SPACE APPS CHALLENGE 2024

SEISMIC DETECTION

PRIMARY OBJECTIVE :

The primary objective is to develop a computer program capable of analyzing seismic data to accurately distinguish seismic quakes from noise.

AGENDA

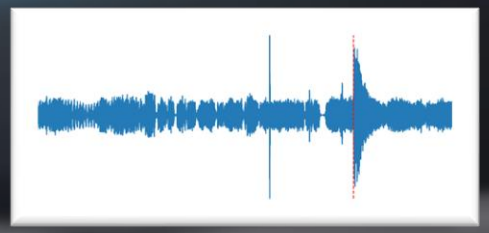
- Data Collection
- Data Preprocessing
- Features Extraction
- Build & Design The Algorithm
- Report & Document the Results

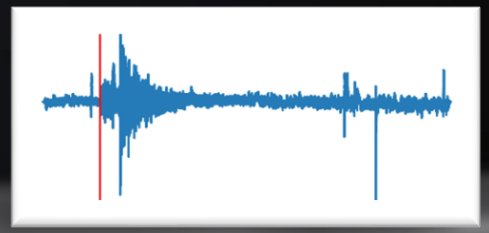
SPACE APPS CHALLENGE 2024

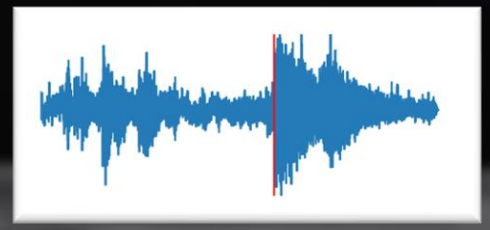
SEISMIC DETECTION

Data Collection

1. Lunar Apollo Mission Seismic Data || 2. Mars InSight Lander Seismic Data || 3. Additional Data: Earthquake



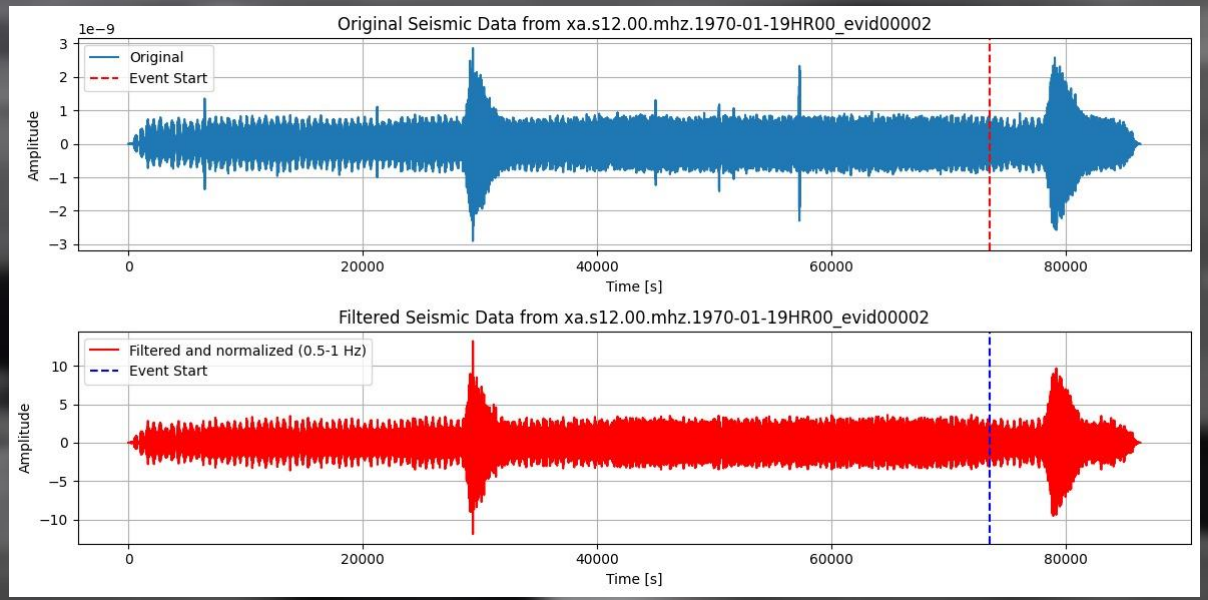




Data Preprocessing

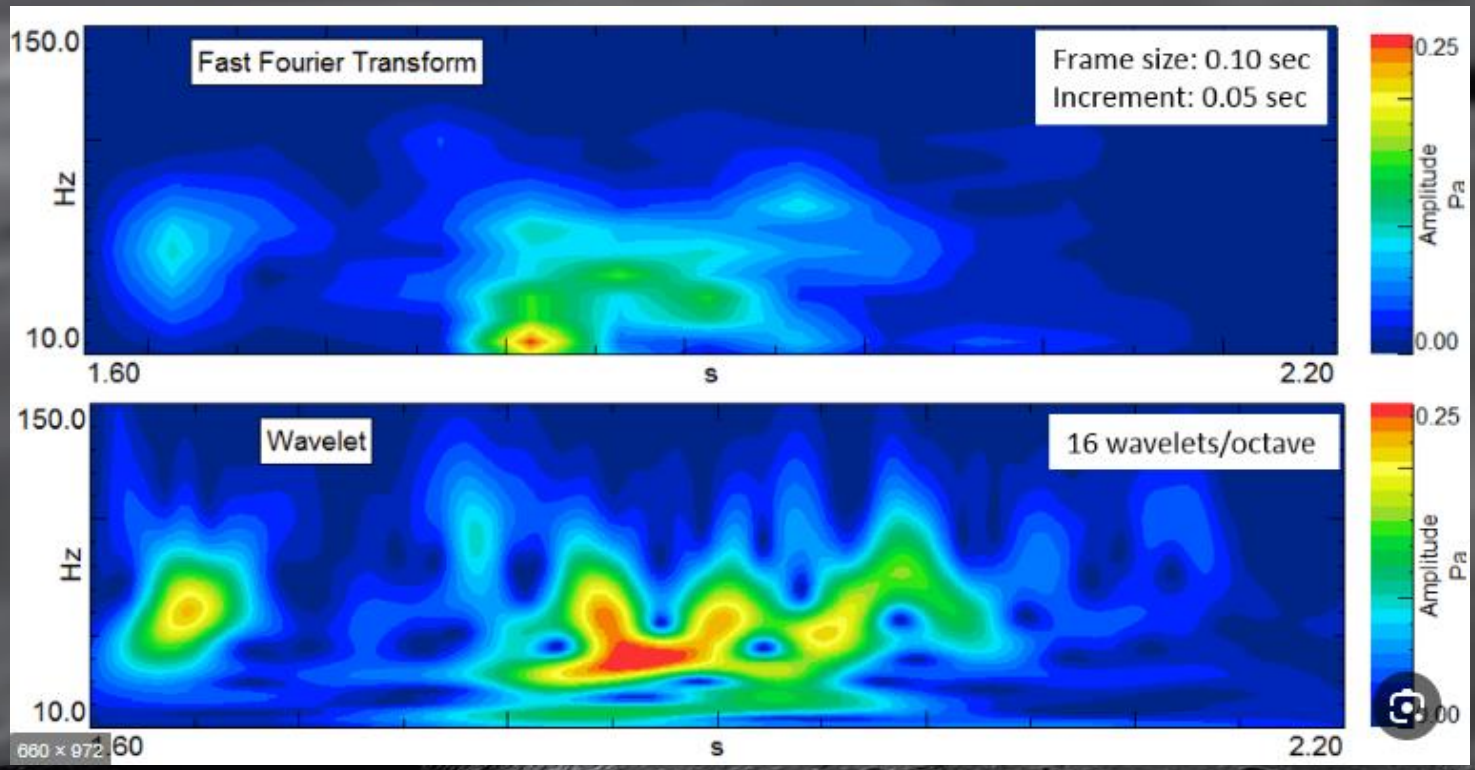
1. Noise Reduction : Bandpass Filter

2. Normalization : Standardization



Features Extraction

Continuous Wavelet Domain (CWT): provides a time-frequency representation of signals, offering multi-resolution analysis across various scales. It captures both short-term, high-frequency details and long-term, low-frequency trends. The output is a 2D matrix of wavelet coefficients, representing the signal's frequency content at each time point.



SPACE APPS CHALLENGE 2024

SEISMIC DETECTION

Build & Design The Algorithm

- The detection algorithm applies a bandpass filter to seismic signals, followed by a continuous wavelet transform (CWT) to extract time-frequency features. It then divides the signal into overlapping windows and assigns weights to high-frequency components. The algorithm identifies the "best window" with the maximum weighted amplitude, marking it as the likely onset of seismic activity.