Sparse Submanifold Neural Network

~20

~50x50

M0

M1

M2

M3

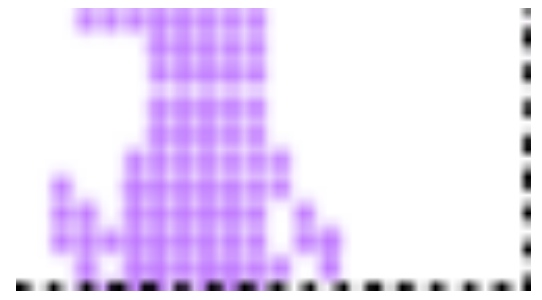
M4

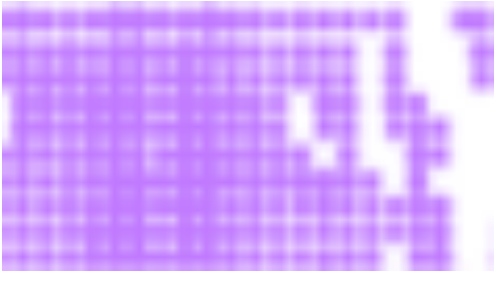
M5

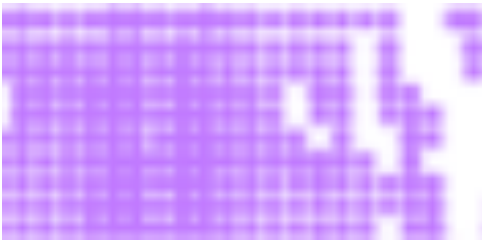
M6

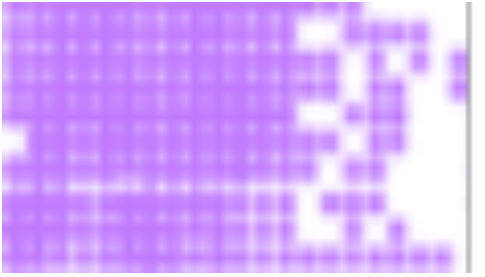
M7

Encoder

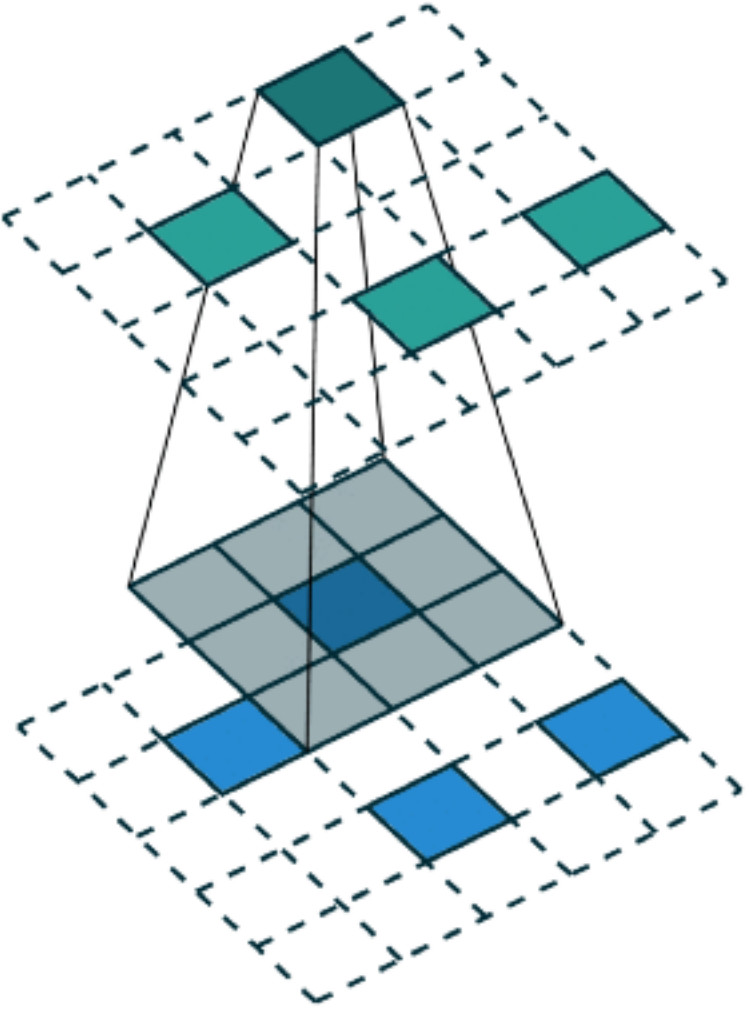


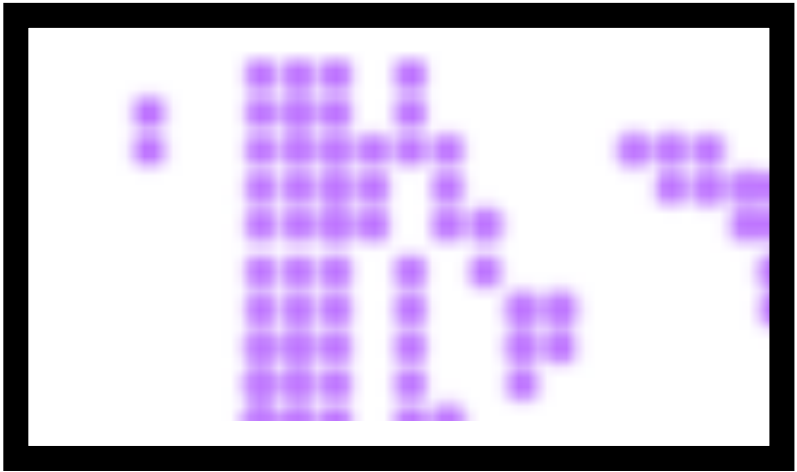






Pre-Training



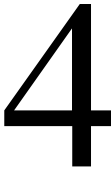


1 feature

768 features

16x16

1 vector embedding



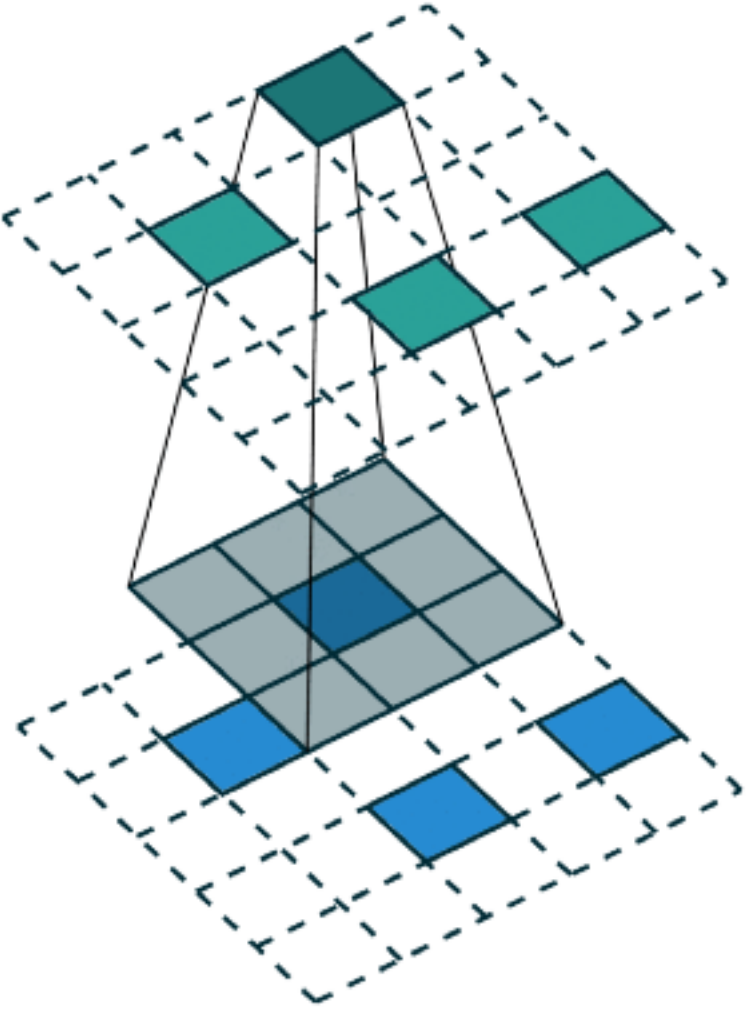
SCNN reduces the spatial coordinates while increasing the feature dimensions.

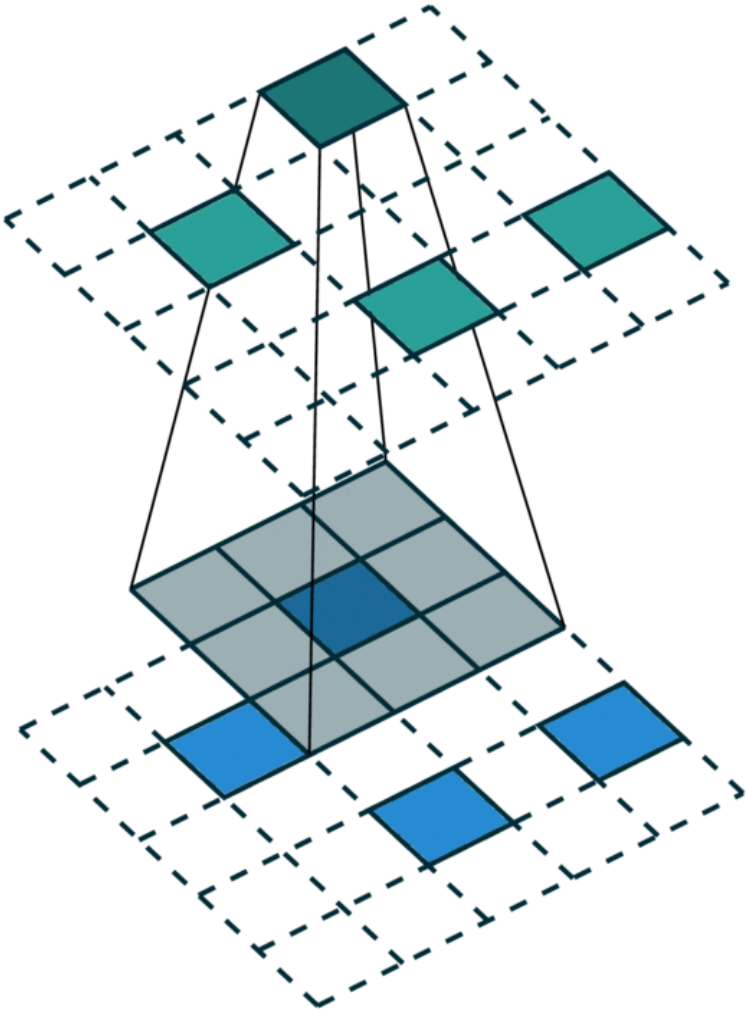
It performs convolution only on active voxels, effectively ignoring the vast empty regions typical in detector data.

SCNN

SCNN: Creates a vector embedding for every patch in the input

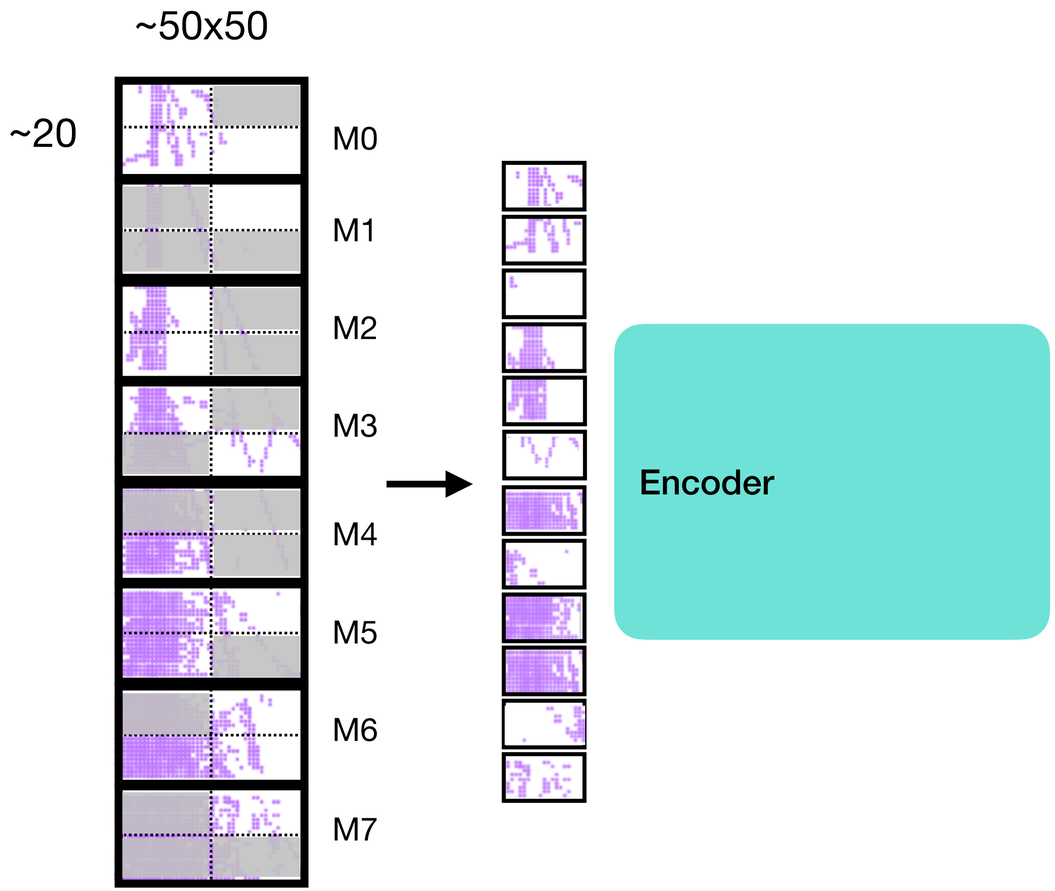
32



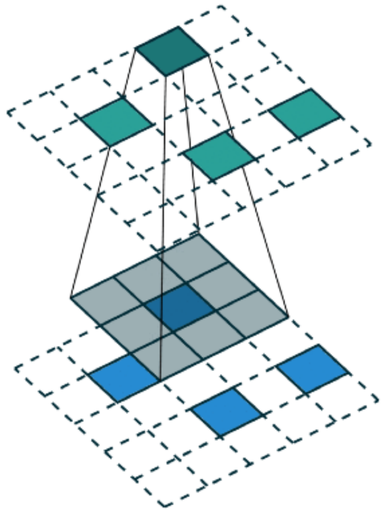


Pre-Training

Sparse Submanifold Neural Network



SCNN: Creates a vector embedding for every patch in the input



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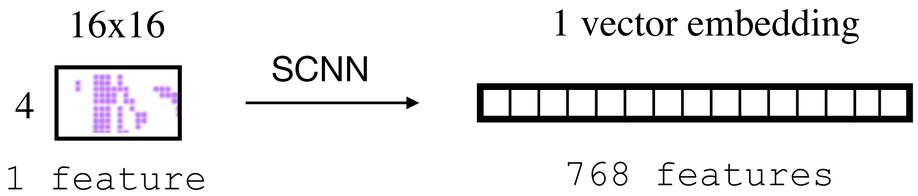
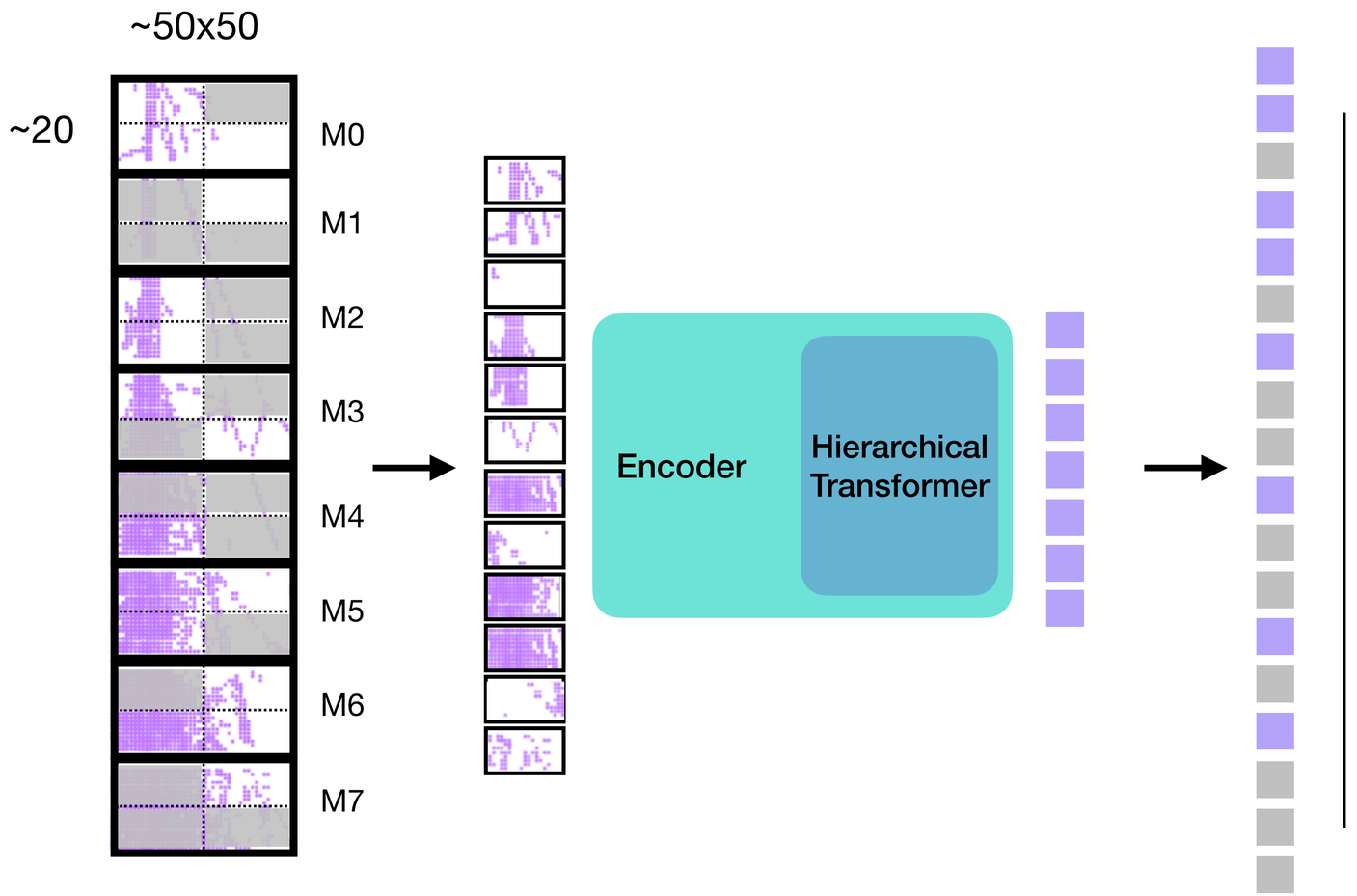
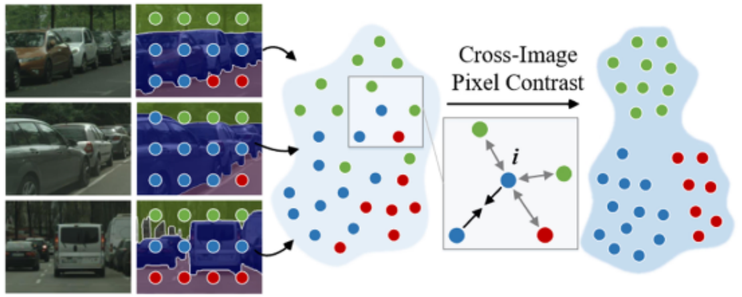


Pre-Training

Hierarchical Transformer



Contrastive Learning



Pixel-wise contrastive learning:

Each pixel (embedding) I is pulled closer to pixels of the same *PDG class*, but at the same time pushed far from pixels from other *PDG classes*