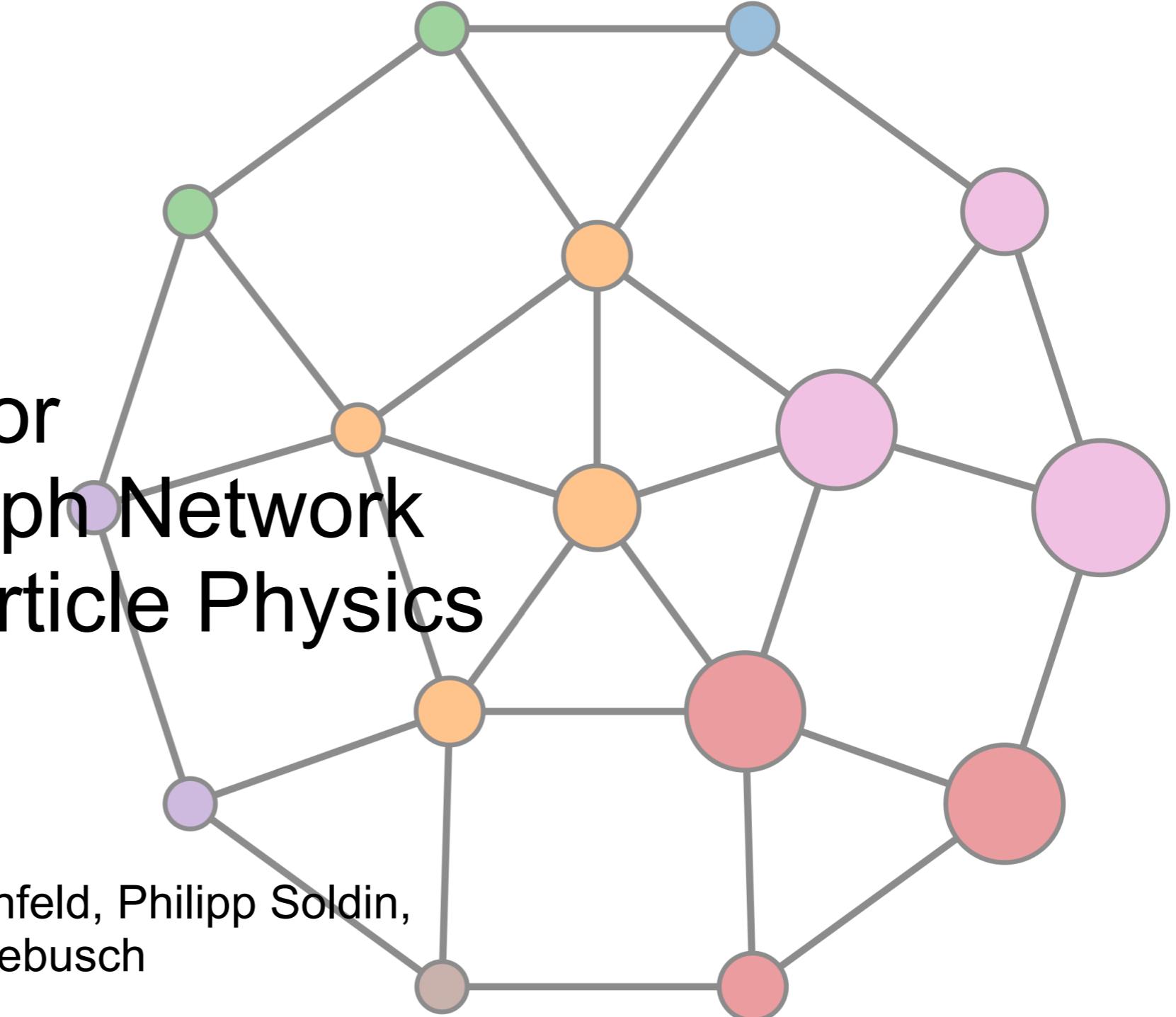




# Partition Pooling for Convolutional Graph Network Applications in Particle Physics

Physics in Collision - Sep. 2022

Markus Bachlechner, Thilo Birkenfeld, Philipp Soldin,  
Achim Stahl, and Christopher Wiebusch

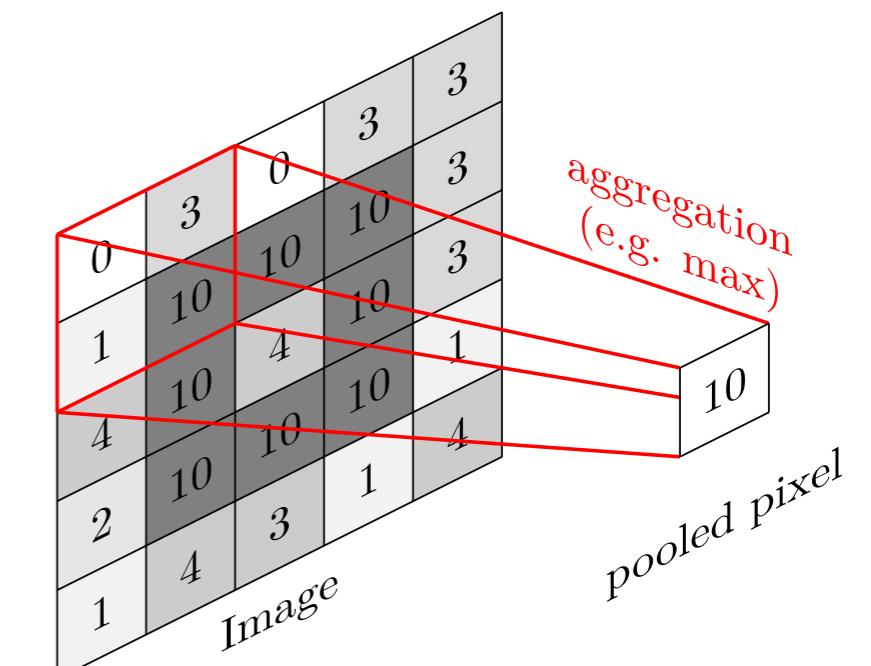
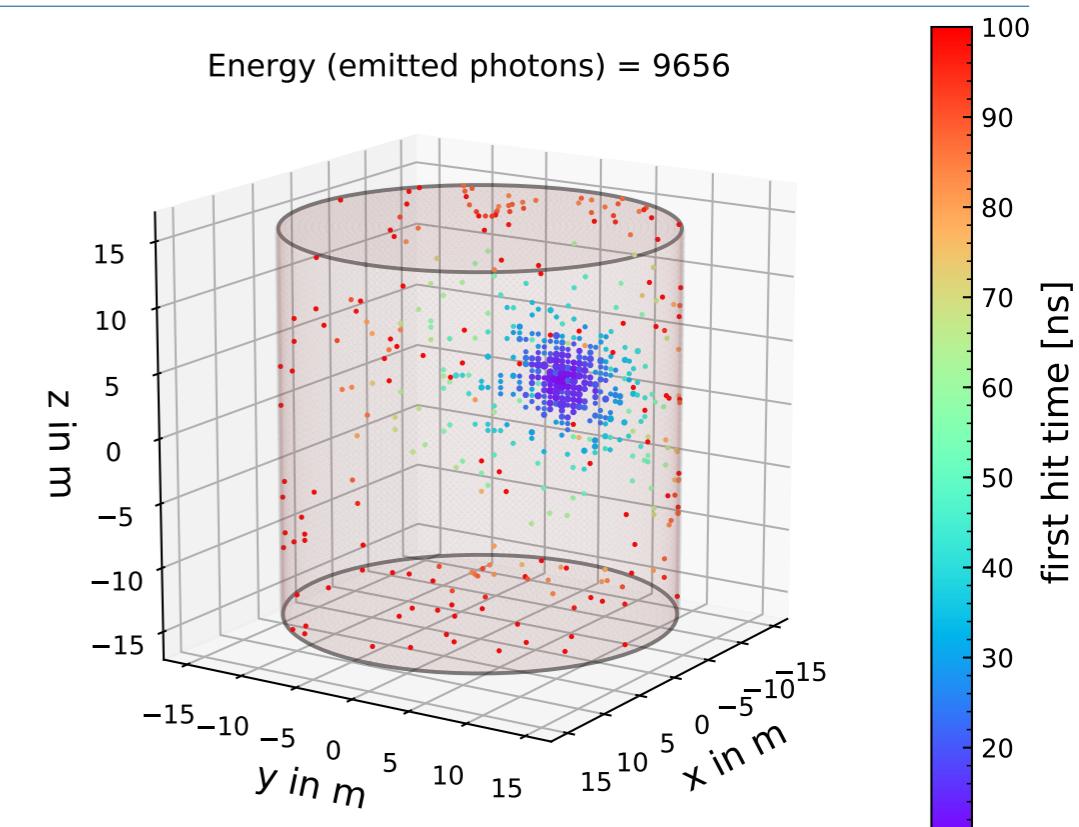
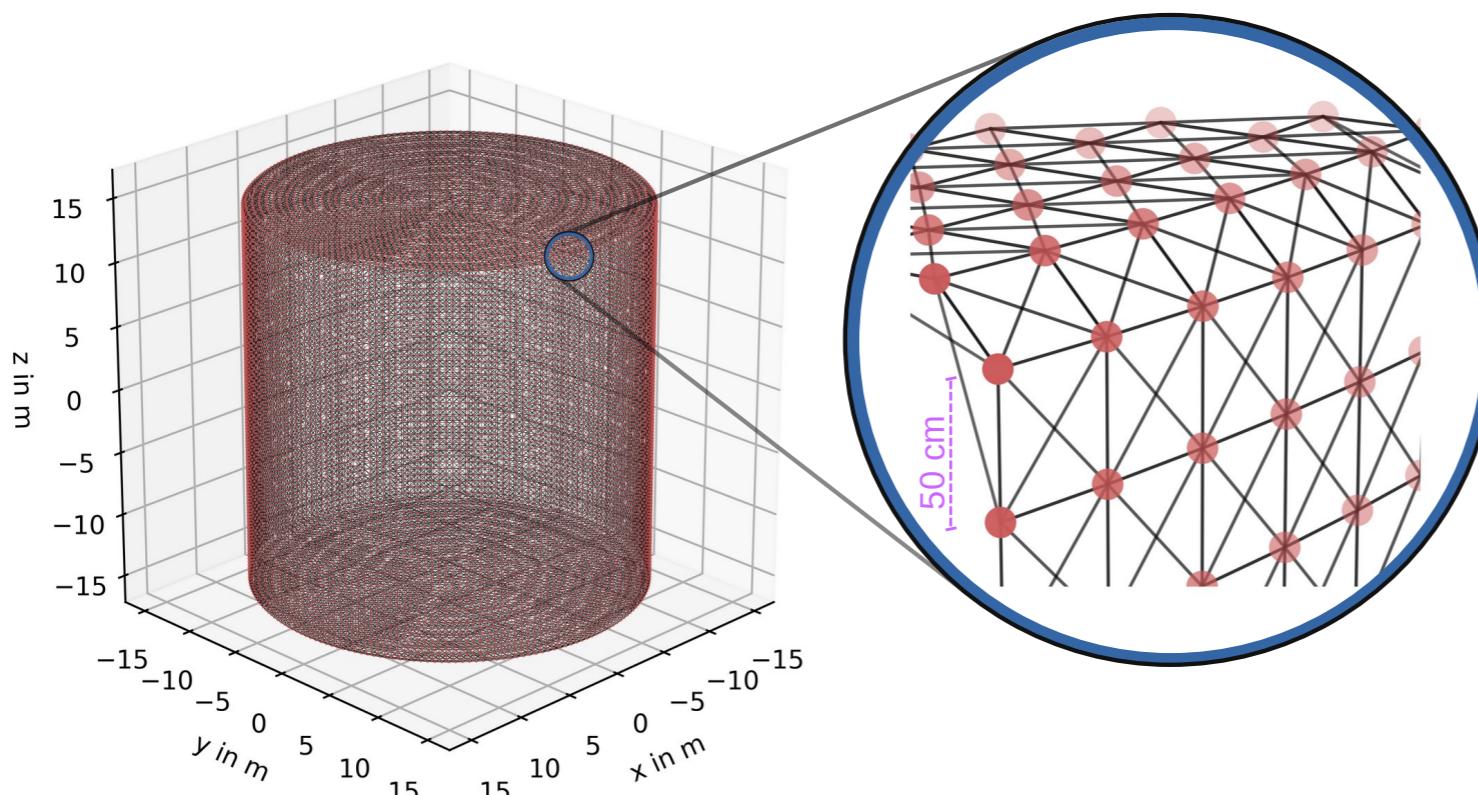


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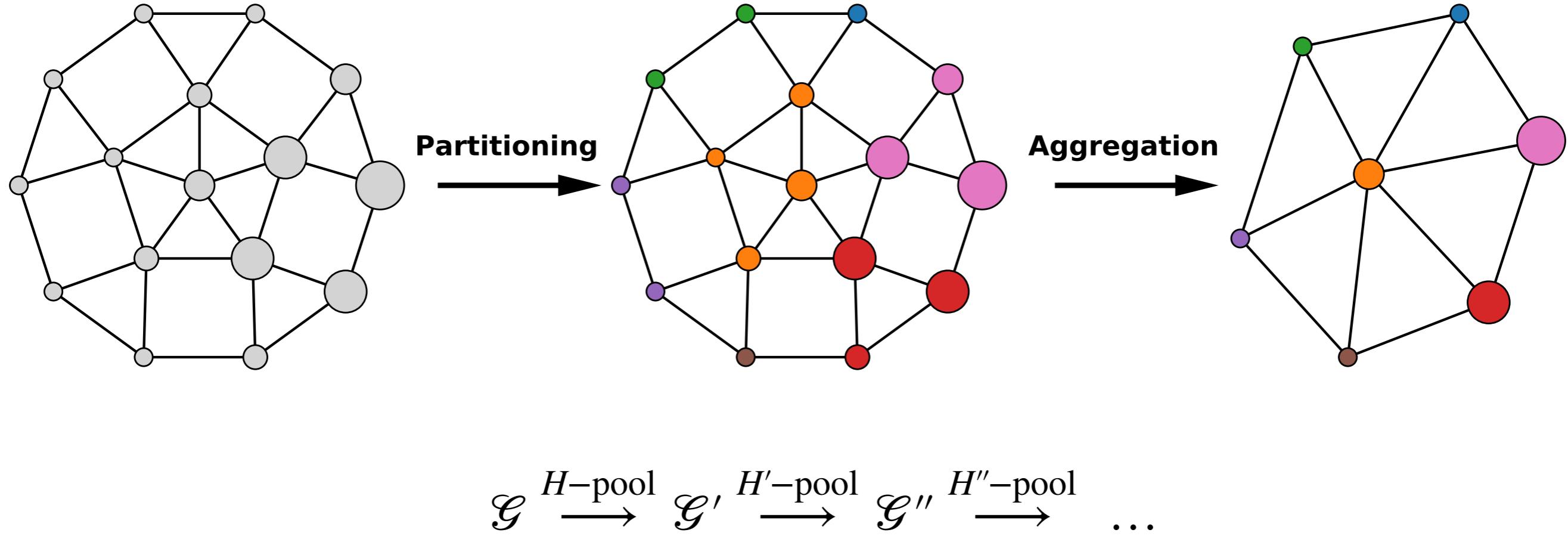
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# Background

- ▶ Example: cylindrical liquid scintillator detector
    - ▶ 15 m radius and 30 m height
    - ▶  $\sim 17 \times 10^3$  PMTs
    - ▶ Event reconstruction task using a Neural Network (NN)
  - ▶ Use graph representation of detector geometry
    - ▶ Advantage: perform convolution operations of NN directly on detector geometry
    - ▶ Limitation: more elaborate NN architectures rely on dimensionality reduction
    - ▶ How to reduce spatial dimension of graph?
- ⇒ Need analogous pooling as in conventional NNs



# Partition Pooling



- ▶ Setup Neural Networks with and without partition pooling
- ▶ Evaluate the impact of partition pooling in an exemplary vertex reconstruction task