

## **759 Final Project Proposal**

**Problem statement:** In seismic study, two methods to improve signal to noise ratio (SNR) are commonly used: 1) linear stacking, reduce noise by average waveform amplitude over group of signals; 2) phase wave stacking, reduce noise by average complex expressions of a group waveform signals. The complex expressions include both instantaneous phase and amplitude information. In my final project, I will use CUDA to implement both methods to improve the SNR of group of repeated earthquake signals.

**Motivation/Rationale:** I am a PhD student in seismology. Processing seismic signals is what I do every day. Previously, most of the seismic signal processing are done on single machine with sequential processing on CPU. Due to the increasing volume of seismic waveforms recorded nowadays, it is import to improve the efficiency of processing seismic signals. Other than doing so with distributed system, using GPU is achievable and manageable for small seismic labs. Seismic signal are all 1-dimensional amplitudes in time domain. Doing the stacking is simply array manipulation. GPU would bring a significant execution time decrease for regular signal processing on CPU.

**How you plan to go about it:**

1. Work on io handling of the seismic signal in a special format.
2. Implement the linear stacking method.
3. Implement the PWS method.
4. Compare them with sequential processing in regards of efficiency and SNR improvement.

**How you will demonstrate what you accomplished:**

1. Compare the results from GPU version with regular CPU version in regards improvement of SNR. If the GPU implementation is done right, the SNR improvements should be exactly the same for GPU and CPU versions of the same method.
2. Compare the time spent on the CPU and GPU version as the number of signals processed.
3. Analysis the grid and block dimension configuration effect on GPU processing efficiency with respect to the seismic signal array length.

**Team members:** Bin Guo. Carry out the whole project by myself.

**Deliverables:**

1. GPU version of linear stacking method.
2. GPU version of PWS stacking method.
3. Discussion on the performance in regards of 1) accuracy; 2) efficiency.

**Participate in Rescale sponsored Final Project competition:** No.

**Link to your Final Project Repo:** [https://github.com/BinQuake/CS759\\_final\\_proj](https://github.com/BinQuake/CS759_final_proj)

I invited Dan and Tim. But I can't find Nirvedh's github account.