CSC431

Real Time Tracking and Analysis of COVID Hotspots

Software Requirements Specification

Team #13

Demir Demirsoy Berk Mankaliye Arjun Misra

Version History

Version	Date	Author(s)	Change Comments
3.0	May 4th, 2021	Demir Demirsoy, Berk Mankaliye, Arjun Misra	Final Version
2.0	March 9th, 2021	Demir Demirsoy, Berk Mankaliye, Arjun Misra	2nd Draft
1.0	February 23rd, 2021	Demir Demirsoy, Berk Mankaliye, Arjun Misra	1st Draft

Contents

List of Figures

List of Tables

1 System Requirements

1.1 Functional Requirements

1.1.1 Gain Instantaneous Access to COVID Data in Real Time

Table 1: Gain Instantaneous Access to COVID Data in Real Time

Title	Gain Instantaneous Access to COVID Data in Real Time
Description	Users can obtain nearly instantaneous access to a plethora of COVID data, including geographically relevant information on hotspots, new cases, infection rates, hospitalizations, deaths, and vaccinations. Additionally, users can effortlessly visualize this data by choosing between a wide variety of data displays. These selections include, but are not limited to, geographic maps overlaid with COVID data, graphical displays, numerical tables, and an assortment of charts, each containing integrated graphical and numerical information. Furthermore, users can readily toggle between these selections by navigating the user-friendly interface. For example, if they select a map of their area, the COVID tracker would function as follows: a color-coded (or gradient-shaded in the case of the visually imparied) map of the requested geographic region is presented to the user, where metrics (such as new cases, vaccinations, or deaths) correspond to a particular color (green for vaccinations, yellow for new cases, red for deaths) or shade.
Source Scenario	FR1
Priority	Mandatory: 0
Precondition(s)	Users must have successfully signed up and logged in to their account. They must also have reliable Wi-Fi or cellular data connectivity. Users should correctly navigate the website and accurately filter for the information they are seeking.
Postconditions(s)	Users will have acquired valuable information on COVID in the selected geographic areas. Charts, graphs, and tables that summarize the COVID activity in said areas will be presented to them accordingly. (This can enable users to make safer and more informed decisions.)
Use Case Diagram	Fig. 1

1.1.2 View Past Data Predicted Future Data

Table 2: View Past Data

Title	View Past Data
Description	This feature is predicated on FR1 and it serves as an extra layer of COVID information for the aforementioned graphical displays. Users can toggle a sliding bar (or "slider") that enables them to view past COVID data pertinent to whichever graphic they are interested in. For example, they can select a local map, filter the metrics they are concerned with, and slide the bar left to display data from the past hours, days, or weeks.
Source Scenario	FR2
Priority	High: 1
Precondition(s)	Users must have successfully signed up and logged in to their account. They must also have reliable Wi-Fi or cellular data connectivity. Users should explicitly specify which time period they are interested in by precisely sliding the bar to that corresponding time.
Postconditions(s)	Users will be shown pertinent past or future COVID data, presented in an orderly, intelligible format. Any other relevant information users attempt to obtain will be suitably displayed in accordance with their requests. (This data is highly advantageous because it can apprise users of past COVID activity in specified regions. It can also be beneficial because it can empower them to make prudent decisions based on predicted future COVID activity.)
Use Case Diagram	Fig. 2

1.1.3 Predicted Future Data

Table 3: View Predicted Future Data

Title	View Past Data
Description	Similarly to viewing past data, users may also utilize the toggle tool to predict future COVID data. They can accomplish this by sliding the bar to the right to predict data in the coming hours, days, or weeks. The sliding bar functions incrementally; sliding the bar farther to one side displays data further in the past or the future. However, users are duly advised (via a salient announcement at the top of the screen) that predictions are NOT infallible and that they should take extreme caution to not underestimate the virus.
Source Scenario	FR2
Priority	High: 1
Precondition(s)	Users must have successfully signed up and logged in to their account. They must also have reliable Wi-Fi or cellular data connectivity. Users should explicitly specify which time period they are interested in by precisely sliding the bar to that corresponding time.
Postconditions(s)	Users will be shown pertinent past or future COVID data, presented in an orderly, intelligible format. Any other relevant information users attempt to obtain will be suitably displayed in accordance with their requests. (This data can be beneficial because it can empower users to make prudent decisions based on predicted future COVID activity.)
Use Case Diagram	Fig. 2

1.2 Non-Functional Requirements

1.2.1: Continuous, Live Updates From Server

Table 4: Continuous, Live Updates From Server

Title	Continuous, Live Updates From Server
Description	The (front-end) client must continuously (every 30 seconds) fetch updated, live data from the (back-end) server. Then it must automatically proceed to refresh the page to ensure the reliability of information being promulgated by the website.
Source Scenario	NFR1
Priority	Mandatory: 0
Applicable FR(s)	FR1

1.2.2: Continual Reallocation of Memory

Table 5: Continual Reallocation of Memory

Title	Continual Reallocation of Memory
Description	In order to store past COVID data, the server must be structured to invariably guarantee sufficient memory. However, as time passes, the magnitude of the stored data will inevitably grow. To circumvent a memory shortage, constraints are necessitated: only a month of past COVID data will be stored, and therefore available. To accomplish this, the server must continually reallocate memory by disposing of data older than a month and freeing that space for relatively newer data. The server will be programmed to continuously run algorithms that check the current memory capacity. When the memory capacity falls below 10% (the occupied memory exceeds 90%), this reallocation occurs.
Source Scenario	NFR2
Priority	High: 1
Applicable FR(s)	FR2/FR3

1.2.3: Simultaneous Execution and Coordination of Artificial Intelligence Algorithms

Table 6: Simultaneous Execution and Coordination of Artificial Intelligence Algorithms

Title	Simultaneous Execution and Coordination of Artificial Intelligence Algorithms
Description	To generate relatively accurate future predictions for COVID data, the server must simultaneously execute artificial intelligence algorithms and coordinate them with the program. These algorithms, which run in the background, utilize artificial intelligence and current and past data to extrapolate future information (up to two weeks in the future). Consequently, they must be synchronized with the database that contains past data as well as the currently available data. The website should intermittently refresh whenever the artificial intelligence programs announce a noteworthy change in their predictions.
Source Scenario	NFR3
Priority	High: 2
Applicable FR(s)	FR3

2 System Constraints

2.1 Tool Constraints

References:
-https://www.mysql.com/

2.1.1 Web Page Framework Constraint

Table 7: Web Page Framework Constraint

Title	Web Page Framework Constraint
Description	We will be using a web-application framework SQL. This will allow for facilitation of deployment on the server-side.
Priority	Mandatory: 0

2.2 Language Constraints

References:
-https://reactjs.org/
-https://vuejs.org/

2.2.1 Standard Web Page Coding

Table 8: Standard Web Page Coding

Title	Standard Web Page Coding
Description	Our website will be heavily contingent on the efficacious HTML5, CSS3 and Javascript. Furthermore, we will utilize Vue.js and React.js to enhance user interface and user experience. Proficiency in JavaScript, the knowledge needed to incorporate the React.js library, and ability to adroitly implement the Vue.js framework are absolutely crucial to fully functionalizing our application.
Priority	Mandatory: 0

2.2.2 Advanced AI Corporation

Table 9: Advanced AI Corporation

Title	Advanced AI Corporation
Description	Our website will require the usage of Python for the AI system that will serve to predict future fluctuations in cases of COVID-19 at a given location.
Priority	Mandatory: 0

2.3 Platform Constraints

2.3.1 Platform Accessibility

Table 10: Platform Accessibility

Title	Platform Accessibility
Description	This application will be available only on web browsers.
Priority	Highest: 1

2.4 Network Constraints

2.4.1 Database Information Retrieval

Table 11: Database Information Retrieval

Title	Database Information Retrieval
Description	This HTML based website requires either a Wireless or a cellular connection at all times in order to keep tabs with sources that report novel information regarding COVID-19.
Priority	Mandatory: 0

2.5 Transition & Support Constraints

2.5.1 Continued Maintenance

Table 12: Application Termination

Title	Application Termination
Description	This application is a short term project set for the duration of the course CSC431. Upon receiving a final grade, the project will be shelved.
Priority	Lowest: 5

2.6 Budget & Schedule Constraints

2.6.1 Time Constraints

Table 13: Time Constraints

Title	Time Constraints
Description	The application files must be submitted before: May 5th 2021.
Priority	Mandatory: 0

2.6.2 Licensing and Money Constraints

Table 14: Licensing/Money Constraints

Title	Licensing/Money Constraints
Description	Licenses and information might need to be purchased from official sources in order to provide and update the application on a regular basis
Priority	Highest: 1

3 Requirements Modeling

3.1 Access Current COVID Data

Table 15: FR1 Scenario

Statement of Purpose	The user is interested in viewing the COVID-19 data with a visual representation on a map.
Individual	A public user
Trigger	The user searches for an area
Preconditions	An area search has been completed.
Postcondition(s)	The data is shown to the user with the data and live map of the requested location.
Assumptions	N/A
Steps of Scenario	1. User A enters an area name to the search box. 2. User A selects the specific area, and locks his or her decision. 3. A map is represented to the user about the number of cases and relevant COVID-19 information in the given location.

Table 16: FR1 Primary Use Case

Name	Access Current COVID Data Use Case
Description	This is the primary use case for the flow of the COVID-19 tracker.
Actors	Any user that accesses the website.
Trigger	The use case is triggered once the user searches a location.
Precondition(s)	The user has selected a specific location of their interest and pressed the track button.
Basic Flow	1. The user selects a location of interest and clicks search. 2. System begins pulling up to date information from official reliable databases such as CDC (Centers for Disease Control and Prevention) or WHO (World Health Organization). 3. After acquiring the data, the algorithm contrasts received information with its in-built scale and plots it onto a region map.
Exceptions	If the user incorrectly spells a location name or puts in an incorrect ZIP code, the system will request the user to recheck their input.
Postcondition(s)	The user has obtained their requested information in the format of their preference.
Special Requirements	None

3.2 View Past COVID Data

Table 17: FR2 Scenario

Statement of Purpose	The user is interested in viewing the past COVID-19 data for the specified location.
Individual	A public user
Trigger	The user slides the bar located under the map to the left of the median
Preconditions	FR1 must be completed, and the user must be currently viewing data of the specified location.
Postcondition(s)	The user is able to view past COVID information for the location.
Assumptions	N/A
Steps of Scenario	User A can: -Glide the bar before the median point to see past COVID data for the specified location. -The further the bar is glided under the map, the further back in time the User will go (up to two months of past data can be viewed).

Table 18: FR2 Primary Use Case

Name	View past COVID cases Use Case
Description	This is the primary use case for the flow of using the past data property of the application.
Actors	Any user that accesses the website.
Trigger	The use case is triggered once the user glides the bar below the map to the left of the median.
Precondition(s)	The user has located the bar that is below the map and is clicking on the bar.
Basic Flow	1. The user can glide backwards on the scale. 2. When gliding backwards, the webpage will retrieve past COVID data on the time and date the user has selected. 3. The user can specifically glide the bar to any time from present to two months back from the current day.
Exceptions	In the rare case that information is missing regarding the given location, the application might have an error presenting the user with past COVID data.
Postcondition(s)	The user has successfully managed to glide the bar to their time of interest.
Special Requirements	None

3.3 View Predicted Future COVID Data

Table 19: FR3 Scenario

Statement of Purpose	The user is interested in viewing predicted future COVID-19 data for the specified location.
Individual	A public user
Trigger	The user slides the bar located under the map to the right of the median.
Preconditions	FR1 must be completed, and the user must be currently viewing data of the specified location.
Postcondition(s)	The user is able to get a glimpse of an AI generated future COVID data for the location.
Assumptions	N/A
Steps of Scenario	User A can: Glide the bar beyond the median point to see future predicted COVID data for the specified location.

Table 20: FR3 Primary Use Case

Name	View future predicted COVID cases Use Case
Description	This is the primary use case for the flow of using the predicted future data property of the application.
Actors	Any user that accesses the website.
Trigger	The use case is triggered once the user glides the bar below the map to the right of the median.
Precondition(s)	The user has located the bar that is below their preferred format of viewing the COVID cases and is clicking on the bar.
Basic Flow	1. The user can glide forward on the scale. 2. When gliding forwards, the application will generate an AI configured prediction of the future potential COVID cases and information on the time and date the user has selected. 3. The user can specifically glide the bar to any time from present to a month in the future from the current day.
Exceptions	In the rare case that information is missing regarding the given location, the application might have an error presenting the user with predicted future COVID data.
Postcondition(s)	The user has successfully managed to glide the bar to their time of interest.
Special Requirements	None

Fig.1: User Accessibility to COVID-19 Data in Real Time

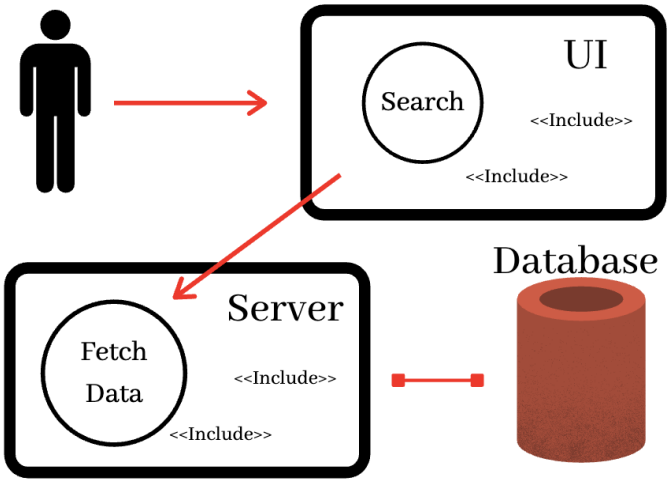
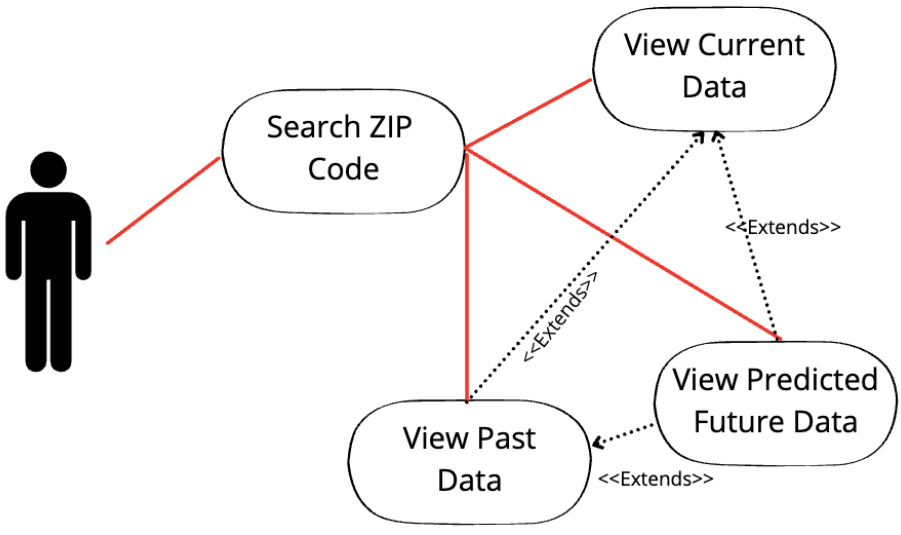


Fig.2: User Accessibility to Past and Predicted Future COVID-19 data



3.4 Refreshing/Renewing User Input

Table 21: NFR1 Scenario

Statement of Purpose	The system should be able to establish a connection with reliable source databases and continuously retrieve COVID information.
Individual	A public user
Trigger	The user keeps updating the location or keeps refreshing the page.
Preconditions	The user is connected to the website with a decent wireless/cellular connection. The user is also repetitively refreshing the page and/or rapidly changing locations to view different data.
Postcondition(s)	Regardless of preconditions, the user is always presented with their desired data.
Assumptions	The user has reliable internet connection.
Steps of Scenario	1. User A enters an area name to the search box. 2. User A selects the specific area, and locks his or her decision. 3. A map is represented to the user about the number of cases in the given location. 4. User wants to do the following: a. Refresh the page to see any changes within a given location b. Change the location to check other places 5. Regardless of step 4a or 4b, a map is represented to the user about the number of cases in the given location.

3.5 Reallocation of Memory for Past COVID Data

Table 22: FR1 Scenario

Statement of Purpose	The system should be able to reallocate memory for a month prior to the current day.
Individual	A public user
Trigger	The user has glided the bar to the left of the median.
Preconditions	FR1 must be completed, and the user must be currently viewing data of the specified location.
Postcondition(s)	The user has selected a specific date and time in the past.
Assumptions	The website must be able to retrieve past data from source databases in order to display the past 30 days worth of COVID information within the specified location.
Steps of Scenario	1. User A clicks on the bar and glides it to a point that is to the left of the median point. 2. User A stops gliding the bar. 3. System displays the date and time selected prior to current day. 4. System provides data regarding COVID cases for the selected date.

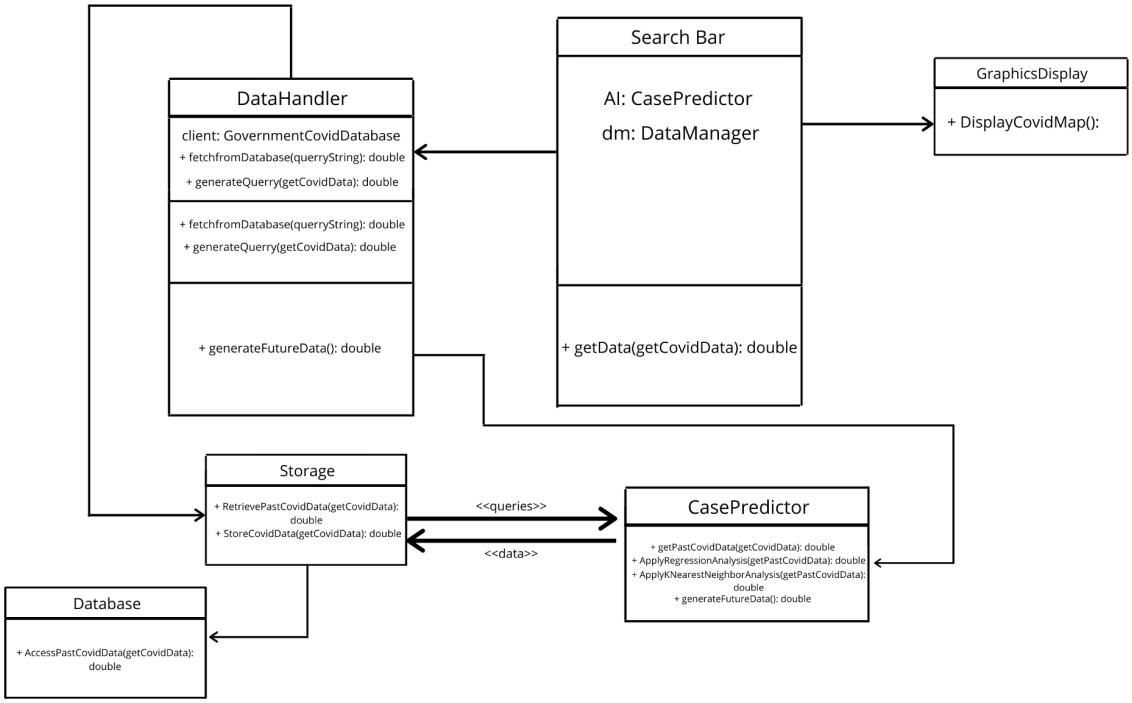
3.6 COVID Cases Prediction of Artificial IntelligenceAlgorithms

Table 20: NFR3 Scenario

Statement of Purpose	The system uses the inbuilt AI system to predict the COVID cases within a location for two weeks ahead of the current date.
Individual	A public user
Trigger	The user has glided the bar to the right of the median.
Preconditions	FR1 must be completed, and the user must be currently viewing data of the specified location.
Postcondition(s)	The user has selected a specific date and time in the future.
Assumptions	The website must be able to predict future COVID cases, the system must establish a connection to reliable source databases to pull in prior information to make an accurate prediction of potential cases in the future for the selected location.
Steps of Scenario	1. User A clicks on the bar and glides it to a point that is to the right of the median point. 2. User A stops gliding the bar. 3. System displays the date and time selected in the future. 4. System provides an algorithm generated data of predicted COVID cases for the selected date.

3.7 UML Class Diagram

Fig.3: UML Class Diagram



4. Evolutionary Requirements

As vaccinations and overall control of the COVID-19 pandemic is increasing, there might be less need to use our webpage. We are fully aware that this is a useful tool to have, and it can be further implemented to be used to monitor other prevalent diseases such as Influenza, or Tuberculosis.

4.1 Functional Requirements

4.1.1 Alternate Disease Implementation

Table 21: Alternate Disease Implementation

Title	Disease Implementation
Description	Like COVID-19, there are many other outbreaks that are happening simultaneously, and our web application should have the option of implementing these outbreaks as well
Priority	Highest: 0
Precondition(s)	Upon entering our webpage, User A will need to select the disease they wish to monitor on our webpage.
Postconditions(s)	User must have selected a ZIP code
Use Case Diagram	None at this time

4.2 Non-Functional Requirements

4.2.1 Alternate Disease Database Access

Table 22: Alternate Disease Database Access

Title	Alternate Disease Database Access
Description	Upon selecting a particular disease when accessing the web application, the system must prepare to accept a ZIP code from the user and access the corresponding database that stores information regarding the type of disease.
Priority	Highest: 0
Applicable FR(s)	FR1/FR4.1