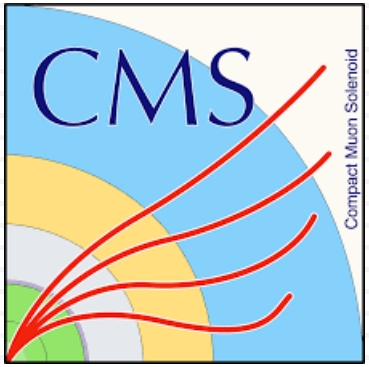
Machine Learning from CMS



Jin Wang

Short term plan from CMS group

- Jet tagging (Old methods with new application in HEP)
  - High-pT(>200 GeV) AK4 b-jets tagging
    - NN architecture + attention mechanism
    - HF jets → longer lifetime → decay closer to pixel layers → larger change in # hits per layer
    - Manpower: Joshuha, Jin
    - Publication: CMS DPS (Detector Performance Summary) note
  - H->WW hadronic jets tagging
    - For H and HH analyses with WW decaying fully hadronically
      - Zhenxuan, Joshuha, Jin etc.
      - Methods: DNN, particleNet etc.
- Pileup mitigation at hardon colliders (New models for general problem in HEP)
  - Use ABCNet (GNN with attention)
    - Let the network learn from two simulated samples containing the same collision events, with and without pileup
    - Learning happens by virtue of optimal-transport-inspired loss function: sliced Wasserstein distance
    - Assign a per-particle weight telling how likely it is for a particle to come from the hard interaction
    - Reweight particles 4-momenta by the network weight and cluster objects
  - Manpower: Fabio Lemmi
  - Status: already very advanced, seeking publication in ML journals