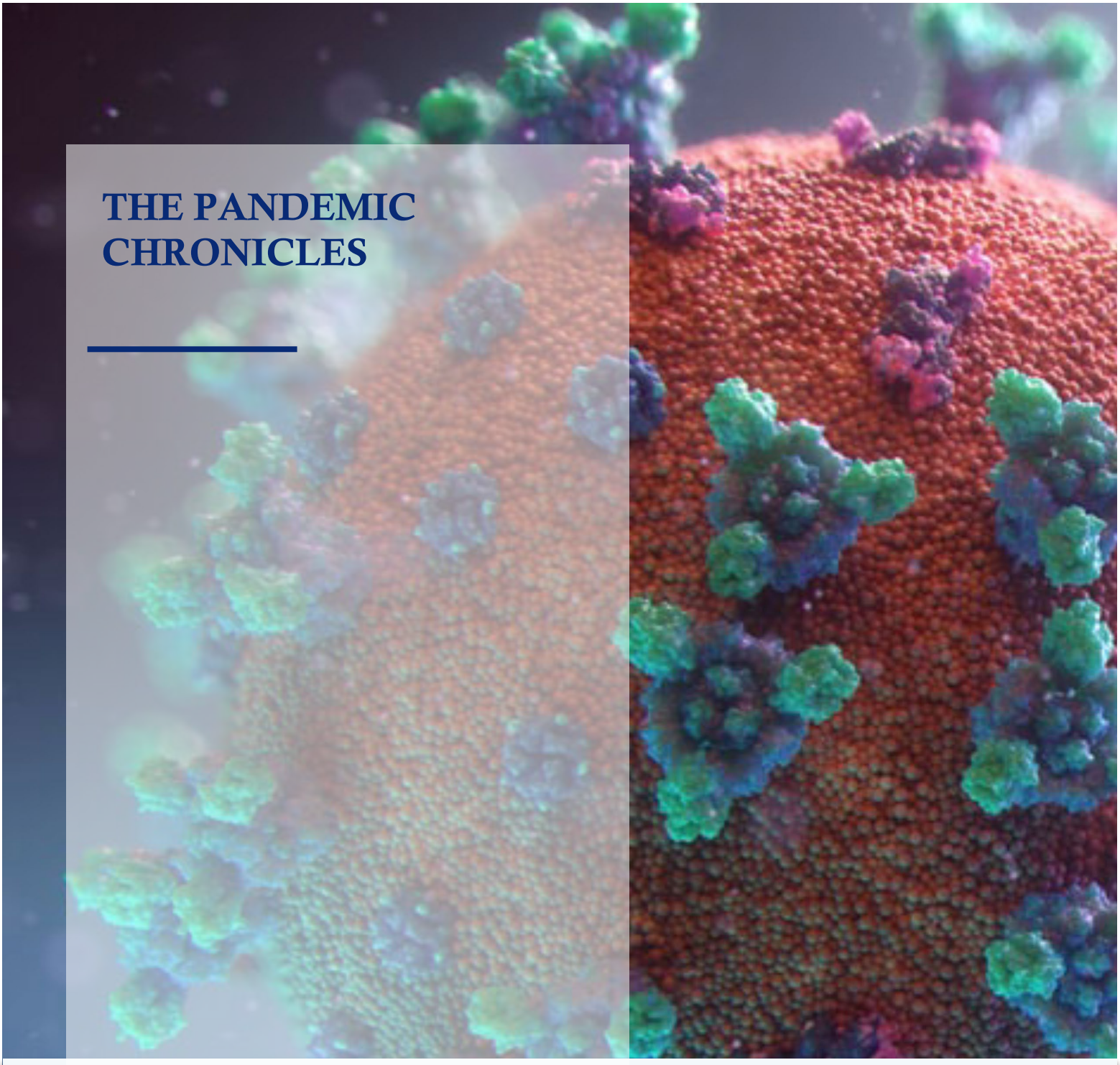


THE PANDEMIC CHRONICLES

SP20: CMPE 280- Web UI Design
Final Project Report
Worked under the guidance of Prof. Ron Mak

THE PANDEMIC
BRUTEFORCE
CHRONICLES

Application Developers

MS Computer Engineering

Vedant Bhoj

MS Software Engineering

Arpit Sharma

MS Computer Engineering

Rashmi Kumari

MS Computer Engineering

Ligin Thiya

Report Navigation

Click on the topic to Navigate

Introduction

The Pandemic Chronicles

Our team has developed an application that is a repository for history of Pandemics. This website contains the details of all the pandemics that occurred over a period of twenty years. This website not only contains the data but also helps in visualizing features of the data for past pandemics so that we can derive conclusions, learnings and predictions from it. The website also contains the data about the major Health Organization that have the latest information and facts related to the current pandemic situations.

Our website contains a in house repository where we can add data for prior or current pandemic, when we find new learnings about a specific pandemic. This repository can be later used in visualizations and comparisons.

Our website is equipped with current pandemic related dashboards where we visualize the current Covid19 data using different kinds of visualizations, charts, graphs etc. to make the data more meaningful and purposeful. The data can be used to analyze, study and predict the trend.

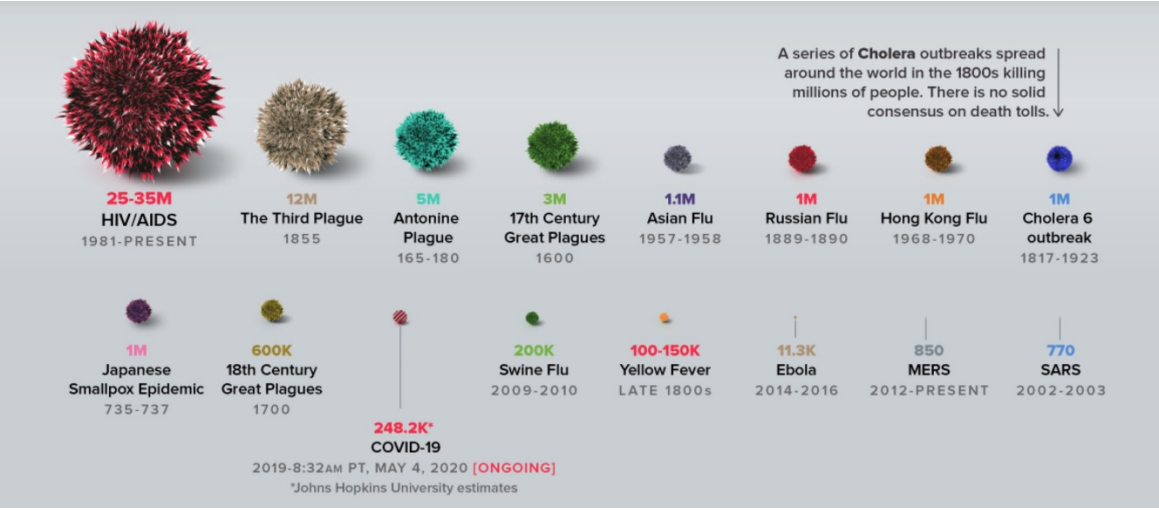
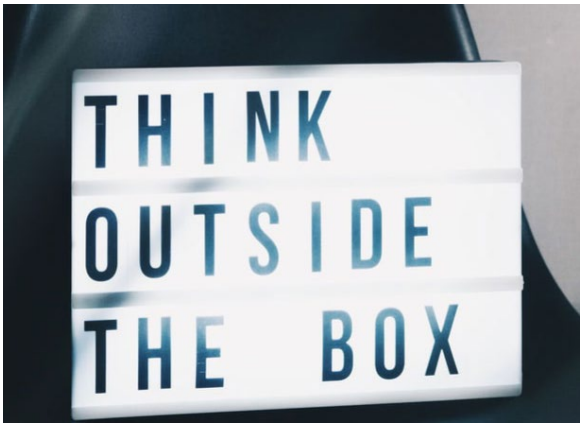


Figure 1: History of Pandemics, Image Reference: https://www.visualcapitalist.com/history-of-pandemics-deadliest/

Motivation



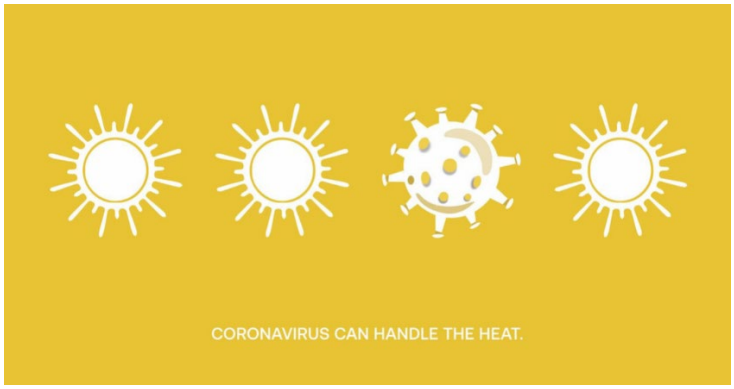
When we started looking for the data for past pandemics just to create visualizations that would compare with the current pandemic with the previous ones we struggled as we did not have many resources when it came to past pandemics. Even though we had some good resources, but the data was varied with respect to features and in chunks here and there over the web. We immediately got an idea to create a common repository website for all the pandemics.

1. The history of pandemics contains data that must be visualized analyzed and learned from.
2. The data had patterns that can be used as training data for the current pandemic situations and future predictions can be based on it.
3. The prior data would provide us the mathematical stats of when this will end based on the restrictions we are imposing and how successful can these strategies be.
4. We can visualize how hour healthcare systems have improved over the years when we look at the treatment time and days for previous pandemics.

"We are here to create history, not repeat it."

-Chantelle Renee

Facts



As we are in a Pandemic, we will get to listen to many number of news daily some fake and some true, but then we have to make sure our website references the trustable sources for the data. That being said, as we did our research for this covid19 virus we found the below facts which seemed scary as well as somewhat motivating in this situation.

- Swine Flu had more mortality rate but it is predicted to change with this pandemic that is in progress.
- COVID 19 cases are mostly found in adults but there were pandemics like Spanish flu, impacted children under the age of 5 and adults aged 20–40.
- Its is recorded in history that, “By interrupting all human-to-human transmission, SARS was effectively eradicated.”
- Corona virus was able to reproduce and spread quickly in warm and humid climates as well.
- It is also important to be motivated as pandemics do end, with the improvement in Medical Science we have hopes for a better tomorrow. We have better equipment's and facilities to fight with the current situation.

Purpose

The purpose of the application is to create a smart repository of Pandemic Data that can be used for visualizations, comparisons, learning and research. The website can be used to study history of pandemics as per the timeline and give the user an overview about each pandemic that occurred. Similar kinds of pandemics can be segregated for example we would be able to find common traits between pandemics and that can be used for analysis and study.

Visualizations and Dashboards on the website can contain real time data tracking for the current pandemic. These visualizations are a good source to find how the current situation is with respect to states, zones, areas and countries. For example, It can be easily understood which states need the most help in terms of medical supplies and which state can start the open up for commercially and is safe as its showing good improvements

The functionality to perform CRUD operations on the websites give you the capability of add, update, remove and delete the data as you find or lean new improvements in it.

Clients

Students can use this data for study thesis, projects etc.

Scientists can use the data to know about the various features for this and other pandemics to find a solution

Data Analysts can use the visualization and data to further input this into machine learning models for good predictions.

Govenment can use the website to know how the rules and regulations are working as per states, zones,

Market Researchers can use the data to understand when will the commercial status of the country get better and how the stock market will do.

Common Public can check how is the current covid19 situation in their areas and take safety measures and precautions. They can also check the organization data to know the latest news on current pandemic

Literature Survey

We did a good amount of research to find data for the current and previous pandemics the visualizations and good amount of data was found on the article 'Visualizing the History of Pandemics' by Nicholas LePan. His visualizations made a lot of sense and portrayed a timeline format. He also had a tabular data for the pre human host and death toll for a specific pandemic.

We used the data mostly available on Wikipedia for the past pandemics we also researched on some data available on trusted websites like CDC and WHO websites.

The "DO THE FIVE" created by google and WHO was also provided on our website for the safety guidelines that has to be followed during this crisis.

For our visualizations on covid19 and all the dashboard we found trusted API sources that provide us with the real time data. Postman COVID-19 API and RapidAPI are the api sources for our Covid19 visualizations.

We found good insights on Kaggle for data visualizations and the kind of graphs that can be useful for pandemic datasets. We found some amazing facts that gave us a lot of motivation in the article 'Comparing COVID-19 with previous pandemics' by Tim Newman these facts were interesting and provided us with the insights of how these for pandemics are correlated and why there is a need to study these.

Data Sources

Since the application is showing details regarding multiple pandemics we have gathered data from multiple resources.

1. Wikipedia - Data pertaining to various pandemics like SARS, MERS, Ebola, Swine Flu(H1N1) was collected.

2. Postman COVID-19 API - We are using this API to gather data pertaining to Covid-19. It contains data for the United States as well for all the countries. With this data we are creating various visualizations.

3. RapidAPI: Data for Covid-19 is also collected from one of the API on the RapidAPI website.

4. WHO and CDC: We have gathered data from WHO and CDC websites. Apart from Covid-19, they provide historical data regarding other pandemics as well as latest guidelines.

Technology stack

- We have used **Model View Controller** architecture to implement this application.
- **NodeJs** has been used for back end operations (controller code)
- **ExpressJS** has been used for routing between the views of the applications.
- **MongoDB** is used for storing the data.
- **HTML, JavaScript, CSS and JQuery** have been used to perform styling and front end operations including the design and the layout.
- **Postman and Amcharts** have been used as the third party sources for the datasets or APIs.

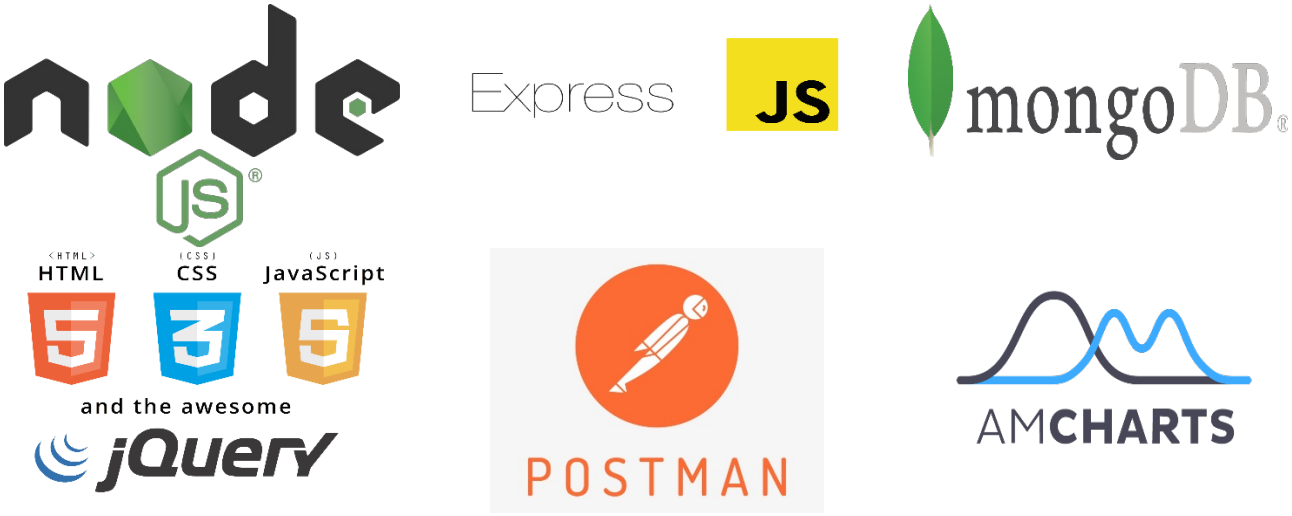


Figure 2: Note: These logos for the tools are downloaded from different sources on the web for citation and reference purposes.

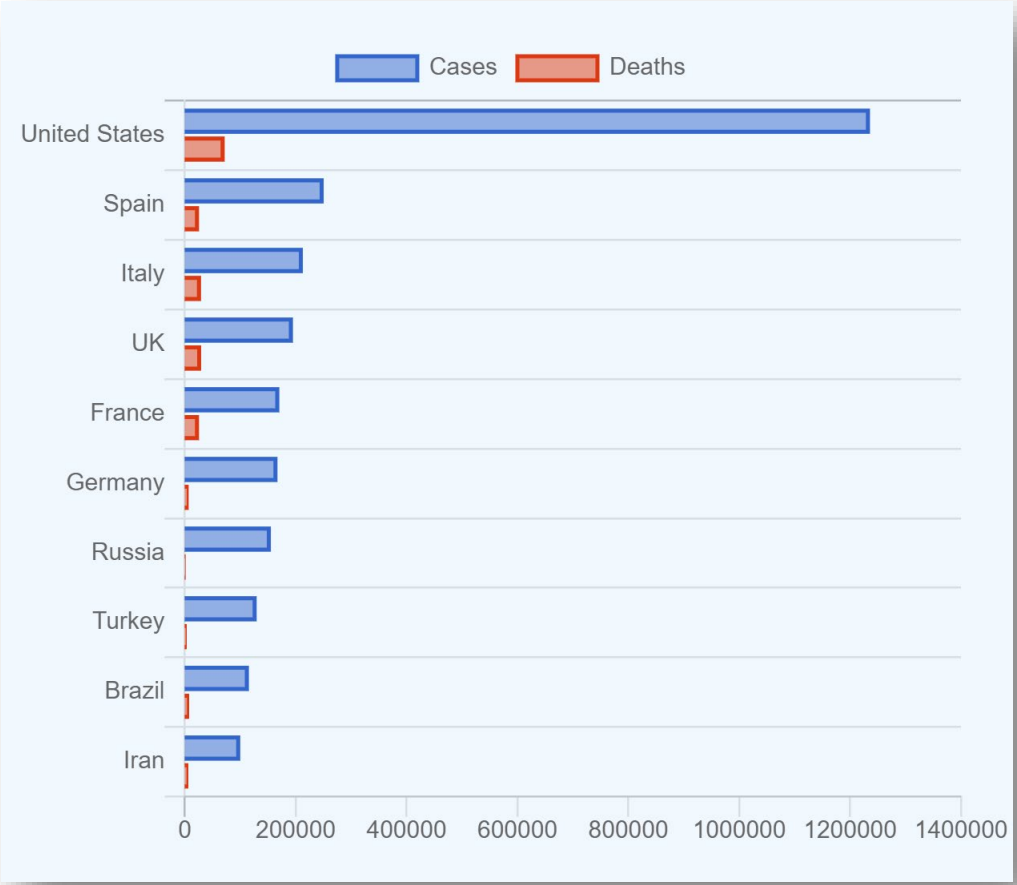
Implementation Steps

Below are the steps used in order to implement the project:

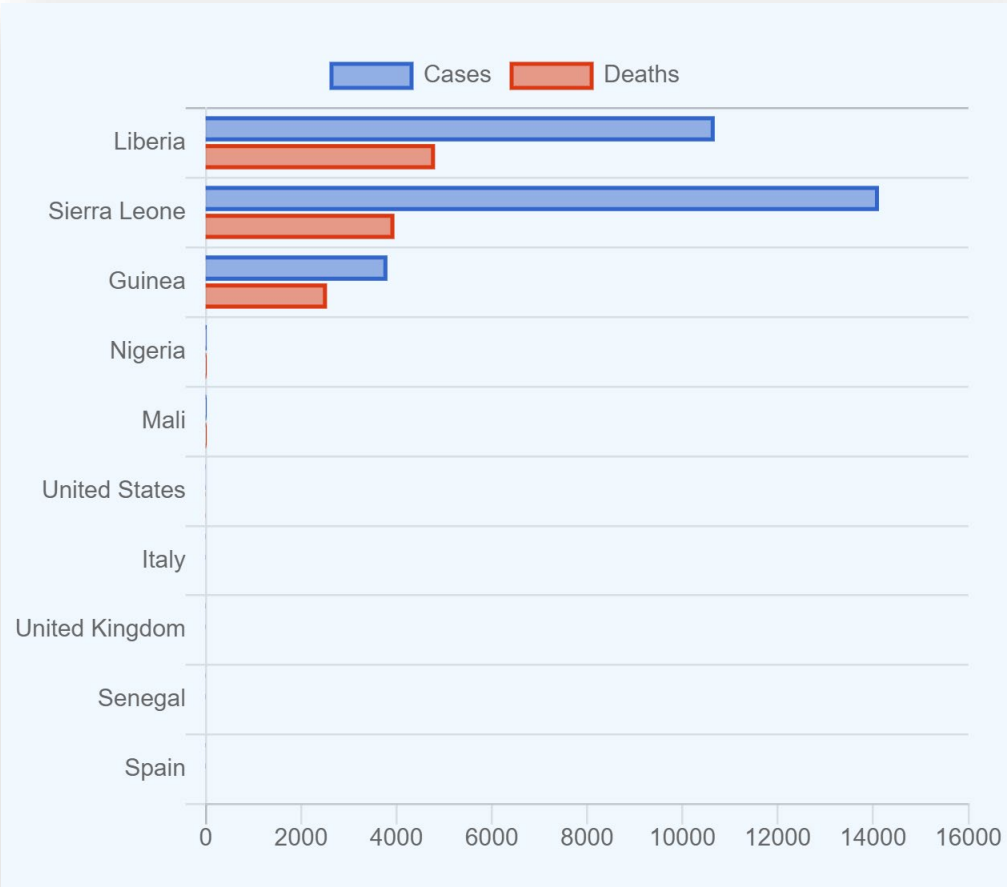
- We started with installing Node.js and NPM so as to start the development at the back end.
  Command used for mac was:
  brew install node
- We, then, set up, a database in MongoDB and connected the application with MongoDB using mongoose.
  To install mongoose, we used, npm install mongoose so as to enable the application to talk to the database.
- Models were created to connect MongoDB collections with the application using collection schemas.
- Then we started writing the controller code in controllers to perform all the data related operations so that clean and necessary data can be rendered on the front end.
- For some of the charts in the dashboard, we used APIs like https://covidtracking.com/api/us/daily and https://covidtracking.com/api/states/daily and performed logical operations on the JSON response from these APIs in the controller to retrieve the important and relevant data for the charts of this application.
- For some of the charts, we imported the JSON data into our MongoDB collections and then rendered the charts from there, making those charts independent of the APIs and hence more reliable.
- To plot some highly interactive charts, we used some smart third-party libraries like amcharts, using which we were able to render user interactive and live charts telling a story of the journey of pandemics so far.
- For the front end, we referred to Bootstrap libraries to improve the look and feel of the application and used Bootstrap classes for a more dapper and cleaner layout of the application.

Visualization Insights

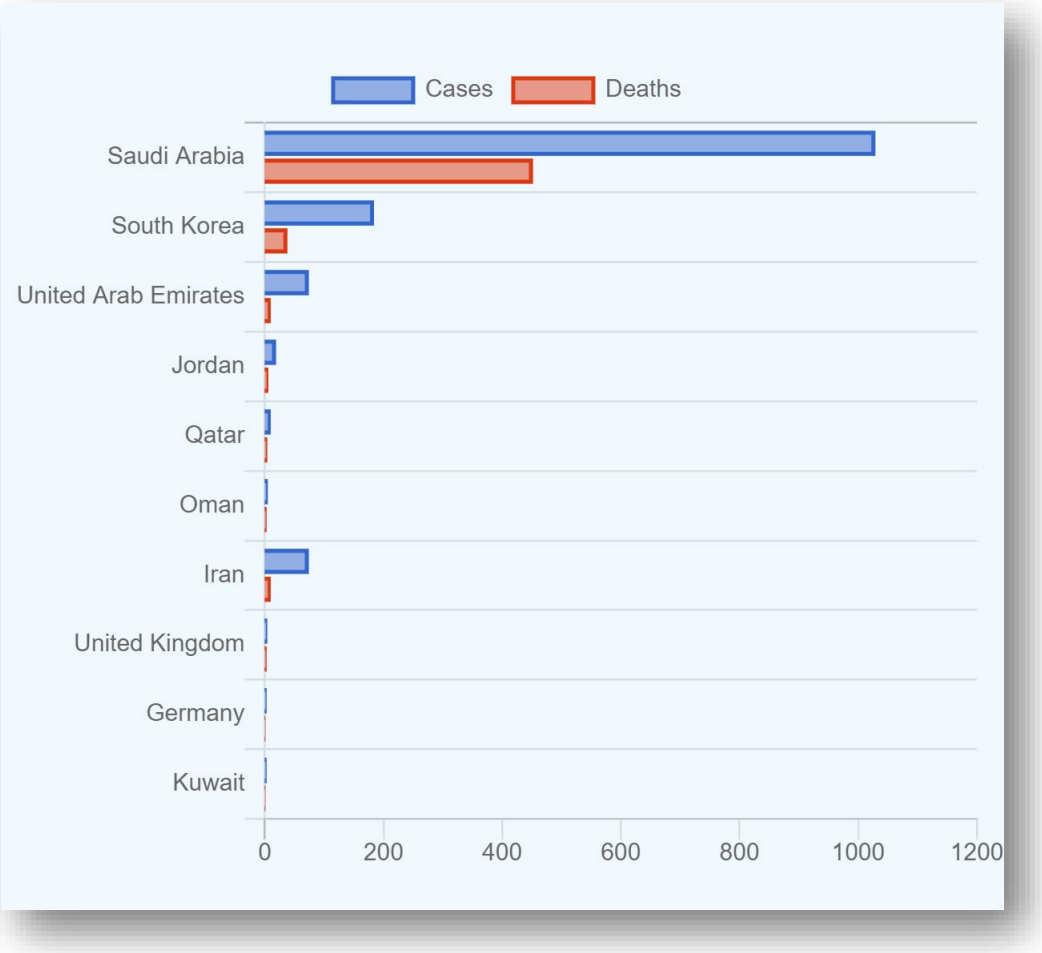
1. COVID-19 pandemic: When the user selects the Covid-19 pandemic from dropdown or from the Flip card , they can view a multi horizontal bar graph that shows a comparison between the number of cases and deaths in multiple countries. On the x-axis we have a number of people and on the y-axis we have different countries. Number of cases have been highlighted in blue and the number of deaths in red. Using this color combination in the graph it is easy for the users to understand the different metrics associated with Covid-19 and the top countries with most cases and deaths. By using cards we have highlighted the important information pertaining to Covid-19. Users can go through the cards and get information like the origin of the pandemic, prevention technique, symptoms etc.



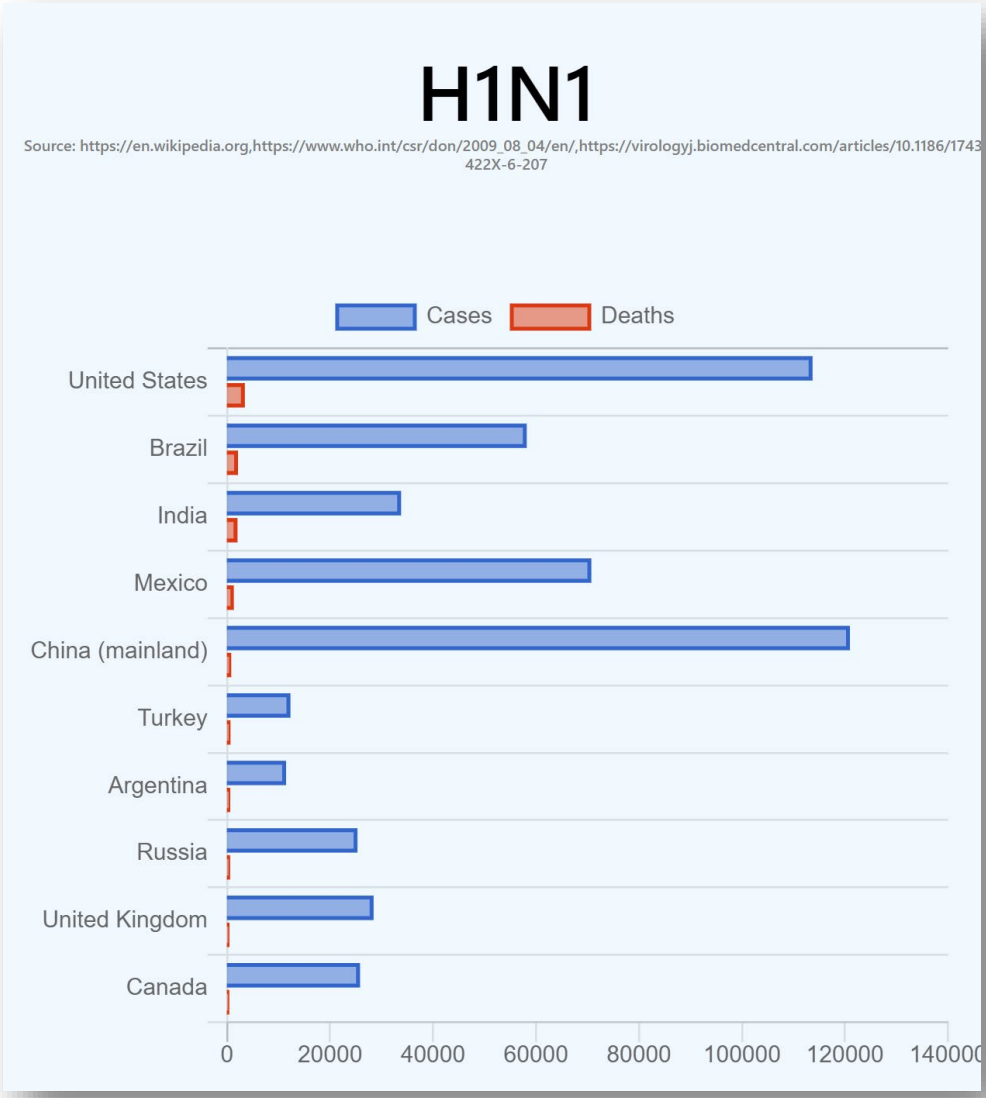
2. Ebola pandemic: When the user selects the Ebola pandemic from dropdown , they can view a multi horizontal bar graph that shows a comparison between the number of cases and deaths in multiple countries. On the x-axis we have a number of people and on the y-axis we have different countries. Number of cases have been highlighted in blue and the number of deaths in red. Using this color combination in the graph it is easy for the users to understand the different metrics associated with Ebola and the top countries with most cases and deaths. By using cards we have highlighted the important information pertaining to Ebola. Users can go through the cards and get information like the origin of the pandemic, prevention technique, symptoms etc.



3. MERS pandemic: When the user selects the MERS pandemic from dropdown or from the Flip card , they can view a multi horizontal bar graph that shows a comparison between the number of cases and deaths in multiple countries. On the x-axis we have number of people and on the y-axis we have different countries. Number of cases have been highlighted in blue and the number of deaths in red. Using this color combination in the graph it is easy for the users to understand the different metrics associated with MERS and the top countries with most cases and deaths. By using cards we have highlighted the important information pertaining to MERS . Users can go through the cards and get information like the origin of the pandemic, prevention technique, symptoms etc.

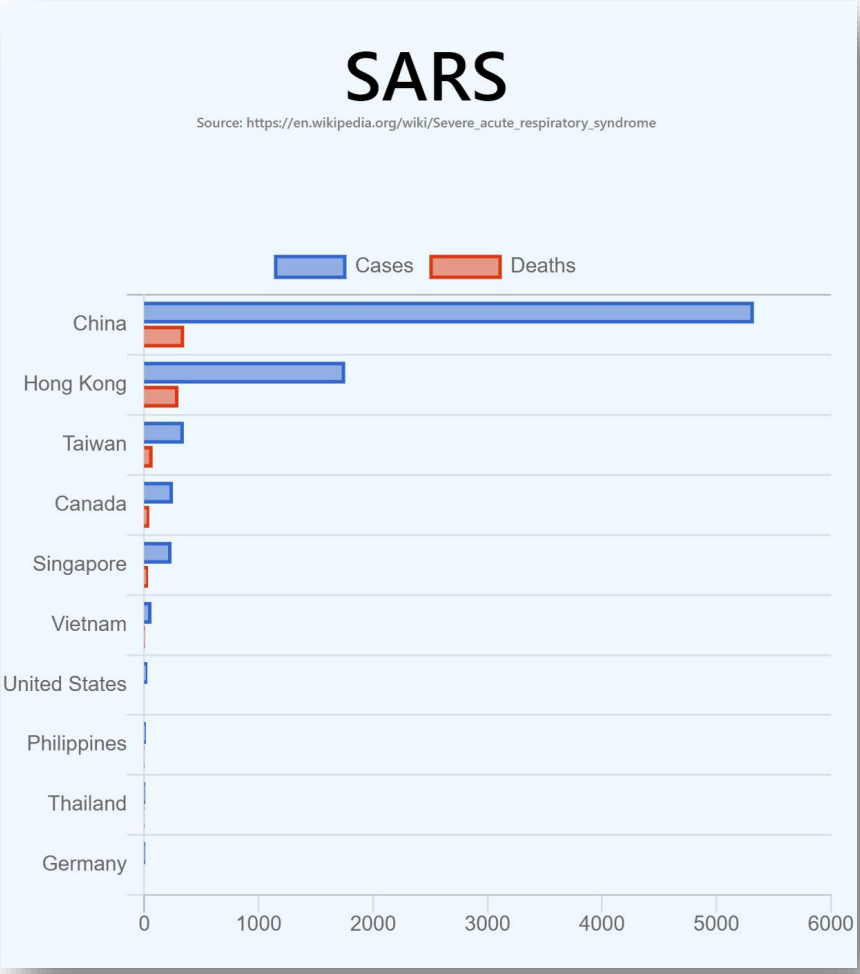


4. Swine Flu(H1N1) pandemic: When the user selects the H1N1 pandemic from dropdown or from the Flip card , they can view a multi horizontal bar graph that shows a comparison between the number of cases and deaths in multiple countries. On the x-axis we have number of people and on the y-axis we have different countries. Number of cases have been highlighted in blue and the number of deaths in red. Using this color combination in the graph it is easy for the users to understand the different metrics associated with H1N1 and the top countries with most cases and deaths. By using cards we have highlighted the important information pertaining to H1N1 . Users can go through the cards and get information like the origin of the pandemic, prevention technique, symptoms etc.

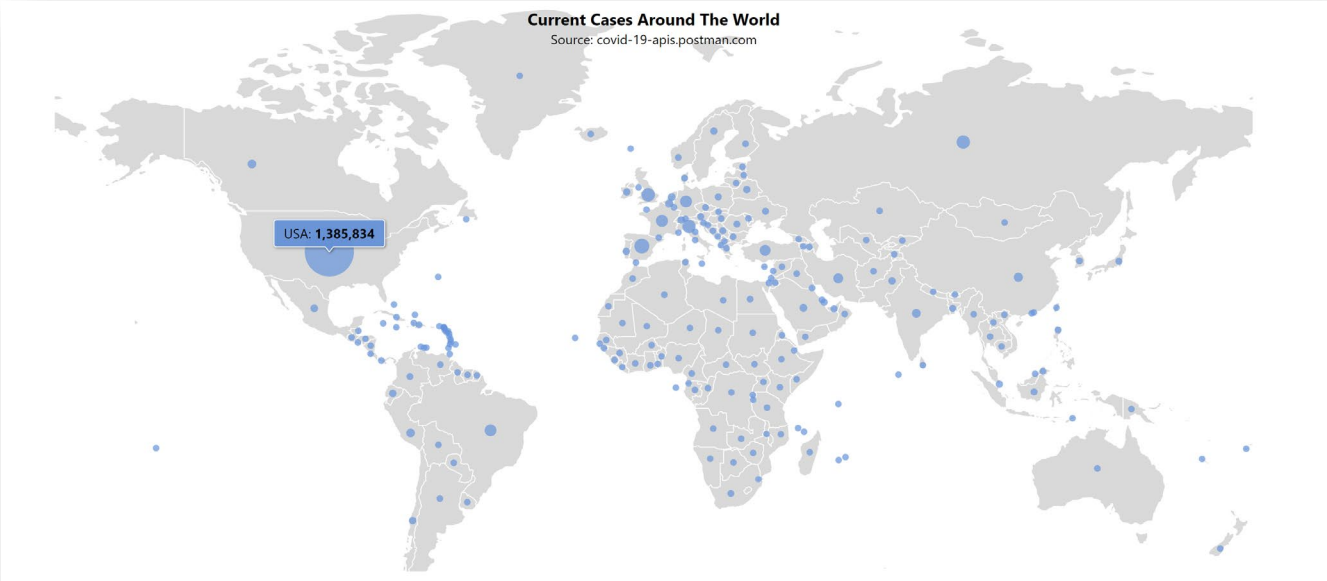


5. SARS pandemic: When the user selects the SARS pandemic from dropdown or from the Flip card, they can view a multi horizontal bar graph that shows a comparison between the number of cases and deaths in multiple countries. On the x-axis we have number of people and on the y-axis, we have different countries. Number of cases have been highlighted in blue and the number of deaths in red. Using this color combination in the graph it is easy for the users to understand the different metrics associated with SARS and the top countries with most cases and deaths. By using cards we have highlighted the important information pertaining to SARS. Users can go through the cards and get

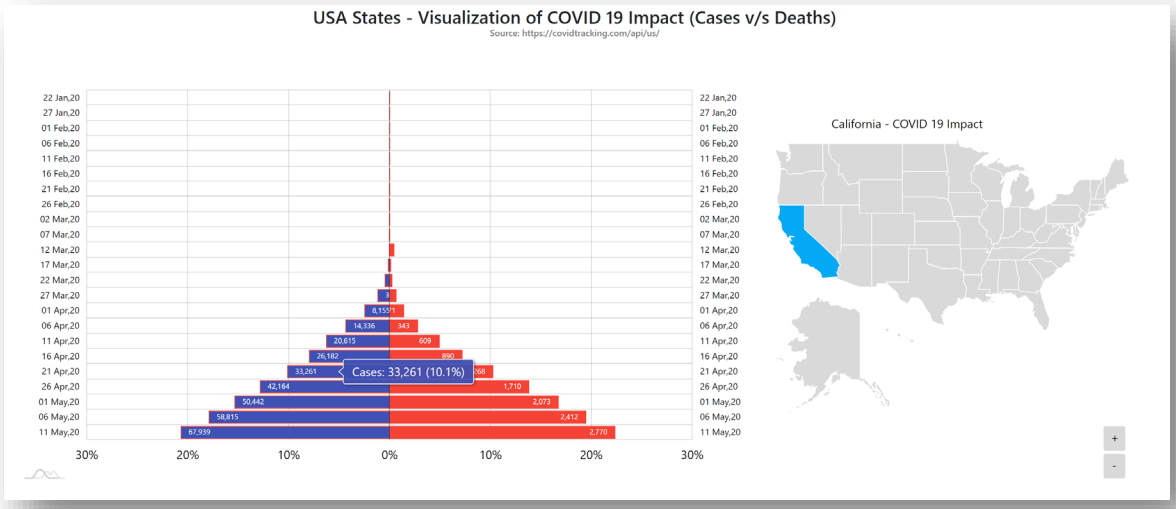
information like the origin of the pandemic, prevention technique, symptoms etc.



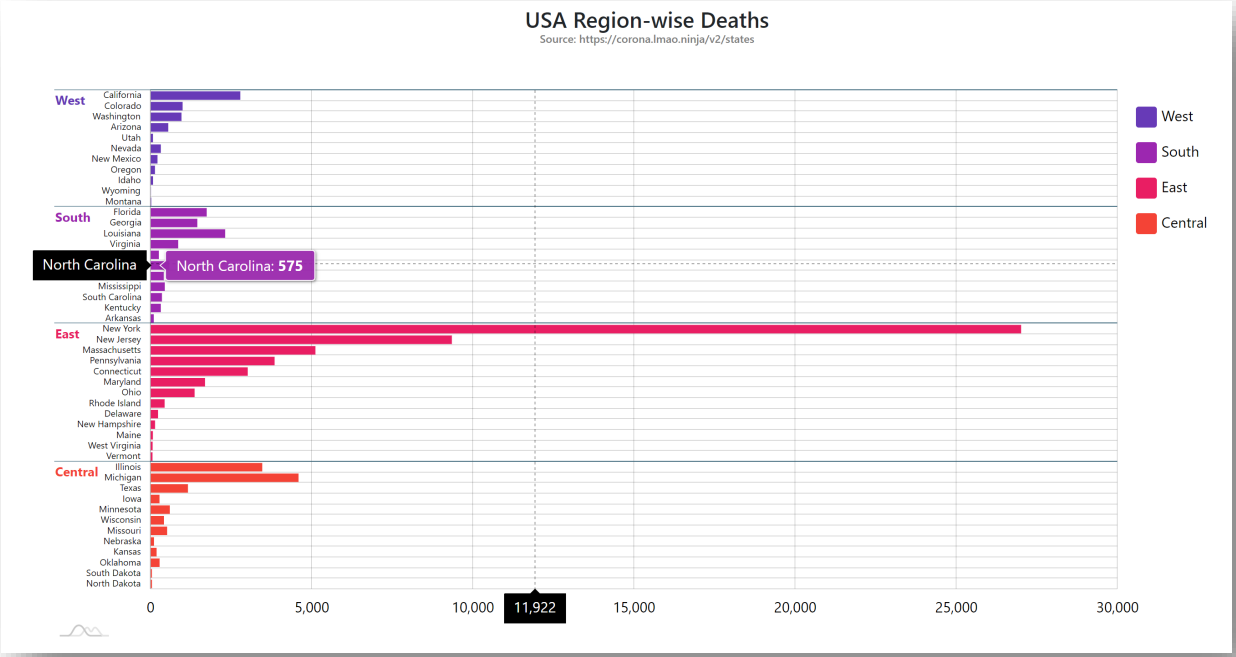
6. World Map dashboard: When the user goes to the dashboard page and selects the World Map tab, they can view the world map with bubbles. The bubbles signify the number of Covid-19 cases in each country. The dashboard allows users to easily compare Covid-19 cases in different countries. The world map is also interactive, and users can zoom-in and zoom-out by using mouse clicks.



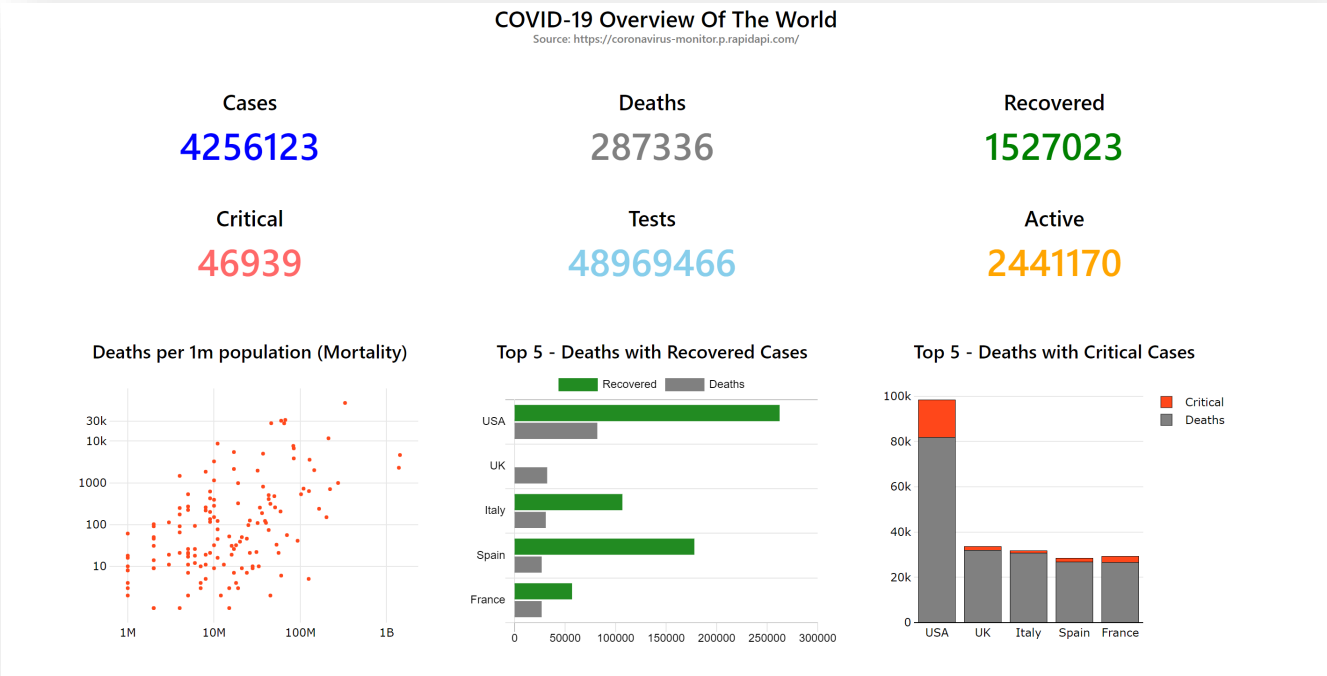
7. USA dashboard: When the user goes to the dashboard page and selects the USA tab, they can view the pyramid chart along with all the US states. The pyramid chart is populated when the user clicks on any US states. On the right side of the pyramid chart we are showing the number of deaths due to Covid-19 which is depicted in red color and on the left side of the pyramid chart we are showing the number of Covid-19 cases in that state which is depicted in blue color. The Pyramid chart clearly makes it easier for the user to understand the number of cases and deaths in each state in the US.



8. USA Regions dashboard: When the user goes to the dashboard page and selects the USA regions tab, they can view a Partitioned Bar chart with all the US states and the deaths in each state due to Covid-19. The chart is partitioned as per US regions (i.e West, South, East, Central). This chart allows users to check which US regions are more impacted due to Covid-19. States within a region share the same color. Users can interact with the chart by filtering any region by clicking on the icons in the right.

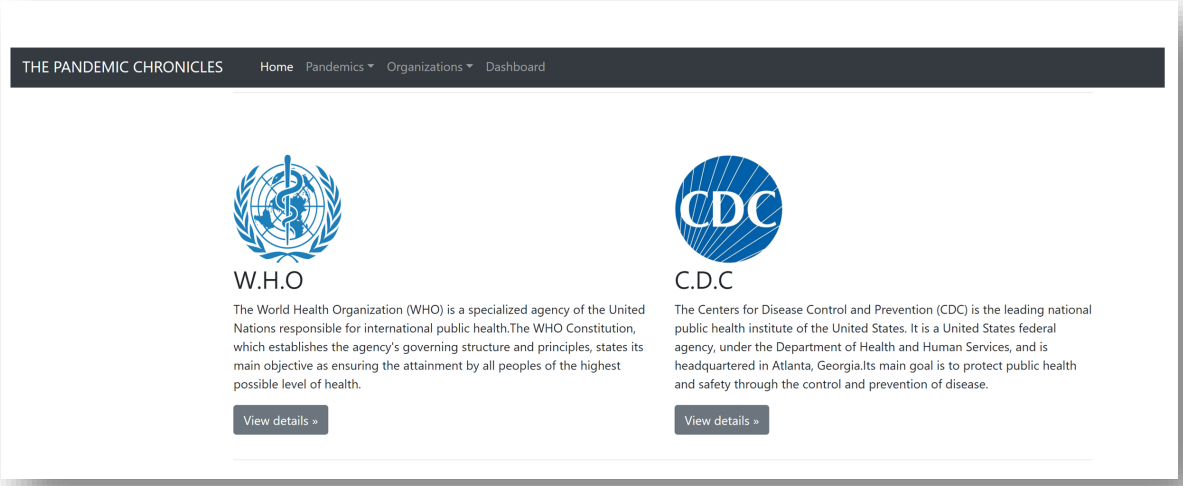


9. Overview dashboard: When the user goes to the dashboard page and selects the overview tab, they can view multiple charts and data regarding Covid-19. We have used a scatter plot chart to show the deaths per 1million population (Mortality). The other chart is a multi-horizontal bar chart which shows the deaths and recovered cases due to Covid-19. We are using a stacked bar chart to show the comparison between the number of critical cases and deaths due to Covid-19. The colors used for specific parameters are consistent throughout the graph.

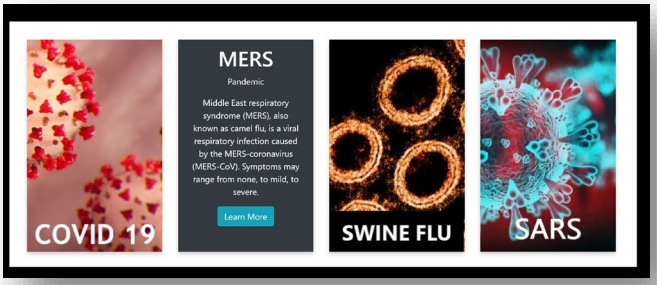


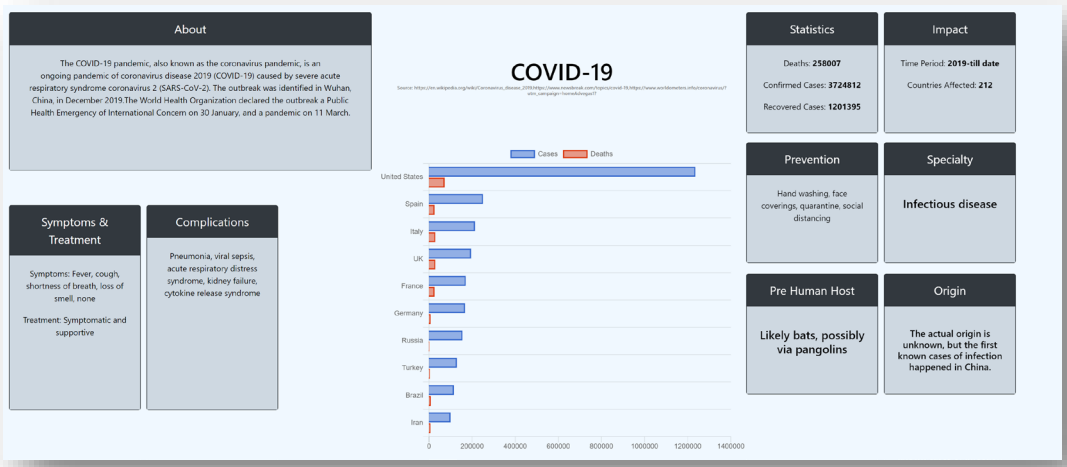
Design Patterns Used

- Organization and Navigation Design Patterns:
  Our application uses this design pattern to make sure that users can easily navigate and interact with the web application. We have used horizontal tabs which allows easy navigation. Users can navigate between multiple pages as we have provided access to the home page and others tabs. Data Organization is consistent throughout the application to ensure good user experience.

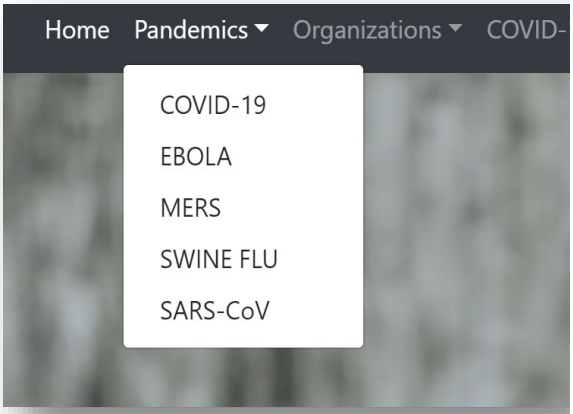


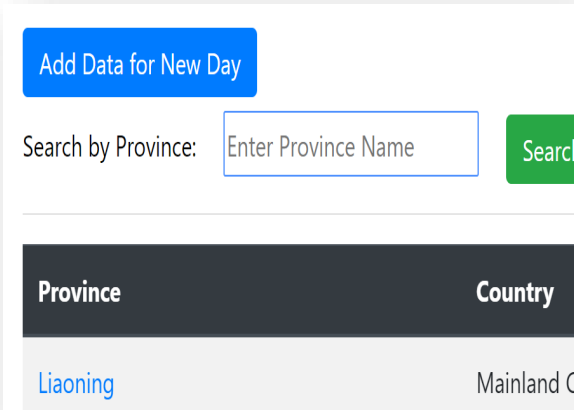
- Layout and List Design Patterns:
  We have used grids and cards for listing data regarding various pandemics. Using tabular representation, we have organized data. All the dashboards are enclosed in a single page and no scrolling is required. The Data tab Lists all the Covid-19 data and we can perform CRUD operations on them.





- Action and User Input Design Patterns:
  For better user experience we have used dropdowns within our horizontal tab, which allows users to check different types of pandemics and organization. The application home page uses Flip information dashboards for different pandemics , the flip card directs the user to the pandemic page if the user wants more information. We have used click filters in our visualization dashboards. Input validation and suggestive text have been used in the data page for ensuring consistency in our CRUD operations. Our dashboards also provide Feedback on mouse hover.





Testing Performed

We performed various kinds of testing activities on our web application.

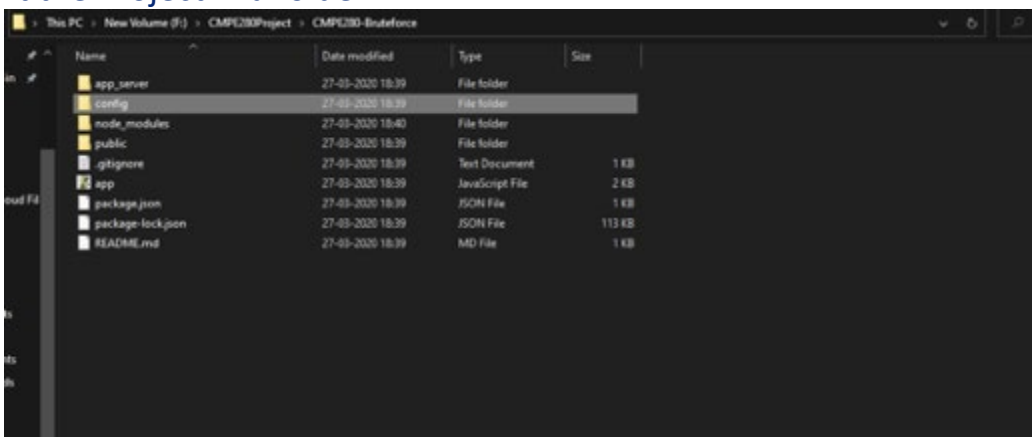
1. Functional Testing: We verified all the functionalities are working properly on the website.
    1. Navigation
    2. CRUD operations
    3. Data Display
    4. Back and Forward Functionalities
2. We did some Browser compatibility testing to make sure the website is working on all the popular web browsers like Google chrome, Safari, Firefox etc.
3. We performed testing of the basic functions after every code commit on related modules.

Application User Manual

Steps to get the application up and running

1. Ensure you have a active Internet Connection
2. Import the Project in a folder.
3. Open terminal → Change the directory to the project location
4. Run ‘npm install’
5. Run ‘npm start’
6. Open a browser and open localhost:3000/→You should be able to see the application

Ensure you have an active internet connection.
Import the Project in a folder.



Open Terminal, and CD to the projects folder

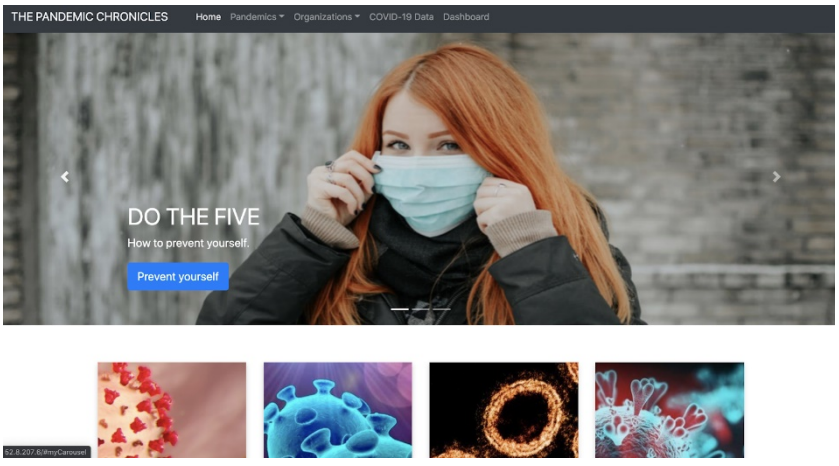
Run following commands: npm install and npm start

```
PS F:\CMPE280Project\CMPE280-Bruteforce> npm install
npm WARN           SKIPPING OPTIONAL DEPENDENCY: fsevents@2.1.2 (node_modules\fsevents):
npm WARN         SKIPPING OPTIONAL DEPENDENCY: Unsupported platform for fsevents@2.1.2: wanted {"os":"darwin","arch
"} (current: {"os":"win32","arch":"x64"})

audited 639 packages in 2.677s
found 0 vulnerabilities

PS F:\CMPE280Project\CMPE280-Bruteforce>
```

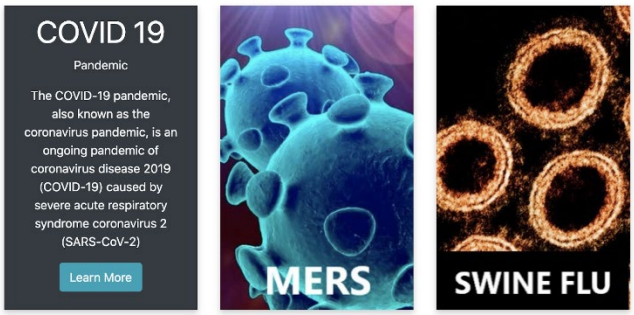
```
PS F:\CMPE280Project\CMPE280-Bruteforce> npm start

> DisasterExplore@0.0.1 start F:\CMPE280Project\CMPE280-Bruteforce
> start http://localhost:3000 & node app.js

express-session deprecated undefined resave option; provide resave option app.js:38:9
express-session deprecated undefined saveUninitialized option; provide saveUninitialized option app.js:38:9
(node:14776) DeprecationWarning: current URL string parser is deprecated, and will be removed in a future version. To us
e the new parser, pass option { useNewUrlParser: true } to MongoClient.connect.
Server started
(node:14776) DeprecationWarning: current Server Discovery and Monitoring engine is deprecated, and will be removed in a
future version. To use the new Server Discover and Monitoring engine, pass option { useUnifiedTopology: true } to the Mo
ngoClient constructor.
connection succesful
```

Open the browser and

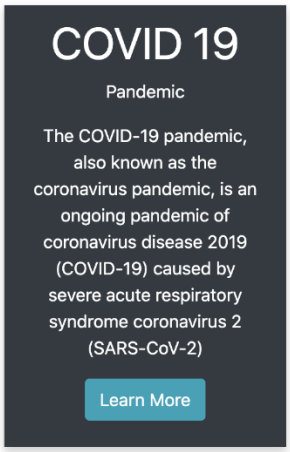
Type the URL: localhost:3000/→You should be able to see the application



These flip cards have been implemented, which tell you more information about some of the recent pandemics as your hover over them.

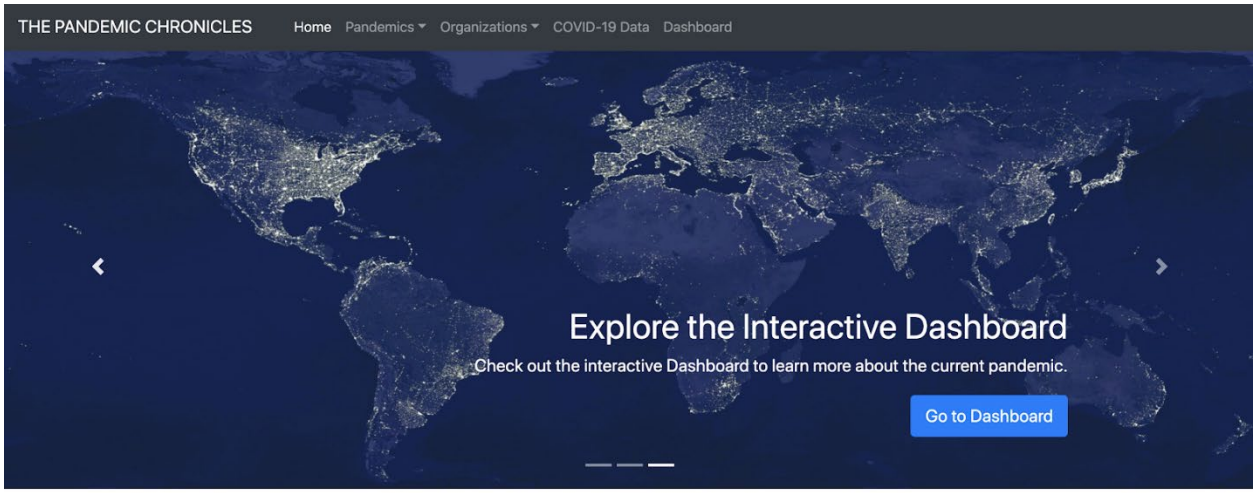


Clicking on the Learn More button will take you to the more detailed page about that pandemic, which we will see in the coming steps.

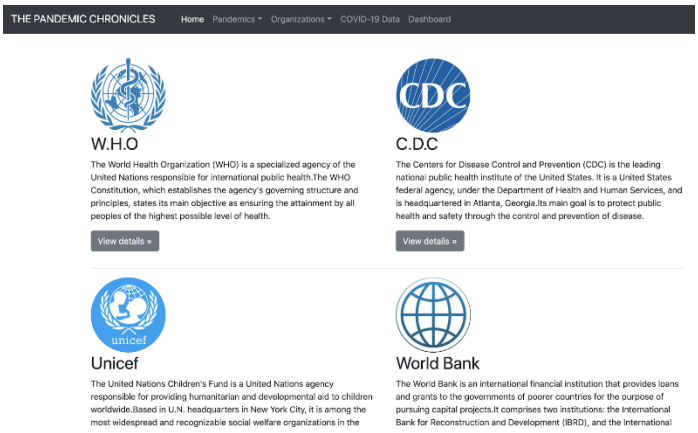


Slider on the home page has the buttons to take you through the website.

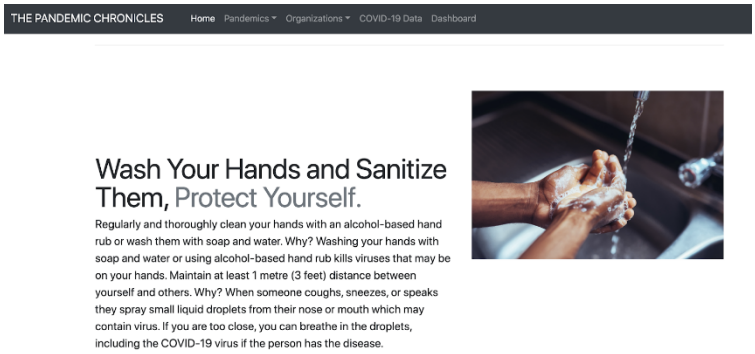
Below button Go to Dashboard, takes you to the information dashboard.



Home page also contains brief information about the world health organizations and user can view detailed information about each of them by clicking on the button, View Details.

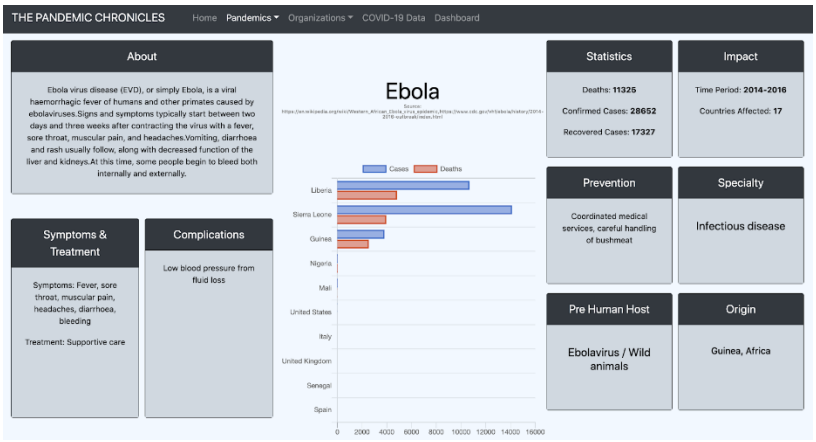


Home page contains some illustrative images with eye-catching and easy to read text.

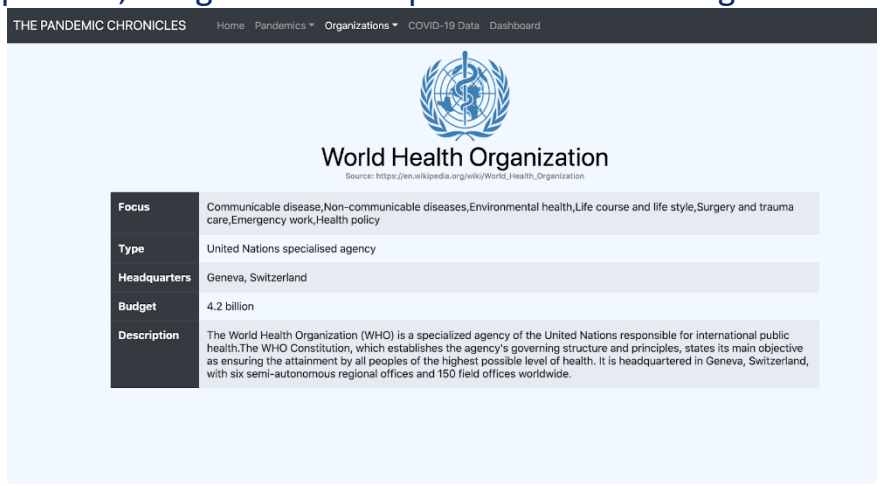


Clicking on the Learn more button, of the pandemic flip cards will take you to this page. This page contains the description of the pandemic selected, symptoms, treatment, statistics, impact, prevention, specialty, pre human host and origin. It also tells the evolution and the spread/impact of the selected pandemic in the affected countries in a graphical way.

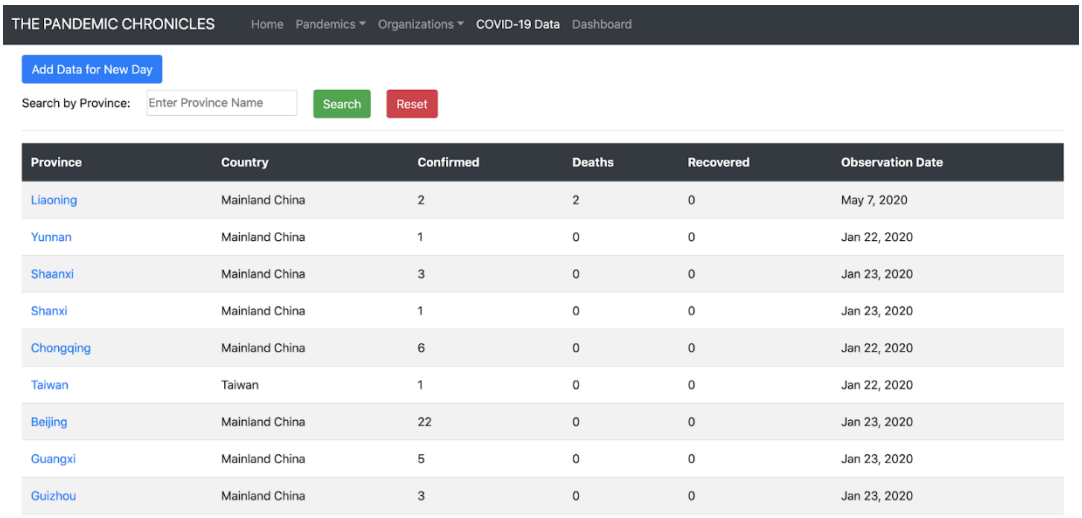
Users can also navigate to this page from the Pandemics button in the top navigation bar, and select the specific pandemic to see more information as shown in the below image.



Organizations button in the top navigation bar takes you to the below page. This page contains the information specific to world health organizations like focus, type, headquarters, budget and description of the health agencies.

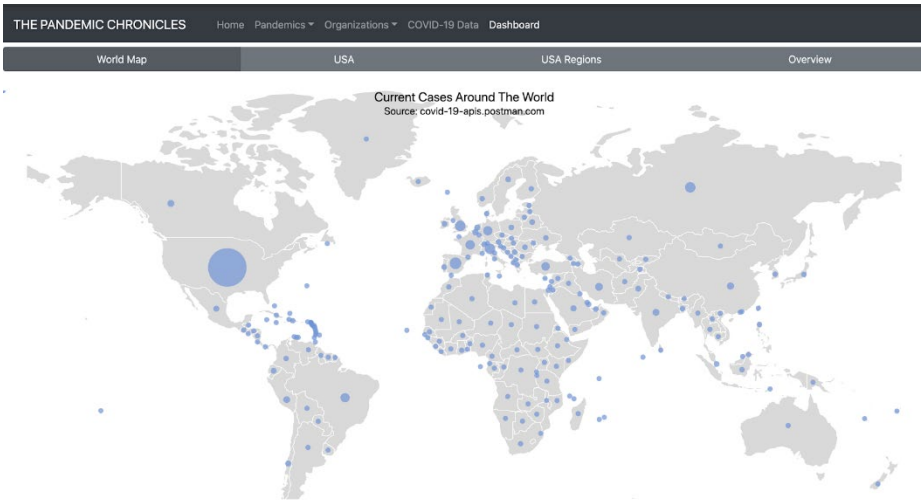


Next button in the top navigation bar is COVID-19 Data which will take you to a page where CRUD (Create, Remove, Update, Delete) operations on one of the sample datasets of COVID-19.



Province	Country	Confirmed	Deaths	Recovered	Observation Date
Liaoning	Mainland China	2	2	0	May 7, 2020
Yunnan	Mainland China	1	0	0	Jan 22, 2020
Shaanxi	Mainland China	3	0	0	Jan 23, 2020
Shanxi	Mainland China	1	0	0	Jan 23, 2020
Chongqing	Mainland China	6	0	0	Jan 22, 2020
Taiwan	Taiwan	1	0	0	Jan 22, 2020
Beijing	Mainland China	22	0	0	Jan 23, 2020
Guangxi	Mainland China	5	0	0	Jan 23, 2020
Guizhou	Mainland China	3	0	0	Jan 23, 2020

Next button is to see the interactive dashboards. You can open different dasboards by selecting the tabs under dashboard menu.



References

Data References

1. Wikipedia - Data pertaining to various pandemics like SARS, MERS, Ebola, Swine Flu(H1N1) was collected.

2. Postman COVID-19 API - We are using this API to gather data pertaining to Covid-19. It contains data for the United States as well for all the countries. With this data we are creating various visualizations.

3. RapidAPI: Data for Covid-19 is also collected from one of the API on the RapidAPI website.

4. WHO and CDC: We have gathered data from WHO and CDC websites. Apart from Covid-19, they provide historical data regarding other pandemics as well as latest guidelines.

Motivation and Fact References

1. https://www.medicalnewstoday.com/articles/comparing-covid-19-with-previous-pandemics

2. https://www.webmd.com/lung/coronavirus-heat

3. https://www.visualcapitalist.com/history-of-pandemics-deadliest/

4. https://www.blog.google/inside-google/company-announcements/covid-19-how-were-continuing-to-help/

Image and Other References

1. SARS VS COVID19
   https://www.medscape.com/viewarticle/924470

2. SARS Logo
   https://www.thailandmedical.news/news/warning-medical-experts-are-saying-that-the-sars-cov-2-coronavirus-could-attack-in-a-series-of-waves-with-new-mutated-strains

3. Swine Flu Logo
   https://www.medicinenet.com/swine_flu/article.htm

4. Mers Picture
   https://odh.ohio.gov/wps/portal/gov/odh/know-our-programs/infectious-diseases/resources/mers

5. Ebola
   https://abcnews.go.com/Health/ebola-/story?id=24733669

6. Epidemic Vs Pandemic
   Image and Content Reference: https://www.verywellhealth.com/difference-between-epidemic-and-pandemic-2615168

7. Content Reference: https://www.readersdigest.ca/health/conditions/epidemic-vs-pandemic-whats-the-difference/

8. Deadliest Pandemics
   https://www.youtube.com/watch?v=qQUdy5ZXAqo

9. Pandemic Epidemic and Outbreak
   https://www.thejakartapost.com/life/2020/03/12/whats-the-difference-between-pandemic-epidemic-and-outbreak.html

10. WHO Logo
    https://timesofindia.indiatimes.com/topic/World-Health-Organisation

11. World Bank Logo
    https://www.worldbank.org/

12. United Nations Children's Fund Logo
https://www.topbots.com/project/unicef-ureport/

13. Centers for Disease Control and Prevention (CDC)
https://celebrityaccess.com/2020/03/16/us-centers-for-disease-control-and-prevention-advises-ban-on-events-of-50/

14. https://www.sciencenewsforstudents.org/article/who-calls-covid-19-a-global-pandemic

15. Wash Hands
https://elemental.medium.com/only-5-of-people-wash-their-hands-properly-a140aaa775e

16. Stay at Home
https://williamsonsource.com/report-violations-stay-home-order-spring-hill/

17. Social Distancing
https://www.pcma.org/social-distancing-future-events/

18. Cover your cough
19. https://www.freepik.com/free-vector/cover-your-cough-coronavirus-pandemic_7350365.htm

20. Sick Call Ahead
https://health.hawaii.gov/coronavirusdisease2019/what-you-can-do/if-you-become-sick/

21. Background 1
https://www.hoover.org/research/potential-pandemics

22. Background 2
https://www.varonis.com/blog/the-world-in-data-breaches/

23. Images on technology stack page references:

https://www.amcharts.com/about/press-kit/amcharts_light_transparent/

https://www.pngkit.com/view/u2t4u2u2u2e6a9e6_the-postman-logo-is-available-in-png-svg/
https://www.pinterest.com/pin/106327241179160451/
https://www.mongodb.com/
https://medium.com/javascript-in-plain-english/3-express-js-features-you-need-to-know-8f78b0035f33
https://en.wikipedia.org/wiki/Node.js