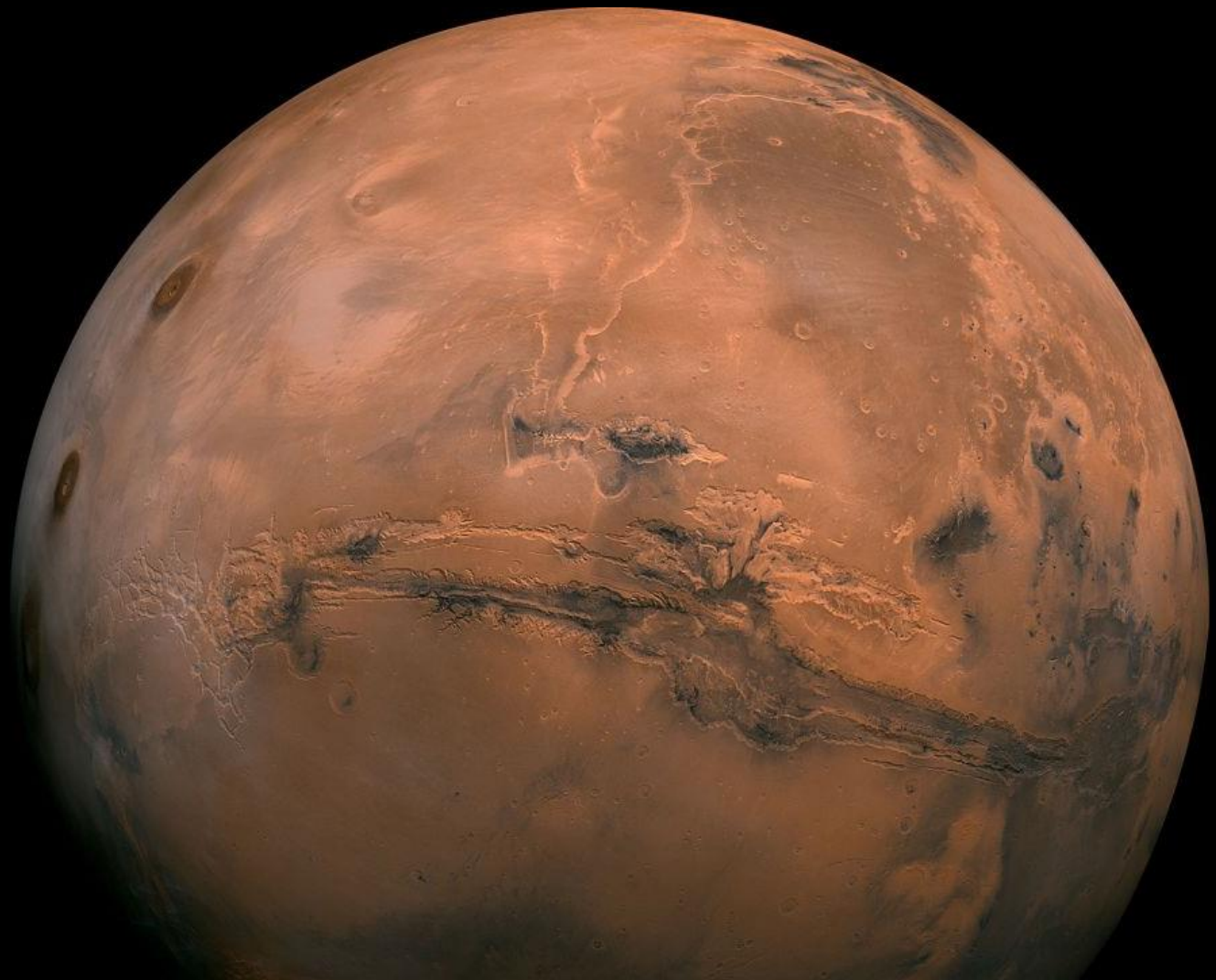
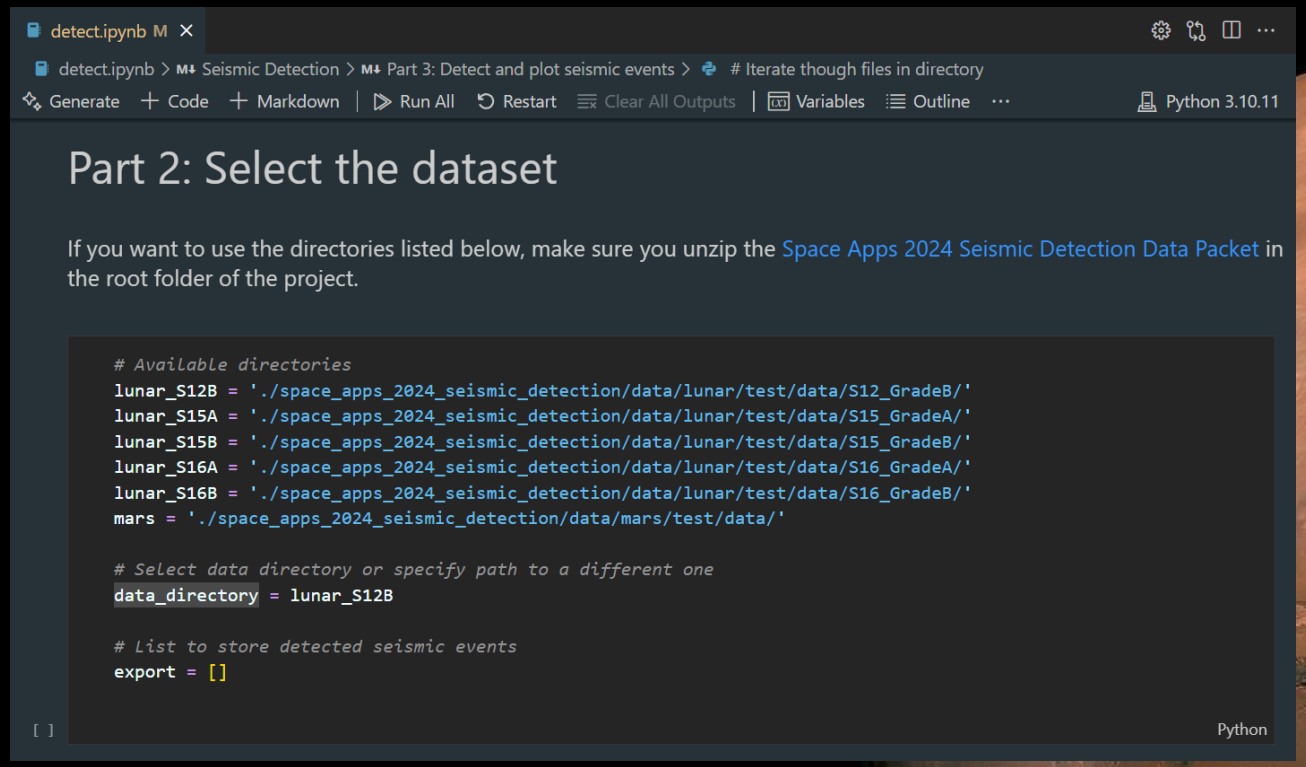
2024 NASA Space Apps Challenge

# Seismic Event Detection Algorithm – SEDA

## Demonstration



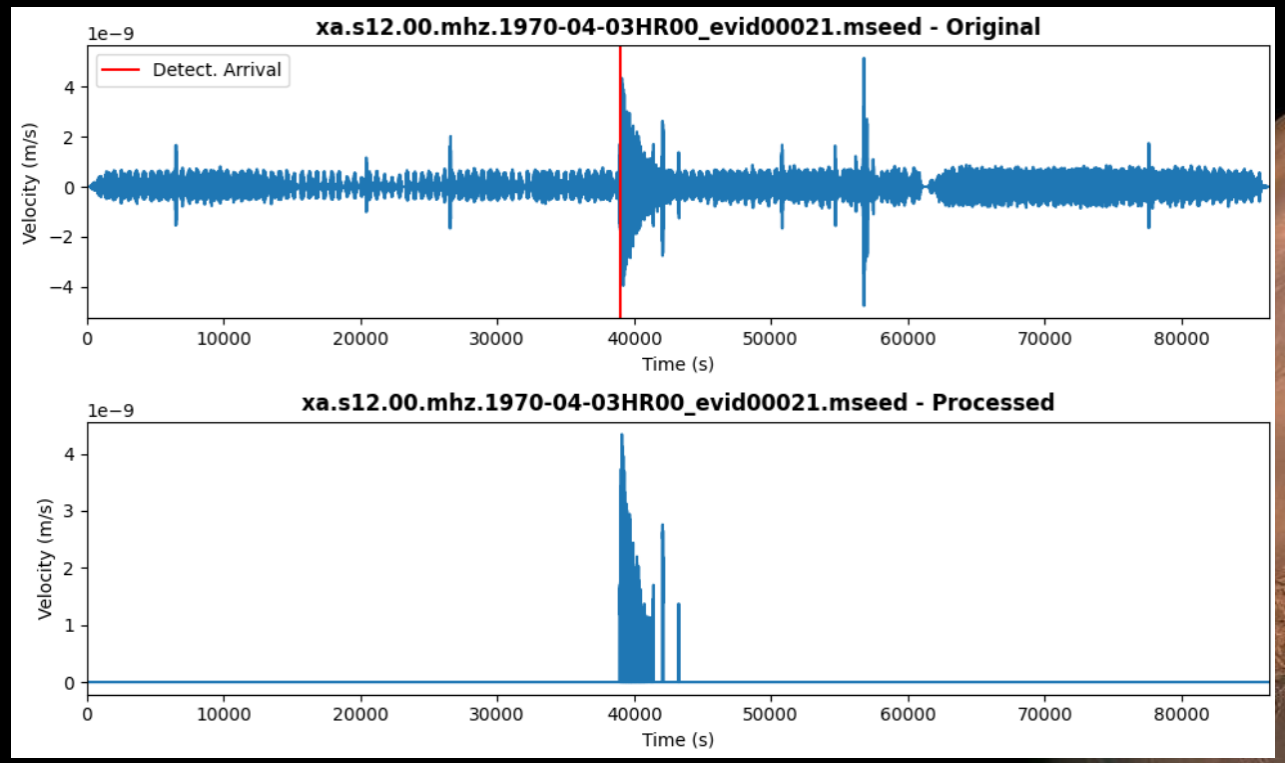
**After following the README setup instructions and navigating to *detect.ipynb*, we select the data directory which we wish to process and plot.**




**Afterwards, we run all cells in sequence.**

If successfully run, the program will plot all pairs of data in the specified directory.

The ".. - Original" represents the raw data we started with.
The ".. - Processed" represents the filtered data which we use to detect the beginning of the seismic event (detected arrival).

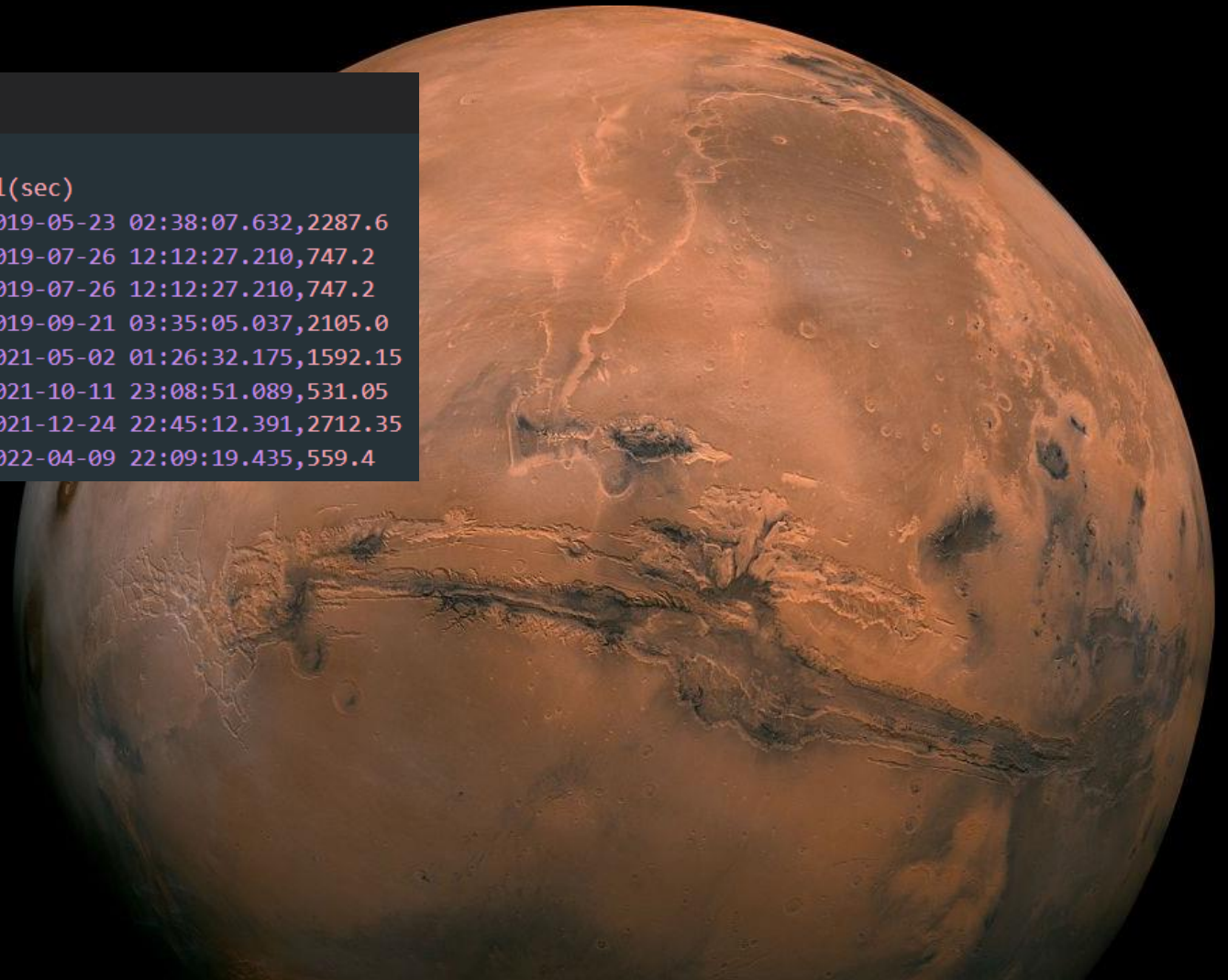


**The relative timestamp of the detected arrival for each of the original .mSEED files is then stored in the *catalog.csv* within the time_rel(sec) column. This makes it easy for users to find the onset of the seismic event within the original, noisy data.**

detect.ipynb ● | *catalog.csv* ×

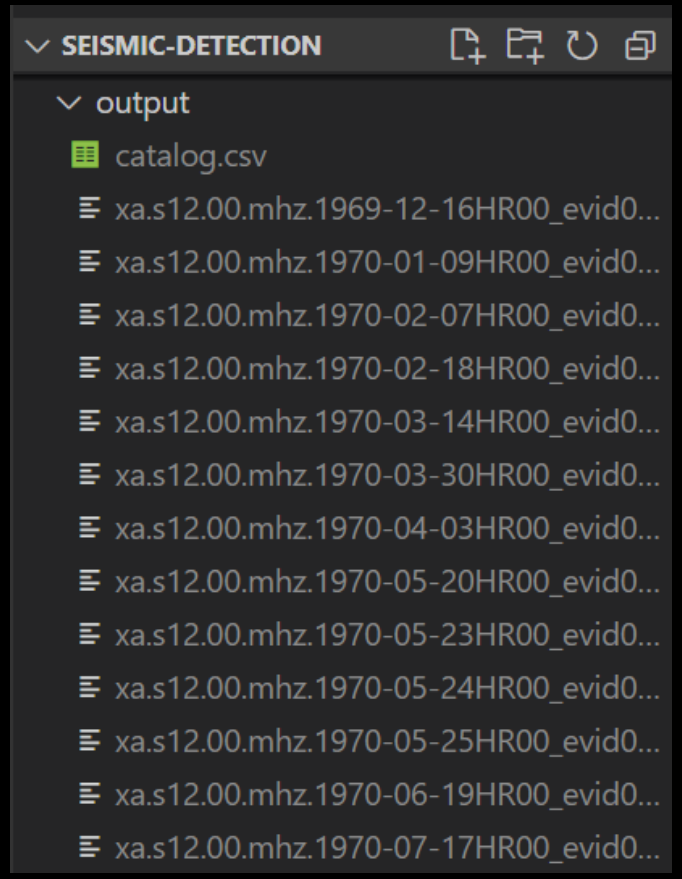
output > catalog.csv > data

```
1  filename,time_abs(%Y-%m-%dT%H:%M:%S.%f),time_rel(sec)
2  XB.ELYSE.02.BHV.2019-05-23HR02_evid0041.mseed,2019-05-23 02:38:07.632,2287.6
3  XB.ELYSE.02.BHV.2019-07-26HR12_evid0033.mseed,2019-07-26 12:12:27.210,747.2
4  XB.ELYSE.02.BHV.2019-07-26HR12_evid0034.mseed,2019-07-26 12:12:27.210,747.2
5  XB.ELYSE.02.BHV.2019-09-21HR03_evid0032.mseed,2019-09-21 03:35:05.037,2105.0
6  XB.ELYSE.02.BHV.2021-05-02HR01_evid0017.mseed,2021-05-02 01:26:32.175,1592.15
7  XB.ELYSE.02.BHV.2021-10-11HR23_evid0011.mseed,2021-10-11 23:08:51.089,531.05
8  XB.ELYSE.02.BHV.2021-12-24HR22_evid0007.mseed,2021-12-24 22:45:12.391,2712.35
9  XB.ELYSE.02.BHV.2022-04-09HR22_evid0002.mseed,2022-04-09 22:09:19.435,559.4
```



**The files which *catalog.csv* points to are original, noisy files which have been trimmed to start at the onset of a seismic event. This reduces the amount of extra data which needs to be analyzed, but very importantly keeps the rest of the data unaltered, so that a true analysis of the sample can be done.**

**It's important to note that even though we store the trimmed files, the relative timestamp for detected arrival (inside catalog.csv) can be used in the original untrimmed files found in the data pack. This is due to the relative time stamp corresponding to the full length of the original file which was analyzed.**




# Future Work

1. Website or GUI to assist scientists/users in analyzing/viewing the data
2. Implementing a Machine Learning model to exclusively label the type of seismic event (impact, deep, etc.)
3. Pipeline to streamline the process of cleaning up the data and outputting usable files
4. Improved data packet compression