IRIS-HEP Fellowship Proposal
Aaron Wang

Duration: January 2020 - June 2020
WBS: Analysis Systems (AS)
Project: Jupyter Notebook Compatibility with ROB (Reproducible Open Benchmarks for Data Analysis Platform)
Funding Period: 5 months (20 weeks) of 1/4th FTE time commitment

The Reproducible Open Benchmarks for Data Analysis Platform (ROB)[1] is a platform that allows for the evaluation of different data analysis algorithms in a controlled competition-style format. The benefit of ROB is that it allows for concrete comparison between neural networks, especially where the efficacy of neural networks are yet to be clearly compared, and are hard to reproduce: such as in particle jet tagging.

The ROB follows a simple four step workflow [2]. First, a common input data set used for benchmarks is imputed by the benchmark coordinator. Then the users provide code and prediction stages of the machine learning model. Lastly, metrics are evaluated with tables and plots as defined by the benchmark coordinator. Through this, different users are able to apply separate machine learning models on a common data set, in a controlled environment (ROB).

Although the ROB is already useful, it is still missing compatibility with the commonly used Jupyter Notebooks. Currently, the ROB only supports code for preprocessing and prediction stages in python files. Since machine learning models are often developed in Jupyter Notebooks, needing to convert the code into a compatible file before submitting it to the ROB can be an unnecessary step. Two possible ways that this problem can be solved is by either using PaperMill[4], a tool for parameterizing and executing Jupyter Notebooks, which transforms the notebooks into Docker containers and running them as workflows, or by extending the ROB client so that it can be used from within the Jupyter Notebook by developing a python library that runs ROB from python notebooks. Under the local supervision of Professor Shih-Chieh Hsu (UW), and the technical guidance of Heiko Müller (NYU), I will be exploring these two possibilities, and then engineering a way to make Jupyter Notebooks compatible with the ROB.
Anticipated Schedule of Deliverables

1st Month (40 Hours)

Week 1 - 3:
- Familiarize with ROB by reading developer documentation and running the provided ROB demos
- Understand the input requirements of the code for the submitted pre-process and prediction files in ROB

2nd Month (40 Hours)

Week 4-7:
- Read PaperMill documentation and explore the suitability of using PaperMill as part of the compatibility project
- Explore integrating ROB clients into Jupyter notebook, and evaluate which method will work better.

Week 8:
- Start developing the ROB and Jupyter Notebook compatibility software

3rd to 5th Month (40 Hours per month)

Week 18:
- Have code finished and start running tests

Week 19:
- Finalize python library and start writing documentation

Week 20:
- Finalize documentation and upload code to a github repository available publically

Academic Workload: During the time, I will also be taking a full course load at the University of Washington

References: