

IAF SPACE OPERATIONS SYMPOSIUM (B6)  
Ground Operations - Systems and Solutions (1)

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MACHINE LEARNING APPLIED TO AMAZONIA-1 SATELLITE POWER SUBSYSTEM  
TELEMETRY PREDICTION**Abstract**

This article presents the collection, exploratory data analysis, model training, evaluation, use of hyperparameters and implementation of the machine learning model that will be used to predict telemetry data from Amazonia-1 satellite developed by National Institute for Space Research (INPE).

The payload data, which are acquired at the earth reception stations on INPE campus in Cuiabá; (Mato Grosso State) and are processed, stored, and distributed, free of charge, are not part of the scope of this research work.

Amazônia-1 satellite is a satellite for remote sensing that was launched in 2021, uses the Multi-Mission Platform (MMP) as a service module and has an imaging camera named Wide Field Imager (WFI). It has 60 m of spatial resolution, 850 km width of the imaged strip and with 5 days revisit time.

Amazônia-1 satellite has 715 telemetries with distinct data types (boolean, categorical, numerical) that will be used as dependent and independent variables. The amount of telemetry data generated daily is large and this makes manual analysis of this data unfeasible. Therefore, during the data preparation and manipulation phase, different attribute selection methods (e.g., filter, wrapper and embedded) are used.

Then, the bagging (e.g., Random Forest) and ensemble (e.g., XGBoost, AdaBoost) machine learning algorithms will be used to predict the values of the dependent variable of the telemetries of the electric power subsystem. of Amazon-1 satellite.

For evaluation and performance of the machine learning model, the metrics Mean Absolute Error (MAE), Root Mean Square Error (RMSE) and (MAE) and R2 (coefficient of determination) will be used. At the end, the machine learning model with better quality and performance will be implemented by INPE's at TT&C facilities.