Chapter 1

Research Plan

The research plan for the PhD thesis work is organised as follows:

- For the first semester of 2014/2015:

  - Requirements elicitation of all physics features to implement on the framework together with the LIP researchers.
  - Validate the proposed framework design and new data analysis programming model.
  - Redesign of the features already implemented in LipMiniAnalysis to fit the new framework requirements.
  - Assess and compare the performance of various C++ collections to store various events on memory.
  - Extend the current event data structure to fit the requirements of all data analysis:
    * By adding the all variables in the ROOT input data files, or;
    * By the user defining which variables are needed for a given analysis, and the data structure being automatically created using that information;
  - Extend the I/O features available in LipMiniAnalysis:
    * By reading multiple input data files in parallel;
    * By build the event data structure in parallel;
  - Assess and compare the performance of DICE, StarPU, and Legion libraries and their available performance models for irregular workload balance in:
    * Homogeneous systems;
    * Heterogeneous systems with hardware accelerators;
    * Heterogeneous cluster nodes;

- Support for hybrid process/thread automatic parallelization with partial integration with the chosen parallelization library.

- Present the first framework prototype without hardware accelerator support in March 2015.

- For the second semester of 2014/2015:

  - Assess the extendibility of the chosen parallelization framework to support the Intel Xeon Phi hardware accelerator.

  - Complete the proposed framework integration with the parallelization library to support GPU accelerators.

  - Adapt the parallelization library to support Intel Xeon Phi accelerator.

- For 2015/2016:

  - Update the state of the art research on software and hardware environments for heterogeneous platforms.

  - Improve the performance across multiple computing nodes in cluster environments.

  - Extend the functionalities of the proposed framework.

  - Thesis write up.