Event as input set
$$X = \{x_i\}$$

Event as graph
$$X = \{x_i\}, A = A_{ij}$$

Transformed inputs
$$H = \{h_i\}$$

Graph building

LSH+kNN

$$\mathscr{F}(X \mid w) = A$$

Message passing

GCN

$$\mathscr{G}(X, A \mid w) = H$$

Target set $Y = \{y_j\}$

Output set $Y' = \{y'_j\}$

Elementwise loss $L(y_j, y'_j)$

classification & regression

Decoding

elementwise FFN

$$\mathscr{D}(x_j, h_j \mid w) = y'_j$$

$$x_i = [\text{type}, p_{\text{T}}, E_{\text{ECAL}}, E_{\text{HCAL}}, \eta, \phi, \eta_{\text{outer}}, \phi_{\text{outer}}, q, \ldots], \quad \text{type} \in \{\text{track, cluster}\}$$

$$y_j = [\text{PID}, p_{\text{T}}, E, \eta, \phi, q, \ldots], \quad \text{PID} \in \{\text{none, charged hadron, neutral hadron}, \gamma, e^{\pm}, \mu^{\pm}\}$$

$$h_i \in \mathbb{R}^{256}$$

Trainable neural networks: $\mathscr{F}, \mathscr{G}, \mathscr{D}$

● - track, ■ - calorimeter cluster, ■ - encoded element

■ - target (predicted) particle, ■ - no target (predicted) particle