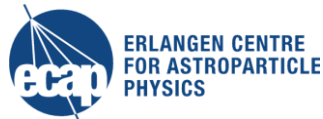# Muon bundle reconstruction with KM3NeT/ORCA using graph convolutional networks

Flash talk

Stefan Reck, Thomas Eberl and Uli Katz for the KM3NeT collaboration

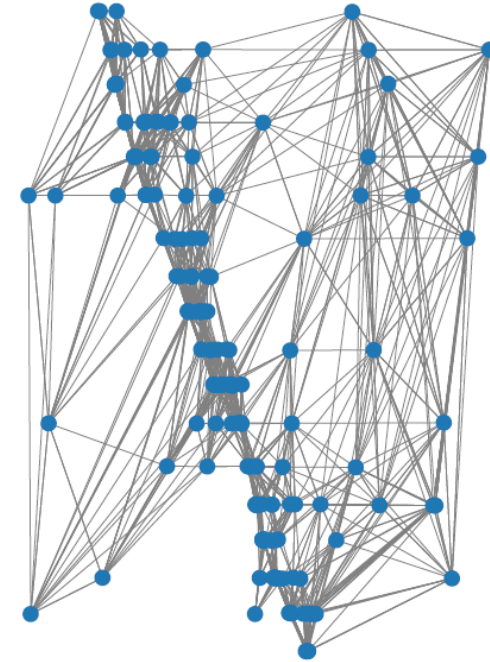*37th International Cosmic Ray Conference (ICRC 2021)*

KM3NeT

ERLANGEN CENTRE FOR ASTROPARTICLE PHYSICS

FAU FRIEDRICH-ALEXANDER UNIVERSITÄT ERLANGEN-NÜRNBERG

KM3NeT/ORCA neutrino detector

- primary goal of ORCA is detecting neutrinos in the GeV energy range

- neutrino oscillations, mass ordering …

- most events are atmospheric muons

➢ useful for detector validation and studying cosmic rays

μ
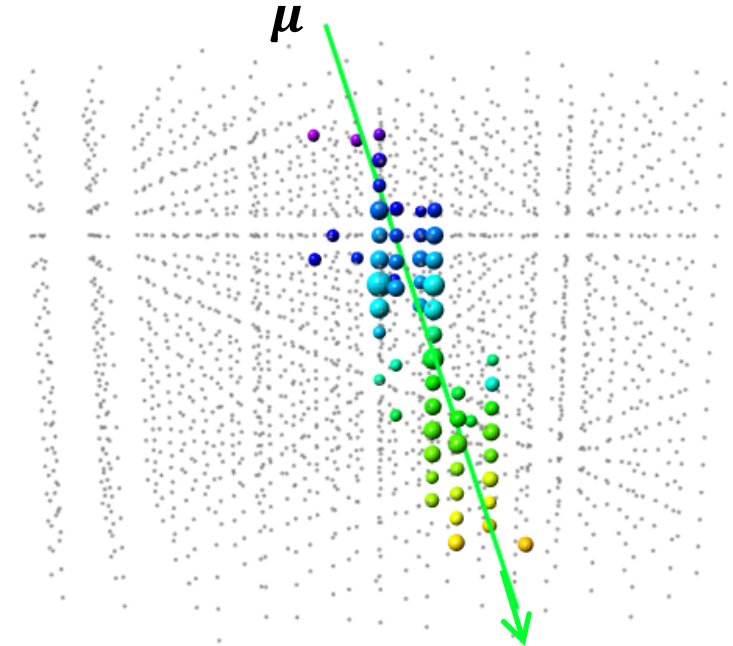
track-like atmospheric muon event

graph neural networks in KM3NeT

- reconstruct muons with graph networks

- each node in the graph represents a hit

- full model has three edge convolutions (ParticleNet*)

graph of an atmospheric muon event

* H. Qu and L. Gouskos, *Particlenet: Jet tagging via particle clouds*, Phys. Rev. D 101, 056019 (2020)

atmospheric muon reco: muon multiplicity

- reconstruct **muon multiplicity**
  (= number of atmospheric muons in an
  event)

➢ application on CORSIKA sibyll 2.3c
  (GST-3) shows: can separate proton
  from iron induced events

KM3NeT Preliminary, ORCA4 simulations