SRS

1. Introduction

1.1 Purpose

The forest Fire Prediction System is an AI-based application that provides real-time predictions on the risk of forest fires to happen. The system will be designed to help forest managers, firefighters, people, etc to make informed decisions and take appropriate actions to mitigate the risk of forest fires. The purpose of this Software Requirements Specification (SRS) is to specify the requirements for the Forest Fire Prediction System.

1.2 Scope

The scope of a Forest Fire Prediction System is to provide real-time predictions on the risk of forest fires based on various data sources. The system will also include the development of a user-friendly interface to enable easy access and interaction with the system.

1.3 Definitions Acronyms and Abbreviations

Abbreviation	Term
SRS	Software Requirements Specifications
AI	Artificial Intelligence
ML	Machine Learning

1.4 References

[1] "Machine Learning for Forest Fire Prediction and Wildfire Management: Literature Review and Future Directions" by R. Kumar, M. Kumar, A. Pandey, et al. (2020)
[2] "A Review on the Use of Artificial Intelligence and Machine Learning for Forest Fire Prediction and Wildfire Management" by S. Khan, S. Khurshid, S. Nasreen, et al. (2020)
[3] "A Machine Learning Approach to Predict Forest Fire Occurrence in Portugal" by H. Barros, L. Oliveira, J. Fernandez-Lopez, et al. (2018)

[4] "A Machine Learning-Based Forest Fire Prediction System Using Multiple Data Sources" by S. Liu, L. Zhang, Y. Lin, et al. (2020)

1.5 Overview

The remaining sections of this document provide a general description, including characteristics of this project's users, the product's hardware, and the product's functional and data requirements. A general description of the project is discussed in section 2 of this document. Section 3 gives the functional requirements, data requirements and constraints, and assumptions made while designing the Forest Fire Prediction System. It also gives the user viewpoints of the product. Section 3 also gives the specific requirements of the product. Section 3 also discusses the external interface requirements and gives a detailed description of functional requirements.

2. Overall Description

2.1 Product Perspective

The product perspective for a Forest Fire Predictions System involves understanding the system's role in broader context for forest fire management. The Model will be trained on various parameters like weather conditions to provide the best results.

2.1.1 System Interfaces

The Forest Fire Prediction System will have the following system interfaces:

- Data Collection: This component is responsible for gathering data from various sources and storing it in a centralized database.
- Data Preprocessing: This component will clean and transform the data to prepare it for analysis
- Predictive Modeling: This component will use machine learning algorithms to learn the data and make predictions on the risk for forest fires.

2.1.2 Interfaces

The interface of the Forest Fire Prediction System will be a Graphical User Interface (GUI) that is easy to use and understand. The interface will allow users to select various parameters to make the most accurate predictions.

2.1.3 Hardware Interfaces

The hardware interfaces that will be used by the forest fire prediction system are:

- Weather Stations: The system may collect data from weather stations located in or near forest, including temperature, humidity, wind speed and precipitation.
- Satellite Imagery: The system will use satellite imagery to monitor vegetation density, temperature and other factors that may affect the risk of forest fires.
- IoT devices: The system may use devices such as sensores, cameras and weather monitoring systems to gather important information.

2.1.4 Software Interfaces

The Forest Fire Prediction system uses multiple AI and ML algorithms to make the most accurate predictions for forest fires to occur. The system will be designed to work with the commonly used AI/ML libraries and frameworks.

2.2 Product Functions

- Data Collection: The system should collect data from various sources, including weather stations, satellite imagery, topographical data, and historical data.
- Data analysis: The system should use artificial intelligence and machine learning algorithms to analyze the data and predict the likelihood of a forest fire.
- Risk assessment: The system should assess the risk of a forest fire based on the analysis of the data.
- Real-time monitoring: The system should monitor the data in real-time to provide up-to-date predictions on the risk of a forest fire.
- Reporting: The system should provide reporting capabilities, allowing users to generate reports on the system's predictions and analysis.

2.3 User Characteristics

Forest Fire Prediction System is designed to be used by a wide range of users who are involved in forest fire prevention and management. They will have easy access to a system that will allow them to take actions in the time of need.

2.4 Constraints

The Forest Fire Prediction System requires an internet connection to function and will only run on devices that meet the specified hardware and software requirements.

2.5 Assumptions and Dependencies

- Data accuracy: The accuracy of the Forest Fire Prediction System depends on the accuracy of the data used to predict forest fires. The system assumes that the data used is accurate, complete, and up-to-date.
- Data availability: The system assumes that the data required for prediction is available in the required format and accessible by the system.
- Weather patterns: Forest fire prediction is heavily influenced by weather patterns, and the system assumes that weather patterns are predictable and consistent. However, extreme weather events such as sudden wind gusts can be difficult to predict and can affect the accuracy of the system's predictions.

3. Specific Requirements

3.1 External Interfaces

The Forest Fire Prediction system will have the following external interfaces:

- User interface: The model will have a user-friendly interface that allows all the users to interact with the model and help them get accurate predictions.
- Data Input Interface: The model will allow the users to enter the appropriate conditions and parameters used to measure the occurrence of a forest fire.
- Data Output Interface: The model will provide predictions on the parameters and will provide the result in the form of a report of the forest fire to occur.
- Server Interface: The model will be hosted on a server that can be accessed from any device with an internet connection.

- Network Interface: The model will communicate with the server through the internet and receive data inputs and provide data outputs through this interface.

3.2 Functions

- Data Collection: The system must be able to collect data from various sources, such as weather stations, satellite imagery, topographical information, and historical data..
- Data Preprocessing: The system must preprocess the collected data, which includes cleaning, transformation, and feature engineering. The preprocessing phase must remove any duplicate or missing values, normalize the data, and convert categorical variables into numerical variables.
- Predictive Model Development: The system must develop a machine learning model to predict the risk of forest fires based on the preprocessed data. The predictive model must use appropriate algorithms to learn from the data and make accurate predictions.
- User Feedback and Support: The system must provide users with access to support and the ability to provide feedback to improve the accuracy and effectiveness of the predictions.

3.3 Performance Requirements

The Forest Fire Prediction System will have the following performance requirements:

- Accuracy: The model will have an accuracy rate of at least 90%
- Response Time: The model will have a response time of less than 2 seconds

3.4 Logical Database Requirements

The Forest Fire Prediction System will have the following logical database requirements:

- Historical data: The system would require historical data on forest fires, including the location, date, time, and intensity of previous fires. This data can be used to develop predictive models and identify high-risk areas.
- Environmental data: The system would need to access and store environmental data, such as weather conditions, topography, vegetation, and soil moisture content. This data can be used to assess the risk of forest fires and provide early warnings.

- Sensor data: The system would require data from various sensors placed in the forest, including cameras, temperature sensors, and smoke detectors. This data can be used to detect and monitor forest fires in real-time.
- User data: The system would need to store user data, such as login credentials and access permissions, to ensure secure access and usage.
- Predictive model data: The system would need to store data related to predictive models, such as training and validation datasets, model parameters, and performance metrics. This data can be used to improve the accuracy of the system's predictions.

3.5 Software System Attributes

3.5.1 Reliability

The model will have a high degree of reliability, ensuring that it produces accurate results consistently and with minimal downtime.

3.5.2 Availability

The Forest Fire Prediction System will be available 24/7, providing all professionals with quick and easy access to predictions whenever needed.

3.5.3 Security

The Forest Fire Prediction System will have robust security measures in place to protect data and prevent unauthorized access.

3.5.4 Maintainability

The model will be easily maintainable, allowing for regular updates and improvements to be made to the system.

3.5.5 Portability

The model will be portable, allowing it to run on various devices and platforms with an internet connection.

3.6 Organizing the specific requirements

3.6.1 System Mode

The model will operate in a standalone mode, allowing professionals to use it independently without the need for additional software or hardware.

3.6.2 User Class

The target user class for the Forest Fire Prediction System are Firefighters, Front-line workers, Government agencies, Research Institutes, General Public

3.6.3 Objects

The objects in the Forest Fire Prediction System include weather reports, classifications, and the different AI/ML algorithms.

3.6.4 Features

The key features of the Forest Fire Prediction System include data preprocessing, prediction, model training, data storage, and data retrieval.

3.6.5 Stimulus

The stimulus for the Forest Fire Prediction System is the input of factors that contribute to forest fires, such as weather conditions, topography, vegetation, and human activity.

3.6.6 Response

The response of the Forest Fire Prediction System is the prediction of the forest fires based on various parameters.

3.6.7 Functional Hierarchy

The Forest Fire Prediction System will have the following functional hierarchy: image preprocessing, prediction, model training, data storage, and data retrieval. These functions will operate in a hierarchical manner, with the prediction function relying on the output from the image preprocessing and model training functions, and the data storage and retrieval functions relying on the output from the prediction function.