



# Project Quake or Not to Quake

Team: Alex Ayala, Alexandre Beauchamp, Anthony Ambs, Brett Baker, Ian Alderson, and Rayne Davidson

# The Challenge

- Planetary seismology missions face challenges with handling data
  - High power requirements for continuous transmission to Earth
  - Large amounts of noise are needlessly transmitted
- We created a program to identify seismic activity
  - Will reduce the amount of data transmitted
  - Used data from Apollo missions and Mars InSight Lande

# Short-term Average/Long-term Average (STA/LTA) Detection Algorithm

We began with an STA/LTA detection algorithm

Consistently identified the onset of seismic activity [1]

Was prone to many false positives [1]

Missing information would skew the algorithm [2]

Figure 1

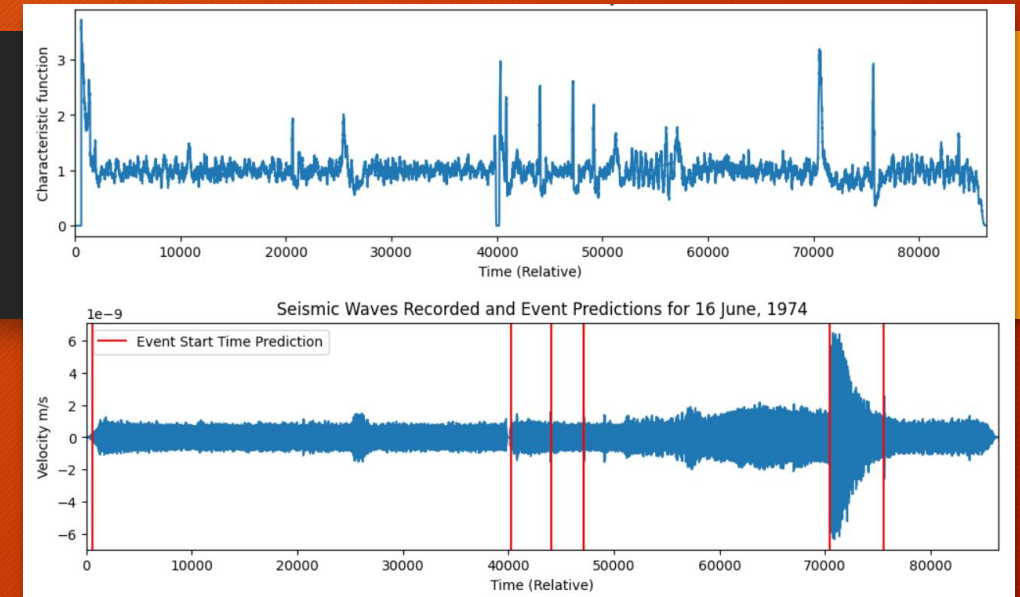
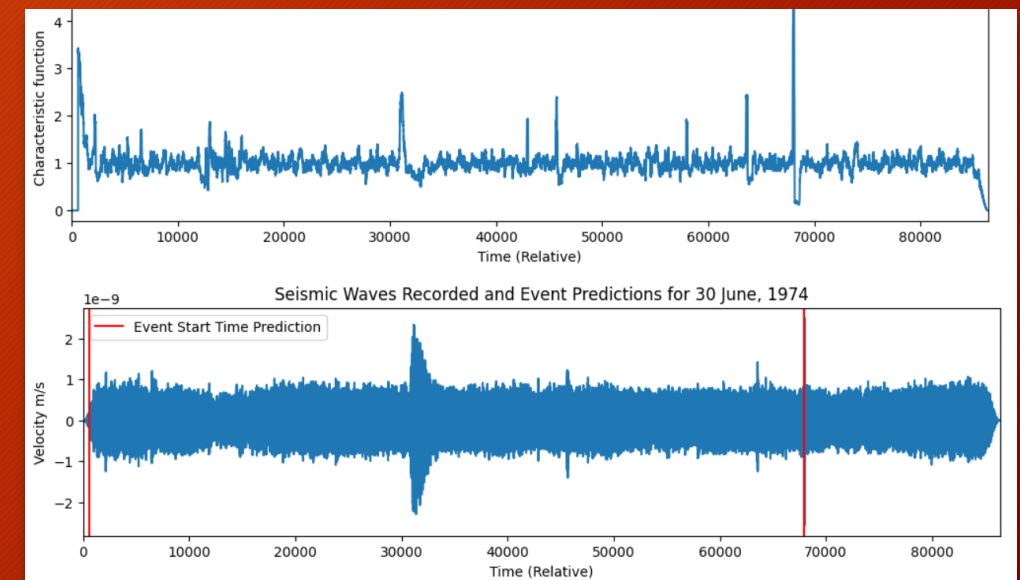


Figure 2



Initial datasets not well suited for machine learning

Not yet normalized

Very few positive examples



Steps

Sliding  
window  
approach

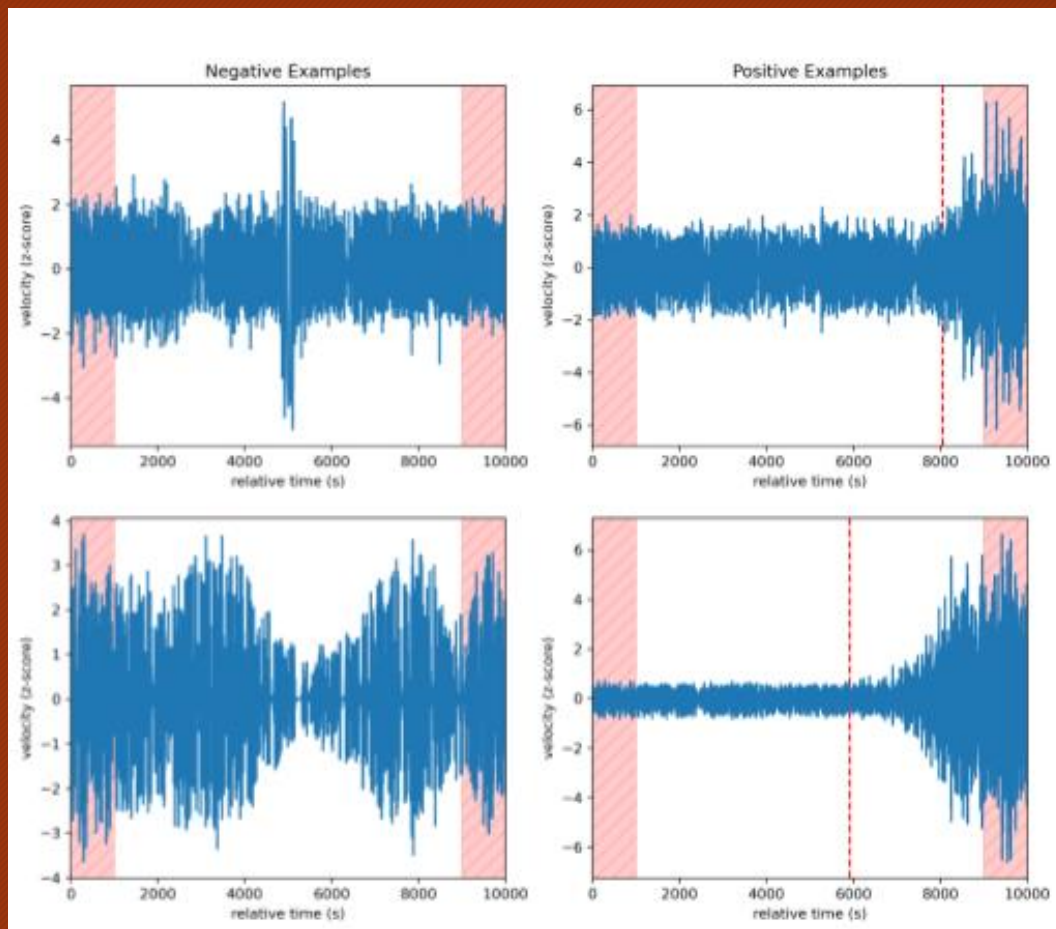
Supplement  
with Earth  
seismic data

Supplement  
with  
synthetic  
data

Normalization

Data  
Preparation for  
Machine  
Learning

# Sliding Window

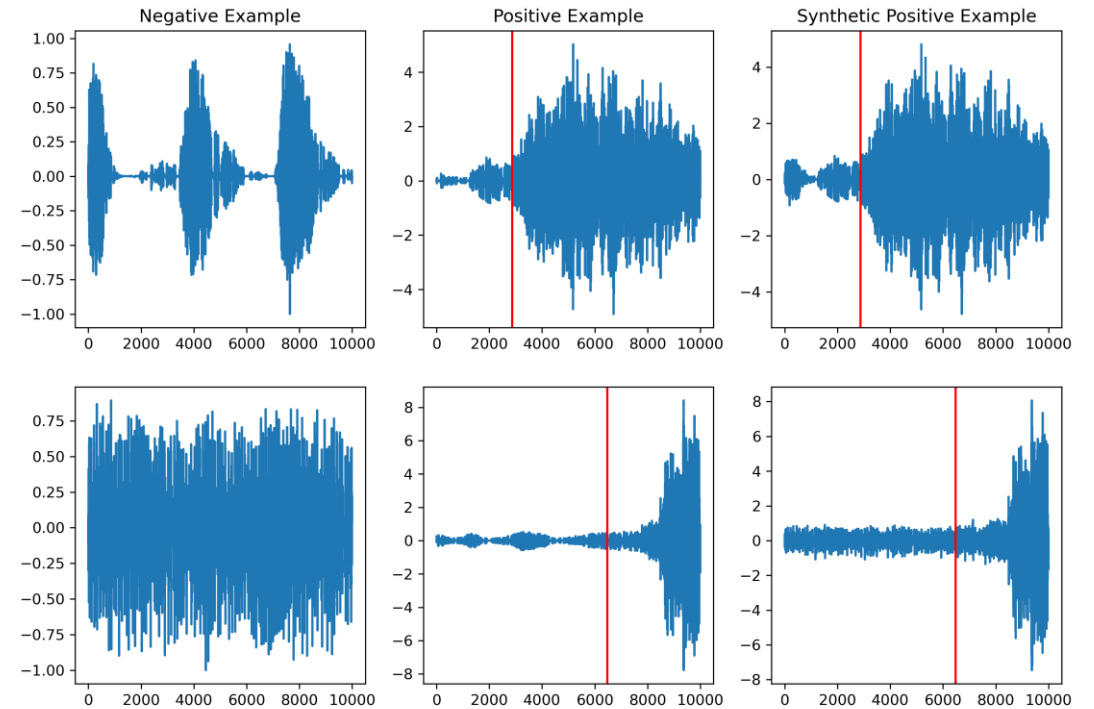
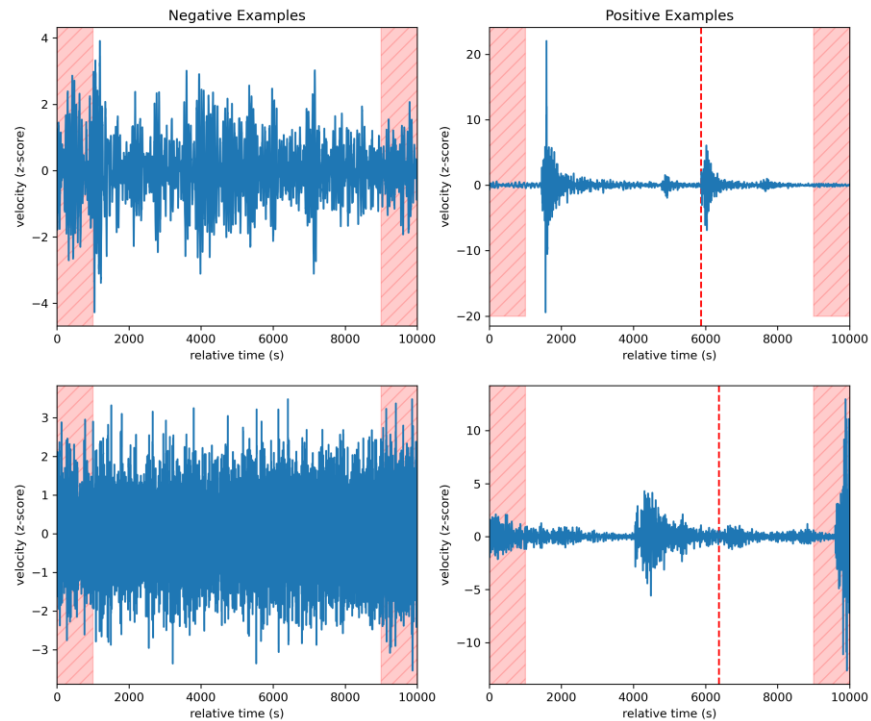


- Create a window of configurable size
- Slide the window by a configurable size
- Mark the edges as “dead zones” to avoid penalizing models
- For the provided Apollo 12 training set, increase positive examples from 76 -> 1,200

- Supplemented training data with Earth Seismic samples

- Synthetic positive examples are produced by overlaying a true positive and true negative example

Earth Quake Samples [1500 (s)]





# Training Pipeline

- We completed the pretraining step
  - Offers a pre-trained model for other researchers
- Further steps will be to finetune WaveNet Architecture

