# Flask-Based Forest Fire Occurrence Prediction System Using Machine Learning

## Abstract

A web-based application that predicts the likelihood of forest fire occurrence using a trained machine learning model based on oxygen level, temperature, and humidity inputs.

## Problem Statement

Forest fires pose significant threats to ecological balance, wildlife, and human settlements. Manual monitoring often delays timely responses, leading to widespread damage. Thus, there is a need for an automated system that can predict fire occurrence based on environmental data to enable proactive measures for prevention and safety.

## Purpose

The purpose of this project is to:

* - Develop a predictive model that determines the likelihood of a forest fire occurrence using environmental parameters.
* - Deploy this model through a Flask web application to allow easy access and real-time predictions by end-users or monitoring agencies.
* - Provide interpretable outputs that support quick decision-making for forest management authorities.

## Technologies Used

* Python for data processing and model training
* scikit-learn for machine learning model development
* Flask for web-based deployment
* HTML & Jinja Templates for frontend integration
* joblib for model serialization

## Dataset Assumptions

The model assumes input features of:

1. Oxygen Level (in % or ppm based on sensor data)
2. Temperature (in °C)
3. Humidity (in %)

## System Flow Diagram (Text Representation)

User Inputs (Oxygen, Temperature, Humidity)  
 ↓  
Flask Web Form Submission  
 ↓  
Input Preprocessing (Conversion to array)  
 ↓  
Loaded Machine Learning Model (model.pkl)  
 ↓  
Prediction Output (1 = Fire Likely, 0 = No Fire)  
 ↓  
Result Displayed on Web Interface

\*(You can convert this into a block diagram in your Word document or PPT slides.)\*

## Key Outcomes

* Successfully trained and deployed a model to predict forest fire risk.
* Developed a user-friendly web interface to input environmental data and view predictions.
* Enabled practical integration of AI-based systems for environmental safety applications.

## Future Scope

* Incorporate real-time sensor data integration for automated alerts.
* Expand the model with additional features (e.g. wind speed, forest type, rainfall).
* Deploy on cloud platforms for scalable use by multiple forest departments.

## Usage Summary

This project showcases the end-to-end pipeline of machine learning deployment, transforming a trained model into a real-time decision-support web tool for forest fire prediction, highlighting practical AI applications for environmental risk management.