FALCON 9 FIRST STAGE LANDING PREDICTION

EXECUTIVE SUMMARY

This is the capstone project for the IBM Data
Science Professional Certificate. The goal of
this project is to conduct predictive
analysis on the first-stage landing
outcomes of SpaceX's Falcon 9 launches. The
project will involve data
collection, exploratory data analysis
(EDA), interactive visualizations, and the use
of machine learning models for predictive
analysis.

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INTRODUCTION

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The objective is to predict whether the Falcon 9 first stage will land successfully.

SpaceX markets the cost of a Falcon 9 rocket launch at 62 million dollars, while other providers charge upwards of 165 million dollars per launch. A significant portion of these savings comes from SpaceX's ability to reuse the first stage.

By accurately predicting whether the first stage will land, we can estimate the overall **cost of a launch**.

METHODOLOGIES

Data collection

Data wrangling

EDA

Interactive visual analytics

•Predictive analysis

DATA COLLECTION & DATA WRANGLING

Methods Utilized:

RESTful API

Web scrapping

EDA & INTERACTIVE VISUAL ANALYTICS

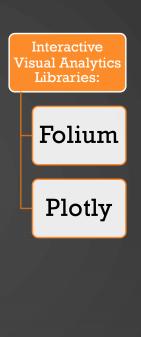
Exploratory
Data Analysis
Libraries:

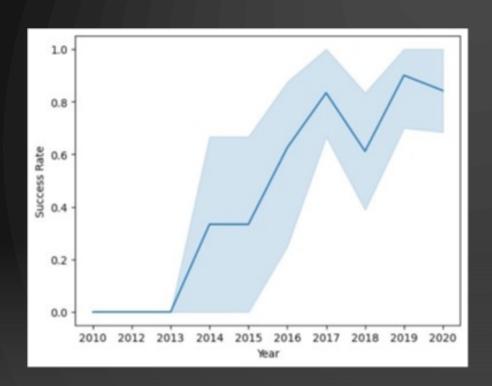
SQLite

Pandas

Matplotlib

Seaborn

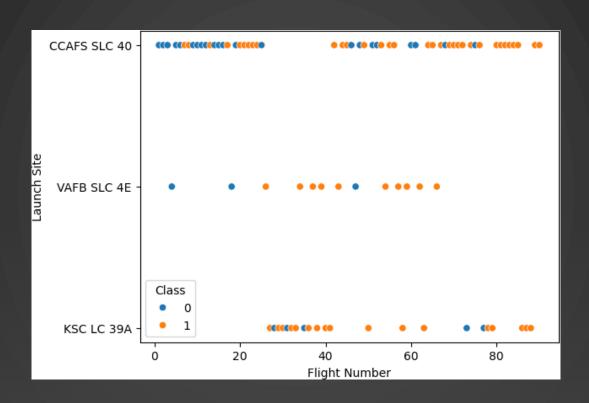




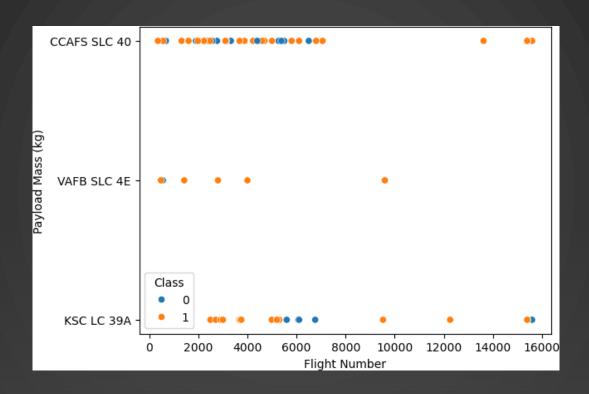
SUCCESS RATE OF FIRST STAGE LANDING OVER YEARS

EDA VISUALISATION RESULTS

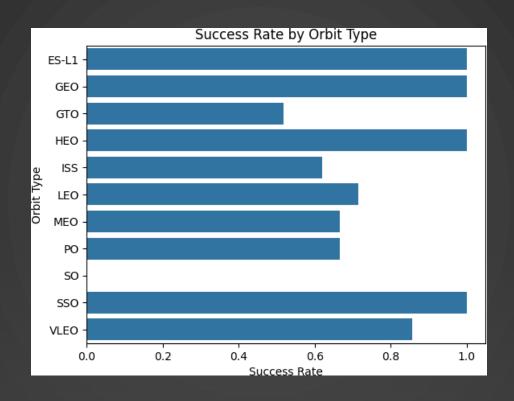
FLIGHT NUMBER VS LAUNCH SITE



FLIGHT NUMBER VS PAYLOAD MASS(KG)



SUCCESS RATE VS ORBIT TYPE



SQL ANALYTICS RESULTS

Unique Launch Sites

- CCAFS LC-40
- VAFB SLC-4E
- KSC LC-39A
- CCAFS SLC-40

Total Payload Mass (KG)

总计: 45,596 kg

First Successful Landing

首次成功的地面着陆:

• 日期: 2015-12-22

SQL ANALYTICS RESULTS

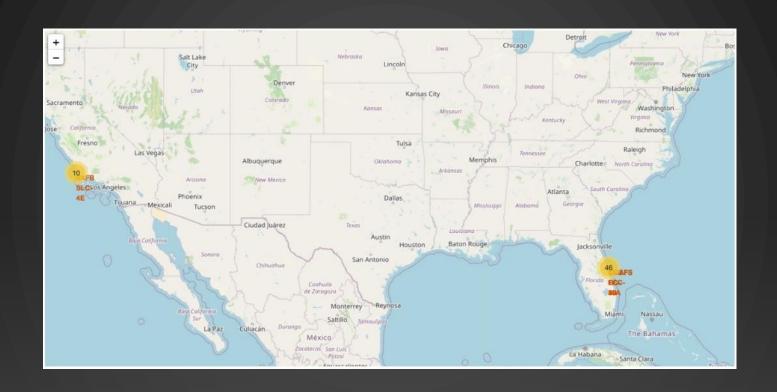
Successful Drone Ship Landings

F9 FT B1022
F9 FT B1026
F9 FT B1021.2
F9 FT B1031.2

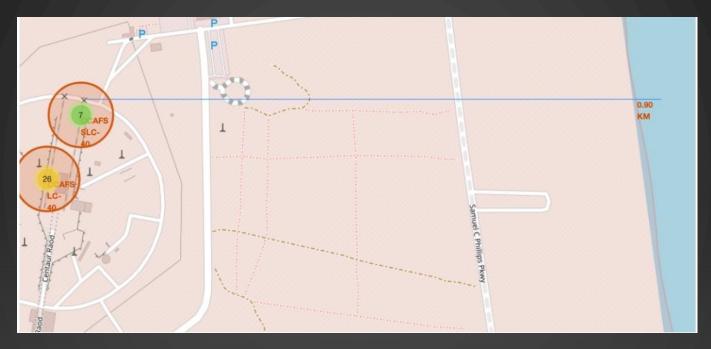
total successful missions

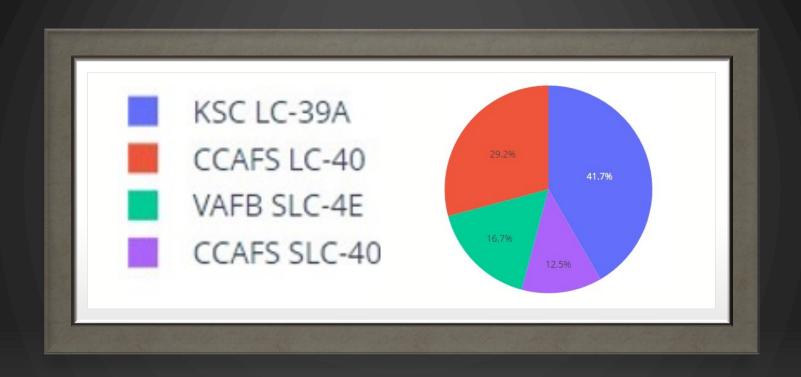
Mission_Outcome	tota	_count
Success		98

LAUNCH SITE LOCATIONS IN USA

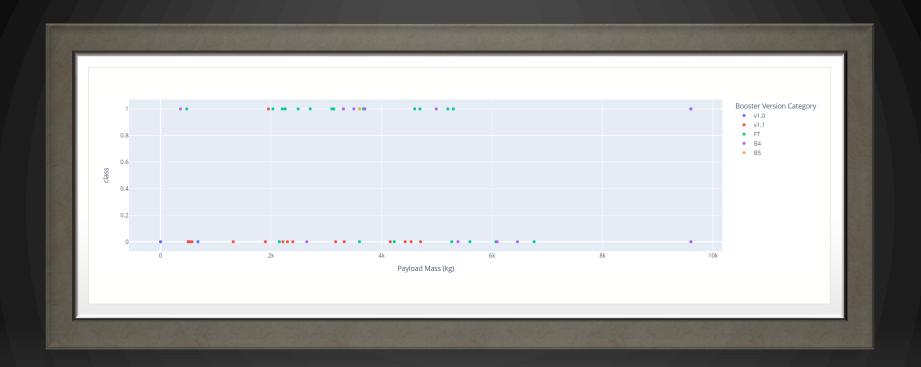


NEAREST COASTAL LINE FROM A SELECTED LAUNCH SITE





TOTAL LAUNCHES FOR ALL SITES

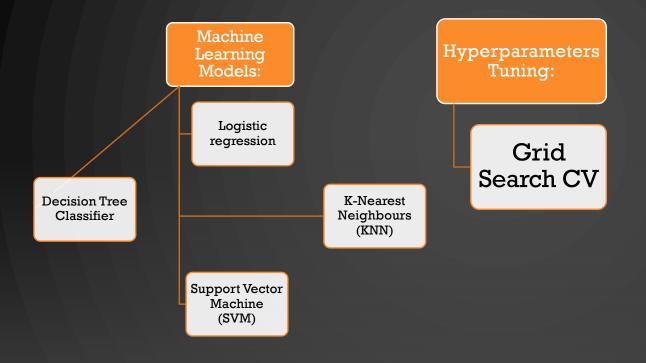


BOOSTER VERSIONS, PAYLOAD MASS & THEIR SUCCESS RATE

Machine Learning Models:

- Logistic regression
- Support Vector Machine (SVM)
- Decision Tree Classifier
- K-Nearest Neighbours (KNN)

PREDICTIVE ANALYSIS



Evaluation Method:

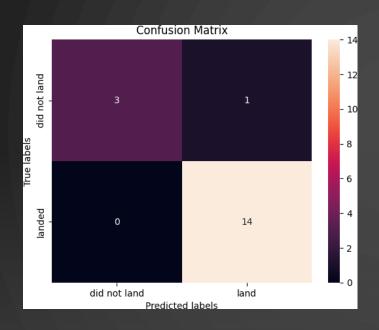
Confusion Matrix

PREDICTIVE ANALYSIS (CLASSIFICATION) RESULTS

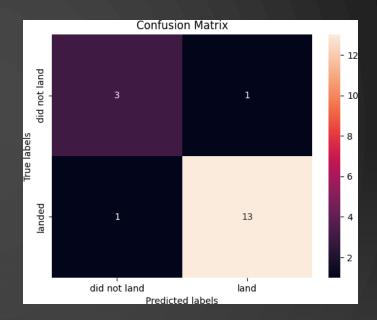
Model No.	Machine Leaming Models	Accuracy on Test data
1		
2		
3		
4	K-Nearest Neighbours (KNN)	

CONFUSION MATRICES

Logistic Regression



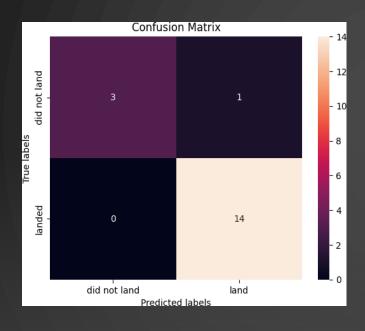
Support Vector Machine



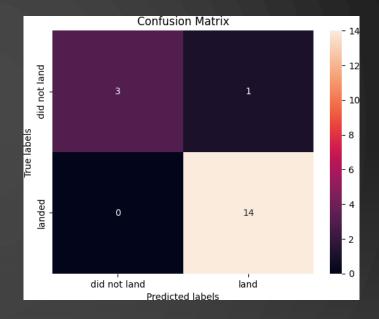
22

CONFUSION MATRICES

Decision Tree Classifier



K-Nearest Neighbours



CONCLUSION

Main Factors

Location

Payload Mass Orbit Type