Department of Computer Science & Engineering
The University of Texas at Arlington

Project Charter
CSE 4316: Senior Design I
Fall 2023

Covid Catchers
Find My Covid

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Revision History

Revision	Date	Author(s)	Description
0.1	09.30.2023	DN	document creation
0.2	10.05.2023	DN,ZH,ZH,MA	complete draft
0.3	10.6.2020	DN,ZH,ZH,MA	release candidate 1

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1 Problem Statement

The world has been grappling with the COVID-19 pandemic, an global health crisis that has had profound social, economic, and public health impacts. Among this crisis, there is a need for a comprehensive and accessible platform that can provide real-time and historical data on COVID-19 cases worldwide. This problem statement addresses the need for a web application that utilizes COVID-19 data APIs to map and visualize the global spread of the virus, covering the past, present, and hopefully the future scenarios.

2 Methodology

We will create a user-friendly web application that serves as a comprehensive and accessible platform to address the urgent need for accurate and up-to-date COVID-19 information.

3 Value Proposition

Our project is a investment for sponsors, instructors, and the broader community. It provides sponsors with real-time COVID-19 data to make crucial decisions, optimize resource allocation, and strengthen their pandemic response efforts. Instructors gain a powerful teaching tool for data analytic courses, fostering research and educational excellence. By supporting us, stakeholders contribute to public health, research advancement, and data-driven decision-making, aligning their interests with the pressing needs of our time.

4 Development Milestones

This list of core project milestones should include all major documents, demonstration of major project features, and associated deadlines. Any date that has not yet been officially scheduled at the time of preparing this document may be listed by month.

Provide a list of milestones and completion dates in the following format:

- Project Charter first draft - October 2023
- System Requirements Specification - October 2023
- Architectural Design Specification - November 2023
- Demonstration of Covid Mapping - December 2023
- Detailed Design Specification - March 2024
- Demonstration of Home Page - March 2024
- CoE Innovation Day poster presentation - April 2024
- Demonstration of Past and Future Trends in the US - April 2024
- Demonstration of the Covid cases of the entire world - April 2024
- Final Project Demonstration - April 2024

5 Background

The COVID-19 pandemic has revealed shortcomings in the availability, accessibility, and comprehensibility of data related to the virus's spread and impact. These shortcomings have created a need for a solution that fixes these gaps.

1. **Data Fragmentation and Complexity:**
    - **The Problem:** Currently, COVID-19 data is dispersed across various sources, including government websites, health agencies, and research institutions. This leads to inconsistencies and difficulties in viewing and interpreting the data.
    - **Business Case:** The lack of centralized, easy-to-access data hinders decision-making at multiple levels. Healthcare professionals, policymakers, researchers, and the public need a single, reliable source of information to make informed choices regarding healthcare, resource usage, and safety measures.
2. **Real-time Information Needs:**
    - **The Problem:** The pandemic's increasing nature demands real-time information on COVID-19 cases, testing, and healthcare capacity. Traditional reporting methods often result in delays and outdated data.
    - **Business Case:** Rapid decision-making is crucial in pandemic response. Healthcare providers require up-to-the-minute data to allocate resources effectively and respond to surges in cases. Policymakers need current information to make data-driven decisions about lock downs, travel restrictions, and more.
3. **Historical Data Analysis:**
    - **The Problem:** Understanding the pandemic's trajectory and identifying trends requires historical data analysis, which is often challenging to obtain and analyze.
    - **Business Case:** Researchers and epidemiologists need access to historical data to study the virus's behavior, assess the effectiveness of interventions, and develop strategies for future pandemics.
4. **User Accessibility:**
    - **The Problem:** Many existing COVID-19 data platforms are complex and not user-friendly, limiting accessibility for the general public and non-technical stakeholders.
    - **Business Case:** A user-friendly platform will allow everyone, from policymakers to the general public, to access and understand COVID-19 data.

6 Related Work

Developing a user-friendly web application for providing accurate and up-to-date COVID-19 information is an important endeavor. Several existing solutions exist in various forms, including academic research, enthusiast prototypes, and commercially available products. Below, I will discuss the state-of-the-art with respect to these solutions and why they may not fully meet the requirements of your envisioned platform.

COVID-19 Dashboards

COVID-19 dashboards, such as the John Hopkins University COVID-19 Dashboard [3], are prominent in providing real-time data on infection rates, deaths, and recoveries. Academic institutions often maintain these dashboards.

Limitation: While these dashboards offer valuable data, they may lack user-friendly features, community engagement, and comprehensive information beyond statistics.

Government Health Portals

Many governments worldwide have launched COVID-19 information websites. For example, the World Health Organization (WHO) provides official updates [6]. These portals offer guidance, testing center locations, and official updates.

Limitation: These portals may not always provide user-friendly interfaces, real-time community-generated content, and advanced features like predictive modeling or personalized alerts.

Mobile Apps

Various mobile apps have been developed to provide COVID-19 information, contact tracing, and alerts. Examples include COVID Alert and NHS COVID-19.

Limitation: Mobile apps may not always cover the full scope of information needed and their accessibility may be limited to specific regions.

Enthusiast Projects

Enthusiast developers have created open-source projects and prototypes related to COVID-19, such as data scrapers and visualization tools [4]. These projects aim to provide accessible data and insights.

Limitation: These projects may lack scalability, reliability, and a comprehensive approach to information delivery.

Academic Research and Data Repositories

Academic researchers have published numerous studies and datasets related to COVID-19, which are valuable for research purposes [1, 2, 5]. These datasets provide insights into the spread and impact of the virus.

Limitation: While these resources are valuable for research, they may not be directly accessible or user-friendly for the general public.

While these existing solutions contribute significantly to addressing the COVID-19 information gap, they often have limitations that your envisioned platform can overcome. These limitations may include:

- Lack of user-friendly and accessible interfaces.
- Limited coverage of community-generated content and user contributions.
- Incomplete or outdated data.
- Insufficient features like predictive modeling and personalized alerts.
- Regional restrictions and language barriers.

Your proposed platform aims to overcome these limitations by providing a comprehensive, user-friendly, and accessible resource for COVID-19 information, catering to a global audience with real-time data, community engagement, and advanced features.

7 System Overview

The COVID-19 Data Mapping and Visualization Web Application aims to address the urgent need for a centralized and user-friendly platform providing real-time and historical data on COVID-19 cases worldwide. At a high level, the system will consist of several major components working in harmony to deliver a seamless experience to users. Below is an overview of these components along with a description of how users and external systems might interface with the application.

Figure 1: System Design

7.1 User Interface:

- **Description:** The User Interface (UI) is the front-end component of the system. It provides an intuitive and interactive web interface accessible through web browsers on various devices such as desktops, laptops, tablets, and smartphones.
- **Functionality:** Users interact with the UI to search for COVID-19 data, view real-time statistics, access historical data, and visualize the information through charts, graphs, and maps.
- **Interfaces:** Users interact with the UI through mouse clicks, keyboard inputs, and touch gestures. They can also filter data, adjust visualization settings, and explore different geographical regions.

7.2 Application Backend:

- **Description:** The Application Backend serves as the central processing unit of the system. It handles user requests, processes data, and communicates with external APIs to fetch real-time and historical COVID-19 data.
- **Functionality:** The backend processes user queries, fetches relevant data from external sources, performs data analysis, and prepares the data for presentation. It also manages user sessions, authentication, and authorization.
- **Interfaces:** The backend communicates with the UI to receive user queries and sends processed data back to the UI for visualization. It also interfaces with external COVID-19 data APIs to fetch the necessary data.

7.3 COVID-19 Data APIs:

- **Description:** External APIs provided by reliable sources such as health organizations, government agencies, and research institutions. These APIs supply real-time and historical COVID-19 data.
- **Functionality:** The COVID-19 Data APIs offer programmatic access to a vast repository of COVID-19 data, including case numbers, testing statistics, healthcare capacity, and more. The application fetches data from these APIs to provide accurate and up-to-date information to users.
- **Interfaces:** The Application Backend interacts with these APIs using standardized protocols (HTTP/HTTPS) to fetch data. APIs respond with JSON or XML data, which is processed by the backend.

7.4 Data Visualization Engine:

- **Description:** The Data Visualization Engine is responsible for creating visually appealing and informative charts, graphs, and maps based on the processed COVID-19 data.
- **Functionality:** It translates raw data into graphical representations, making complex data sets comprehensible to users. It supports various types of visualizations such as bar charts, line graphs, heat maps, and geographical maps.
- **Interfaces:** The Data Visualization Engine receives structured data from the backend and presents it visually in the UI. Users can interact with these visualizations to gain insights into COVID-19 trends.

7.5 User Database (Optional):

- **Description:** An optional component that stores user profiles, preferences, and historical interactions with the application.
- **Functionality:** If implemented, the User Database allows users to create accounts, save their preferences, and access personalized features. It can enhance user experience by providing customized content and recommendations.
- **Interfaces:** The User Database interacts with the backend for user authentication and authorization. User-specific data and settings are retrieved from the database to personalize the user experience.

7.6 System Interaction

7.6.1 User Interaction Flow

- Users access the web application through their web browsers.
- They input search queries, adjust visualization parameters, and explore the data interactively through the UI.

7.6.2 External System Interaction

- The Application Backend communicates with external COVID-19 Data APIs to fetch real-time and historical data.
- The backend processes this data and provides it to the Data Visualization Engine, which generates visual representations displayed on the UI.

7.7 Conclusion

This high-level overview illustrates the core components of the COVID-19 Data Mapping and Visualization Web Application. By integrating these components effectively, the system will provide users with a comprehensive, user-friendly, and real-time platform for understanding the global spread of the virus and its impact, thereby contributing significantly to data-driven decision-making during the ongoing pandemic and future health crises.

8 Roles & Responsibilities

The stakeholders are the customers, data providers, and the professor.

The teams members are :
Dev Naganoolil: Product Owner
Muhammad Zuhaimi: Scrum Master
Muhammad Zahrudin: Team
Aryan Mainkar: Team
Our team will maintain the product owner and scrum master for the whole project.

9 Cost Proposal

For our Covid-19 Web application and API, we will look to utilize certain software to build our website application. We will also be relying on existing resources that are free to use, in hopes of reducing the need for financial investments in paid resources. We do have the financial support of the CSE department, who provided a budget of 800 for our project.

9.1 Preliminary Budget

Table 1: Preliminary Budget

Name	Amount of Budget
Software Licenses	$100

9.2 Current & Pending Support

Table 2: Current & Pending Support

Source of Budget	Amount of Budget
Prof. Chris Conly / CS Department	$800

10 Facilities & Equipment

Our project primarily involves software development, data analysis, and web-based platform creation. As such, our lab space requirements are minimal, and we do not require specialized laboratory facilities. We can operate from a standard office space that can occupy 4 people.

11 Assumptions

The following list contains critical assumptions related to the implementation and testing of the project:

- Data Source Availability: We assume that government health agencies, research institutions, and data providers will continue to make COVID-19 data accessible and available for integration into our platform.
- Internet Connectivity: The availability of reliable internet connectivity is assumed throughout the project's life cycle. This includes both the team's working environment and the end-users' access to the platform.
- Regulatory Compliance: We assume that the project will comply with all relevant data privacy and regulatory requirements related to COVID-19 data handling.
- Timely Updates: We assume that COVID-19 data sources will provide timely updates and notifications of changes.
- Hardware and Software Availability: The availability of necessary hardware components, software licenses, and third-party tools is assumed according to the project schedule.

12 Constraints

The following contains a list of the most critical constraints related to the project:

- Project completion deadline: The web application must be fully developed and operational by April 2024, to address the immediate need for COVID-19 information.
- Budget constraint: The total budget allocated for this project is limited to $800, including development, hosting, and maintenance costs.
- Data accuracy and reliability: The accuracy and reliability of COVID-19 data depend on external sources, and any inaccuracies or delays in data updates may impact the application's quality.

- Cross-Browser Compatibility: The web application must function correctly and consistently across a range of modern web browsers, including Google Chrome, Mozilla Firefox, Microsoft Edge, and Safari, to ensure a seamless user experience.
- Scalability and performance: The web application should be designed to handle a potentially high volume of users and data, ensuring optimal performance during peak usage times.

13 Risks

Risk description	Probability	Loss (days)	Exposure (days)
The risk of inaccurate or incomplete COVID-19 data from various sources.	0.50	20	10
Complex technical issues, such as data integration and scalability.	0.30	20	6
Database not being able to store all of needed data	0.20	9	1.8
Web application not suitable for cellular devices or certain browsers	0.10	20	2.0
The data given by the Api is not sufficient enough for mapping or analysis	0.20	10	2

Table 3: Overview of highest exposure project risks

14 Documentation & Reporting

14.1 Major Documentation Deliverables

14.1.1 Project Charter

Maintenance and Updates: The project charter will be reviewed and updated during significant project milestones or scope changes, ensuring alignment with the project objectives.
Initial Version Delivery: October 2023
Final Version Delivery: April 2024

14.1.2 System Requirements Specification

Maintenance and Updates: The SRS will be continuously updated based on evolving project requirements and feedback from stakeholders.
Initial Version Delivery: October 2023
Final Version Delivery: April 2024

14.1.3 Architectural Design Specification

Maintenance and Updates: The ADS will be updated in response to architectural changes and improvements.
Initial Version Delivery: November 2023
Final Version Delivery: April 2024

14.1.4 Detailed Design Specification

Maintenance and Updates: DDS will be updated during development iterations, ensuring it accurately reflects the system's design.
Initial Version Delivery: March 2024
Final Version Delivery: April 2024

14.2 Recurring Sprint Items

14.2.1 Product Backlog

Addition to Backlog: Product backlog items will be added from the SRS based on priority determined by the Product Owner.

Software: Utilize GIT for maintaining and sharing the product backlog with team members and stakeholders.

14.2.2 Sprint Planning

Planning: Sprint planning sessions will occur at the beginning of each sprint cycle.
Number of Sprints: 8

14.2.3 Sprint Goal

Decision: The team will collectively decide the sprint goal, ensuring alignment with project objectives.

14.2.4 Sprint Backlog

Decision: Product Owner selects items for the sprint backlog, which will be managed using Google Drawings and displayed on a Scrum board.

14.2.5 Task Breakdown

Assignment: Team members voluntarily claim tasks based on their expertise and interest.
Documentation: Time spent on tasks will be documented in Overleaf.

14.2.6 Sprint Burn Down Charts

Responsibility: Dev Naganoolil will generate burn down charts for each sprint.
Access: Effort expended by each team member will be accessible via Sprint Report.
Format: XLS Chart

14.2.7 Sprint Retrospective

Handling: Team conducts retrospective discussions after each sprint, analyzing what worked well and areas for improvement.
Documentation: Group and individual feedback will be documented and submitted by the end of each sprint.

14.2.8 Individual Status Reports

Frequency: Weekly status reports submitted by Sunday each week, highlighting completed tasks, challenges faced, and upcoming goals.

14.2.9 Engineering Notebooks

Updates: Weekly updates in engineering notebooks by Friday each week.
Accountability: Peer review and Dev Naganoolil as a witness for each page.

14.3 Closeout Materials

14.3.1 System Prototype

Inclusion: The final system prototype, demonstrating the complete functionality, will be presented to Christopher Conly.
Tests: Prototype Acceptance Test (PAT) will be conducted with Christopher Conly.

14.3.2 Project Poster

Content: The poster will include an overview of the project, key features, and visual representations of the COVID-19 data visualization.
Dimensions: TBH
Delivery: April 2024

14.3.3 Web Page

Content: The project web page will feature a project description, team details, real-time data visualization, and regular updates.
Accessibility: Public access, updated throughout the project.

14.3.4 Demo Video

Content: The demo video will showcase the application's features, demonstrating real-time data updates, historical data analysis, and user interactions.
Duration: TBH
Delivery: April 2024

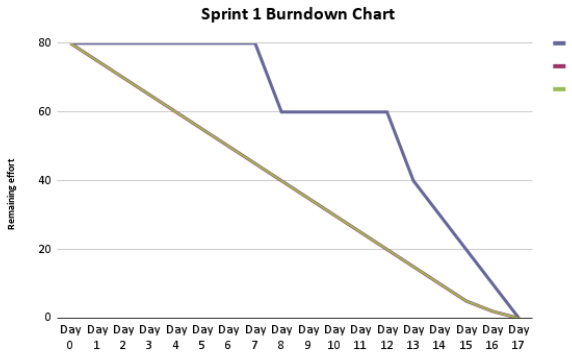

Figure 2: Example sprint burn down chart

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