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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05/13/22

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. It is recommended to read through section 1.3 to understand the application. Developers may read over Section 2.3 to get a better understanding of the functions the application is intended to have. They may also read Section 1.5 to read through our references. These references are links to documentation of resources we used to develop the application.

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 and in the future 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
JavaScript	Language API: https://www.w3schools.com/js/default.asp

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, and Dependencies.

2.1 System Analysis

- The goal of this software is to provide users with general information about wildfires in the past two decades, as well as the cause and effect of wildfires.
- 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, etc. 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 Displays Soil Moisture Map
- 2.3.1.4 Displays Temperature Map Video
- 2.3.1.5 Displays Surface Wind Speed Map
- 2.3.1.6 Displays Drought Map

2.3.2 News Page
- 2.3.2.1 California Wildfire News

2.4 User Classes and Characteristics

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

A. Public: Everyone will be able to interact with all the maps and read current wildfire news available in the dashboard but will not be able to make any modification to the application.

B. Developer: The developer will have the same access the public has and make modifications/edits to the maps or website.

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 JavaScript/HTML - As the programming language to implement the web application

2.6.3 Github - 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 historical maps.
2.9.2 Dashboard needs to implement more GUI Elements.

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 go to any other section via the navigation bar.

3.1.3 Users can contact the admins via contact info at the bottom of the site.

3.2 Hardware Interfaces

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

3.3 Software Interfaces

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

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- The application shall use the ArcGIS Online embed option to visualize common causes and effects of wildfires.
- The application shall use ArcGIS Online to visualize a historical vegetation map.
- The application shall use ArcGIS Online to visualize a historical soil moisture map.
- The application shall use ArcGIS Online to visualize a historical drought map.
- The application shall use ArcGIS Online to visualize a historical wind map.
- The application shall have a video to visualize a historical temperature map.

II. Wildfire Watchers Mobile App

(TBA)

3.4 Communications Interfaces

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

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- The application shall receive data using HTTPS requests in a web browser to filter and display 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 maps from ArcGis Online
4.1.3	The system shall use the retrieved data to display symbols/information on the maps
4.1.4	The system shall use the retrieved data to display shape areas on the wildfire map
4.1.5	The system shall visualize how large wildfires were based on the size of the shapes area
4.1.6	The system shall visualize the vegetation using different band combinations
4.1.8	The system shall display soil moisture in the past two decades
4.1.10	The system shall display drought levels in the past two decades
4.1.11	The system shall display a video of the past two decades temperature changes

4.2 External Interface Requirements

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- The dashboard shall correctly display meteorological and wildfire maps. The data shall be displayed on an ArcGis map embedded in the website.

4.3 Logical Database Requirements

The dashboard does not require a logical database

4.4 Design Constraints

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- **STANDARD LIMITATION**
  - We had no experience using any ArcGIS application before this project.
  - There are a limited number of datasets with enough information to visualize.

- **HARDWARE LIMITATION**
  - The dashboard must load on the user's computer without any special hardware, such as a GPU.

5. Other Nonfunctional Requirements

5.1 Performance Requirements

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- Be able to load maps quickly.

5.2 Safety Requirements

No safety requirements were identified for this application.

5.3 Security Requirements

No security requirements were identified for the application.

5.4 Software Quality Attributes

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

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- **Availability**: Dashboard shall be ready to use for users and load maps when needed
- **Reliability**: Data is loading accurately
- **Maintainability**: Data is maintained on the ArcGis Servers
- **Usability**: Users are able to easily navigate the dashboard

5.5 Business Rules

The list below contains the business rules for each application:

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- All data from our are maps are public
- The maps should be accessed by the public without an ArcGis License

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

PLANNED FOR FUTURE

Appendix C: To Be Determined List

PLANNED FOR FUTURE