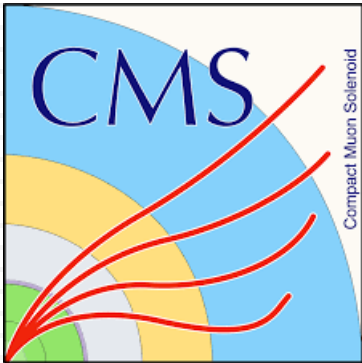# Machine Learning Plans in CMS

Jin Wang

Plans from CMS group

- **Pileup mitigation at hardon colliders**
  - 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, further implementation in CMS, 1 publication in ML journals

- **Jet/event tagging**
  - H->WW hadronic jets tagging
    - For H and HH analyses with WW decaying fully hadronically
      - Matching correct pairs of jets to W in Higgs decays
      - Challenge: validation/scale factors for different taggers
    - Manpower: Zhenxuan Zhang, Jin Wang etc.
    - Methods: DNN, particleNet etc.

- **Generative model research for fast simulation in ECAL**
  - Manpower: Jin Wang, Jie Zhang