

A Machine Learning-Based Study On The Estimation Of The Threat Posed By Orbital Debris

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Abstract : This research delves into the classification of orbital debris through machine learning (ML): it will categorize the intensity of the threat orbital debris poses through multiple ML models to gain an insight into effectively estimating the danger specific orbital debris can pose to future space missions. As the space industry expands, orbital debris becomes a growing concern in Low Earth Orbit (LEO) because it can potentially obfuscate space missions due to the increased orbital debris pollution. Moreover, detecting orbital debris and identifying its characteristics has become a major concern in Space Situational Awareness (SSA), and prior methods of solely utilizing physics can become inconvenient in the face of the growing issue. Thus, this research focuses on approaching orbital debris concerns through machine learning, an efficient and more convenient alternative, in detecting the potential threat certain orbital debris pose. Our findings found that the Logistic regression machine worked the best with a 98% accuracy and this research has provided insight into the accuracies of specific machine learning models when classifying orbital debris. Our work would help provide space shuttle manufacturers with guidelines about mitigating risks, and it would help in providing Aerospace Engineers facilities to identify the kinds of protection that should be incorporated into objects traveling in the LEO through the predictions our models provide.

Keywords : aerospace, orbital debris, machine learning, space, space situational awareness, nasa

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