**Utilising machine learning, computer vision, and the Haversine formula to predict the**

**International Space Station's speed.**

# Introduction

This report presents a study that predicts the International Space Station's (ISS) speed using machine learning (RFR), machine vision (OpenCV), and the Haversine formula. The results show how well the project's algorithm predicts the ISS's speed.

1. **Methodology**

This section explains machine learning, including its data and model, calculation and assessment process, computer vision, and all related results.

* 1. **Machine learning:**

**Information:** Training data was derived from the ISS's real-time API and labelled (speed) data. Those contain altitude, latitude, longitude, and label speed data.

**Model:** Random forest regression, supervised learning, which model has excellent predictive power.

* 1. **Computer Vision:**

Based on the change of features in two consecutive images to determine the ISS’s speed.

* 1. **Calculating:**

To determine the ISS’s speed, use the Haversine formula, the great-circle distance formula. Our calculations are based on the assumption that the ISS is located 420 km from Earth.

* 1. **Results:**

The test employed 42 images

**Results in Machine Learning:** Estimated speed results were all within the range of 7 km/s.

**Results in Computer Vision:** Estimated speed results vary from 7km/s to 8km/s.

**Result in Haversine formula:** The majority of estimated speeds were within 7km/s, and a few estimated speeds were within 6km/s to 10km/s.

The speed of the ISS is around 7km/s, which is highly approximate to the ISS's actual speed.

**Conclusion:**

The algorithm can fairly accurately estimate the ISS's speed. Nevertheless, algorithms could be improved in a lot of ways. Machine learning could tune hyperparameters to enhance estimation matching. The Haversine formula could determine the ISS's actual high for a more accurate estimation. Sensor data were not employed in this technique. We want to attempt to use various data to estimate the ISS's speed.