Mini Project Report

on

Forest Fire Prediction

Submitted by
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Course Name : Machine Learning

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(ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING)

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1. Problem Statement

Forest fires cause severe environmental damage, loss of wildlife, and economic loss. Manual monitoring and delayed response increase the severity of these incidents. Therefore, there is a need for a **data-driven system** that can **predict the likelihood of forest fires** in advance based on environmental parameters such as temperature, humidity, wind speed, and rainfall.

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2. Project Objectives

- To develop a machine learning model capable of predicting forest fire risk using environmental data.
- To analyze which parameters most influence the occurrence of forest fires.
- To build a simple and interactive web interface for users to input data and view predictions.
- To assist forest management teams in taking preventive actions by providing early fire risk warnings.

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3. Methodology

1. **Data Collection** – Gather dataset containing temperature, humidity, wind speed, and rainfall data.

2. **Data Preprocessing** – Handle missing values, normalize data, and label encode categorical variables.

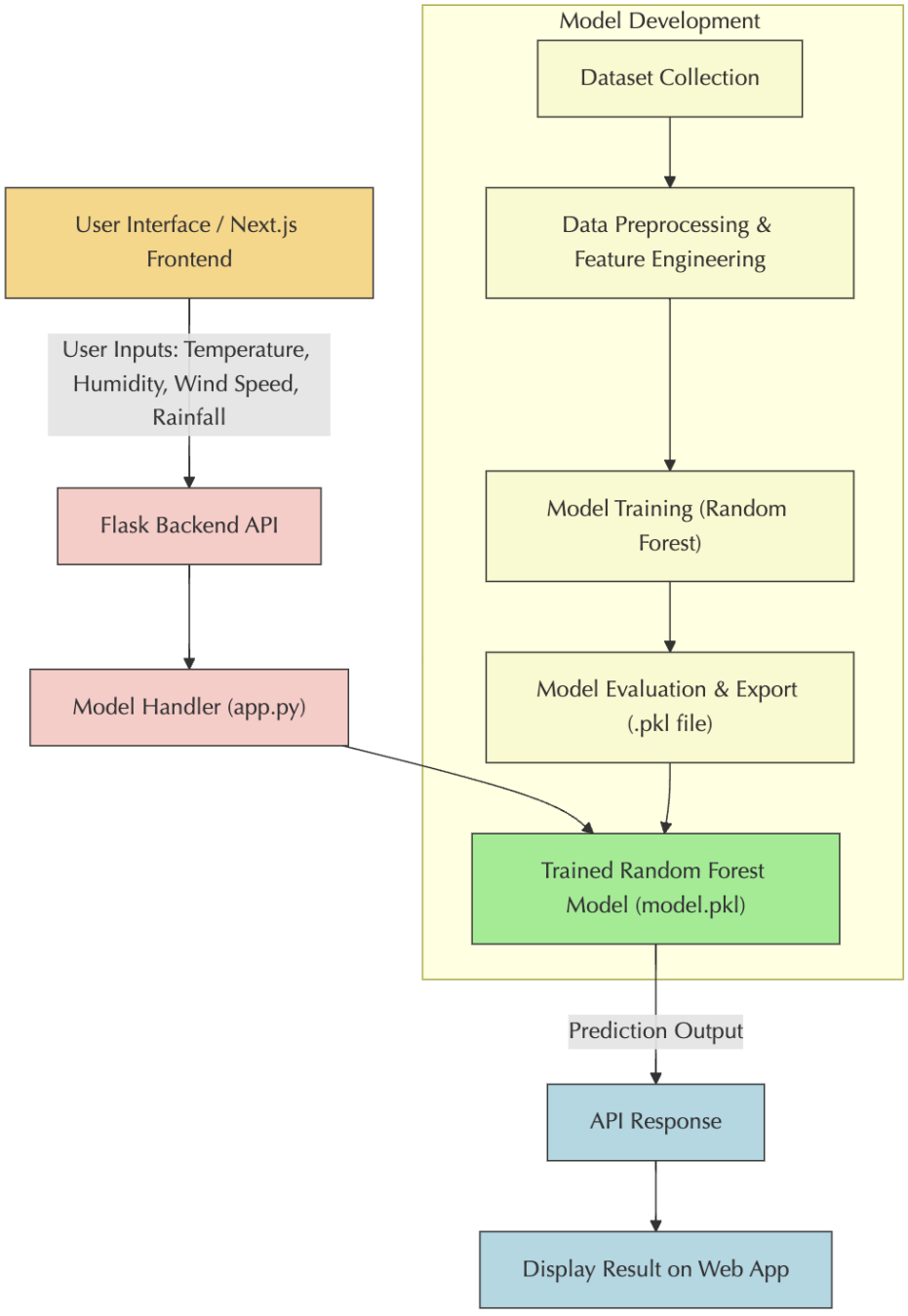
3. **Model Training** – Train multiple ML algorithms (Decision Tree, Logistic Regression, Random Forest) and compare results.

4. **Model Selection** – Choose **Random Forest** as it provides the highest accuracy and handles non-linear relationships well.

5. **Model Evaluation** – Evaluate the model using accuracy, precision, recall, and F1-score.

6. **Deployment** – Integrate the trained model with a **Flask backend** to provide predictions via a web interface.

Architecture



4. Technology Stack

Components	Tool/Library Used
Programming Language	Python
Libraries	Pandas, NumPy, Scikit-learn, Flask, Flask-CORS
Machine Learning Model	Random Forest Classifier
Frontend	Next.js
Deployment	Vercel
Dataset	Forest Fire Dataset

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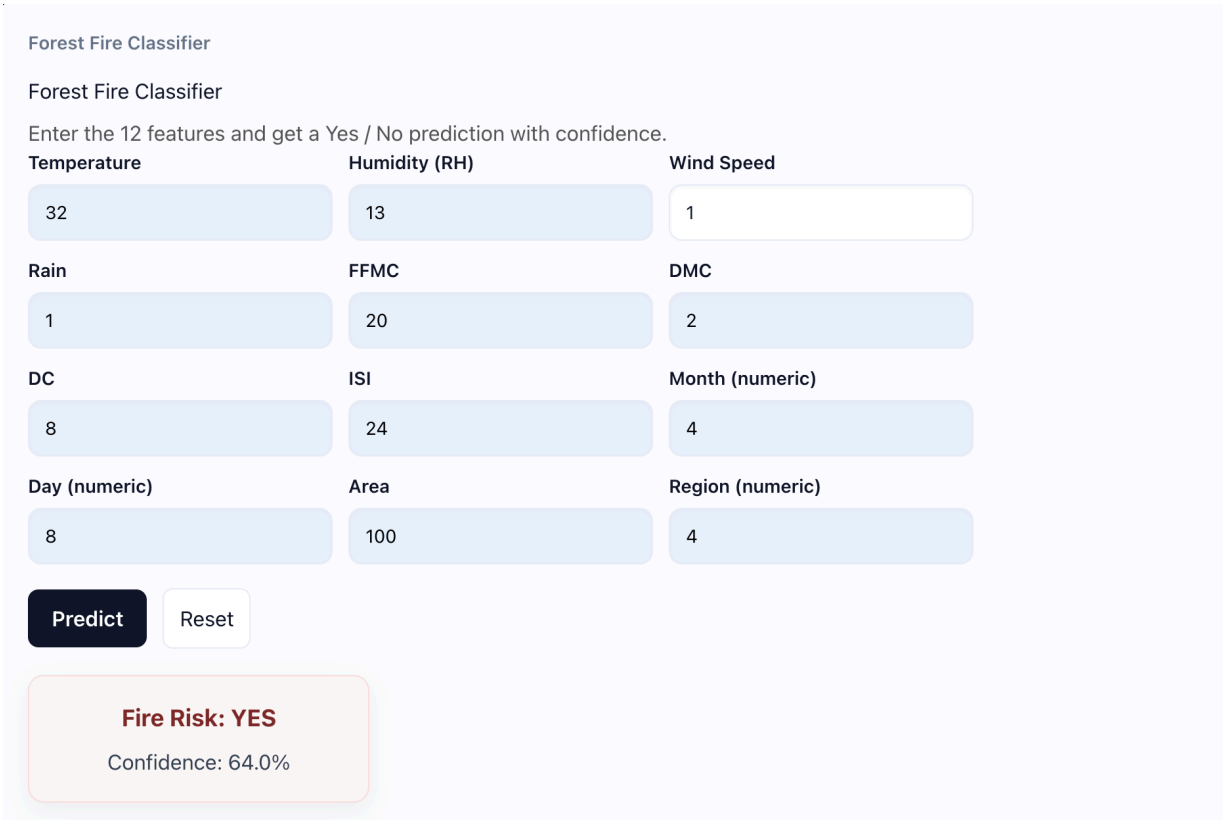
5. Result

- The Random Forest model achieved **high accuracy (≈88%)** in predicting fire risk.
- It identified **temperature and humidity** as the most influential parameters.
- The web app successfully displayed predictions in real-time when users entered data.

Output



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6. Conclusion

The project successfully demonstrates how machine learning can be applied to environmental safety by predicting forest fire risks accurately. The Random Forest model provided robust results and interpretability, making it suitable for real-world use. This system can be extended with IoT sensors and live weather APIs for real-time monitoring and alert generation.