DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING
THE UNIVERSITY OF TEXAS AT ARLINGTON

SYSTEM REQUIREMENTS SPECIFICATION
CSE 4316: SENIOR DESIGN I
FALL 2023

COVID CATCHERS
FINDMYCOVID

DEV NAGANOOLIL
MUHAMMAD ZUHAIMI
MUHAMMAD ZAHARUDIN
ARYAN MAINKAR

Revision History

Revision	Date	Author(s)	Description
0.1	10.23.2023	DN	document creation
0.2	10.23.2023	DN, MZ, MZ, AM	complete draft
0.3	10.24.2023	DN, MZ, MZ, AM	release candidate 1
1.0	10.24.2023	DN, MZ, MZ, AM	official release

CONTENTS

List of Figures

1 Product Concept

This section describes the purpose, use, and intended user audience for the COVID-19 Global Data Visualization Platform. It is a web application designed to provide real-time and historical data on global COVID-19 cases, enabling researchers, healthcare professionals, policymakers, and the public to visualize and understand the pandemic's impact.

1.1 Purpose and Use

The COVID-19 Global Data Visualization Platform is a web application designed to provide users with real-time and historical data on COVID-19 cases worldwide. It allows users to visualize the global spread of the virus, enabling researchers, healthcare professionals, policymakers, and the general public to make informed decisions and gain insights into the pandemic's impact. This platform serves as a user-friendly tool for tracking and comprehending the social, economic, and public health aspects of the COVID-19 crisis.

1.2 Intended Audience

The COVID-19 Global Data Visualization Platform is intended for a diverse range of audiences, including:

1. Researchers: Epidemiologists, data scientists, and researchers in various fields who require comprehensive and up-to-date COVID-19 data for analysis and modeling.
2. Healthcare Professionals: Doctors, nurses, and healthcare administrators who need accurate information to monitor and respond to the pandemic in their regions.
3. Policymakers: Government officials and policymakers at local, national, and international levels who use data for decision-making and resource allocation.
4. General Public: Anyone interested in tracking and understanding the global spread of COVID-19, making informed choices, and staying informed about the pandemic's developments.
5. Journalists: Reporters and media professionals who rely on accurate and real-time data for reporting on the pandemic.

The platform is designed for general use and serves as a standalone tool for accessing COVID-19 data. It can also be used as a component in larger systems or applications for those who wish to integrate its data into their projects.

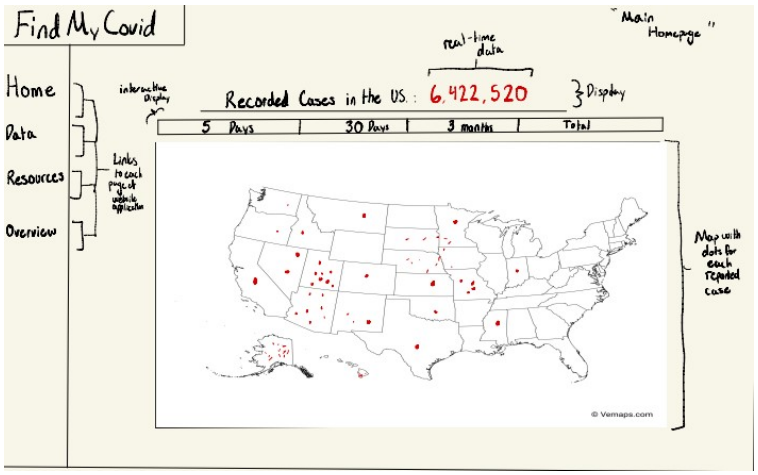

Figure 1: FindMyCovid conceptual drawing

2 Product Description

This section provides an overview of our COVID-19 mapping and data visualization web application. The primary objective is to outline the key features, functions, and operational aspects of the product from the perspective of end users, maintainers, and administrators. We will describe the critical user interactions and user interfaces, ensuring a comprehensive understanding of the product's capabilities and functionalities

2.1 Features & Functions

- Real-time Data Updates: The application provides real-time COVID-19 data, including new cases,recoveries, and fatalities. Users can access the most current information to stay informed.
- Historical Data: Users can view COVID-19 data for different timeframes, including the past day, 30 days, three months, and more. This feature enables users to track the progression of the pandemic over time.
- Data Filters: Users can filter data based on various parameters such as states, counties, and specific date ranges. This feature enhances data customization and analysis.
- Heat Maps: The application generates heat maps to visually represent the intensity of COVID-19 cases, helping users identify hotspots and trends.

2.2 External Inputs & Outputs

Data Element	Description	Use
Geographic Data (Input)	Geographical map of the United States and user-selected date ranges for COVID-19 data	To filter and display COVID-19 statistics based on user preferences
Real-time COVID-19 Data (Input)	Live data on new cases, recoveries, fatalities, and other pandemic-related statistics	to provide up-to-date information to users for visualization and analysis
Historical COVID-19 Data (Output)	Data related to past 5 days, 30 days, three months, etc., in graphical and tabular formats	To provide users with historical data for trend analysis and comparison

2.3 PRODUCT INTERFACES

The end-user will be able to interact with the heat map of the United States and zoom into certain parts to precisely study high-infected areas in each state. There will be a row of buttons on top of the heat map that allows the user to pick the time frame. The choices available for that time frame will be 5 days, 30 days, 3 months, and total. There will be labels at the left side of the webpage which allows the user to travel to two other links connected to the website: data and resources. All operational interfaces will look the same for both the end-user and the administrator.

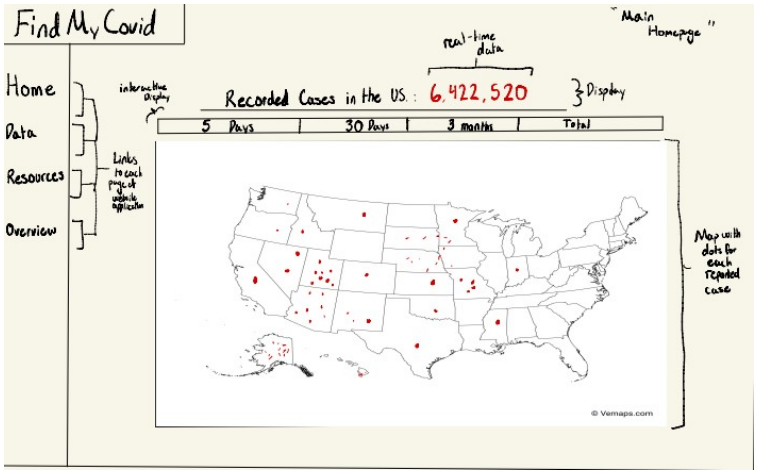

Figure 2: FindMyCovid Home Interface

y

3 Customer Requirements

The following requirements are specified for and by the intended audience of the product, which is a web application providing real-time and historical data on global COVID-19 cases.

3.1 Real-Time Data Display

3.1.1 Description

The web application must display real-time COVID-19 data in an easily readable format. This data should include the total number of cases, deaths, and recoveries globally. It should also show the same statistics for individual countries and regions. Users should be able to see this information at a glance on the main dashboard, presented in a user-friendly interface with clear headings, up-to-the-minute data timestamps, and color-coded sections to distinguish cases, deaths, and recoveries. The display should also include a world map with real-time markers to show the severity of outbreaks in various regions.

3.1.2 Source

- Customer

3.1.3 Constraints

The data must be updated in real-time from a reliable source such as a government health agency or a trusted international organization like the World Health Organization (WHO). The data should not be delayed by more than 15 minutes to ensure accuracy and usefulness.

3.1.4 Standards

- Data Visualization Standards: The application will adhere to data visualization standards recommended by authoritative bodies like the International Institute for Visualization, ensuring that data is represented clearly and accurately. These standards typically cover aspects such as data encoding, chart types, labeling, and color usage to convey information effectively.
- Web Accessibility Standards: The color scheme used for data representation will comply with web accessibility standards. This involves adhering to guidelines like the Web Content Accessibility Guidelines (WCAG), which ensure that the application is accessible to users with disabilities, including those with visual impairments.
- Global Health Reporting Standards: The application will follow the best practices of the World Health Organization (WHO) for presenting public health data. This includes aligning with WHO guidelines for data reporting and presentation, and ensuring that your application's data is consistent with international health reporting standards and methodologies.

3.1.5 Priority

- 1 Critical (must-have for the product's success)

3.2 Historical Data Visualization

3.2.1 Description

The web application will prominently display historical COVID-19 data on a map, utilizing a mapping format that adheres to the latest web standards. Users will have the capability to interact with this map to visualize the geographic distribution of COVID-19 cases over time. Key features will include the ability to select specific date ranges, regions, and data types (such as cases, deaths, or recoveries)

to generate customized and dynamic visualizations. The interactive map should provide intuitive functionality, allowing users to zoom in for finer details, overlay multiple data series to compare trends, and receive informative screen tips with detailed data for each geographic point. To enhance user experience and data exploration, a clear and user-friendly legend will be included, helping users understand the significance of map elements. Additionally, users will be able to export or share these map-based visualizations to facilitate information sharing and analysis. The mapping format will align with the latest web specifications and mapping standards, ensuring a responsive, visually appealing, and informative representation of historical COVID-19 data.

3.2.2 SOURCE

- Customer

3.2.3 CONSTRAINTS

Economic constraints necessitate efficient historical data storage and rendering to minimize cloud storage costs and reduce server load. Ethical constraints require an objective and accurate presentation of historical data, preventing any potential misinterpretation. Additionally, ensuring data privacy and security will be a fundamental constraint, given the sensitivity of the information.

3.2.4 STANDARDS

- Web Mapping Standards: Adherence to established web mapping standards such as those defined by the Open Geospatial Consortium (OGC) and Web Map Service (WMS) standards for consistent, interoperable map data rendering.
- Data Accuracy Standards: Compliance with industry best practices for data accuracy, including data validation, cleansing, and error handling to ensure precise representation of historical COVID-19 data on the map.
- Web Accessibility Standards: Ensuring that the map's color scheme, user interface, and data representations conform to web accessibility standards, making the application inclusive for all users, including those with disabilities.
- Interactivity Standards: Incorporation of interactive design standards, enabling user-friendly features like zooming, data series overlay, and tooltips for enhanced user engagement and exploration.
- Data Privacy and Security Standards: Integration of data privacy and security measures, ensuring the protection of user data and compliance with relevant regulations such as GDPR.

3.2.5 PRIORITY

- 2 High (very important for customer acceptance)

4 Packaging Requirements

The COVID-19 Global Data Visualization Platform is a web-based application, and it can be accessed exclusively through the internet. Users can simply open their web browsers and navigate to the platform's website to access a wealth of real-time and historical data related to COVID-19 cases worldwide. This web-based approach ensures convenient access without the need for software installation or physical components, making it accessible to a wide audience with an internet connection.

4.1 Internet Connectivity

4.1.1 Description

Users must have access to a reliable internet connection to use the COVID-19 Global Data Visualization Platform. The platform's functionality, including real-time data updates and data retrieval, depends on an internet connection to ensure seamless access for all users. This requirement is essential to meet the platform's intended purpose of providing global COVID-19 data through online means.

4.1.2 Constraints

Users must have access to an internet connection with a minimum download speed of 2 Mbps and a minimum upload speed of 1 Mbps. This constraint ensures that users can access and utilize the COVID-19 Global Data Visualization Platform efficiently. Users with slower internet connections may experience delays in data retrieval and visualization, potentially impacting their experience and the platform's functionality.

4.1.3 Standards

1. **High-Speed Internet Requirement:** Users must have access to a high-speed internet connection (e.g., broadband) for a smooth and responsive experience.
2. **Secure Website (HTTPS):** The platform should have a secure connection (HTTPS) to protect user data during transmission.
3. **Mobile-Friendly Design:** The platform should be designed to work well on mobile devices, making it accessible to users on smartphones and tablets.
4. **Browser Compatibility:** Ensure that the platform functions correctly on commonly used web browsers (e.g., Chrome, Firefox, Safari, Edge).
5. **Load Time Optimization:** The platform should load quickly, even for users with slower internet connections, to enhance the user experience.

4.1.4 Priority

1

5 Performance Requirements

Performance requirements for the **Covid Catchers: Real-time Data Visualization System** are essential to ensure the smooth functioning and responsiveness of the software. These requirements dictate how fast critical operations must complete, the time it takes to start or stop activities, and the efficiency of various system processes.

5.1 Response Time for Data Queries

5.1 Requirement Name
5.1.1 Description: The system must respond to user data queries within 2 seconds under normal operating conditions.
5.1.2 Source: User expectations and industry standards.
5.1.3 Constraints: Heavy user load may affect response time.
5.1.4 Standards: None applicable.
5.1.5 Priority: 2

5.2 Real-time Data Visualization Updates

5.2 Requirement Name
5.2.1 Description: Real-time data visualizations must update every 5 seconds to provide users with the latest information.
5.2.2 Source: User requirements and system design specifications.
5.2.3 Constraints: System bandwidth and server processing capabilities.
5.2.4 Standards: None applicable.
5.2.5 Priority: 2

5.3 Data Import and Processing Time

5.3 Requirement Name
5.3.1 Description: The system must import and process external data sets in various formats (CSV, JSON, etc.) within 10 seconds per dataset.
5.3.2 Source: Technical specifications and user requirements.
5.3.3 Constraints: Complexity of the imported data and server processing power.
5.3.4 Standards: None applicable.
5.3.5 Priority: 3

5.4 System Availability

5.4 Requirement Name
5.4.1 Description: The system must have an uptime of 99.9% per month, allowing for regular maintenance windows.
5.4.2 Source: Service level agreements and industry best practices.
5.4.3 Constraints: Scheduled maintenance periods.
5.4.4 Standards: None applicable.
5.4.5 Priority: 3

6 Safety Requirements

Safety requirements for the **Covid Catchers: Real-time Data Visualization System** are focused on data security, user privacy, and regulatory compliance to prevent any cybersecurity threats, data breaches, or violations of data agreements.

6.1 Cybersecurity Measures

6.1 Requirement Name
6.1.1 Description: The system must implement robust cybersecurity measures, including encryption protocols, secure socket layer (SSL) certificates, and multi-factor authentication, to protect user data and ensure confidentiality and integrity.
6.1.2 Source: Industry best practices and cybersecurity guidelines.
6.1.3 Constraints: Continuous monitoring and updating of cybersecurity protocols.
6.1.4 Standards: Adherence to cybersecurity standards such as ISO/IEC 27001 and NIST Cybersecurity Framework.
6.1.5 Priority: 1

6.2 Data Breach Prevention

6.2 Requirement Name
6.2.1 Description: The system must incorporate intrusion detection systems, regular security audits, and proactive vulnerability assessments to prevent and detect potential data breaches. Immediate action protocols will be in place to contain and mitigate any security incidents.
6.2.2 Source: Data security experts and cybersecurity guidelines.
6.2.3 Constraints: Timely response and mitigation strategies are crucial in the event of a security breach.
6.2.4 Standards: Compliance with data breach notification laws and regulations (e.g., GDPR, HIPAA).
6.2.5 Priority: 1

6.3 Data Agreement Compliance

6.3 Requirement Name
6.3.1 Description: The system must adhere strictly to data agreements and privacy policies established with data sources. User consent and data usage policies will be transparently communicated, and opt-in/opt-out mechanisms will be provided to users for data collection and processing.
6.3.2 Source: Legal counsel and data protection regulations.
6.3.3 Constraints: Compliance with varying international data protection laws.
6.3.4 Standards: Compliance with data protection regulations such as GDPR, CCPA, and local data protection laws.
6.3.5 Priority: 1

7 Maintenance & Support Requirements

This section outlines the maintenance and support requirements for the COVID-19 Global Data Visualization Platform. These requirements detail what is necessary to ensure the ongoing care, support, and maintenance of the product once it is delivered and in use "in the field."

7.1 Maintenance and Support Requirements

7.1.1 Error Correction and Updates

The platform must have a dedicated team or individual responsible for promptly addressing errors, bugs, and issues. Regular updates should be provided to improve functionality and address emerging issues.

Source Product development team, maintenance team

Constraints The availability of personnel for error correction and updates must align with the severity of reported issues. Critical issues should be addressed with higher priority.

Standards - Best practices for error tracking and resolution. - Software development standards for implementing updates safely.

Priority 1

7.1.2 Support/Documentation Portal

An online support and documentation portal should be maintained, offering troubleshooting guides, FAQs, and user manuals. This portal should be easily accessible to both end-users and the maintenance team.

Source Product development team, maintenance team

Constraints The support portal must be regularly updated with the latest information and solutions.

Standards - User support documentation standards. - Web development standards for a user-friendly portal.

Priority 1

7.1.3 Source Code Availability

The source code of the platform should be well-documented and version-controlled, with access provided to the maintenance team to ensure efficient code modifications and updates.

Source Product development team, maintenance team

Constraints Access to the source code should be restricted to authorized personnel.

Standards - Source code management standards. - Documentation standards for code structure and comments.

Priority 1

7.1.4 Technical Documentation

Comprehensive technical documentation, including system architecture, database schema, and API specifications, must be available to assist maintainers in understanding the platform's infrastructure and components.

Source Product development team, maintenance team

Constraints Technical documentation must be kept up-to-date to reflect any system changes.

Standards - Technical documentation best practices. - Standards for documenting system architecture and data models.

Priority 3

7.1.5 Backup and Disaster Recovery Plan

A robust backup and disaster recovery plan should be in place to safeguard data and ensure minimal downtime in the event of system failures or data loss.

Source Product development team, IT team

Constraints Regular testing and validation of the backup and disaster recovery plan are required.

Standards - Disaster recovery planning standards. - Data backup and restoration best practices.

Priority 1

7.1.6 Specific Tools and Software

The maintenance team should have access to specific tools and software required for maintaining the platform. This may include debugging tools, security scanning software, and performance monitoring utilities.

Source Maintenance team, IT team

Constraints Software licenses and tool availability must be kept current.

Standards - Software and tool usage standards. - Software licensing and maintenance best practices.

Priority 1

7.1.7 Environment Replication

An environment that replicates the production system should be available for testing and debugging purposes to identify and resolve issues without affecting the live platform.

Source Product development team, IT team

Constraints Replication environments should closely mirror the production environment to be effective for testing.

Standards - Environment replication and testing standards. - Data isolation standards.

Priority 1

7.1.8 User Support Channel

A dedicated user support channel, such as a helpdesk or email system, should be established to address user inquiries and provide assistance as needed.

Source Product development team, support team

Constraints Support staff availability and response times must meet defined service level agreements.

Standards - Service level agreement (SLA) standards. - User support best practices.

Priority 1

7.1.9 Periodic Audits and Security Updates

Regular security audits and updates should be conducted to identify and address vulnerabilities, ensuring the platform remains secure and compliant with evolving security standards.

SOURCE Security team, maintenance team

CONSTRAINTS Security audits must be performed without disrupting platform availability.

STANDARDS - Security auditing standards. - Patch management best practices.

PRIORITY 1

7.1.10 END-USER TRAINING

If necessary, end-user training materials and sessions should be available to help users make the most of the platform and understand its features.

SOURCE Training team, product development team

CONSTRAINTS Training materials and sessions must be kept current to reflect platform updates.

STANDARDS - User training and education standards. - User documentation standards.

PRIORITY 3

8 Other Requirements

This section outlines the final requirements necessary for the completion of the COVID-19 Global Data Visualization Platform. It includes requirements related to customer setup and configuration, and product architecture.

8.1 Finalization Requirements

8.1.1 User Onboarding and Configuration

Description The platform should provide an intuitive and guided onboarding process for new users, assisting them in setting up their accounts, selecting their preferred geographic regions, and customizing their data preferences.

Source User experience team, user feedback

Constraints User interface design, data validation

Standards User onboarding best practices, data validation guidelines

Priority 1

8.1.2 Extensibility

Description The platform should be designed to accommodate future enhancements seamlessly. Developers should be able to add new features, data sources, or visualization tools without major restructuring of the existing codebase.

Source Technical team, development roadmap

Constraints Code maintainability, backward compatibility

Standards Software development standards, backward compatibility guidelines

Priority 1

8.1.3 Programming Language Compatibility

Description The source code should adhere to coding standards and practices that ensure compatibility with multiple programming languages and environments. This facilitates future development and adaptations.

Source Development team, coding standards

Constraints Language-specific features, library compatibility

Standards Cross-platform coding standards, library compatibility guidelines

Priority 3

8.1.4 Platform Portability

Description The source code should be written and structured in a way that allows for portability across various platforms, including Windows, Linux, Unix, and macOS. This ensures a broader user base and adaptability to diverse IT infrastructures.

Source Development team, platform compatibility requirements

Constraints Platform-specific APIs, system dependencies

Standards Cross-platform development standards, API abstraction guidelines

Priority 3

8.1.5 Scalability and Performance Optimization

Description The platform architecture should be scalable to handle increased user loads without compromising performance. Performance optimization should be an ongoing concern, ensuring a responsive and efficient user experience.

Source Technical team, performance testing

Constraints Hardware limitations, latency considerations

Standards Scalability best practices, performance optimization guidelines

Priority 1

8.1.6 Data Privacy and Security Compliance

Description Ensure that the platform adheres to data privacy regulations and industry standards for data security, encryption, and user privacy. Regular security assessments and compliance checks should be conducted.

Source Security team, legal requirements

Constraints Regulatory changes, evolving security threats

Standards Data privacy regulations, security best practices

Priority 1

8.1.7 Documentation and User Guides

Description Provide comprehensive and up-to-date user documentation, guides, and manuals to assist users in making the most of the platform's features and capabilities.

Source Documentation team, user feedback

Constraints Documentation maintenance, user training resources

Standards User documentation standards, training material development guidelines

Priority 4

9 Future Items

9.1 Future Requirements

9.1.1 Enhanced Data Sources

Description Integration of diverse and detailed data sources, such as demographic information, vaccination rates, and hospital capacity, to provide a comprehensive view of the pandemic.

Source User feedback, data providers

Constraints Availability and compatibility of data sources, budget considerations

Standards Data integration best practices, privacy regulations

Priority 5

9.1.2 Customizable Dashboards

Description Allow users to create personalized dashboards with their choice of data visualization widgets to focus on specific aspects of the pandemic.

Source User feedback, user experience team

Constraints User interface design, development resources

Standards User interface (UI) design principles, personalization best practices

Priority 5

9.1.3 Machine Learning and Predictive Analytics

Description Integration of machine learning models and predictive analytics to forecast COVID-19 trends for proactive decision-making.

Source Data scientists, technical team

Constraints Data availability, model accuracy, computational resources

Standards Machine learning best practices, data privacy regulations

Priority 5

9.1.4 User-Generated Content

Description Enable users to contribute data or insights, fostering a collaborative community of experts and citizens working together.

Source User feedback, community engagement team

Constraints Data validation and moderation, user privacy

Standards User-generated content guidelines, data quality assurance

Priority 5

9.1.5 Advanced Alerts and Notifications

Description Implementation of a notification system to inform users about significant changes in specified regions to ensure they stay informed.

Source User feedback, user experience team

Constraints Notification delivery mechanisms, user preferences

Standards Notification service standards, user notification preferences

PRIORITY 5

9.1.6 ACCESSIBILITY IMPROVEMENTS

DESCRIPTION Ongoing enhancement of accessibility features to ensure the platform remains inclusive and usable by individuals with disabilities.

SOURCE User feedback, accessibility experts

CONSTRAINTS Compliance with accessibility standards, user testing

STANDARDS Web accessibility standards, inclusive design principles

PRIORITY 5

9.1.7 MULTI-LANGUAGE SUPPORT

DESCRIPTION Expansion of language support to make the platform accessible to a broader global audience.

SOURCE User feedback, localization experts

CONSTRAINTS Translation resources, internationalization efforts

STANDARDS Localization standards, language support best practices

PRIORITY 5

9.1.8 USER TRAINING AND EDUCATION

DESCRIPTION Development of comprehensive training materials and user education programs to help users maximize the platform's potential.

SOURCE Training team, user experience team

CONSTRAINTS Training content development, user engagement

STANDARDS Training and education best practices, user onboarding guidelines

PRIORITY 5

9.1.9 COMMUNITY ENGAGEMENT FEATURES

DESCRIPTION Creation of interactive forums and community engagement features to foster discussions, share insights, and promote collective problem-solving.

SOURCE Community engagement team, user feedback

CONSTRAINTS Community moderation, content quality

STANDARDS Online community standards, content guidelines

PRIORITY 5

9.1.10 REAL-TIME COLLABORATION TOOLS

DESCRIPTION Implementation of collaborative features that allow users to collaborate on research, share findings, and work together on addressing pandemic-related challenges.

SOURCE User feedback, technical team

CONSTRAINTS Collaboration platform development, data sharing security

STANDARDS Collaboration tool standards, data collaboration best practices

PRIORITY 5

REFERENCES