ZDC Simulation with ML

Wen-Chen Chang

2024/7/5

* Date: July 5 (Friday), 2024

* Time: 1:00-2:00 PM at Taiwan (GMT+8), 7:00-8:00 AM at CERN (GMT+1)

* Zoom link:

https://cern.zoom.us/j/66342263280?pwd=DBemHUOnO6QIiQyU5y2WbeaEaBGcyT.1

Current Participants

郭家銘（中央物理教授）

林伯儒（中央物理教授）

周欣毅（中研院博後）

謝佳諭（中研院博後）

蔡茗名（彰化陽明國中老師，2002年高師大碩士畢業，文箴第一個碩士生）

章文箴

Agenda

- Introduction of project and people (Wen-Chen, 10 mins)
- Status of ZDC GEANT4 simulation (Chia-Yu, 20 mins)
- ZDC ML (Hsin-Yi, 20 mins)
- Planning (Wen-Chen, 10 mins)

Project Overview

- EIC ZDC: 國科會卓越領航計畫、中研院深耕計畫
- ZDC: ECAL + HCAL
  - Energy resolution
  - Position resolution
  - Particle identification (gamma/e/pi,K/p/n)
- Application of ML for Calorimeter
  - Fast simulation
  - Reconstruction
  - Trigger (FPGA+GPU)

Fast Simulation

- Fast Calorimeter Simulation Challenge 2022 https://calochallenge.github.io/homepage/
- CaloChallenge Workshop https://agenda.infn.it/event/34036/overview
- Various models:
  - Normalized flow https://arxiv.org/abs/2210.14245 https://arxiv.org/abs/2405.20407
  - Point Cloud https://arxiv.org/abs/2307.04780
  - …
- Evaluation: https://arxiv.org/abs/2406.12898
- Similar study for ZDC: https://arxiv.org/abs/2406.12877

Plans

- Chia-Yu: define the format of output information from ZDC GEANT4 simulation. (https://arxiv.org/abs/2406.12877 , EIC RECO)
- Hsin-Yi: select the most promising ML approach, considering the availability of source codes/tools.
- Chia-Ming, Po-Ju: Draft manual of running EIC sim.