IAF EARTH OBSERVATION SYMPOSIUM (B1)
Interactive Presentations - IAF EARTH OBSERVATION SYMPOSIUM (IP)

Author: Mr. Yichuan Man
National Space Science Center (NSSC), Chinese Academy of Sciences, China

SATELLITE TELEMETRY ANOMALY DETECTION BASED ON MACHINE LEARNING ALGORITHMS

Abstract

Satellite telemetry data plays a crucial role in monitoring the health and performance of satellites. Detecting anomalies in such data is essential for ensuring the reliability and stability of satellite operations. This study aims to develop an anomaly detection framework using machine learning algorithms for satellite telemetry data.

The research methodology involves preprocessing the telemetry data to handle missing values and outliers, followed by feature extraction and selection to capture relevant patterns. Various machine learning algorithms, including Isolation Forest, One-Class SVM, and Autoencoders, are employed to detect anomalies in the telemetry data. Performance evaluation is conducted using metrics such as precision, recall, and F1-score.

The results demonstrate the effectiveness of the proposed anomaly detection framework in accurately identifying abnormal patterns in satellite telemetry data. The Isolation Forest algorithm exhibits robust performance in detecting anomalies, achieving high precision and recall rates. Additionally, the Autoencoder model proves to be effective in capturing complex nonlinear relationships in the data, enhancing anomaly detection capabilities.

In conclusion, this study presents a comprehensive approach to anomaly detection in satellite telemetry data using machine learning algorithms. The developed framework offers valuable insights into the health and performance of satellites, enabling timely intervention and maintenance to ensure uninterrupted satellite operations.