

Software Requirements Specification

for

Artificial Intelligence and Data Science for Climate Change Management with Focus on Drought and Wildfire in California

Version 1.1.2 approved

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Revision History

Name	Date	Reason For Changes	Version
Mazel Fernandez	11/16/21	Added to Sections 1.1, 1.2, 1.4, 1.5 and 2 (Intro).	1.0.0
Mazel Fernandez			1.0.1
Jennifer Serrano	11/18/21	Added to Section 1.3	1.1.0
Rayan Hyder	11/25/2021	Added to Section 2.1	1.2.0
Victor Raj	11/27/2021	Added to Section 2.3, 2.6, 2.8	1.3.0
Rayan Hyder	12/5/2021	Added to Section 2.9, 3.2, 3.3, 3.4, 4.3, 4.4	1.2.1
Rayan Hyder	12/6/2021	Added to Section 1.5, 2.4, 4.1, 5, 6	1.2.2
Jennifer Serrano	12/8/2021	Revised Section 1.3, Added to Section 4.2, Added to Section 1.4, Edited Section 2	1.1.2

1. Introduction

1.1 Purpose

The purpose of the software requirements specification (SRS) document is to explain the functions that the following web application will perform as well as cover all aspects of the software and its functionalities.

- **Climate Change Management with Focus on Drought and Wildfire in California (Web Application, Version 1.0.0)**

1.2 Intended Audience and Reading Suggestions

The intended audience of the software requirements specification document are developers and government workers. It is recommended to read through the Project Scope to understand the application before proceeding. If you are a developer, it is recommended to read over Section 2.3 to get a better understanding of the functions each product is intended to have as well as Section 1.5 and Section 2.8 to obtain a list of all the references that were used while developing the applications as well as user documentation. If you are a project manager, it is recommended to read over Section 2 to get a better understanding of the product perspective as well as any design and implementation constraints. It is also recommended to read over Sections 4 to Sections 6 to look over the different types of requirements for each application as well as any legal or ethical considerations. For testers, it is recommended to read over Section 3 for the full list of all the interfaces the user will be able to interact with and their functionalities.

1.3 Product Scope

The Climate Change Management with Focus on Drought and Wildfire in California dashboard website will consist of several wildfire-related maps. These maps include: current wildfires, vegetation, temperature, wind speeds, etc. The software will be used to help citizens of California get information/predictions of wildfires and their size. The dashboard can be used to help first responders be prepared for possible wildfires as well as help predict evacuation zones by providing data analytics.

1.4 Definitions, Acronyms, and Abbreviations

The list below contains the definitions, acronyms, and abbreviations used for the software requirements specification document.

- **AIDSCCM:** Artificial Intelligence and Data Science for Climate Change Management with Focus on Drought and Wildfire in California
- **ArcGis's Living Atlas:** Collection of geographic data provided by Esri

- **Climate Change:** A change in global or regional climate patterns
- **Data Science:** Field where the goal is to extract knowledge from data to use for future purposes such as prediction
- **Esri:** Mapping and spatial analytics tool
- **Wildfire:** Unplanned large fire that spreads quickly in a natural area

1.5 References

The following table contains the references that are most referred to for this application.

Alias	Description
ArcGIS	All reference to ArcGIS services: https://doc.arcgis.com/en/
CSS	Language understanding: https://www.w3schools.com/css/
HTML	Language API: https://www.w3schools.com/html/default.asp
React	Language API: https://www.w3schools.com/react/default.asp
React.js	Language API: https://reactjs.org/tutorial/tutorial.html

2. Overall Description

This section shall satisfy the System Analysis, Product Perspective, Product Functions, User Classes and Characteristics, and Operating Environment. This application shall provide Documentation, inform users of any Constraints, Assumptions, Dependencies, as well as any Requirements that may be delayed.

2.1 System Analysis

- The goal of this software is to provide users with general information about wildfires in their area. This software will also provide predictions on the levels of air pollution and air quality with a focus on drought and wildfire using machine learning and data science techniques.
- Some hurdles along the development were:
 - Aligning the UI display
 - Plotting the maps for meteorological data.
 - Communication/Group collaboration system
- The solutions that the group came up with:
 - Implementing the bootstrap library as well as flexbox to align the items.
 - Using the ArcGis tools to create the maps.
 - Using CodeSandbox a third party IDE for development within the group.

2.2 Product Perspective

The Climate Change Management with Focus on Drought and Wildfire in California web application can be used by any individual, group, company, ect, without the need of any other software.

2.3 Product Functions

2.3.1 Display Maps

- 2.3.1.1 Displays Wildfire Map
- 2.3.1.2 Displays Vegetation Map
- 2.3.1.3 United States Rain/Precipitation Forecast Map
- 2.3.1.4 Heat Severity in U.S. Cities Map
- 2.3.1.5 Surface Wind Speed Map
- 2.3.1.6 Recent Conditions in Air Quality

2.3.2 News Feed

- 2.3.2.1 California Fires News
- 2.3.2.2 California Air Quality Due to Fires News

2.4 User Classes and Characteristics

I. Climate Change Management with Focus on Drought and Wildfire in California Data Visualization

- A. Public: This user will be able to interact with all current features available in the application but will not be able to make any modification to the application.
- B. Developer: This user will be able to interact with all current features available in the application but will be able to make any modification to the application.

2.5 Operating Environment

This web application will run on any computer or mobile device which has access to the internet and has a web browser.

2.6 Design and Implementation Constraints

Developers must work within any limitation the following software comes with.

2.6.1 CodeSanbox - As the online editor to create the web application.

2.6.2 React.js - As the programming language to implement the web application

2.6.3 Vercel - As the deployment tool to publish the dashboard

2.7 User Documentation

User documentation will not be provided unless requested.

2.8 Assumptions and Dependencies

- 2.8.1 Users are expected to have a device that has a web browser
- 2.8.2 Users are expected to have an internet connection. A stable internet connection will provide the best experience.
- 2.8.3 Any device the user has must have a display screen to display the web application and a keyboard/mouse.

2.9 Apportioning of Requirements

- 2.9.1 Dashboard needs to include the predictive models.
- 2.9.2 Dashboard needs to implement more live data of air quality, meteorological data.
- 2.9.3 Dashboard needs to implement more GUI Elements.
- 2.9.4 Dashboard needs a new platform like an IOS/Android app.

3. External Interface Requirements

The external interface requirements detail the User Interfaces, Hardware Interfaces, Software Interfaces, and Communication Interfaces of the application.

3.1 User Interfaces

- 3.1.1 Users will see a homepage when first visiting the website.
- 3.1.2 Users can choose which section they would like to see.
- 3.1.3 Users can contact the admins via email.

3.2 Hardware Interfaces

This application will not need any additional hardware interface requirement other than viewing the application on a device.

3.3 Software Interfaces

The list below contains the requirements for the software interface of each application:

I. Climate Change Management with Focus on Drought and Wildfire in California Data Visualization

- The application shall use the ArcGIS Online JavaScript API to visualize common causes and effects of Wildfire.
- The application shall use the ArcGIS Online JavaScript API to visualize Rain/Precipitation forecast.
- The application shall use the ArcGIS Online JavaScript API to visualize Heat Severity forecast.
- The application shall use the ArcGIS Online JavaScript API to visualize Air Quality forecasts.
- The application shall use the ArcGIS Online JavaScript API to visualize Wind speed forecast.
- The application shall use the ArcGIS Online JavaScript API to visualize Temperature forecast.

II. Wildfire Watchers Personalized App

THOUGHT IN PROGRESS (Possible for next semester)

3.4 Communications Interfaces

The list below contains the requirements for the communications interface of each application:

I. Climate Change Management with Focus on Drought and Wildfire in California Data Visualization

- The application shall receive data using HTTPS requests in a web browser to filter the maps.

4. Requirements Specification

The requirements specification details the Functional Requirements, External Interface Requirements, Logical Database Requirements, as well as any Design Constraints.

4.1 Functional Requirements

The table below contains the functional requirements for each application:

4.1.1	The system shall retrieve data for Feature Layers from ArcGIS's Living Atlas
4.1.2	The system should retrieve data for custom Feature Layers from sensors and fill in data for census tracts
4.1.3	The system shall use the retrieved data to display symbols on the map
4.1.4	The system shall use the retrieved data to display polygons on the map
4.1.5	The system shall visualize measured levels of heat using colors based on severity
4.1.6	The system shall visualize demographic statistics using colors based on
4.1.8	The system shall display a popup window upon clicking on a highlighted polygon on the map
4.1.10	The system shall toggle on and off Feature Layers in the map
4.1.11	The system shall add Feature Layers to the map

4.2 External Interface Requirements

I. Climate Change Management with Focus on Drought and Wildfire in California Data Visualization

- The dashboard shall correctly display various feature layers provided by ArcGis's Living Atlas (collection of geographic information). The data shall be displayed on an ArcGis map embedded in the website.

4.3 Logical Database Requirements

None of the applications require a logical database

4.4 Design Constraints

I. Climate Change Management with Focus on Drought and Wildfire in California Data Visualization

- **STANDARD LIMITATION**
 - No prior experience using any ArcGIS application.
 - Limited design options when designing web applications with ArcGIS.
- **HARDWARE LIMITATION**
 - Applications must run on browsers that support ArcGIS requirements.
 - System must have access to the internet.

5. Other Nonfunctional Requirements

5.1 Performance Requirements

I. Climate Change Management with Focus on Drought and Wildfire in California Data Visualization

- Be able to present data in real time when the user asks for it.

5.2 Safety Requirements

No safety requirements were identified for this application.

5.3 Security Requirements

No security requirements were identified at this time for the application.

5.4 Software Quality Attributes

The list below contains the software quality attributes for each application:

I. Climate Change Management with Focus on Drought and Wildfire in California Data Visualization

- **Availability:** Accessible through a web application
- **Reliability:** Data from Feature Layers are accurate
- **Maintainability:** Data from Feature Layers update in real-time
- **Usability:** There is a simple User Interface for all users

5.5 Business Rules

The list below contains the business rules for each application:

I. Climate Change Management with Focus on Drought and Wildfire in California Data Visualization

- All data from Feature Layers are open to the public
- All features are accessible to all users

6. Legal and Ethical Considerations

No legal or ethical issues were identified for these applications.

Appendix A: Glossary

See Section 1.4.

Appendix B: Analysis Models

Optionally, include any pertinent analysis models, such as data flow diagrams, class diagrams, state-transition diagrams, or entity-relationship diagrams.

PLANNED FOR FUTURE

Appendix C: To Be Determined List

Collect a numbered list of the TBD (to be determined) references that remain in the SRS so they can be tracked to closure.

PLANNED FOR FUTURE