IRIS-HEP Fellow Project Proposal

Peter Chatain

A Common Tracking Software (ACTS) is an experiment-independent project designed to leverage modern computing architecture to reconstruct particle paths in detectors, such as the High-Luminosity Large Hadron Collider (HL-LHC). One part of this software is track seeding - the process of finding initial parameters for the trajectories of charged particles and is described in more detail in the links below.[1,2] These initial parameters are then propagated forward and fitted in later steps to get the final particle paths. Track seeding is computationally expensive, since the combinatorial possibilities explode as the number of data points increases. Examples already exist for the track propagation and fitting steps, but not yet for track seeding, so it is a needed area for ACTS.[3]

I will be implementing an example algorithm in the ACTS framework such that track seeding algorithms can be tested in a standalone manner. Once this is complete, I will work on some of the ongoing work with the Stanford and LBNL groups on the parallelization of the track finding and seeding for ACTS. Specifically, my mentors are Lauren Tompkins and Rocky Garg from the Stanford physics department. With these mentors, I'm a part of the Stanford summer physics research program that lasts for eight weeks (June 22nd - August 14th), but I plan to work for 10 or 12 weeks. My project falls under the Innovative Algorithms R&D area, and the end deliverable will be a working example track seeding algorithm for ACTS located in the GitHub project below.[4] If that deliverable is met, I will work on testing and implementing track seeding algorithms.

[1] https://arxiv.org/pdf/1910.03128.pdf
[2] https://cds.cern.ch/record/2243297/files/ATL-SOFT-PROC-2017-030.pdf
[3] https://github.com/acts-project/acts/tree/master/Examples/Algorithms/Fitting/src
[4] https://github.com/acts-project/acts/tree/master/Examples