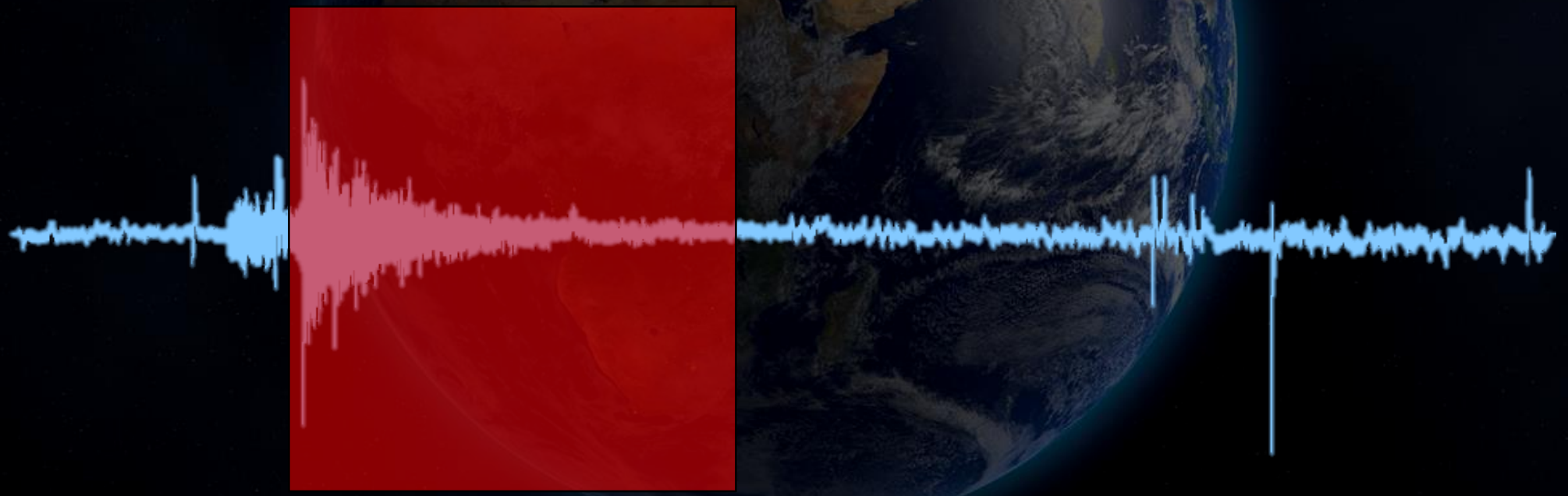
CHALLENGE

Planetary seismology missions face significant **energy demands** to continuously transmit seismic data back to Earth, yet only a small portion of this data holds scientific value. Instead of sending everything, what if a lander could **differentiate valuable** signals from noise and transmit only the important data?

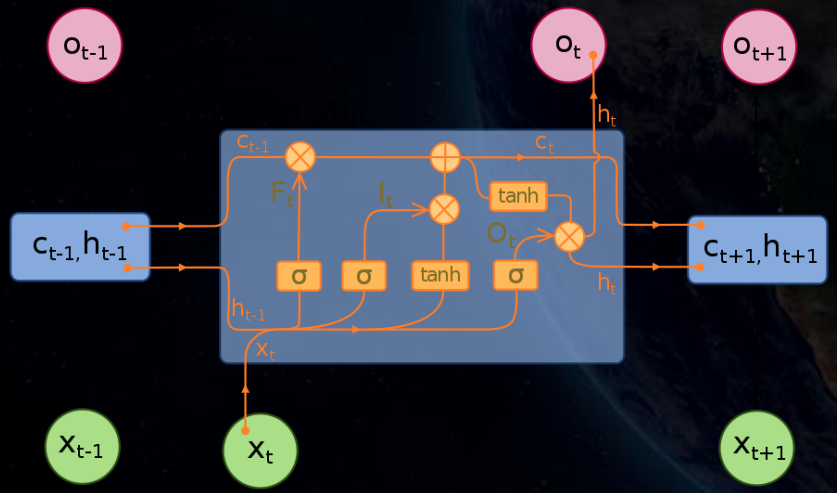
CHALLENGE

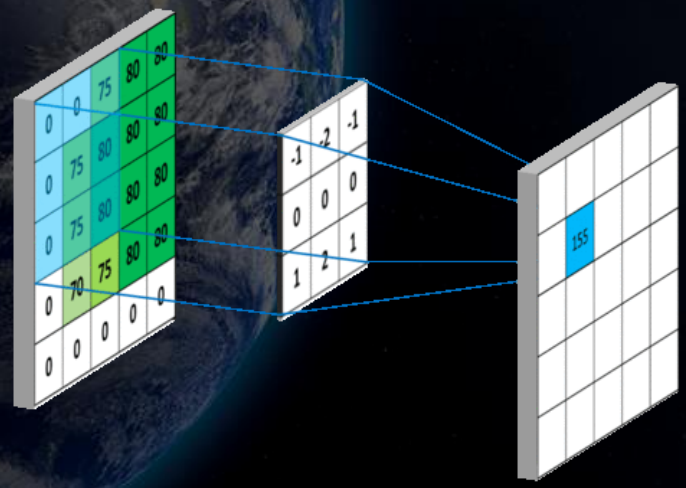
The main objective is to detect the **most important seismic data** so that only these relevant subsets are **transmitted** back to Earth.



POSSIBLE SOLUTIONS

We proposed two possible solutions: the first is a **neural network-based** model, supported by scientific research on the topic, and the second is an innovative algorithm based on **computer vision.**

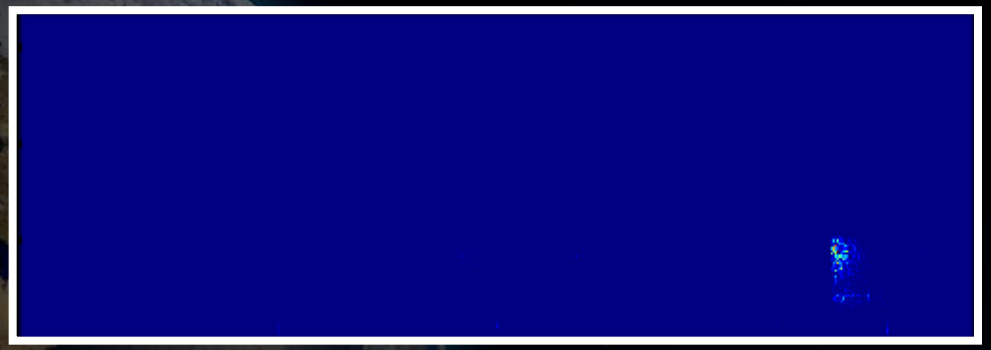




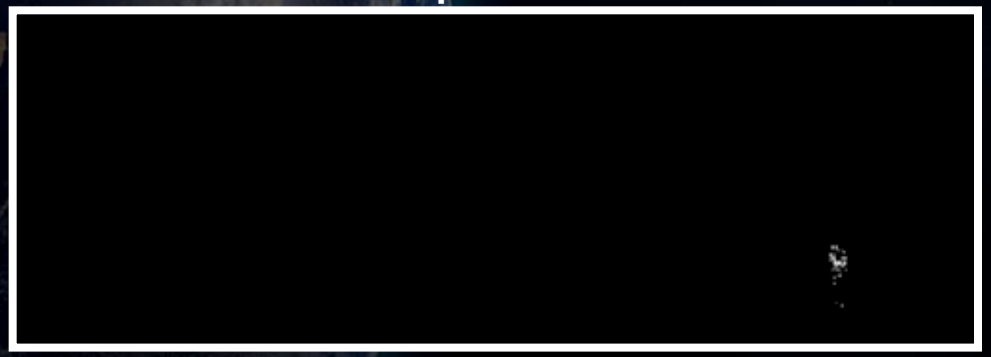
CHOSEN SOLUTION

The computer vision-based solution was selected, as there is currently no such implementation. The algorithm focuses on **detecting anomalies** in the spectrograms of seismic wave frequencies, using advanced computer vision models.

Espectrograma



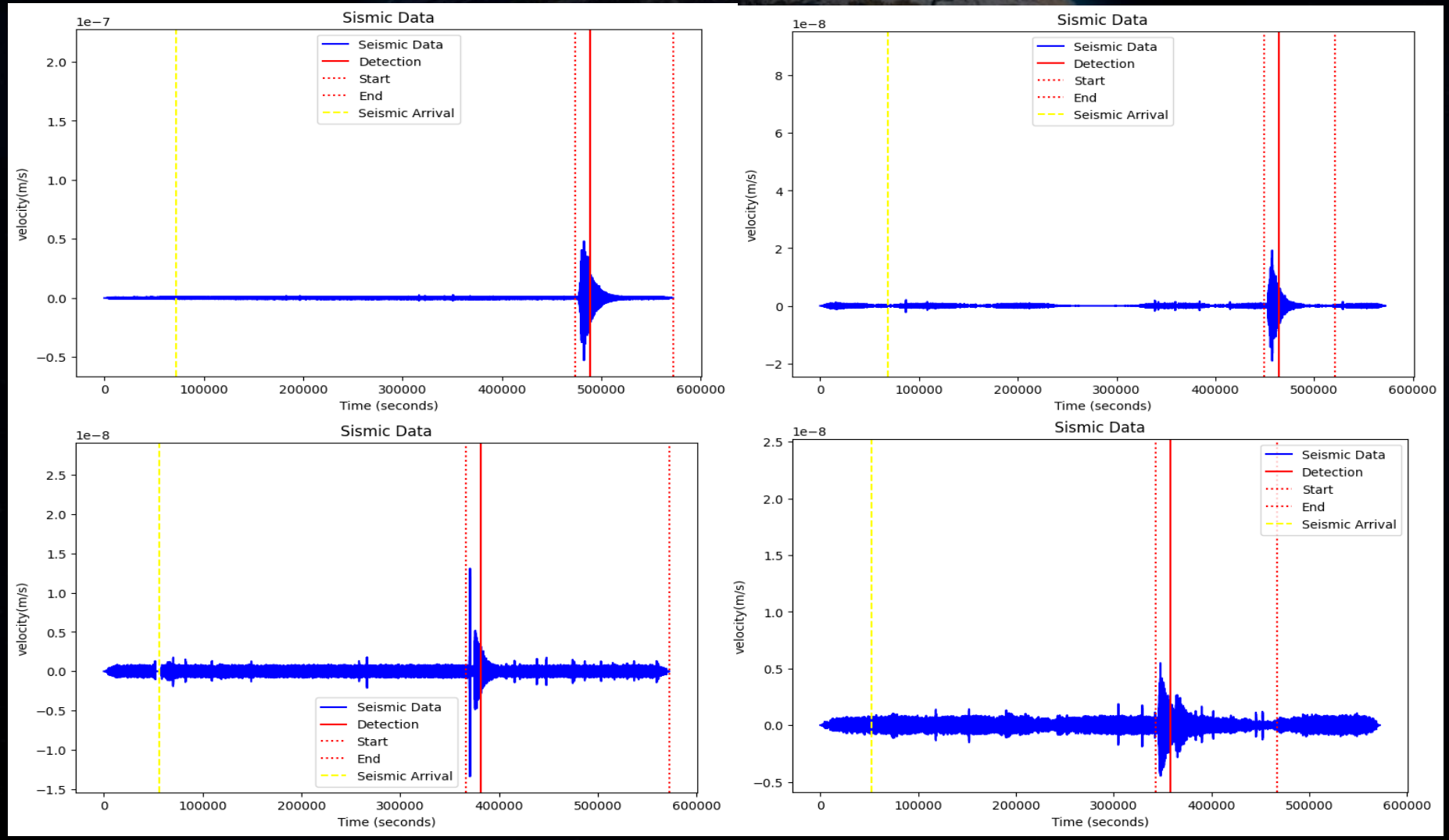
Preprocesado



Detección de anomalías

DEMONSTRATION

Below are examples of the seismic wave segments.



ADVANTAGES

Data Savings: We reduce the transmission of non-scientific data by 93.10%, translating to lower energy costs in seismological stations.

Sustainability: By decreasing the amount of data sent to Earth, resource usage in communication infrastructure is minimized, contributing to a more sustainable approach to space exploration.

Reduction of Redundancy: Filtering and sending only relevant data prevents duplication, enhancing the efficiency of data storage and processing on Earth.

Less Strain on Communication Systems: By reducing data load, pressure on communication systems is lessened, potentially improving transmission quality and reliability.

POSSIBLE APPLICATION FIELDS

Preventive Medicine: Use anomaly detection techniques to identify patterns in health data, such as **ECG** or **EEG** readings, which may indicate underlying medical conditions.

Brain Activity Analysis: Employ advanced techniques to interpret electroencephalography (**EEG**) data and detect anomalies in brain activity potentially linked to neurological disorders.

Predictive Maintenance: Implement algorithms to analyze noise in electrical systems, identifying patterns that signal imminent equipment failures and enabling proactive maintenance.

Network Optimization: Apply noise detection techniques in telecommunications systems to identify interference and improve transmission quality.