Contribution ID: **261** Type: **Theory poster**

Learning Physics at Future e^-e^+ Colliders with Machine

Thursday, May 28, 2020 6:45 PM (1 hour)

Information deformation and loss in jet clustering are one of the major limitations for precisely measuring hadronic events at future e^-e^+ colliders. Because of their dominance in data, the measurements of such events are crucial for advancing the precision frontier of Higgs and electroweak physics in the next decades. We show that this difficulty can be well-addressed by synergizing the event-level information into the data analysis, with the techniques of deep neutral network. In relation to this, we introduce a CMB-like observable scheme, where the event-level kinematics is encoded as the Fox-Wolfram (FW) moments at leading order and multi-spectra at higher orders. Then we develop a series of jet-level (w/ and w/o the FW moments) and event-level classifiers, and analyze their sensitivity performance comparatively with two-jet and four-jet events. As an application, we analyze measuring Higgs decay width at e^-e^+ colliders with the data of 5ab^{-1}@240GeV. The precision obtained is significantly better than the baseline ones presented in documents. We expect this strategy to be applied to many other hadronic-event measurements at future e^-e^+ colliders, and to open a new angle for evaluating their physics capability.

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Session Classification: Poster Session (I)

Track Classification: Upgrade & Future