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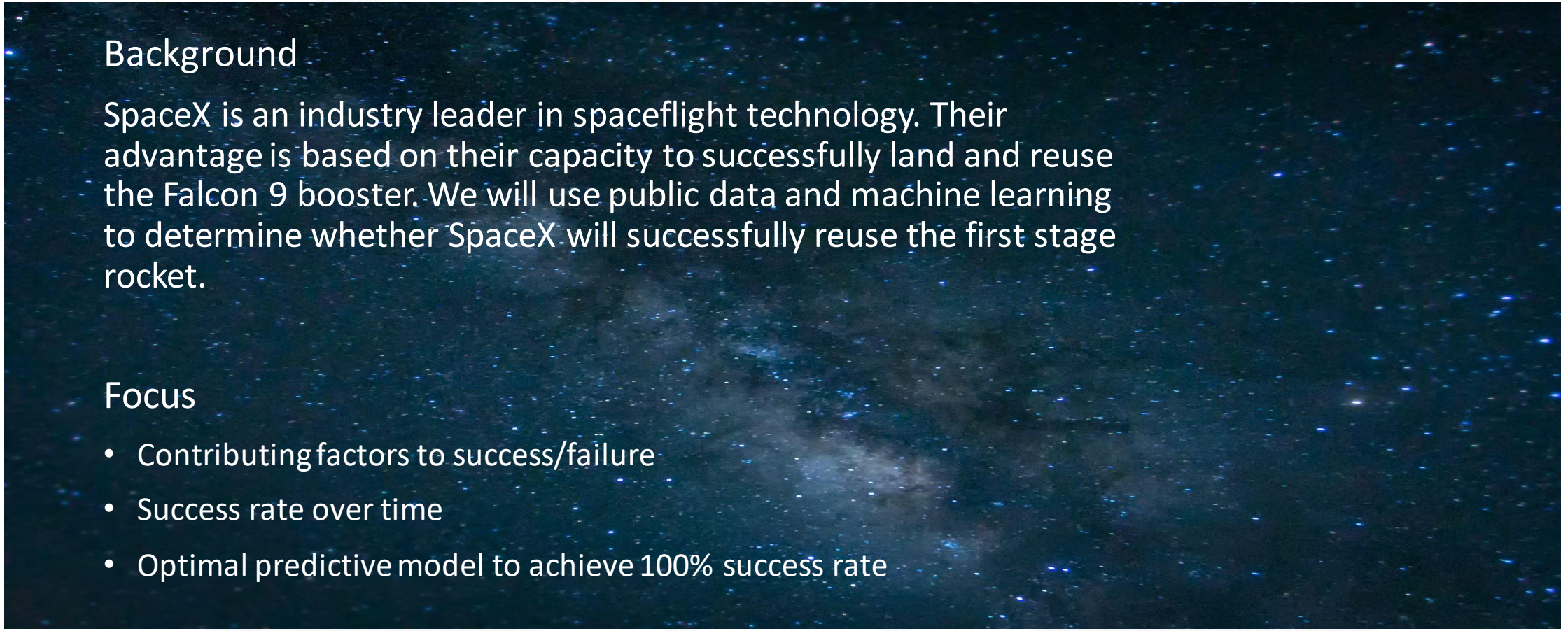
INTRODUCTION



Background

SpaceX is an industry leader in spaceflight technology. Their advantage is based on their capacity to successfully land and reuse the Falcon 9 booster. We will use public data and machine learning to determine whether SpaceX will successfully reuse the first stage rocket.

Focus

- Contributing factors to success/failure
- Success rate over time
- Optimal predictive model to achieve 100% success rate

METHODOLOGY

- Collection
- Wrangling
- Exploration
- Visualization
- Build/Test Models
  - Logistic Regression
  - Decision Tree
  - Support Vector
  - K Nearest Neighbour

DATA COLLECTION & WRANGLING

Collect

- API call to request data
- Apply .json() and .json_normalize() to decode and convert to dataframe
- Pre-process data and filter out non Falcon 9 boosters
- Convert and save data to csv

Wrangle

- Load data
- Create binary "Class" landing outcome column
- Determine success outcome
- Convert and save data to csv

EDA VISUALS & METHODOLOGY

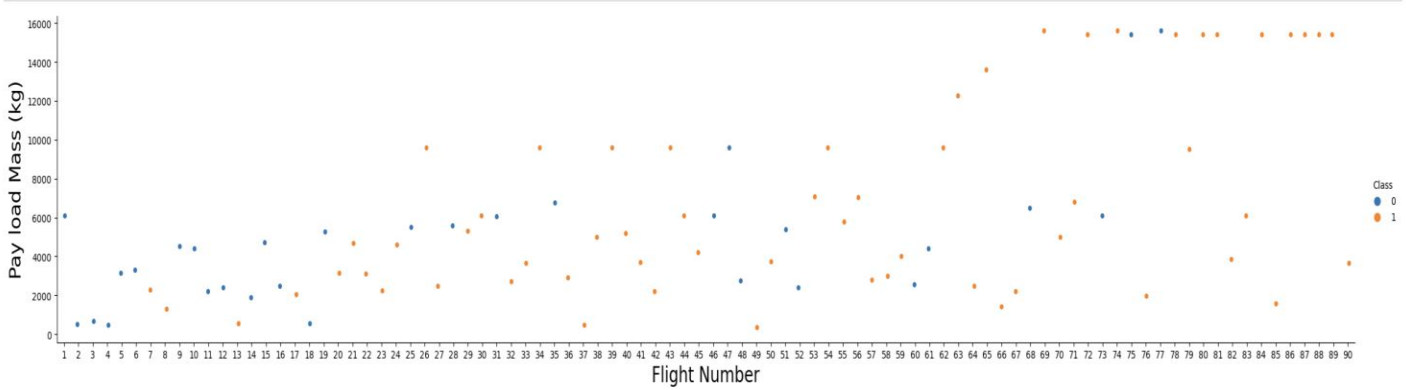
Visuals

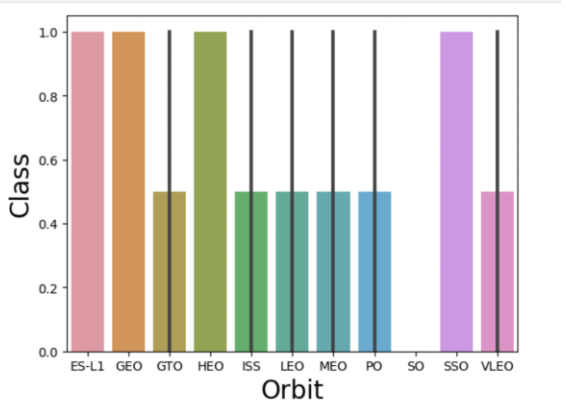
- Payload mass vs launch site
- Payload mass vs orbit type
- Payload mass vs flight number
- Launch site vs flight number

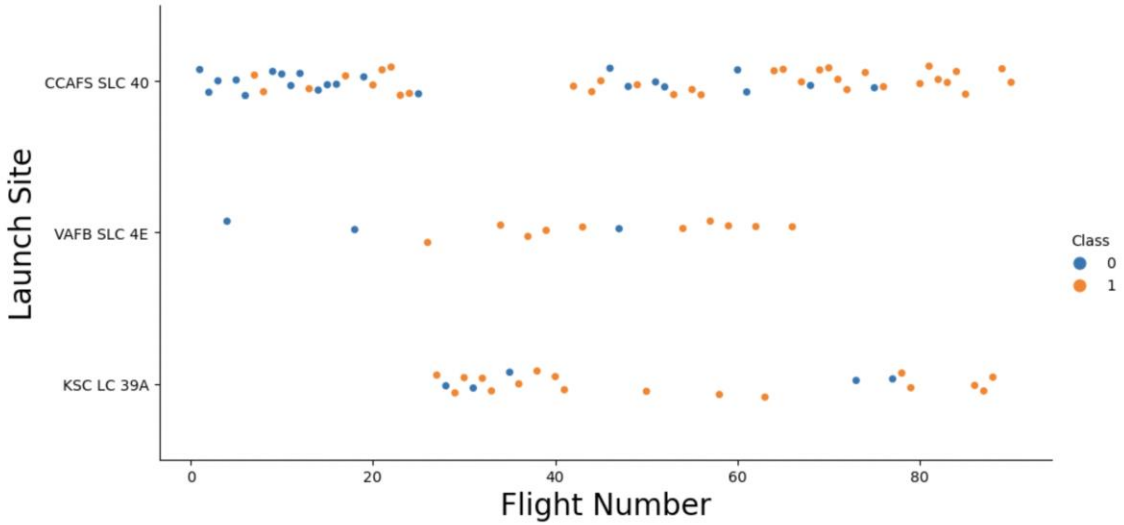
Analysis

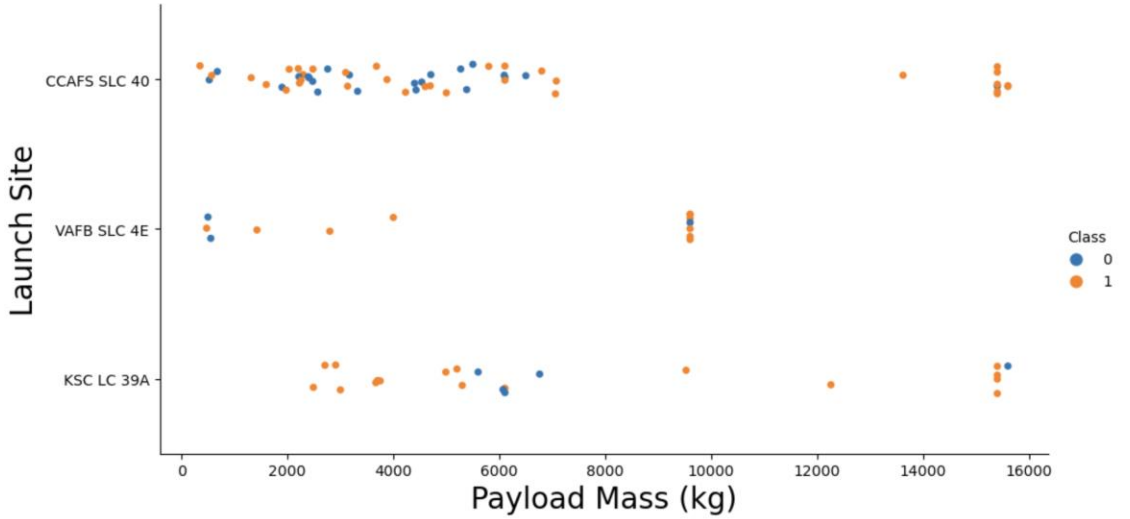
- Improved success rate over time
- Payload - Launch site correlation
- Payload - Orbit type correlation

EDA VISUAL RESULTS





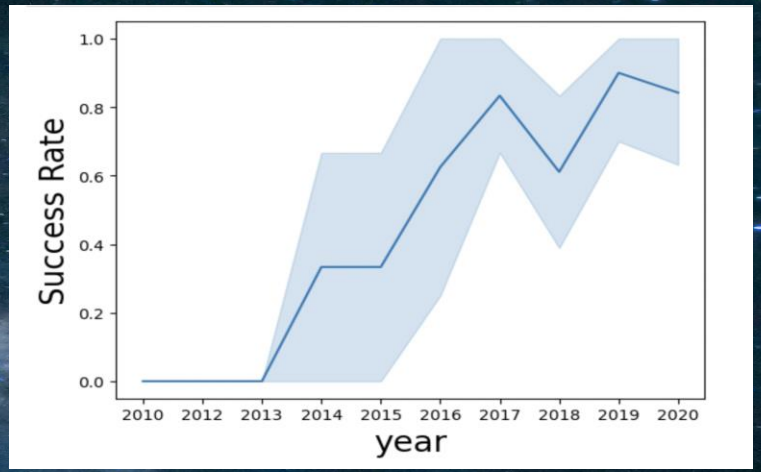




EDA VISUAL RESULTS

- KSC LC 39A had high success rate under 5,000kg
- CCAFS SLC 40 high success rate over 6,500 kg
- Orbit, launch site and payload were shown to be determining factors in landing success

- ES-L1, GEO, HEO, SSO orbits all had high success rate
- Improved launch success over time



EDA & SQL RESULTS

Findings

- First successful ground pad landing Dec 22, 2015
- Avg payload mass 2928.4 kg
- 100 successful mission outcomes, 1 failed mission outcome

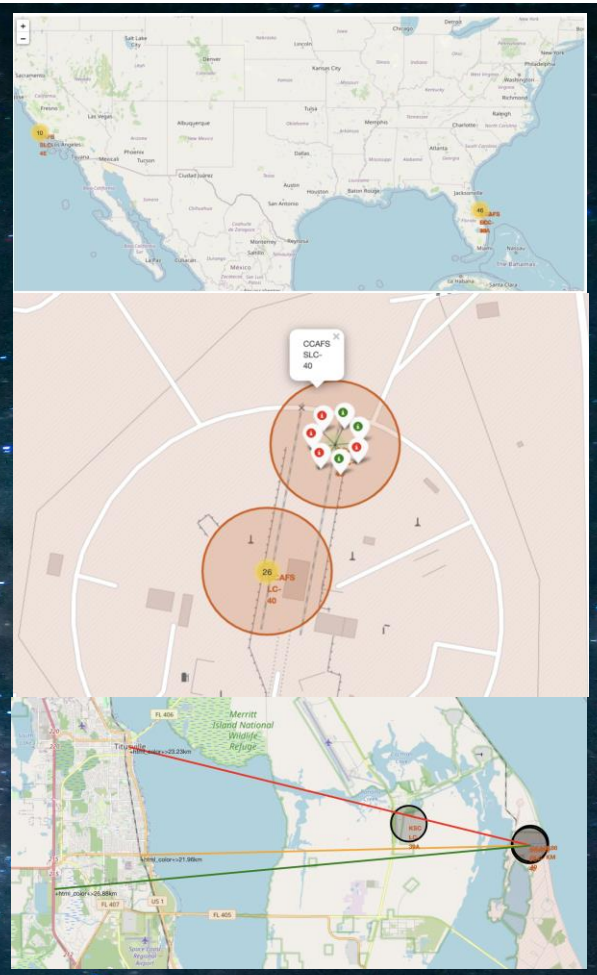
Landing_Outcome	Total Count
No attempt	10
Success (ground pad)	5
Success (drone ship)	5
Failure (drone ship)	5
Controlled (ocean)	3
Uncontrolled (ocean)	2
Precluded (drone ship)	1
Failure (parachute)	1

INTERACTIVE FOLIUM MAP

All launches in Florida or California

Launch site success marked at each location

Launch sites are a safe distance from at-risk locations



PREDICTIVE ANALYSIS RESULTS

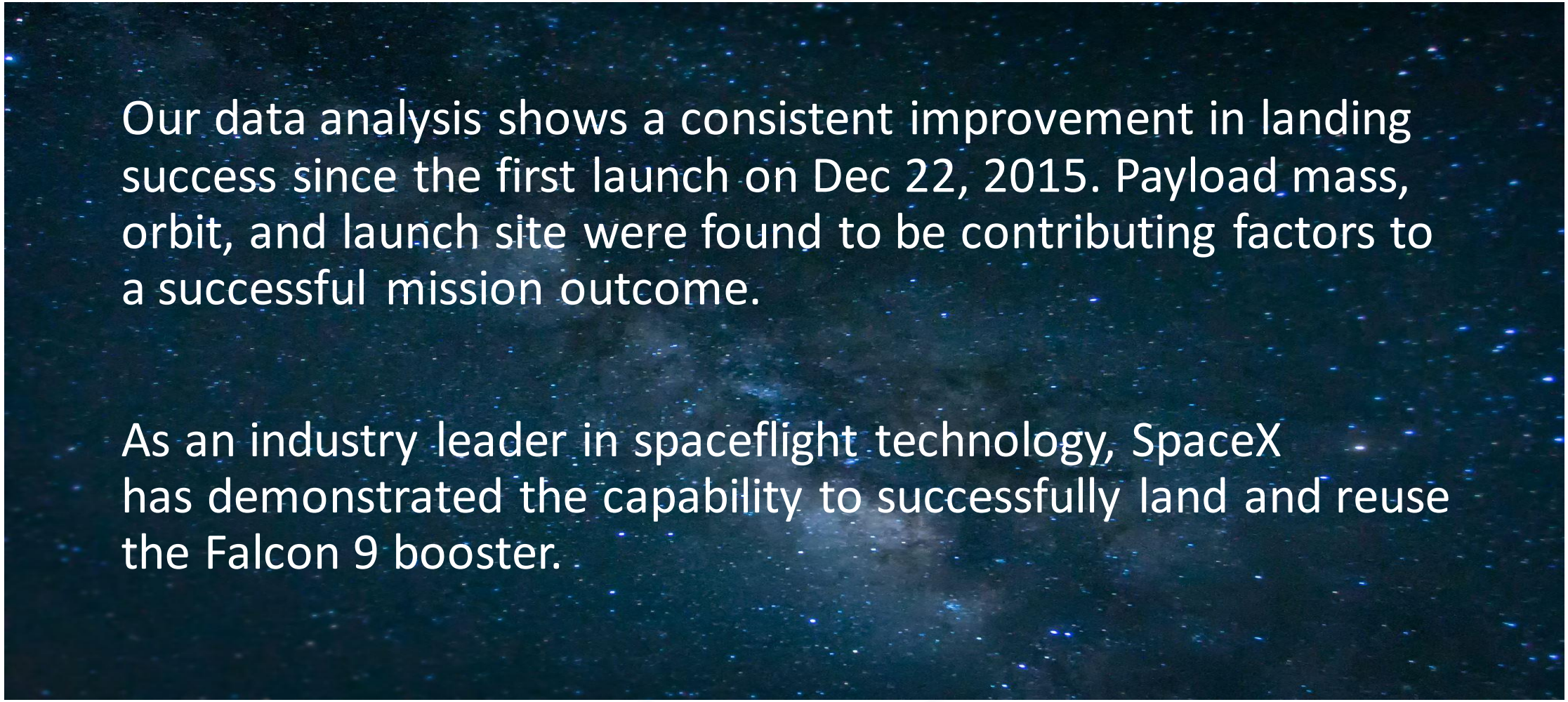
- Create a column for the class
- Standardize the data
- Split the data into training data and test data
- Create GridSearchCV objects of each model
- Find the method that performs best using the test data

```
print("tuned hpyerparameters :(best parameters) ",tree_cv.best_params_)
print("accuracy :",tree_cv.best_score_)
```

```
tuned hpyerparameters :(best parameters)  {'criterion': 'entropy', 'max_
er': 'random'}
accuracy : 0.8910714285714286
```

Decision Tree model had highest accuracy

CONCLUSION



Our data analysis shows a consistent improvement in landing success since the first launch on Dec 22, 2015. Payload mass, orbit, and launch site were found to be contributing factors to a successful mission outcome.

As an industry leader in spaceflight technology, SpaceX has demonstrated the capability to successfully land and reuse the Falcon 9 booster.