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Learning representations of irregular particle-detector geometry with distance-weighted graph networks

Wednesday 17 April 2019 15:30 (20 minutes)

We explore the possibility of using graph networks to deal with irregular-geometry detectors when reconstructing particles. Thanks to their representation-learning capabilities, graph networks can exploit the detector granularity, while dealing with the event sparsity and the irregular detector geometry. In this context, we introduce two distance-weighted graph network architectures, the GarNet and the GravNet layers and we apply them to a typical particle reconstruction task. As an example, we consider a high granularity calorimeter, loosely inspired by the endcap calorimeter to be installed in the CMS detector for the High-Luminosity LHC phase. We focus the study on the basis for calorimeter reconstruction, clustering, and provide a quantitative comparison to alternative approaches. The proposed methods outperform previous methods or reach competitive performance while keeping favourable computing-resource consumption. Being geometry agnostic, they can be easily generalized to other use cases and to other detectors, e.g., tracking in silicon detectors.

Preferred contribution length

20 minutes

Authors: KIESELER, Jan (CERN); IIYAMA, Yutaro (CERN); QASIM, Shah Rukh (SEECS - School of Electrical Engine ering and Computer Science); PIERINI, Maurizio (CERN)

Presenter: KIESELER, Jan (CERN)

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