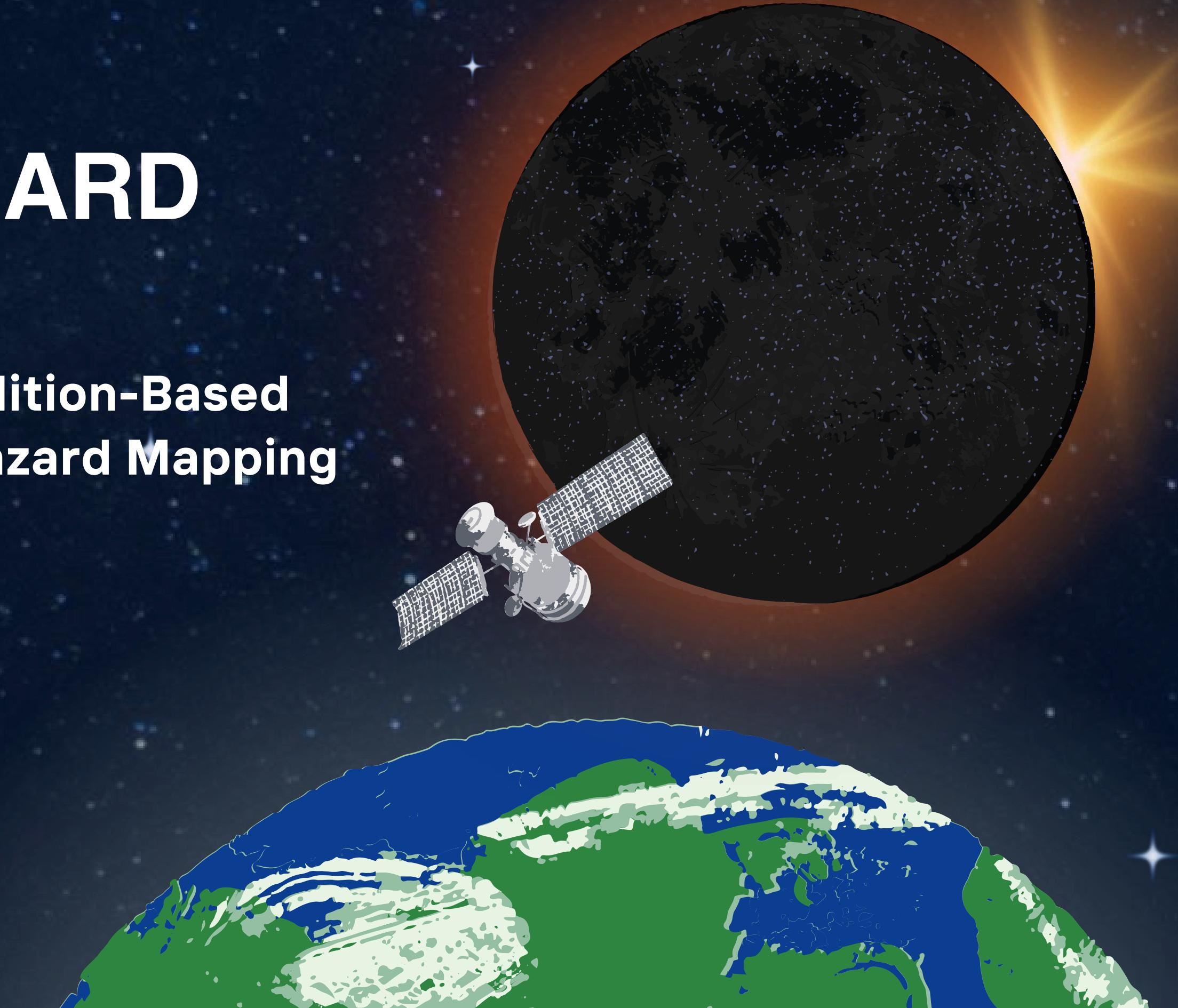


# ORBITAL VANGUARD

**Satellite Sustenance with Condition-Based  
Predictive Maintenance and Hazard Mapping**

**TEAM - COBRA TATE SRM**



# PROBLEM STATEMENT



**Current satellite systems lack comprehensive monitoring and response mechanisms to mitigate the risks posed by meteoroid attacks, debris, and communication disruptions, leading to potential damage, data loss, and operational interruptions. Additionally, there is a need for improved performance evaluation and analysis of space weather events.**



# ABSTRACT

In satellites, condition-based predictive maintenance (CBPM) uses machine learning algorithms and data analytics to forecast when maintenance should be done depending on different parameters. CBPM is able to identify patterns or abnormalities that may be signs of upcoming failures by examining telemetry data, which includes temperature, pressure, power usage, and other operating factors. By taking a preventive approach, satellite operators can plan maintenance tasks ahead of time, increasing satellite lifespan and reliability, and preventing crucial failures.

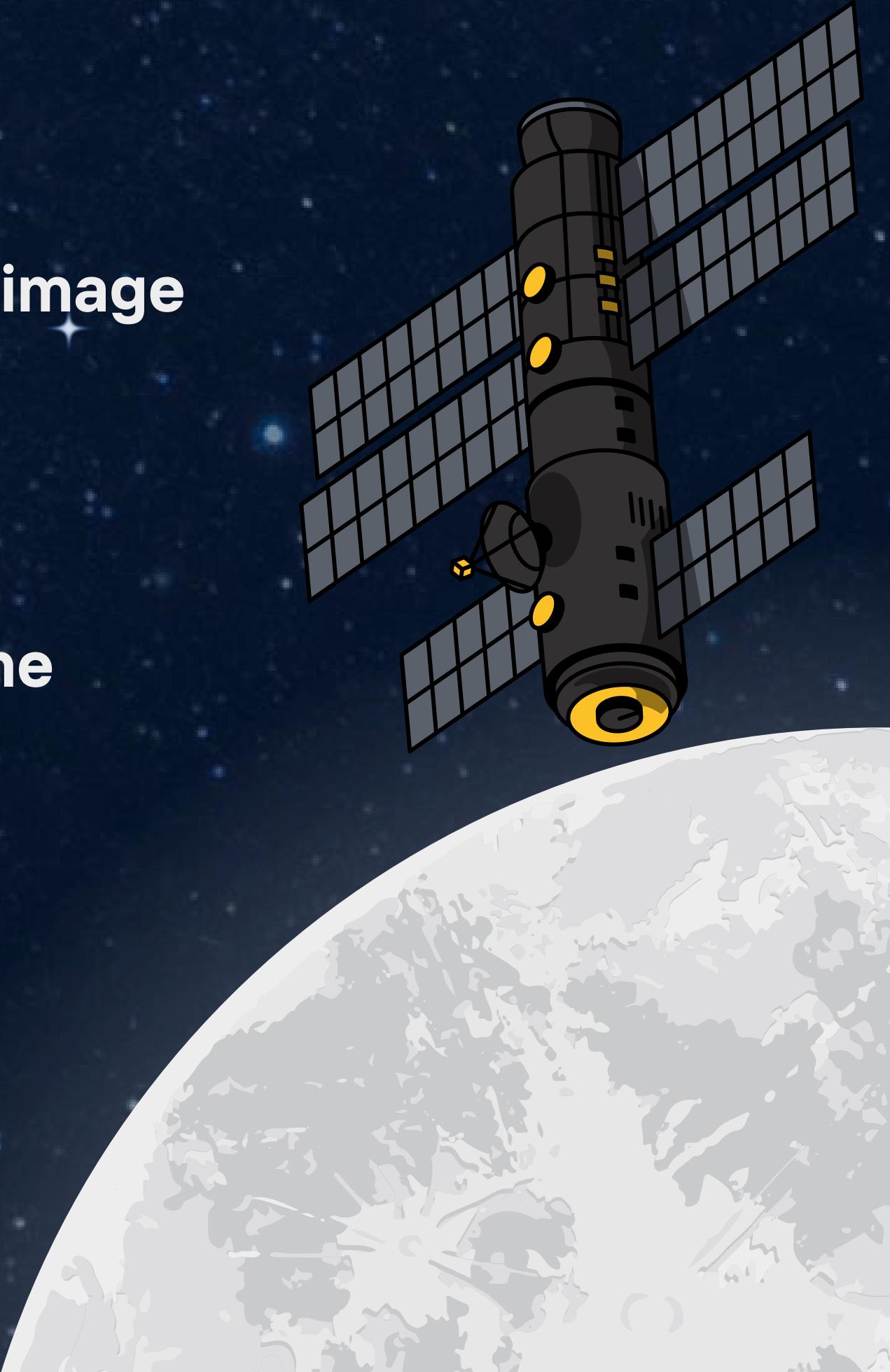
# OBJECTIVE

- Implement an advanced system for maintaining satellite functionality
- Predict potential issues based on real-time conditions
- Enhance satellite sustainability
- Ensure optimal performance through predictive maintenance strategy



# EXISTING SYSTEM

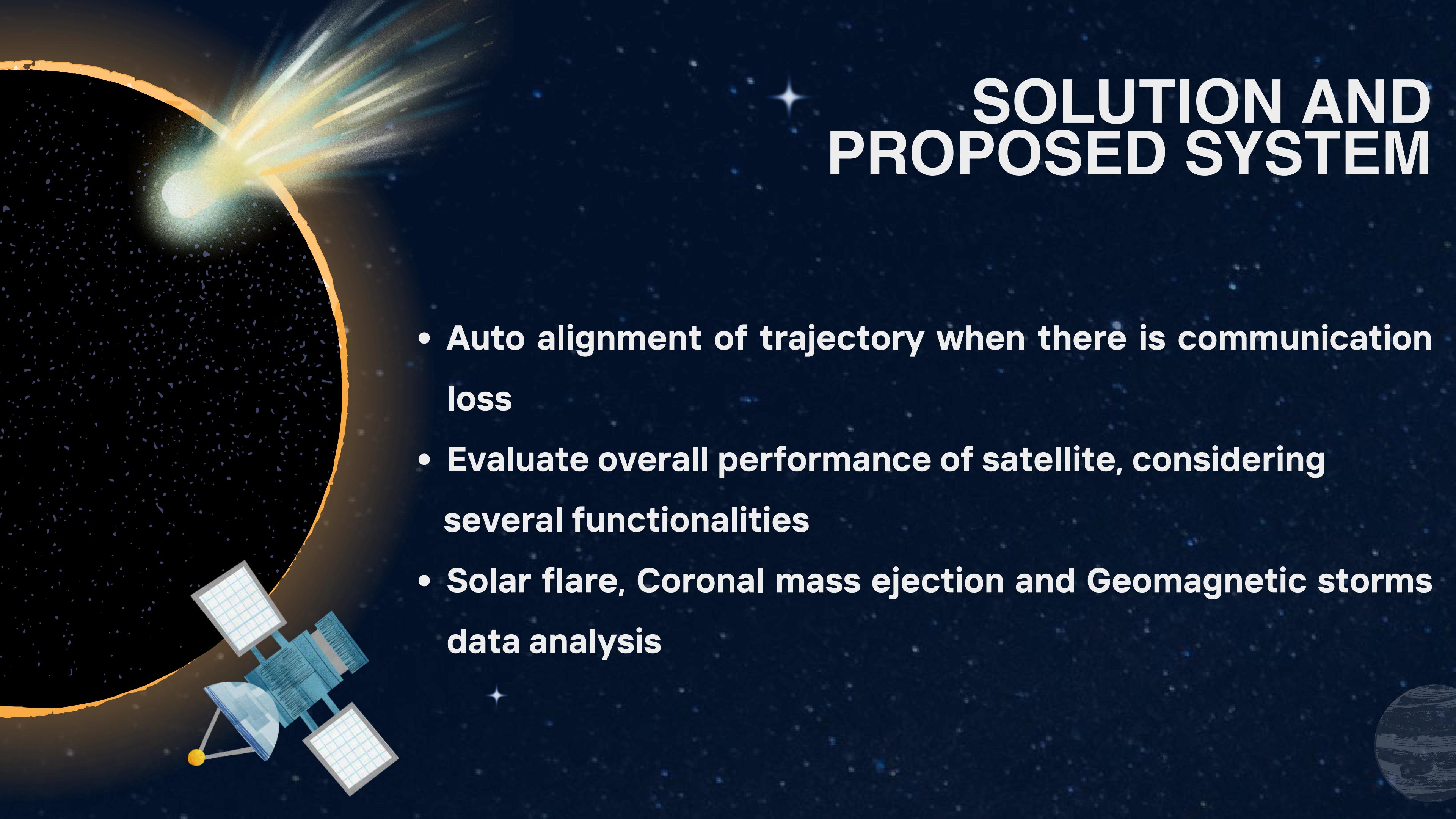
- Precise fault detection and diagnosis using image processing and machine learning.
- Swift responses to emerging issues with real-time data analysis.
- Minimized downtime and maximized operational uptime for satellite missions.
- Cutting-edge integration of computer vision in satellite monitoring.
- Ensuring mission longevity and prosperity with valuable insights.



# SOLUTION AND PROPOSED SYSTEM

- Setting up of the software in the space stations to observe the patterns of meteoroid attacks using CBPM
- Integration of computer vision in satellite monitoring
- Setting up a software in the space stations for hazard mapping of the meteoroids.
- For debris and micro debris, they don't follow any fixed path and they are not as large as asteroids and meteoroids. So, hardening and strengthening of physical components
- Detection of debris and micrometeoroids

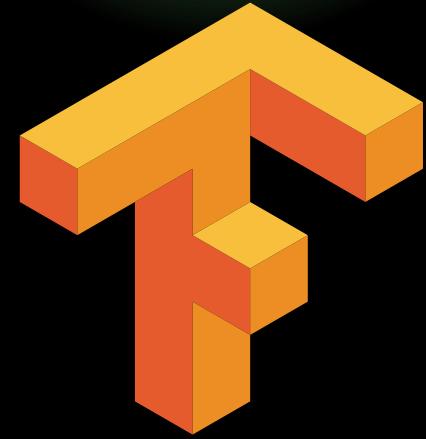




# SOLUTION AND PROPOSED SYSTEM

- Auto alignment of trajectory when there is communication loss
- Evaluate overall performance of satellite, considering several functionalities
- Solar flare, Coronal mass ejection and Geomagnetic storms data analysis

# Tech Stack



Tensorflow



Roboflow



PyTorch

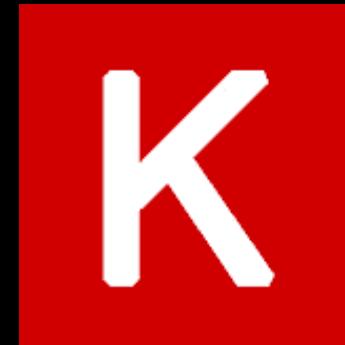
# Tech Stack



Jupyter Notebook



Sci-kit Learn



Keras

**KISHORE R**  
[RA2212703010009]

**JAYSHNAV S**  
[RA2211003012086]

**ARAVINDH M**  
[RA2211026010028]

**RAHGUL R**  
[RA2211030010278]

**SUBHASH J**  
[RA2212703010006]

