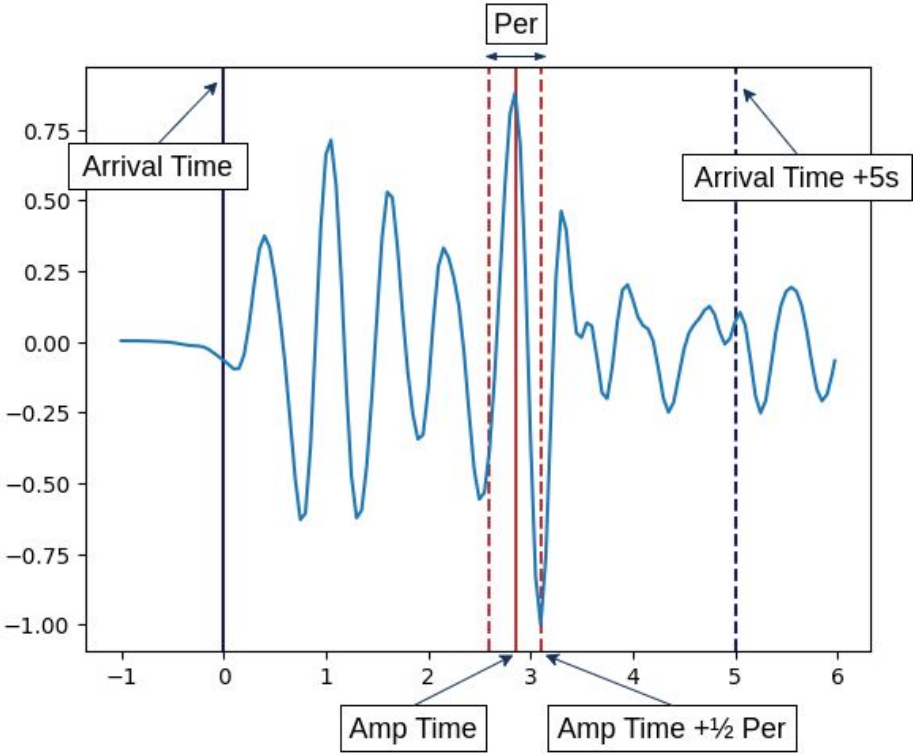
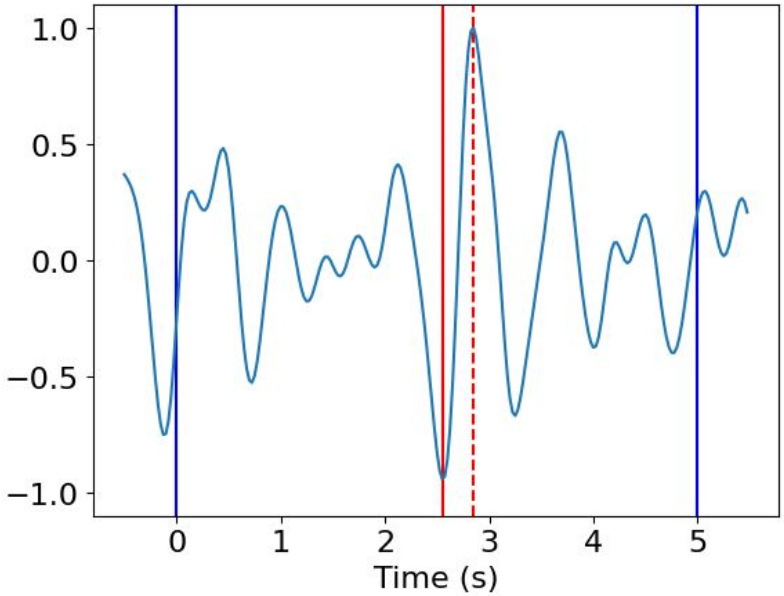
PAW: Seismic Phase Amplitude and Period Waveform Detection

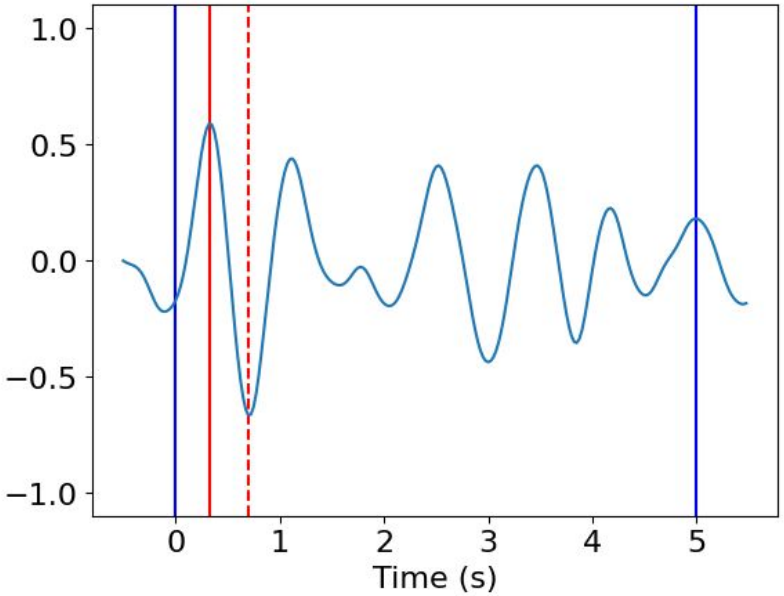
Amplitude Window



The period and amplitude is measure inside the picked amplitude window.

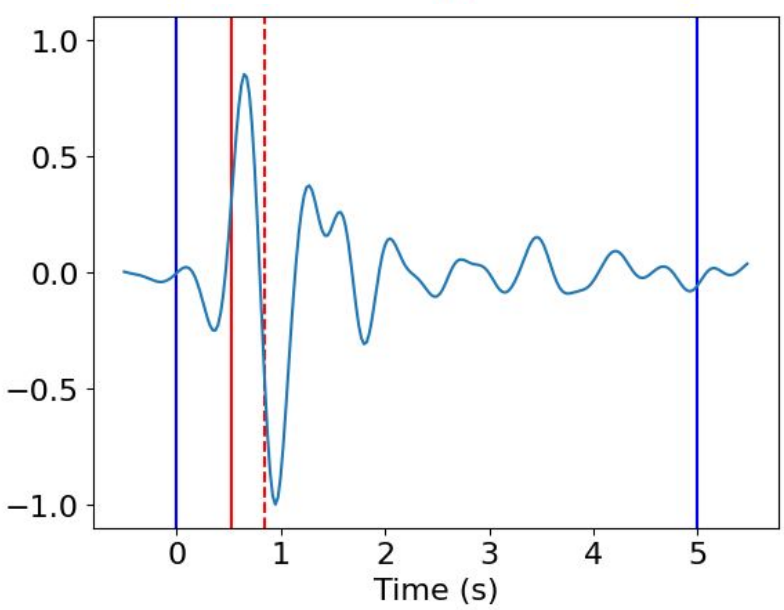
Examples ...

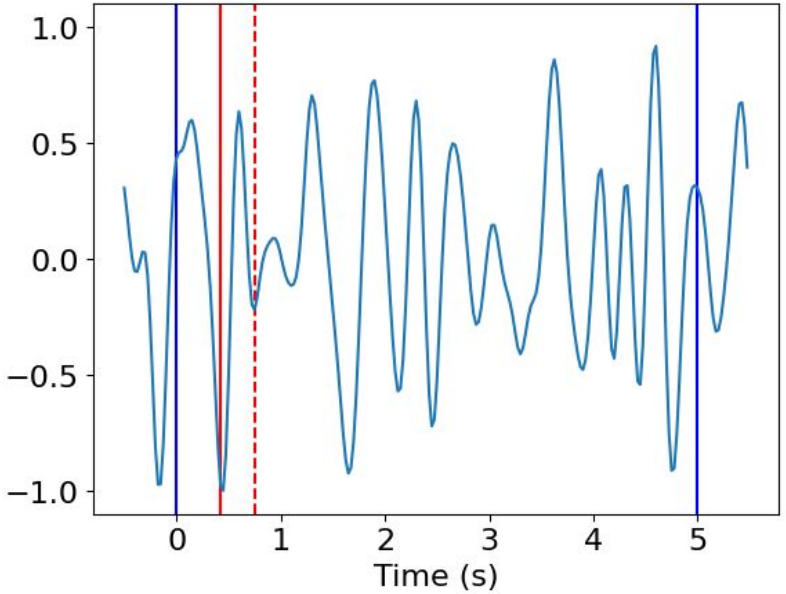




Some examples clearly shows a half-cycle ...

Examples ...



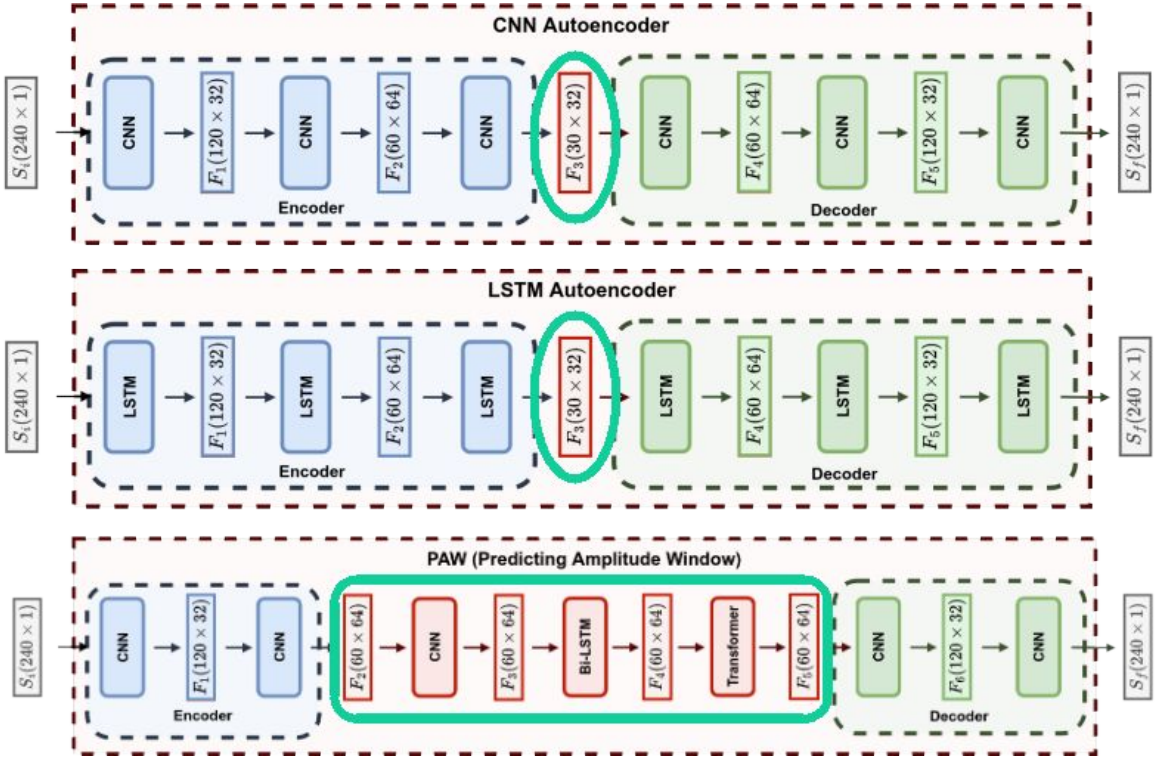


... and some are not intuitive.

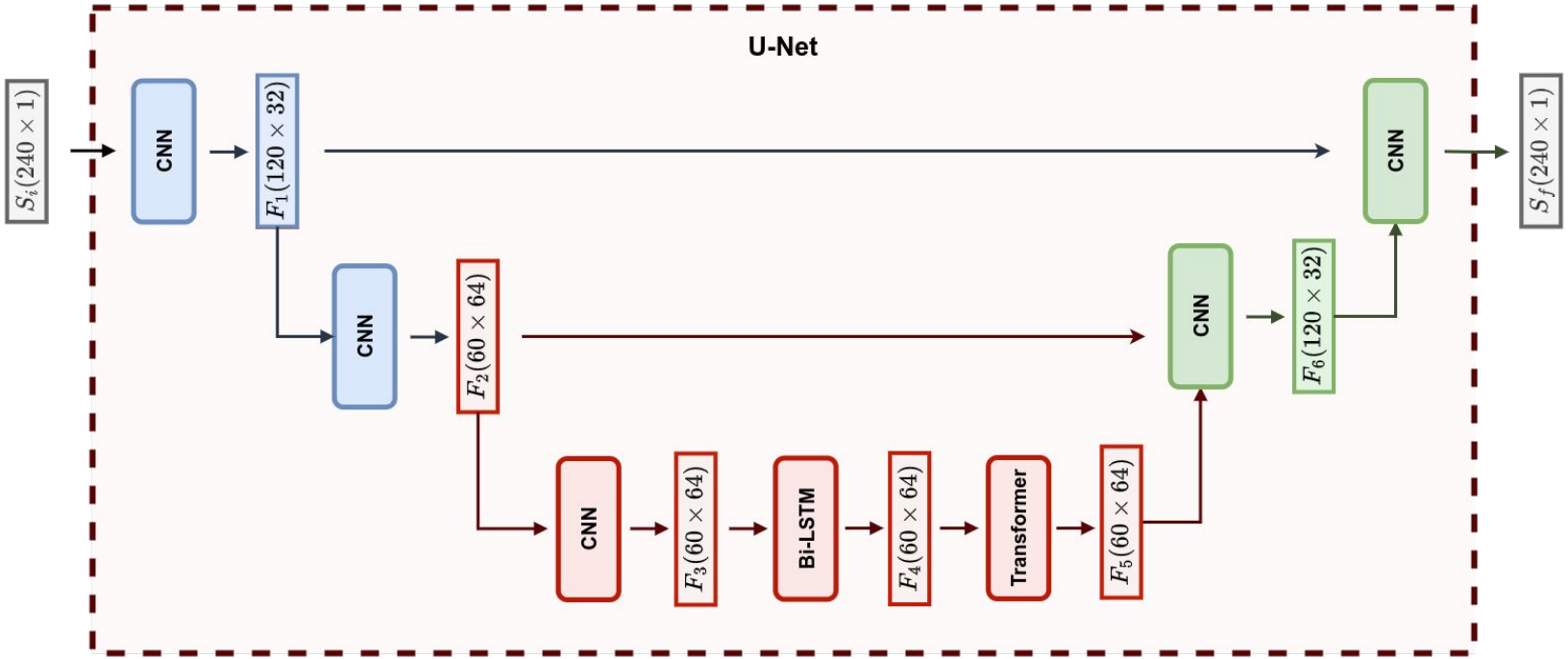
Autoencoder Models

Directly decode the latent representation

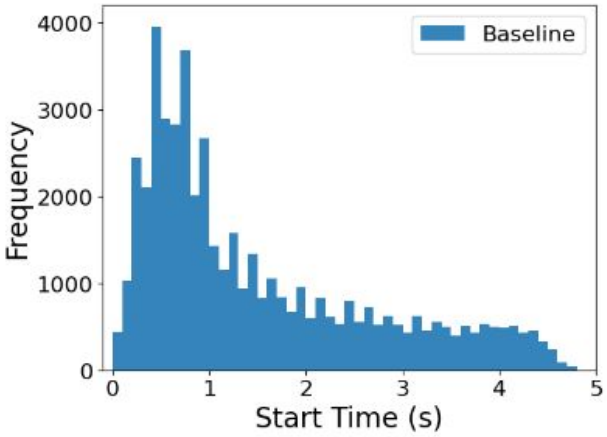
Transformations in latent space

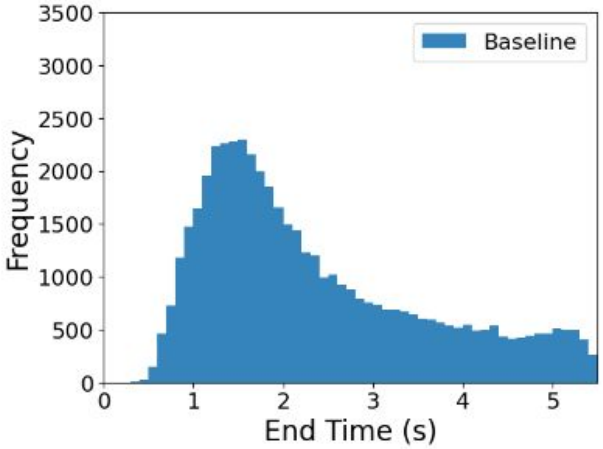


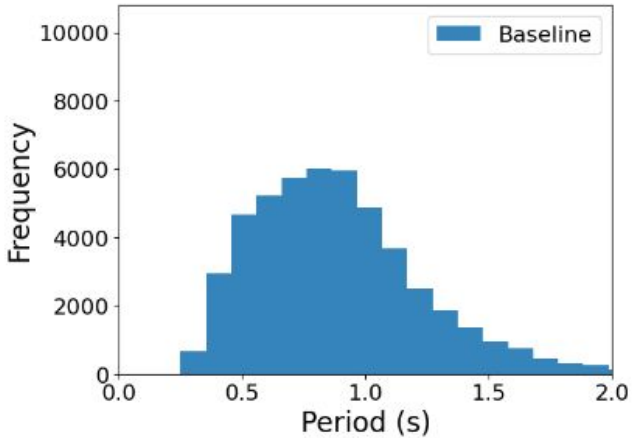
PAW + Skip Connections



Distributions...

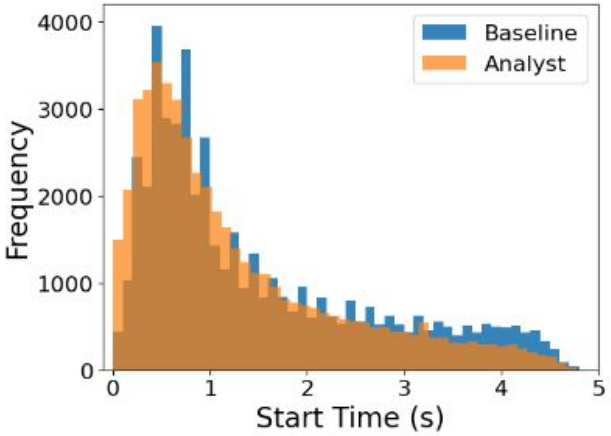


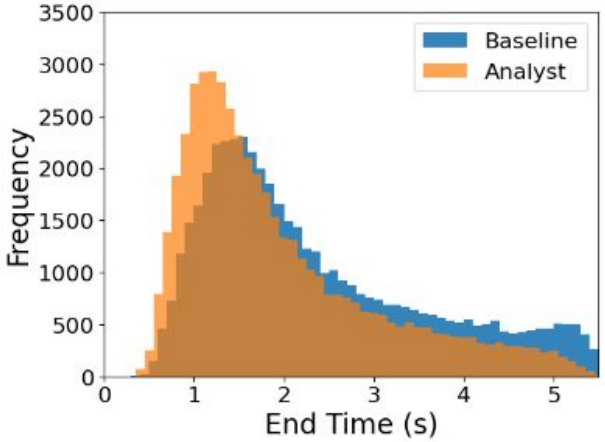


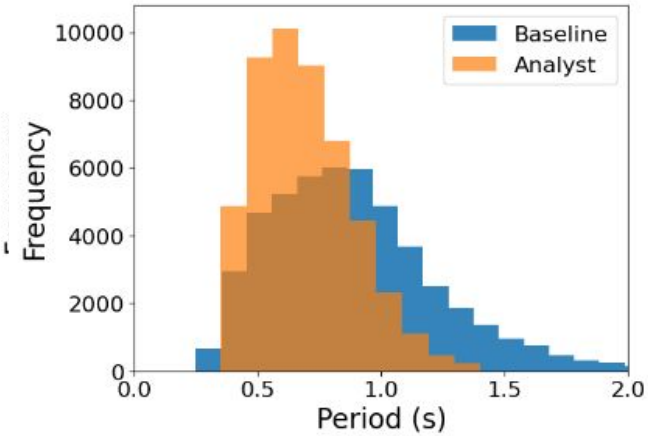


Automated algorithm distribution of start time, end time and period

Distributions...

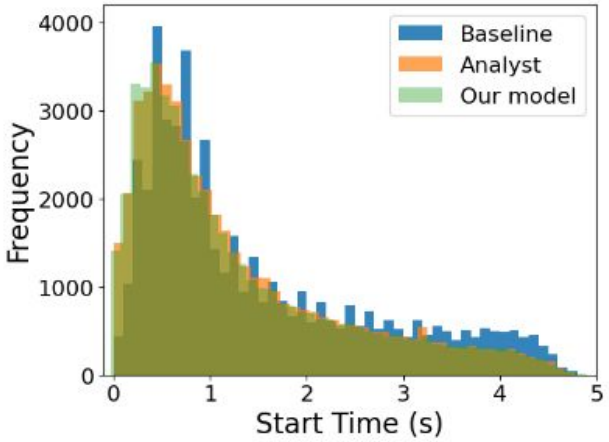


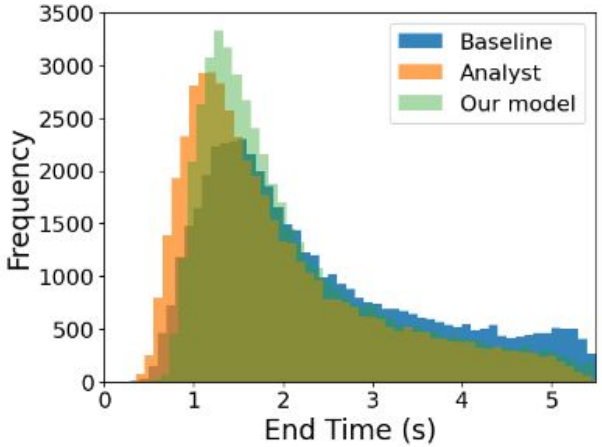


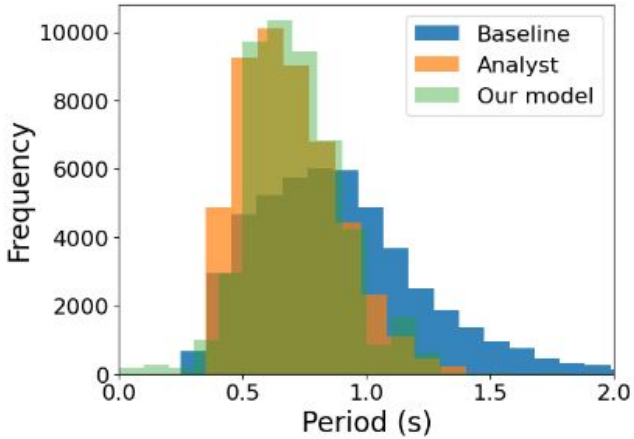


Distributions of the windows corrected by the analysts

Distributions...

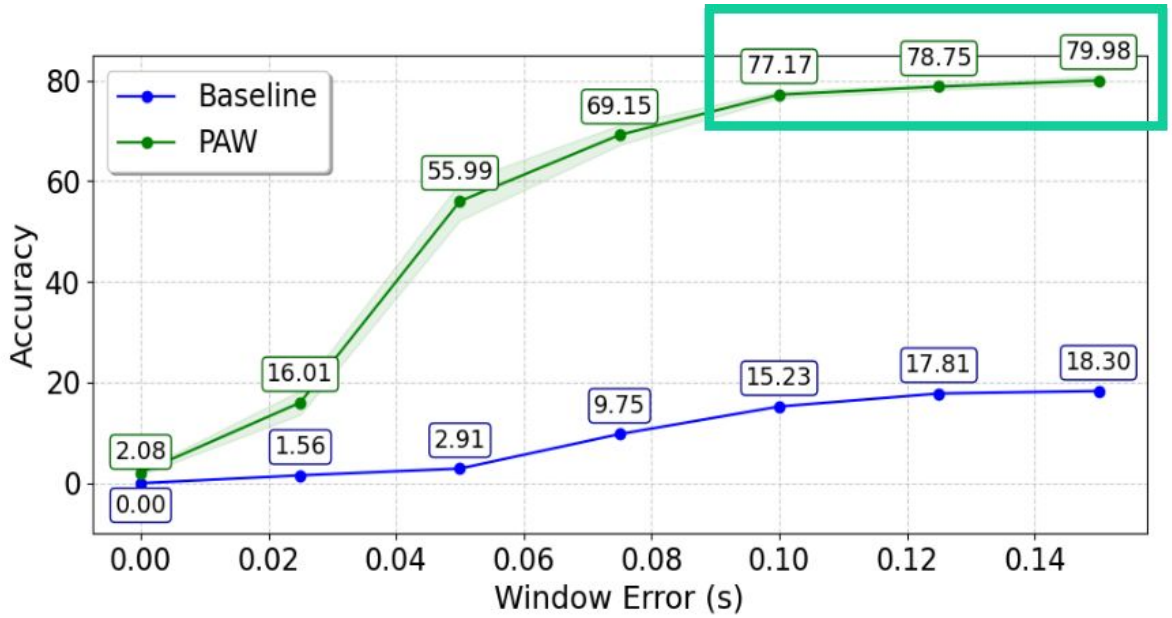






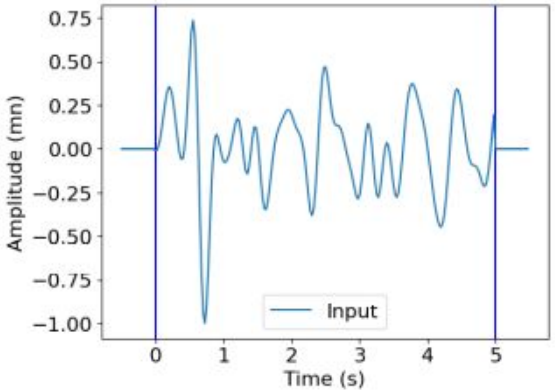
Distributions of our model (PAW), it nearly overlaps the analysts' distributions!

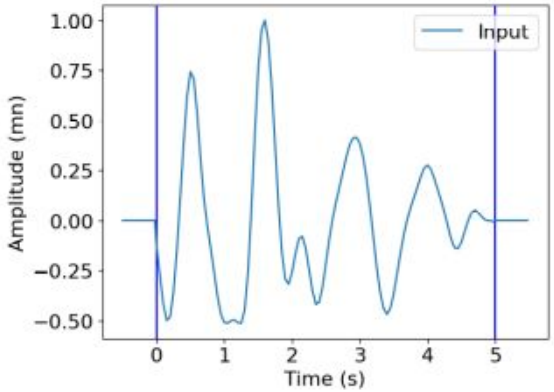
Sensitivity to window error

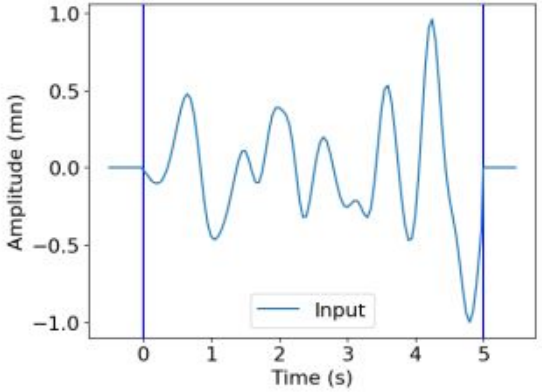


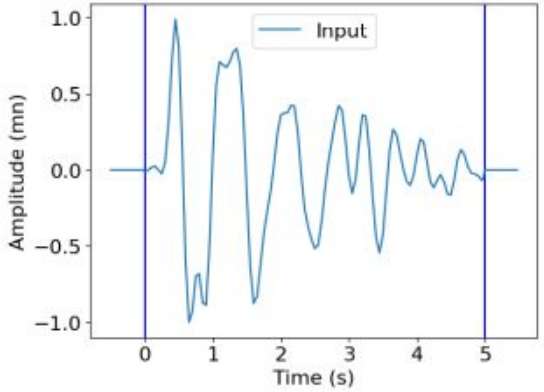
Above 0.1s window error, we reach an accuracy plateau close to 80%!

Limitation: Examples of PAW failing



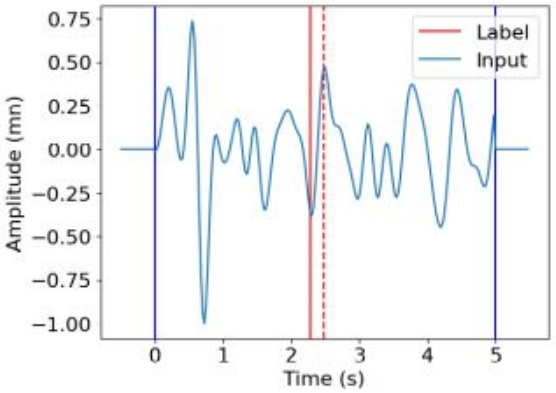


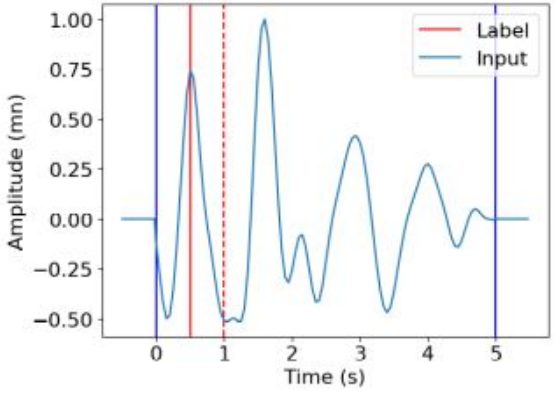


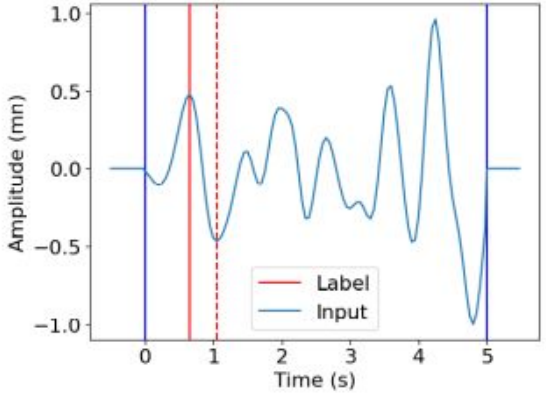


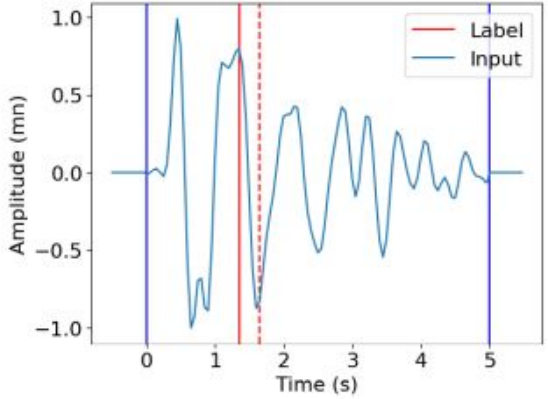
Some waveforms are less smooth

Limitation: Examples of PAW failing



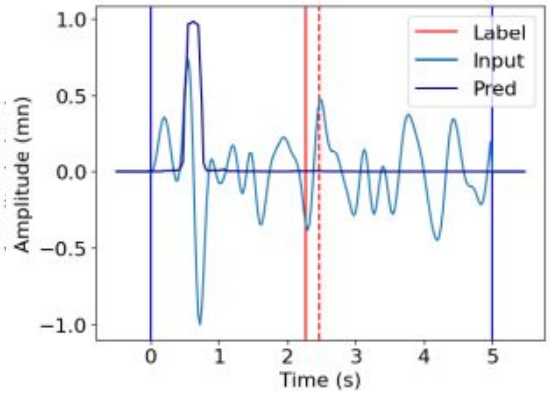


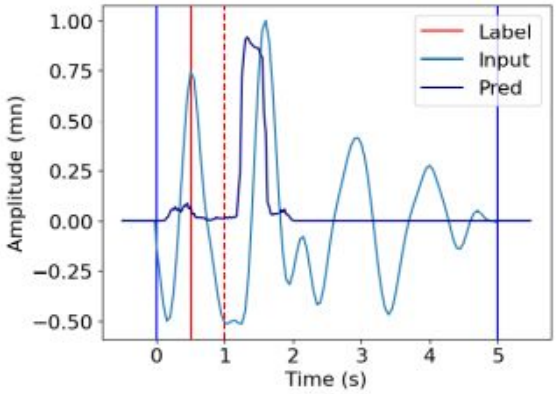


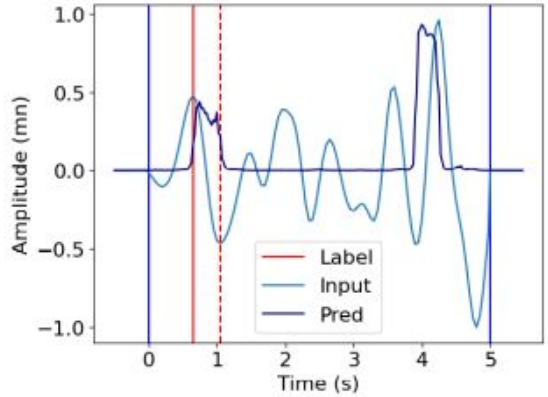


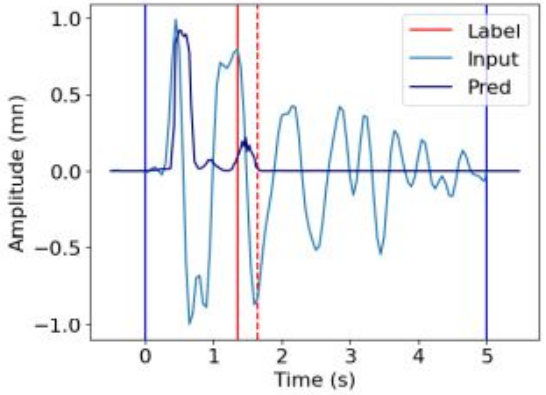
The amplitude window not always have the greatest amplitude

Limitation: Examples of PAW failing



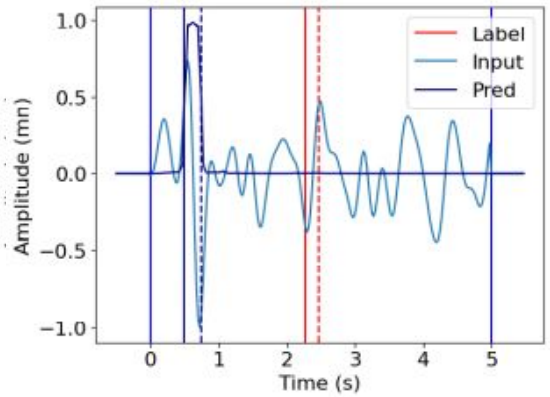


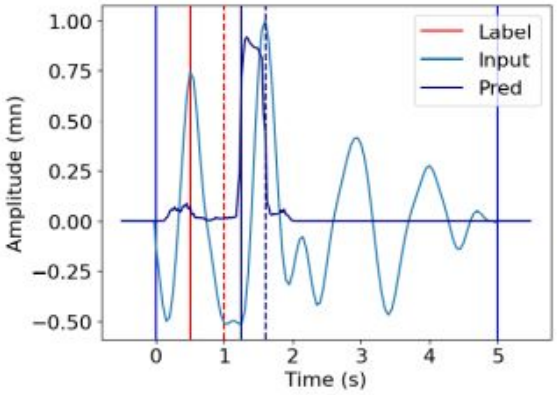


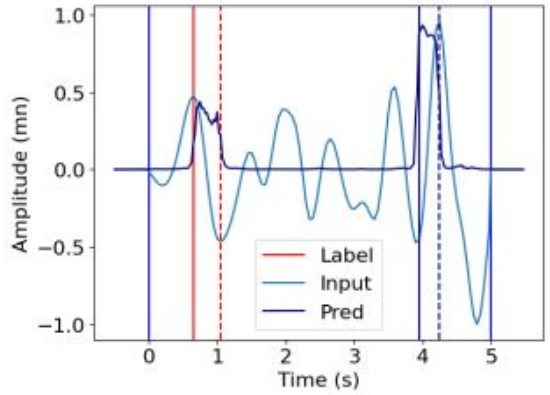


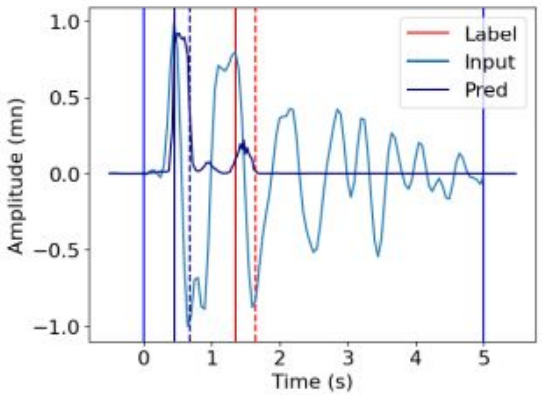
PAW is confident that the amplitude window is located in other half cycle

Limitation: Examples of PAW failing



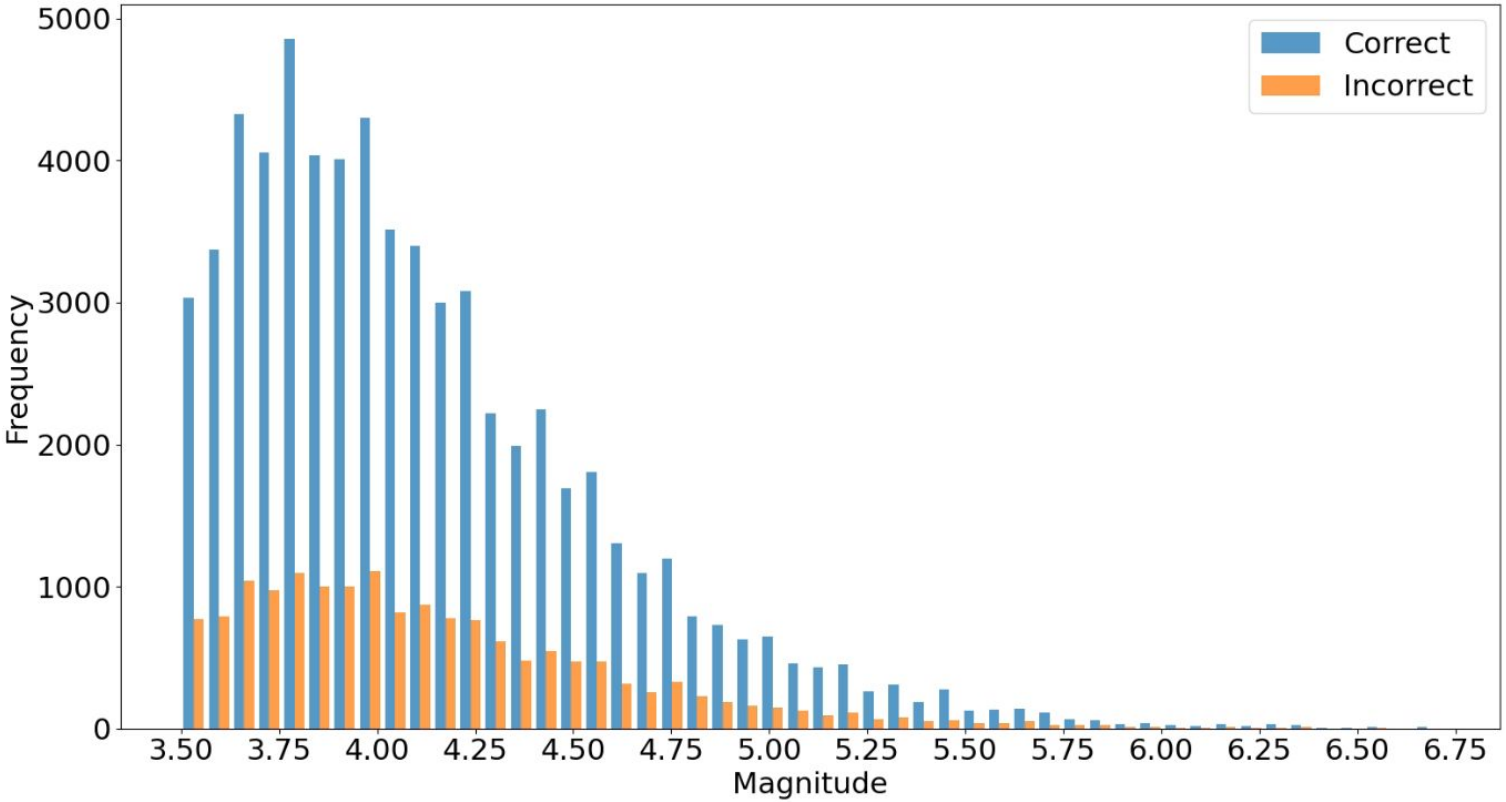




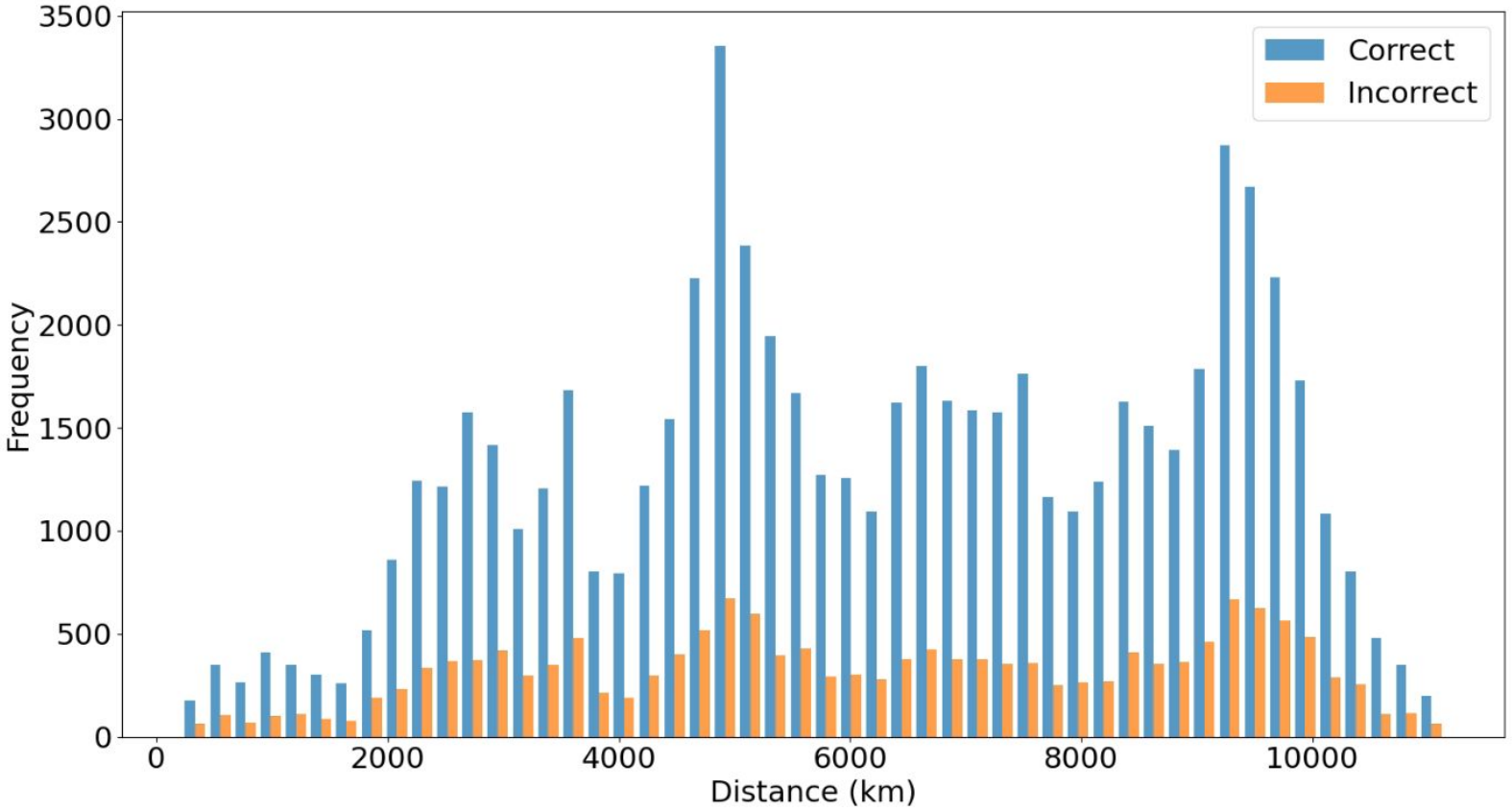


The amplitude window chosen by PAW usually has a higher amplitude than the label

Magnitude


Correct
Incorrect
Frequency
5000
4000
3000
2000
1000
0
3.50
3.75
4.00
4.25
4.50
4.75
5.00
5.25
5.50
5.75
6.00
6.25
6.50
6.75
Magnitude

Distance


Correct
Incorrect
Frequency
Distance (km)
0
500
1000
1500
2000
2500
3000
3500
0
2000
4000
6000
8000
10000