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A novel ML-based method of primary vertex reconstruction in high pile-up condition

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The High-Luminosity LHC (HL-LHC) is expected to reach a peak instantaneous luminosity of $7.5\times10^{34}\mathrm{cm}^{-2}\mathrm{s}^{-1}$ at a center-of-mass energy of $\sqrt{s} = 14\mathrm{TeV}$. This leads to an extremely high density environment with up to 200 interactions per proton-proton bunch crossing. Under these conditions, event reconstruction represents a major challenge for experiments due to the high pileup vertices present.
To tackle the dense environment, we adapted a novel ML-based method named Sparse Point-Voxel Convolution Neural Network(SPVCNN), the current state-of-the-art techniques in computer vision, which leverages point-based method and space voxelization to categorize tracks into primary vertices. Then SPVCNN is trained and tested on the samples generated by ACTS.
In this talk, the performance of SPVCNN vertexing will be presented, as well as the comparison with the conventional Adaptive Multi-Vertex Finding(AMVF) algorithm used in ATLAS.

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