Satellite Anomaly Detection & Power Prediction for Mars Express

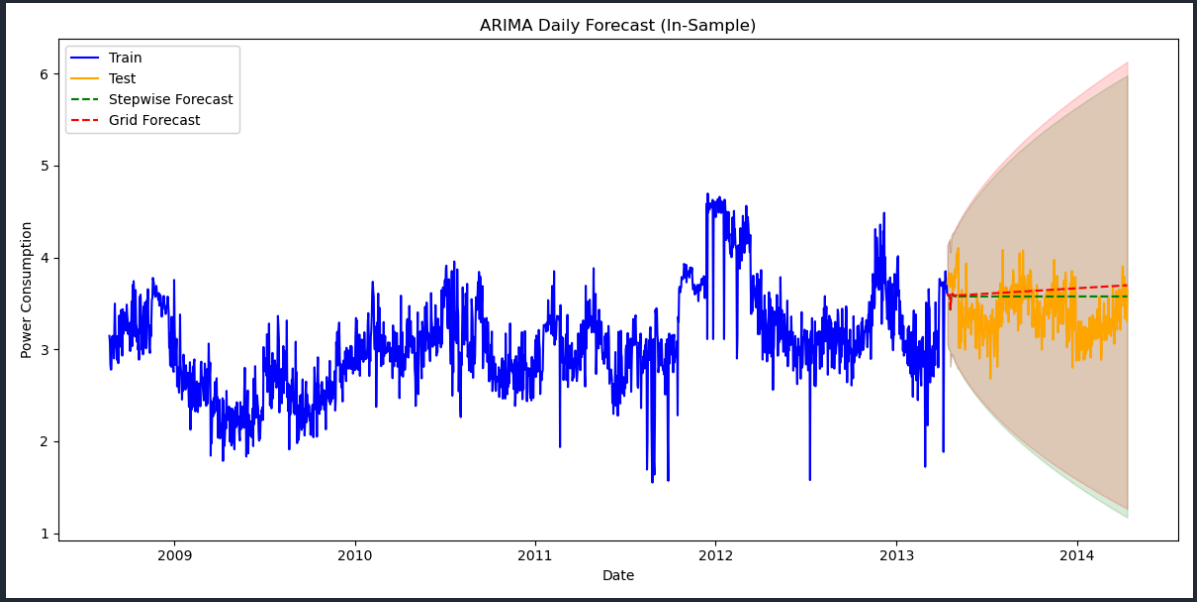
Developed by Rajat Pundir & Blessy Evangeline | Data from ESA

Introduction

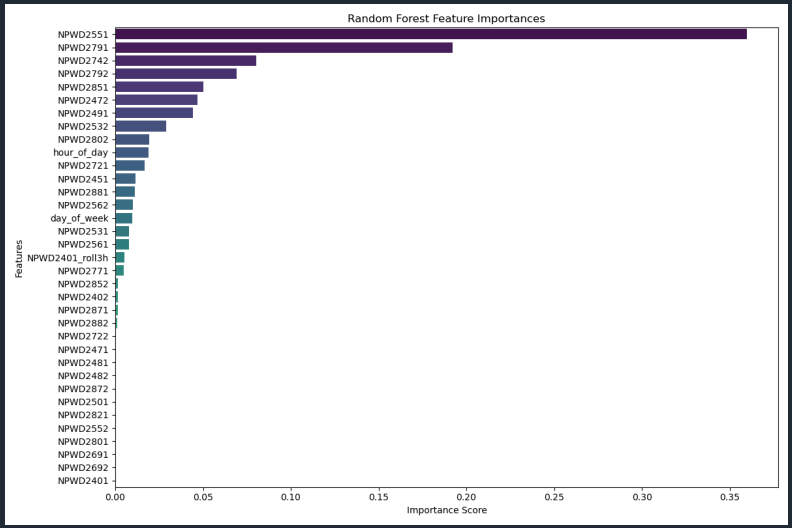
Predicting power usage and spotting anomalies for Mars Express (MEX) spacecraft, ensuring mission safety and efficiency.

Objectives

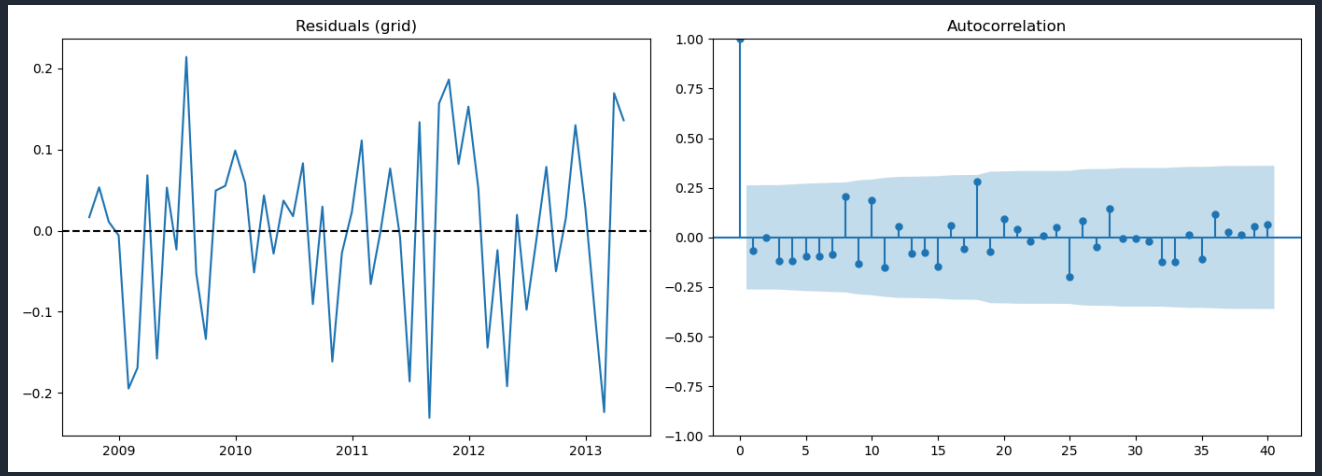
- Forecast Power: Accurately predict future power needs.
- Detect Anomalies: Quickly identify unusual power events.

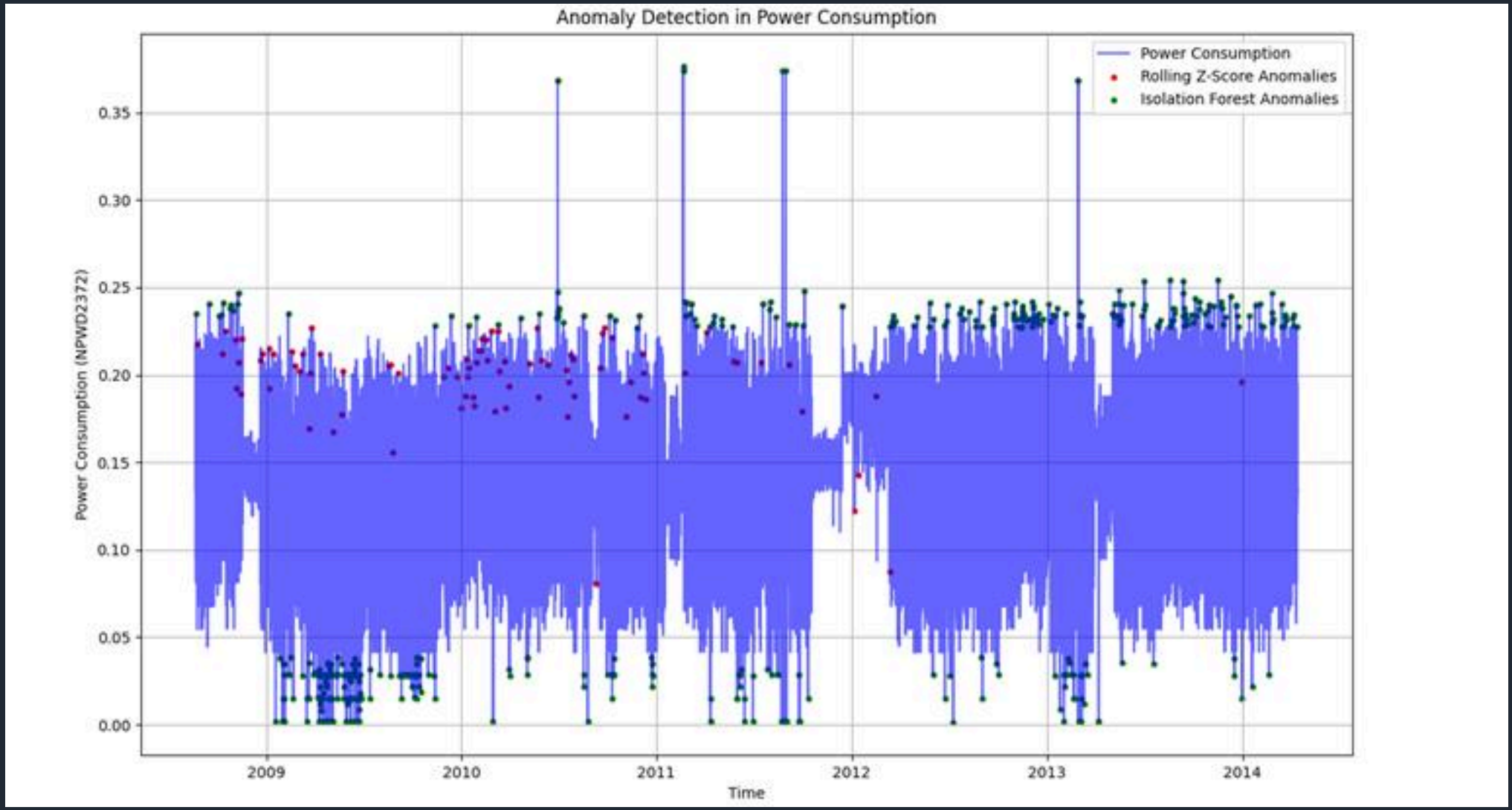


Random Forest Feature Importance



Residual Analysis and Autocorrelation for Monthly ARIMA Forecast (Grid Search)





Methodology:

- **Power Forecasting: ARIMA & SARIMA models with automatic tuning.**
- **Anomaly Detection: Isolation Forest & Rolling Z-Score methods.**

Limitations & Next Steps

- **Current: Limited anomaly classification accuracy.**
- **Future: Enhance anomaly classification with advanced AI models.**