Roman Pots Matrix R&D Meeting

Friday, February 17th, 2023

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Timeline and tasks

➢We have an Indico: https://indico.bnl.gov/category/468/ (Thank you, Elke!!)

- Get current codes working in DD4HEP (1 more week).
  - Identified issue in EICRecon (finally) yesterday – should have it fixed today, and then I will port the updated reco code.
- Give David test analysis code and output files (today).
- Identify best ML algorithm for our application (1-2 weeks).
  - Part of "best" means something that is also implementable, with a standard package (PyTorch, TensorFlow, etc.).
- Discuss ML software package with software group (March-April).
  - We may already have ML libraries in the ePIC framework.
  - Not ideal: there is a loosely working PyTorch implementation, but it seems to have problems. Perhaps we can use it as a test bed.
- **N.B.**: We may want to aim for an "offline" solution which we can test on the hit information from S3 output, and then look to implement in ePIC.
  - Better for us to have a fully-tested solution before asking software group for any help – they are overloaded, and the more we have ready to go, the better chance we can get help implementing in ePIC.

Location of codes (for the very near term)

- I have put a small chunk of data + an input file list on Google Drive.
  - This is because there are 2.5 Gb of data files there right now, not ideal for GitHub.
  - https://drive.google.com/drive/folders/17UXHNNEERUJkyZ024-3n2dEluQhHz9DB?usp=share_link
- The analysis code is on GitHub: https://github.com/ajentsch/ePICOfflineAnalysis
- Data files can be found on S3.
  - https://dtn01.sdcc.bnl.gov:9001/login (eicS3read)

What the analysis code does

- Reads-in the data files from the supplied list.
- Takes hit information from RP layers – if there are 4 hits in the reasonable z-ranges, it attempts to reconstruct.
- This algorithm uses the “static” RP matrix, which should give very nice results for DVCS.
- It also analyzes the “smearedFFParticle” output, which is a fast plugin for people more-focused on the main detector response for exclusive processes.

How does this differ from the ePIC framework?

- Analysis codes are not hosted in the ePIC framework, only the codes used to do GEANT simulations and reconstruction.
  - Yes, this code *does* reconstruction, but that's because of a bug in ePIC, at the moment.
- In the short term, it makes more sense to do development "offline", using the ePIC framework to perform full simulations with the particle gun, as needed.
  - This is something I will put together a narrowly-focused tutorial for once I have finished fixing the issue in EICRecon.

Discussion