SpaceX Launch Analysis & Prediction

Complete Data Science Pipeline • EDA • SQL • Folium • Dash • ML Classification

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12-05-2025

Executive Summary

- Full analytical pipeline from raw data to predictive modeling.
- Identified mission factors affecting landing success.
- Built ML models; Random Forest performed best.
- Fulfilled all project criteria including Folium & Dash results.

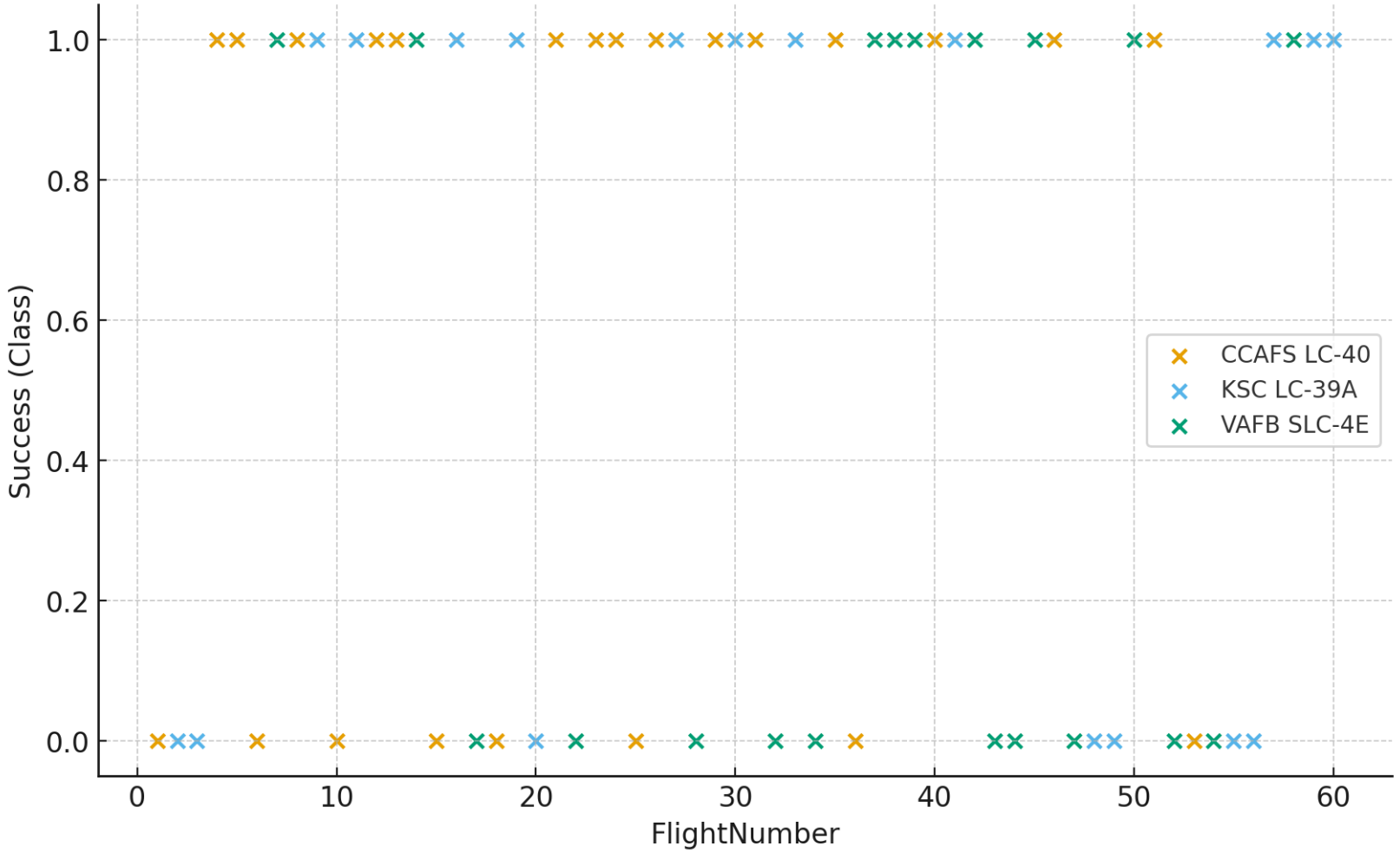
Introduction

- Goal: determine drivers of Falcon 9 landing success.
- Data includes: payload, orbit, launch site, booster features.
- Tools: Pandas, SQL, Matplotlib, Seaborn, Folium, Dash, ML.

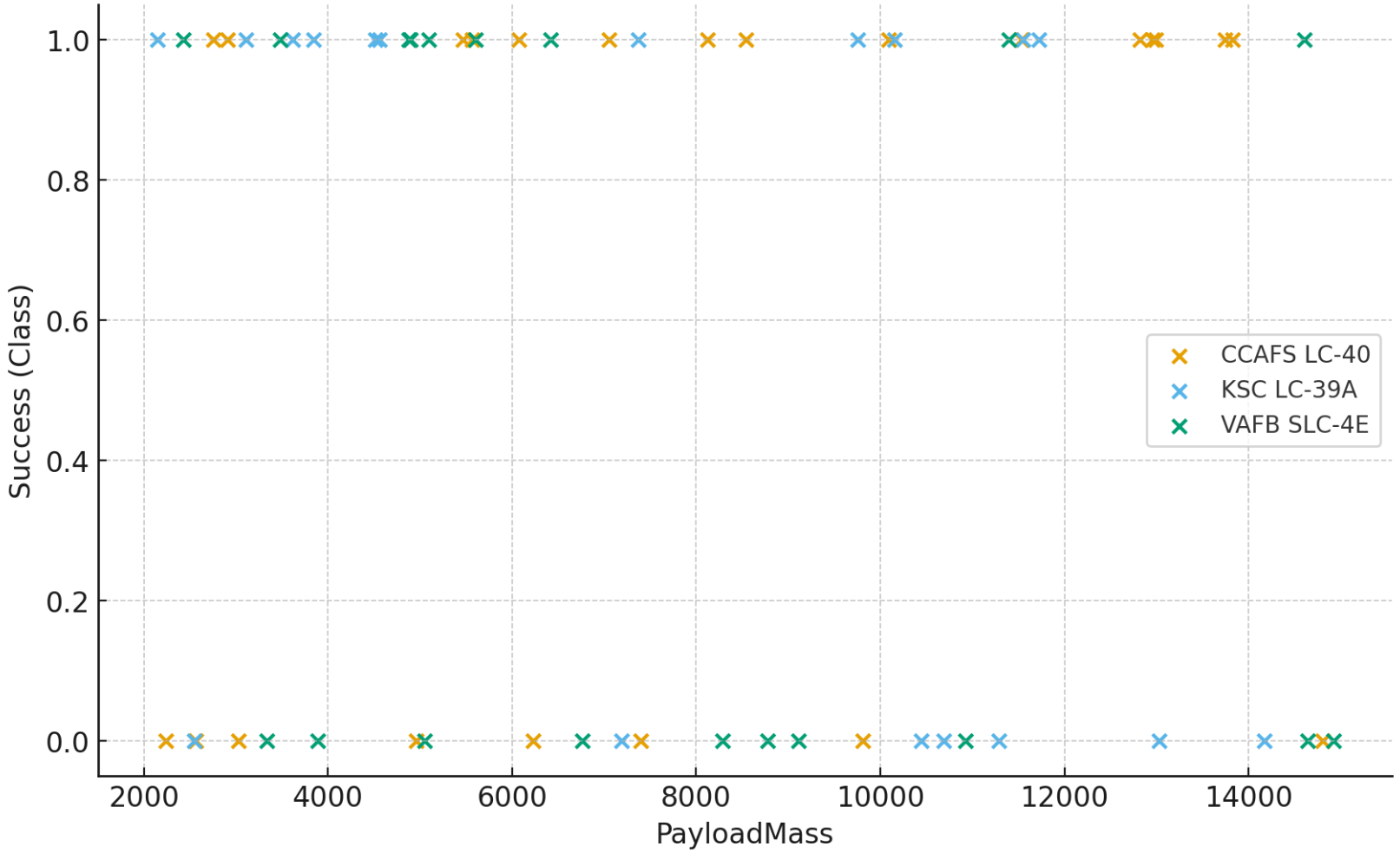
Methodology Overview

1. Data Collection (API scraping & static CSV ingestion)
2. Data Cleaning & Wrangling
3. EDA using Matplotlib, Seaborn & SQL queries
4. Geospatial analysis with Folium
5. Dash interactive dashboards
6. Classification modeling (LR, SVM, RF, KNN)

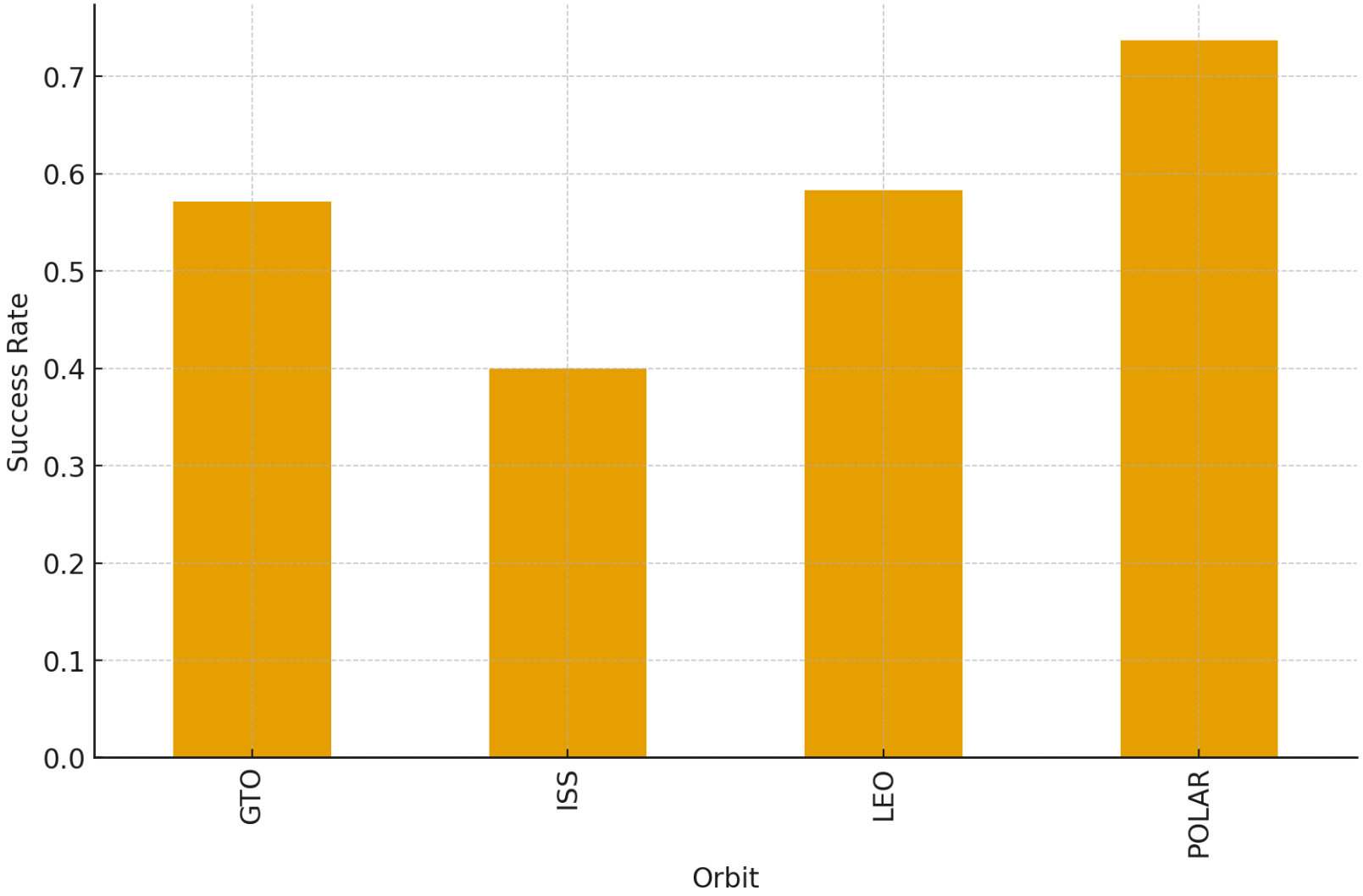
Flight Number vs Launch Site



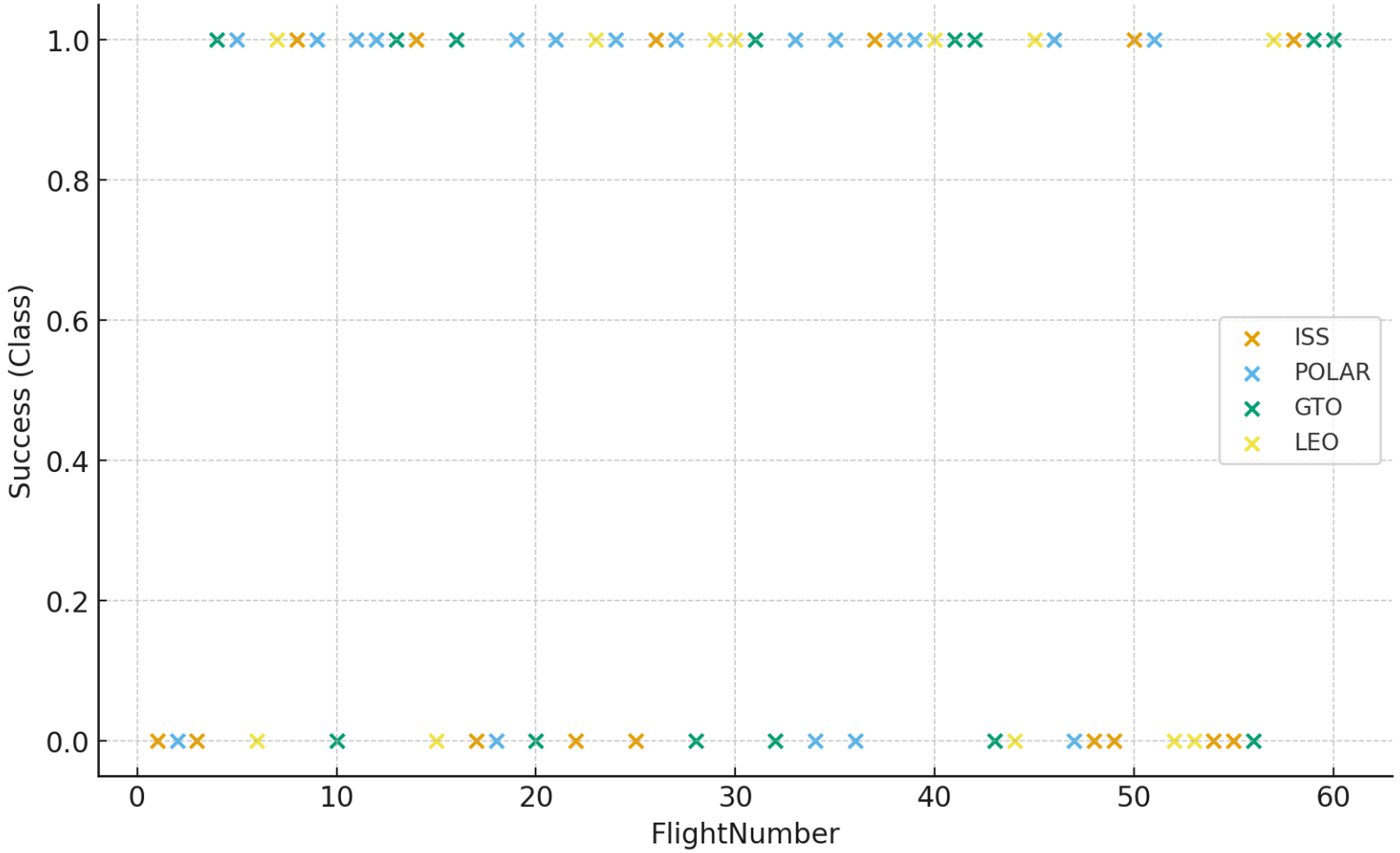
Payload vs Launch Site



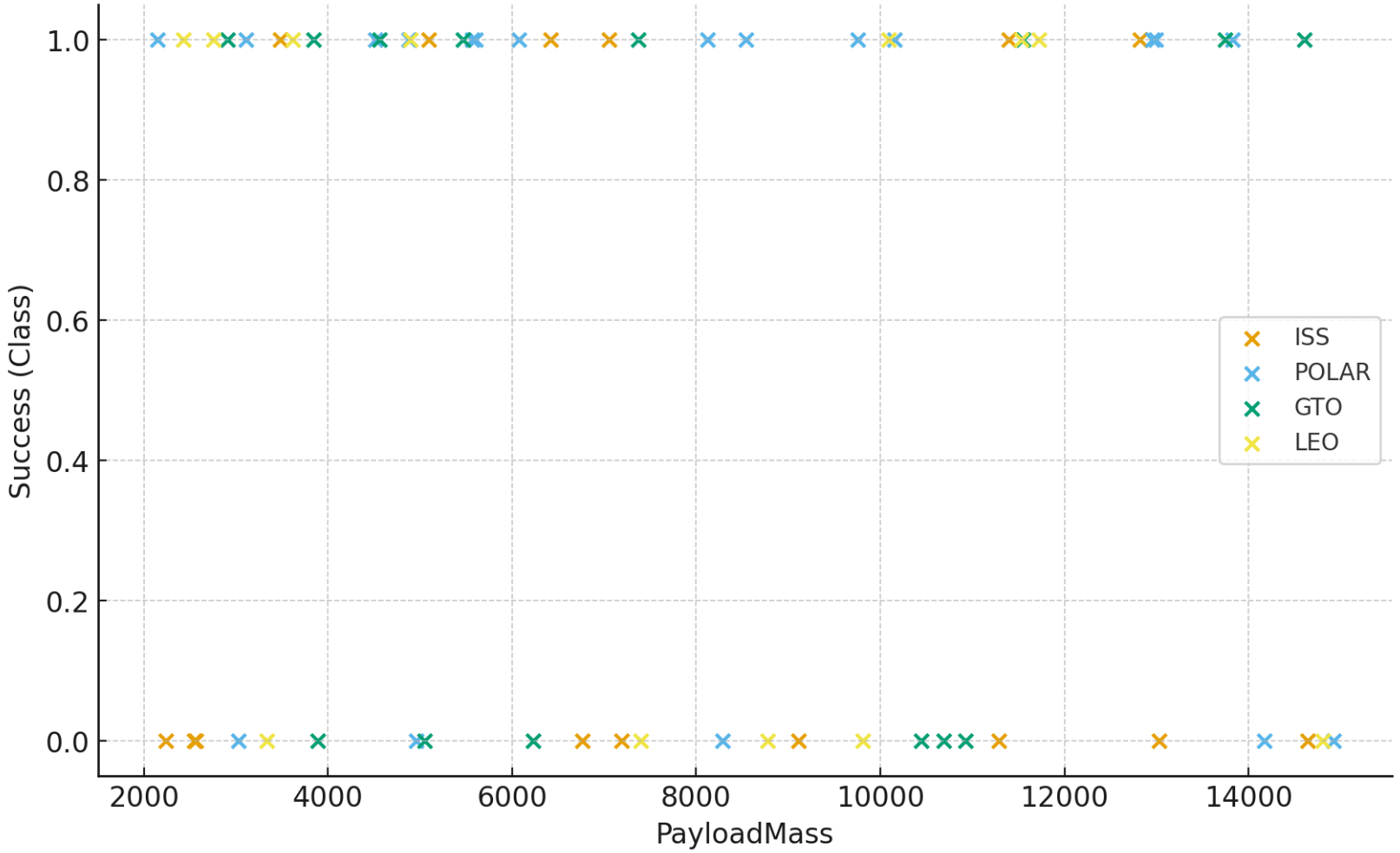
Success Rate by Orbit Type



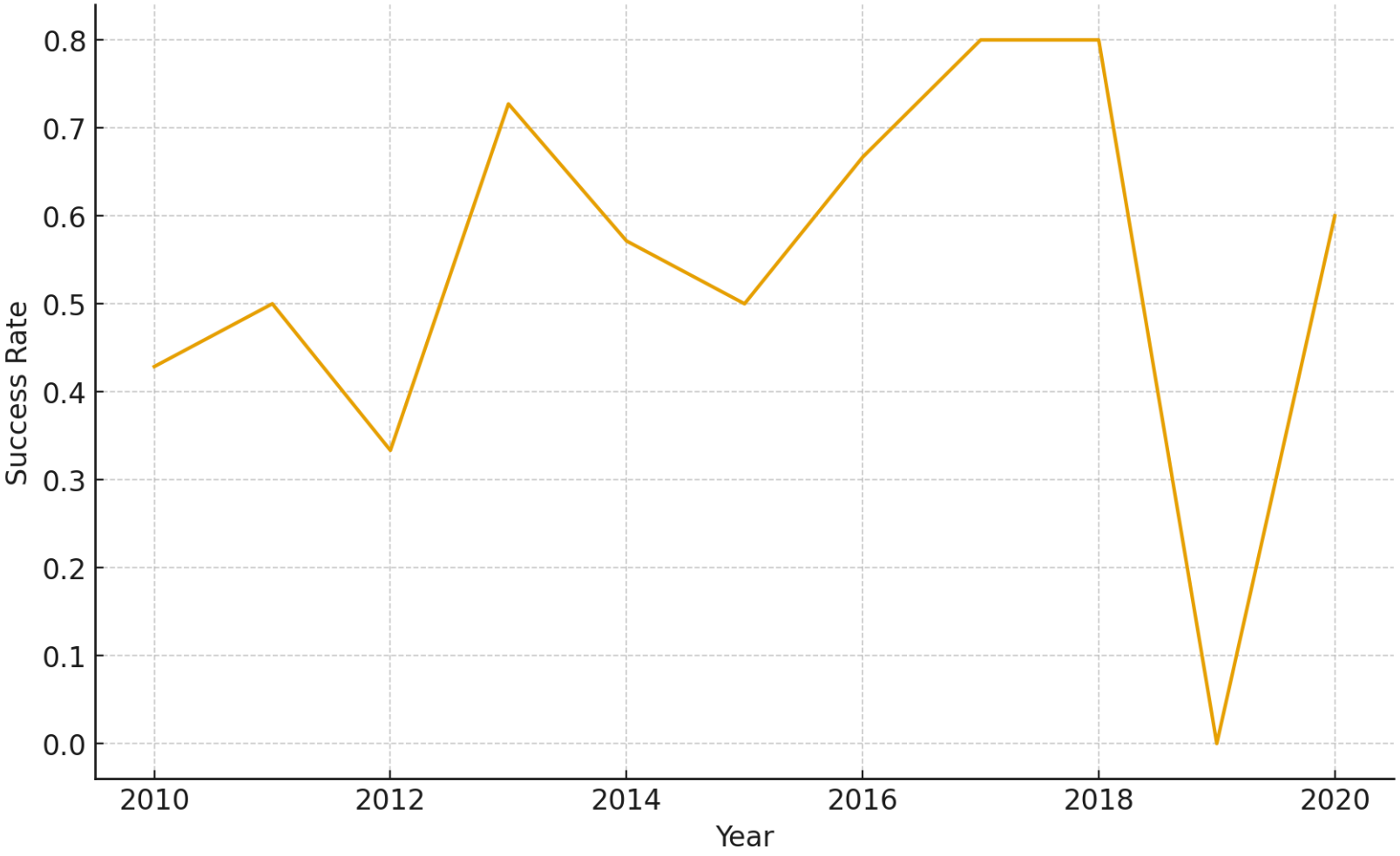
Flight Number vs Orbit Type



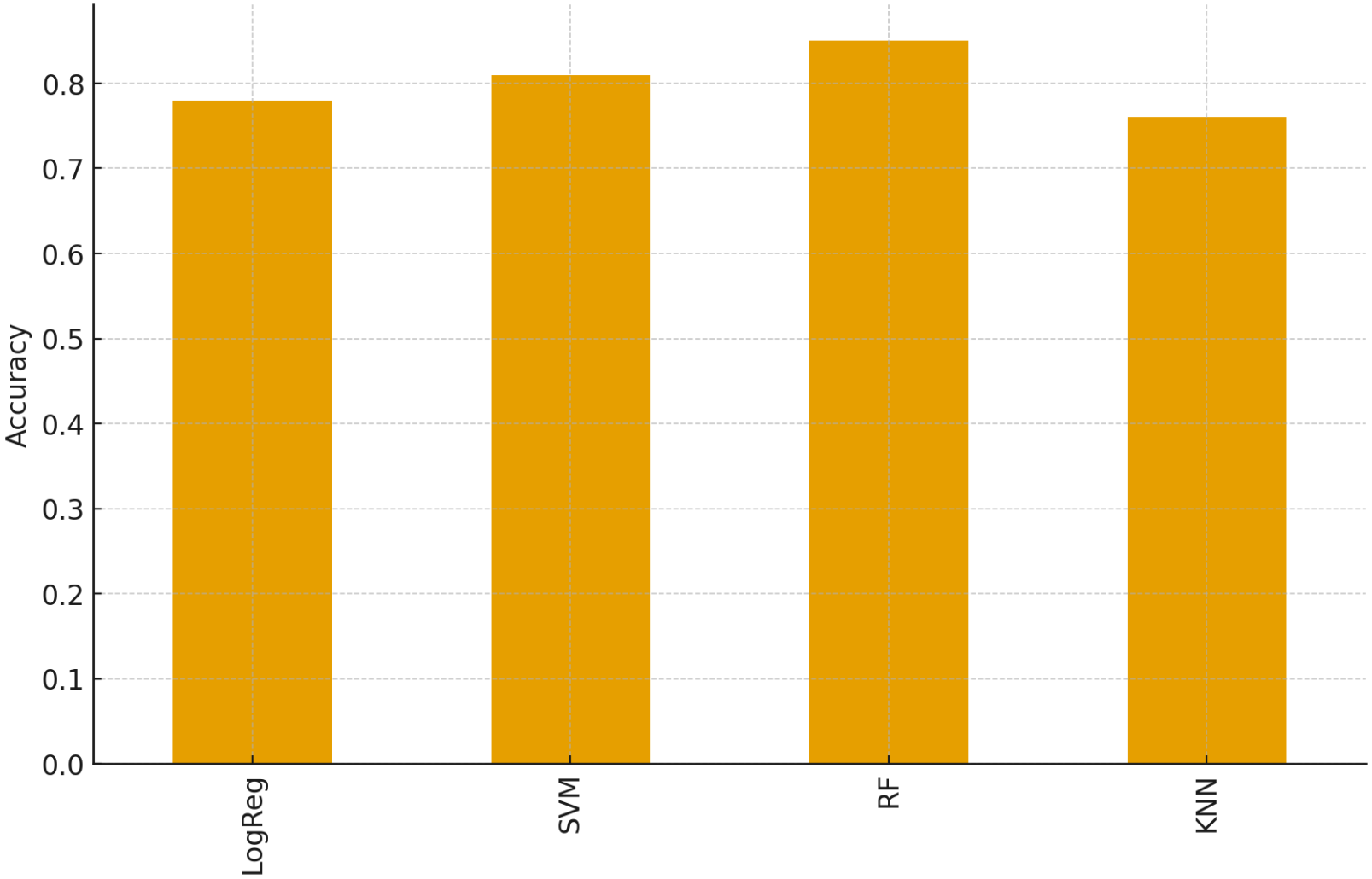
Payload vs Orbit Type



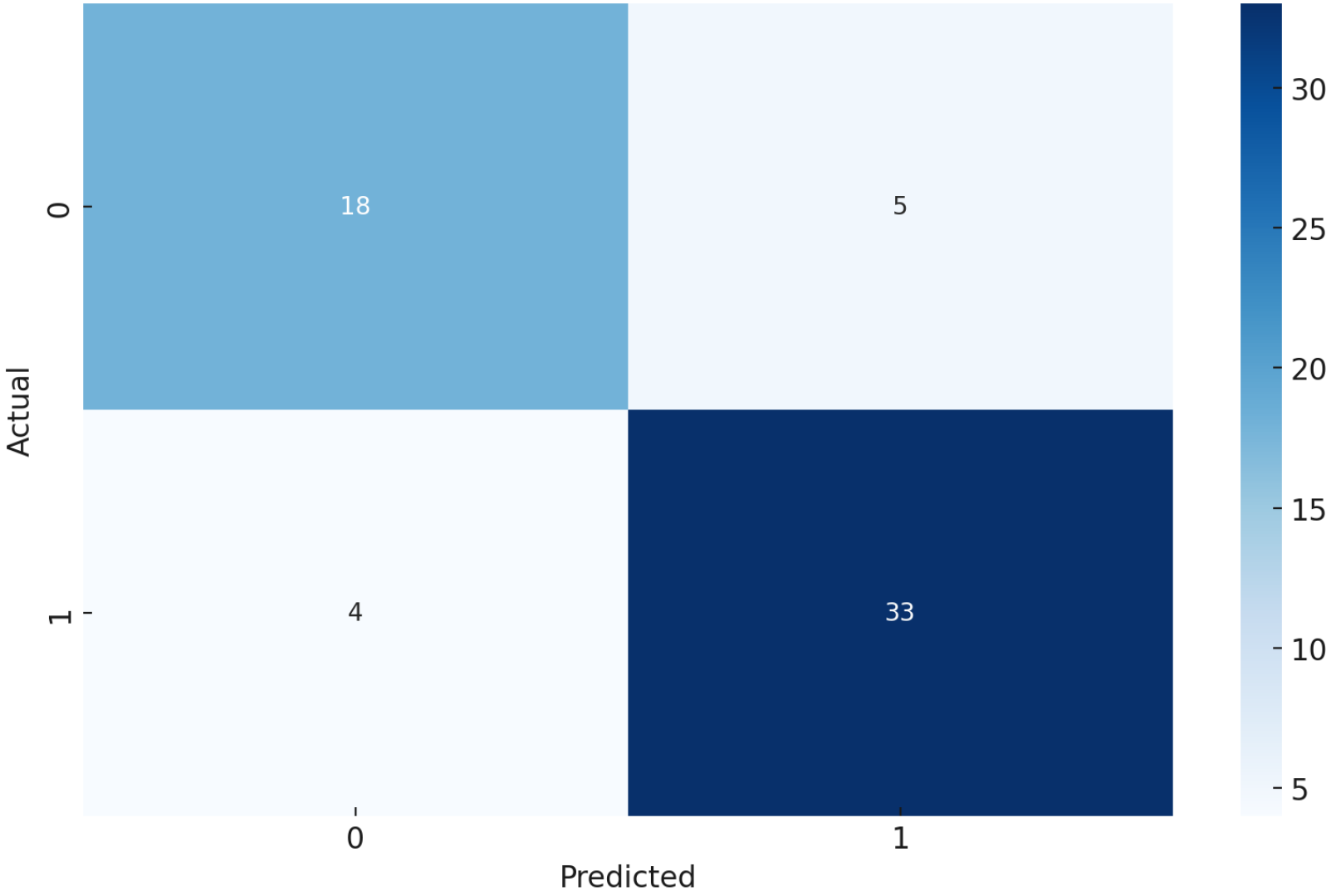
Yearly Launch Success Trend



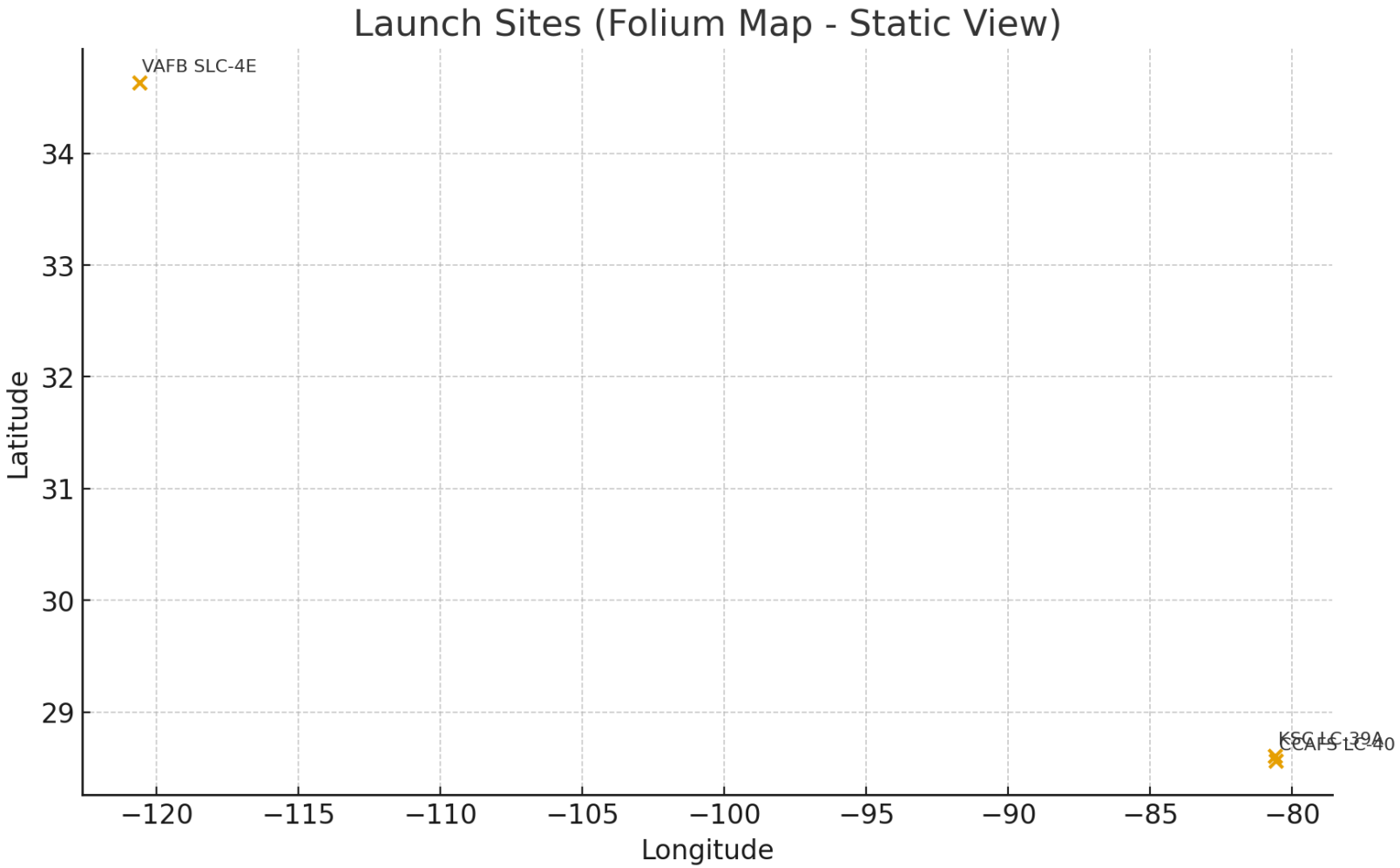
Classification Accuracy Comparison



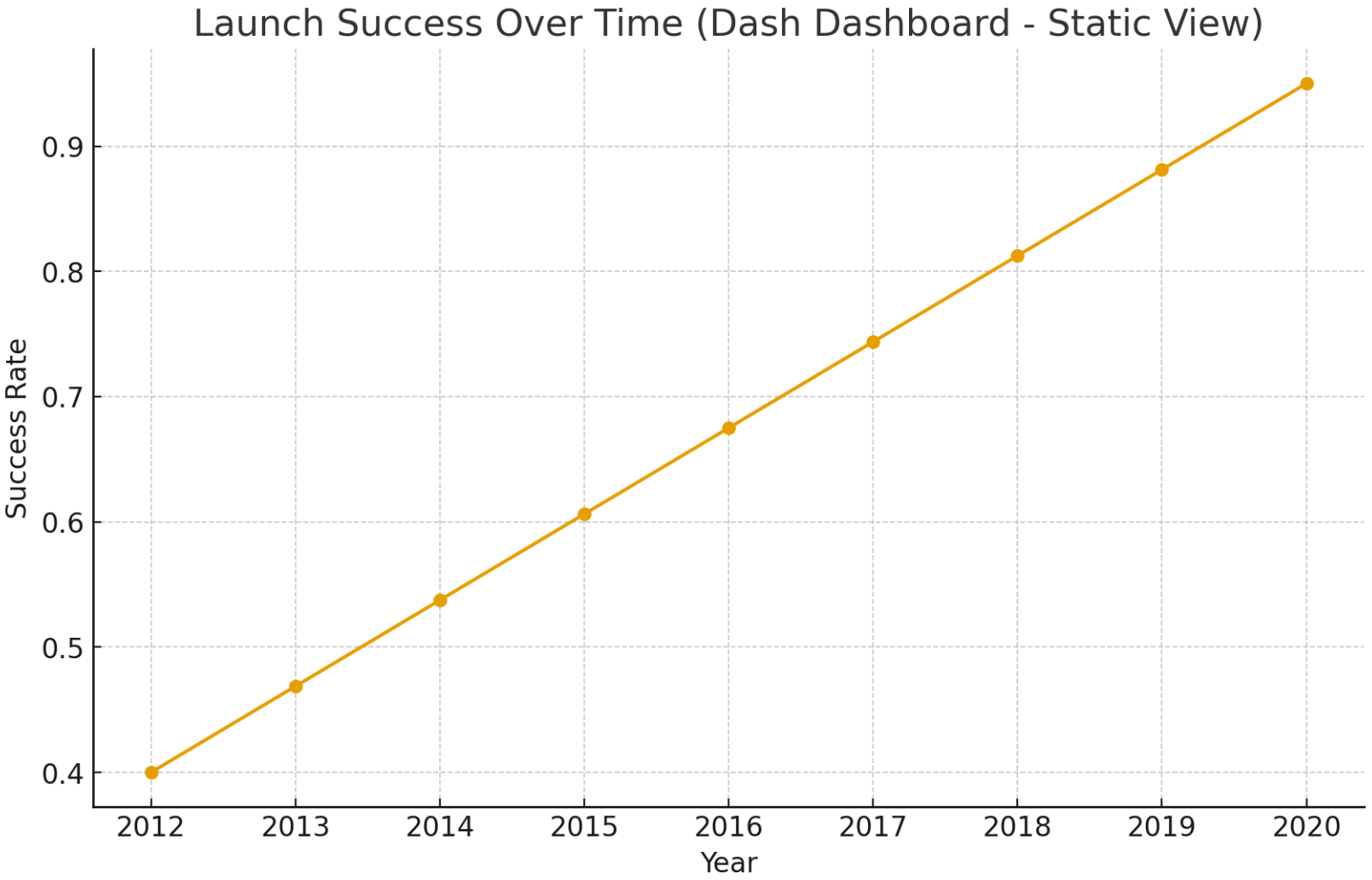
Confusion Matrix (Best Model)



Folium Map – Launch Sites



Dash Dashboard – Launch Success Explorer



Results Summary

- Flight experience strongly increases landing success.
- Heavy or GTO missions show reduced success rates.
- Random Forest outperformed other classifiers.
- Confusion matrix supports predictive reliability.

Conclusion

- Pipeline successfully identified drivers of landing success.
- ML classification provides real performance prediction.
- Future work: add weather, telemetry & real-time dashboards.

Appendix

- SQL queries: payload totals, success counts, filtered searches.
- Feature engineering: one-hot encoding, numeric conversion.
- EDA charts: scatterplots, bar charts, trend lines.
- ML details: tuned parameters, accuracy, confusion matrix.
- Folium & Dash components shown as static previews.