RN SHETTY TRUST®

RNS INSTITUTE OF TECHNOLOGY

Autonomous Institution Affiliated to VTU, Recognized by GOK, Approved by AICTE (NAAC 'A+ Grade'
Accredited, NBA Accredited (UG - CSE, ECE, ISE, EIE and EEE)
Channasandra, Dr. Vishnuvardhan Road, Bengaluru - 560 098
Ph:(080)28611880,28611881 URL: www.rnsit.ac.in

Estd : 2001

Department of CSE (Data Science)

Course Code: MP21ADMP67

Semester and Section: 6th

Date:09-06-2024

Mini Project Synopsis

Title of the Project	ROCKET LANDING PREDICTION
Guide Name	NAVYASHREE
Students Name with USN	PRATEEK VK (1RN21CD035)
	NAMANU (1RN21CD029)

1. Introduction

Brief Overview of the Project Topic

This project aims to predict the landing status of SpaceX Falcon 9 rockets using machine learning. By analyzing launch data such as launch site, flight number, and gridfins usage, we seek to build a model that classifies whether a rocket will successfully land.

Importance and Relevance of the Project

Predicting the landing outcomes of Falcon 9 rockets is crucial for improving reusable rocket technology. Successful landings reduce space mission costs and enhance the sustainability of space exploration. This project supports SpaceX's mission and the broader goal of making space travel more economical and reliable

Objectives of the Project

- **Develop a Predictive Model:** Create an accurate model to predict rocket landing status.
- **Data Collection:** Gather and preprocess data from the SpaceX API and Wikipedia.
- **Exploratory Data Analysis (EDA):** Identify relationships among features.
- **Model Evaluation:** Compare classification algorithms and select the best model.
- **Deployment:** Implement the model in a Flask web application.
- **Continuous Improvement:** Plan for regular updates and retraining of the model.

2. Problem Statement

Defining the Problem

This project aims to predict the landing status of SpaceX Falcon 9 rockets based on launch parameters

Context and Background

SpaceX's Falcon 9 rockets are designed for reusability to cut space mission costs. Predicting successful landings is complex due to various launch factors.

Significance of Addressing the Problem

Accurate predictions enhance mission efficiency and safety, reduce costs, and support sustainable space exploration by optimizing reusable rocket technology.

3. Literature Review / Related Work

Existing Work

- **SpaceX and Machine Learning**: Predicting mission outcomes using machine learning.
- **Rocket Landing Predictions**: Using Logistic Regression, Decision Trees, and Random Forests to predict landings.
- **EDA and Feature Engineering**: Identifying key factors like weather and launch site.

Gaps

- **Limited Public Data**: Reliance on proprietary data.
- **Feature Correlations**: Inadequate exploration of feature relationships.
- **Model Comparison**: Lack of comprehensive model comparisons.

Project Contribution

- **Public Data**: Uses SpaceX API and Wikipedia data.
- **In-Depth EDA**: Explores feature relationships.
- **Model Comparison**: Compares and fine-tunes multiple algorithms.
- **Deployment**: Creates a Flask web application for predictions.

4. Methodology

Approach:

The project follows a systematic approach combining data collection, preprocessing, model development, and evaluation using machine learning algorithms.

Details:

- **Data Collection:** Utilizes SpaceX API and Wikipedia web scraping.
- **Tools:** Python, scikit-learn, Flask.
- **Techniques:** Data preprocessing, EDA, model training, hyperparameter tuning, and evaluation.

Steps:

- **Data Collection:** Fetch data, scrape Wikipedia.
- **Preprocessing:** Handle missing values, encode variables, scale features.
- **EDA:** Explore distributions, visualize relationships.
- **Model Development:** Train initial models.
- **Hyperparameter Tuning:** Fine-tune models using Grid Search CV.
- **Evaluation:** Assess models using accuracy, precision, recall.
- **Deployment:** Develop Flask web app for model deployment.
- **Continuous Improvement:** Plan for updates and monitoring.

5. Project Design

High-Level Design

- **Data Collection:** Fetch data from SpaceX API and scrape Wikipedia.
- **Data Preprocessing:** Handle missing values, encode variables, scale features.
- **Exploratory Data Analysis (EDA):** Explore data distributions and visualize feature relationships.
- **Model Development:** Train classification algorithms using preprocessed data.
- **Hyperparameter Tuning:** Fine-tune model parameters using Grid Search CV.
- **Model Evaluation:** Assess model performance using metrics.
- **Deployment:** Develop Flask web app for model deployment.
- **Continuous Improvement:** Plan for updates and monitoring

6. Implementation Plan

Phases of Project Development

- **Data Collection:** Fetch data (1 week).
- **Data Preprocessing:** Handle data (1 week).
- **Exploratory Data Analysis:** Explore data (1 week).
- **Model Development:** Train models (2 weeks).
- **Hyperparameter Tuning:** Fine-tune models (1 week).
- **Model Evaluation:** Assess performance (1 week).
- **Deployment:** Develop web app (1 week).

Timelines and Milestones

- **Weeks 1-2:** Data collection and preprocessing.
- **Weeks 3-4:** EDA and initial model development.
- **Weeks 5-6**: Model tuning and evaluation.
- **Week 7:** Deployment and final review.

Resources and Tools

- **Tools:** Python, scikit-learn, Flask.
- **Resources:** SpaceX API, Wikipedia.

7. Expected Outcomes

Anticipated Results:

A predictive model for determining the landing status of SpaceX Falcon 9 rockets.
Insightful analysis of key factors influencing rocket landings.

Addressing the Problem Statement:

The model will provide accurate predictions, aiding in optimizing reusable rocket technology.
Insights from the analysis will help understand and mitigate risks associated with rocket landings.

Potential Impact and Benefits:

Improved mission success rates and cost-efficiency for SpaceX and the broader space industry.
Enhanced safety and reliability in space exploration endeavors.
Advancement towards sustainable and accessible space travel.

8. Conclusion

Key Points Summary:

The project aims to predict the landing status of SpaceX Falcon 9 rockets using machine learning. Utilizes data from SpaceX API and Wikipedia, with a systematic approach to model development and evaluation.

Importance of the Project:

Enhances reusable rocket technology, contributing to cost-efficiency and sustainability in space exploration.
Supports mission success and safety in space missions.

Future Work:

Further analysis on additional factors influencing rocket landings.
Integration of real-time data for continuous model improvement.
Exploration of applications beyond SpaceX missions in the aerospace industry.

9. References

- SpaceX official : https://www.spacex.com/vehicles/falcon-9
- wikipedia : List of Falcon 9 and Falcon Heavy launches

Signature of Students Signature of Guide