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SPACEX

Executive Summary

Predicting SpaceX Falcon 9 first-stage landings using cost-effective reusability. Applied API, web scraping, and ML algorithms for over 85% accuracy.

Contents

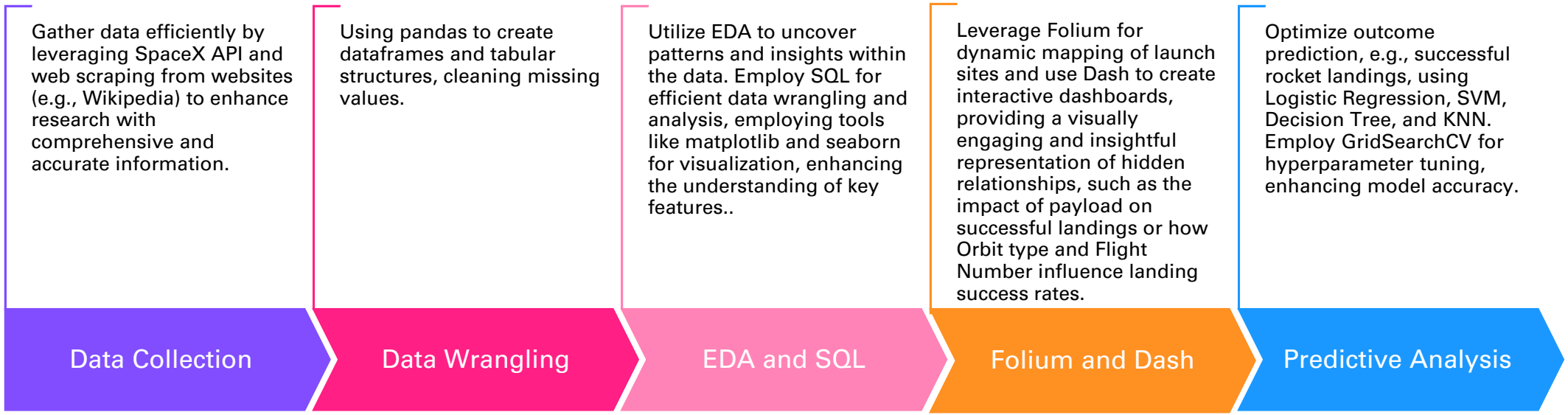
Introduction

I'm a SpaceY data scientist analyzing SpaceX's rocket landings.

Collected data via SpaceX API, used pandas, sqlite, and visualization tools.

Predictive modeling achieved over 80% accuracy in determining successful first-stage landings.

Methodology



Results

- In the exploratory phase, notable insights emerged: NASA (CRS) led with a total payload mass of 45,596, Falcon 9's booster version F9 v1.1 averaged 2928.4 payload_mass, achieving its first successful ground pad landing on 2015-12-22.
- Up to 5 booster versions successfully landed on drone ships with payload_mass between 4000-6000. Falcon 9 achieved 99 successful mission outcomes.
- Visualizations revealed a higher success rate for CCAFS SLC 40 with increasing flight numbers, and a 100% success rate for Falcon 9 landings with orbit types ES-L1, SSO, HEO, and GEO. Overall, Falcon 9's first-stage landings showed significant success from 2010 to 2020.

Findings and Implications

Operational Insights:

- Increased flight numbers correlate with higher success rates at Launch Site CCAFS SLC 40.
- Payload mass and success rates exhibit a positive relationship, influencing mission outcomes.

Orbit Type Success:

- Orbit types ES-L1, SSO, HEO, and GEO consistently achieve a 100% success rate, offering reliability for mission planning.

Continuous Improvement:

- Falcon 9's landing success has seen a steady rise from 2010 to 2020, showcasing continual advancements.

Predictive Power:

- Our model boasts an impressive 88% accuracy, providing stakeholders with a reliable tool for landing outcome predictions.

Booster Carried Max Payloads

Booster_Version	Landing_Outcome	Payload_Mass_KG
F9 B5 B1048.4	SUCCESS	15600
F9 B5 B1049.4	SUCCESS	15600
F9 B5 B1051.3	FAILURE	15600
F9 B5 B1048.5	FAILURE	15600
F9 B5 B1051.4	SUCCESS	15600

Conclusions

With increasing flight numbers, Launch Site CCAFS SLC 40 exhibits higher success rates, similarly observed for payload mass. Orbit types ES-L1, SSO, HEO, and GEO maintain a 100% success rate. Falcon 9's landing success has steadily increased from 2010 to 2020. Our model demonstrates impressive over 85% accuracy, ensuring reliable landing outcome predictions.

Appendix

All pertinent assets—Python code snippets, SQL queries, charts, notebook outputs, and datasets—are available on my GitHub for reference.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Thank you.
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