



CIDeR-ML Workshop

Plans and Goals

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Status (slides taken from Cesar)

- Neutrino 2024: Talked with Cesar, we decided to move from Taichi framework to JAX due to multiple reasons.
- NPML: Cesar translated SimpleSim from Numpy to JAX and achieved good gradients and optimization for 7 parameters (track origin, track direction, Cherenkov angle).

Next steps (@ Summer Workshop & beyond):

- 1) Improve execution speed. Currently a bottleneck for the study. First step is to identify what is driving the time reduction from numpy implementation to JAX implementation. Might need to change quite significantly the propagation logic.
- 2) Optimize track length (photons are currently distributed along the track length randomly without breaking the grads, but want to check if this is true for length itself.)
- 3) Implement attenuation (and optimize normalization and att length). Just because this is something we were doing with Taichi, so it is likely a good idea to reach the same point.
- 4) Implement reflections & scattering.

Time assessment: Doing all steps above at summer workshop might be over optimistic. The current plan is for me to work on step 1 and try to reduce the execution time. Cesar is planning to look into 4 (adding random effects). We also plan to discuss strategies for the rest in preparation for my long stay at IPMU.

Plans for this week and the next

- I have two different ongoing projects that are somewhat related. One on WC and the other on LArTPC. My current plan is to work on the LArTPC side for 2-3 days, then on the WC for the rest of the workshop
- WC:
 - Look over the entire JAX code and try to fully understand it.
 - Profile each part of the code to try and find the bottleneck
 - Redesign some parts of the code if necessary
- LArTPC:
 - I am working on a different project of trying to combine PMT and wireplane information into one model. This project focuses on working with low level information (raw detector wire/pmt waveforms)
 - Goals for this workshop is to look into how to efficiently compress a waveform using a discrete wavelet transform

Example of denoising work so far

Centered PMT Wave vs. Denoised Waves

