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Secondary Vertex finding in Jets with Graph Neural Networks

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Secondary vertex finding is a crucial task for identifying jets containing heavy flavor hadron decays. Bottom jets in particular have a very distinctive topology of ⊠→⊠→⊠ decay which gives rise to two secondary vertices with high invariant mass and several associated charged tracks.

Existing secondary vertex finding algorithms search for intersecting particle tracks, and group them into secondary vertices based on geometrical constraints only. We propose an algorithm where the vertex finding step is performed with a graph neural network. Particle tracks are represented as nodes in a fully connected graph, and the task of vertex finding is cast as a node and edge classification task.

We present performance metrics for evaluating vertex finding performance, and compare the performance of several different graph network architectures on a simulated dataset.

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