Detecting Satellite Laser Ranging Station Data and Operational Anomalies with Machine Learning Isolation Forests at NASA's CDDIS

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The International Laser Ranging Service (ILRS) is currently composed of 45 active satellite laser ranging (SLR) stations with several more set to join the network over the next several years. Station changes and histories are logged to files, but not always in real time. Sometimes these details are not added until long after changes have been made to the station – on occasion, years later. This in addition to unexpected hardware errors and other system issues that are not immediately detected affects data trustworthiness and the quality of models and products generated by analysts. The ILRS Central Bureau (CB) and NASA's Crustal Dynamics Data Information System (CDDIS) have worked to provide tools for station engineers to use. This includes the creation of station plots which contain temperature and pressure information along with LAser GEOdynamic Satellite (LAGEOS) and Laser RElativity Satellite (LARES) tracking information that enable the monitoring of station performance and to determine whether the station has undergone any changes. As next steps, the CDDIS is working to enhance these station performance monitoring tools through machine learning to improve data quality and integrity. Isolation forest is an unsupervised machine learning algorithm commonly applied to anomaly detection. In this poster, the CDDIS details the steps taken to track anomalies within SLR station performance using isolation forest with LAGEOS and LARES satellite data.