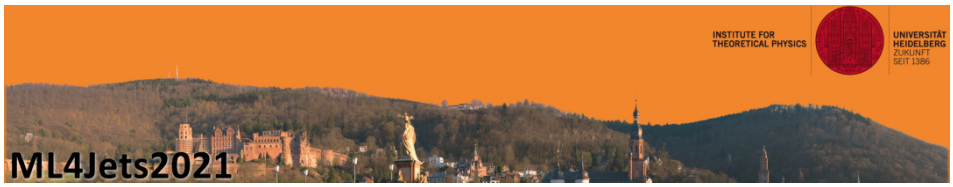

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SO(3)-equivariant Neural Network for b-tagging

Tuesday 6 July 2021 09:00 (20 minutes)

Jets originating from bottom quarks, b-jets, are of particular interest in high energy physics. While b-jets are similar to other jets, they have certain qualities that present unique challenges in the context of machine learning. Generally, there is an underlying rotational symmetry of the particles about a jet's axis. However, in the case of b-jets, some of the most discriminating observables, the transverse and longitudinal impact parameters, are not compatible with this symmetry. To address this, we instead consider the full 3-dimensional vector-valued impact parameter as the relevant observable for b-tagging. We then compare the b-tagging performance of a novel SO(3)-equivariant neural network against a standard baseline architecture of similar complexity. A preliminary study using DELPHES-simulated events with track smearing shows that the equivariant network significantly outperformed the baseline model. In particular, the equivariant model was less prone to over-training and improved background rejection overall and by over 1.5x at the 70% working point.

Affiliation

Yale University

Academic Rank

Undergraduate

Authors: SHIMMIN, Chase Owen (Yale University (US)); SMITH, Ema Catalina

Presenter: SMITH, Ema Catalina

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