Sparse Submanifold Neural Network

~20

~50x50

MO

M1

M2

M3

M4

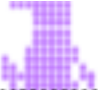
M5

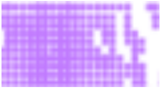
M6

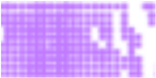
M7

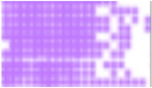
……

Encoder

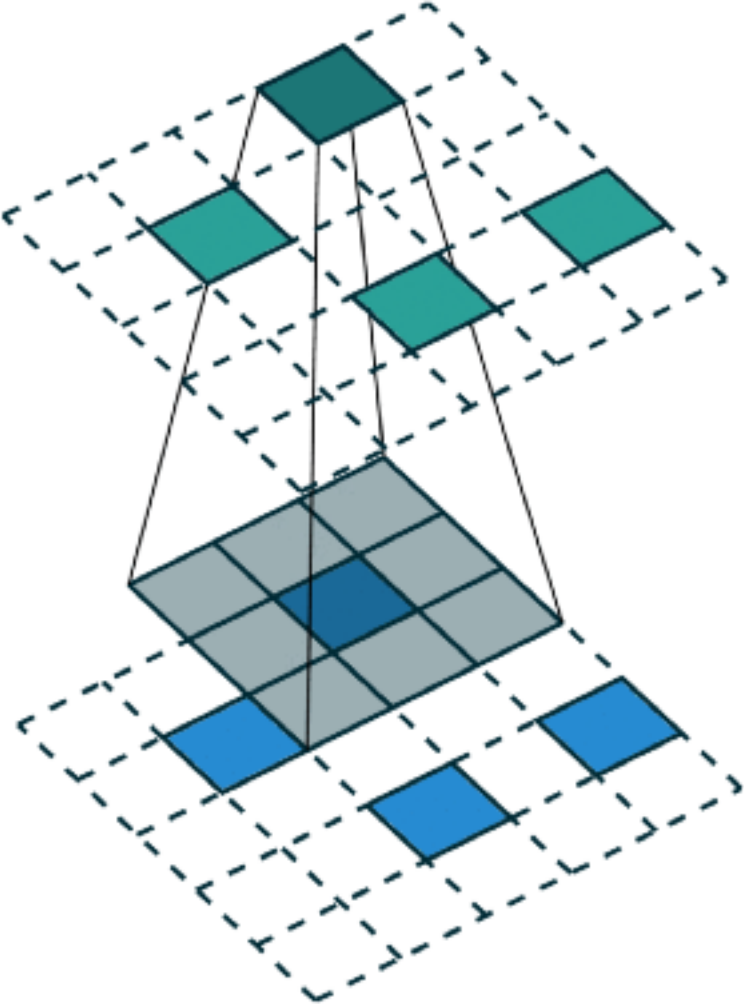








Pre-Training



1 feature

768 features

16x16

1 vector embedding

[redacted]

[redacted]

[redacted]

[redacted]

[redacted]

[redacted]

[redacted]

[redacted]

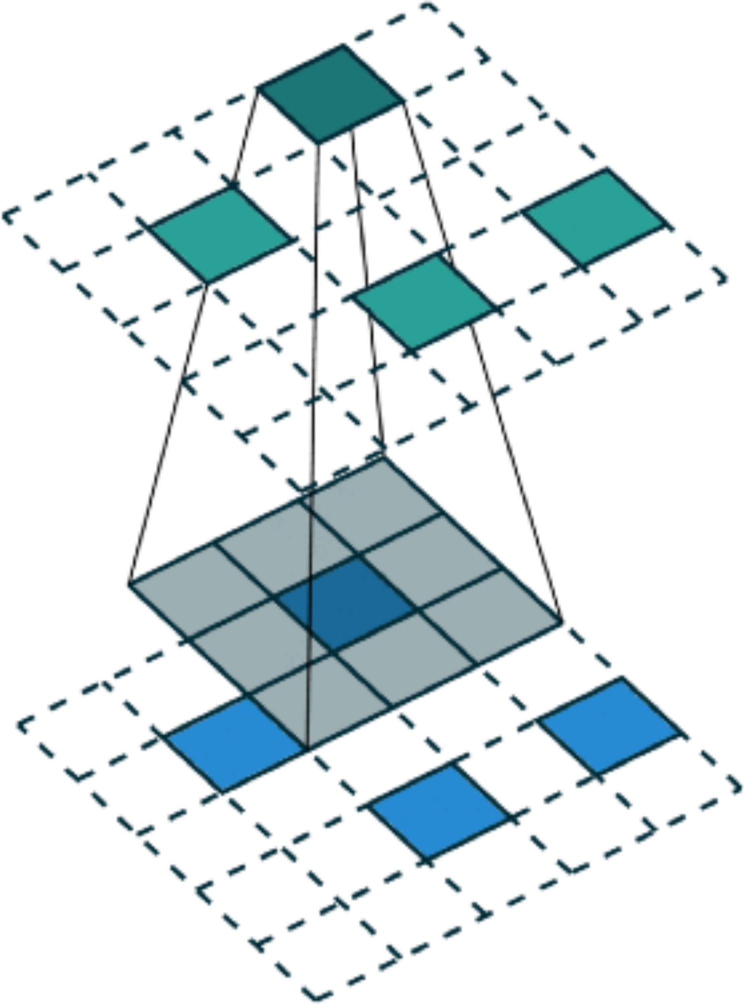
4

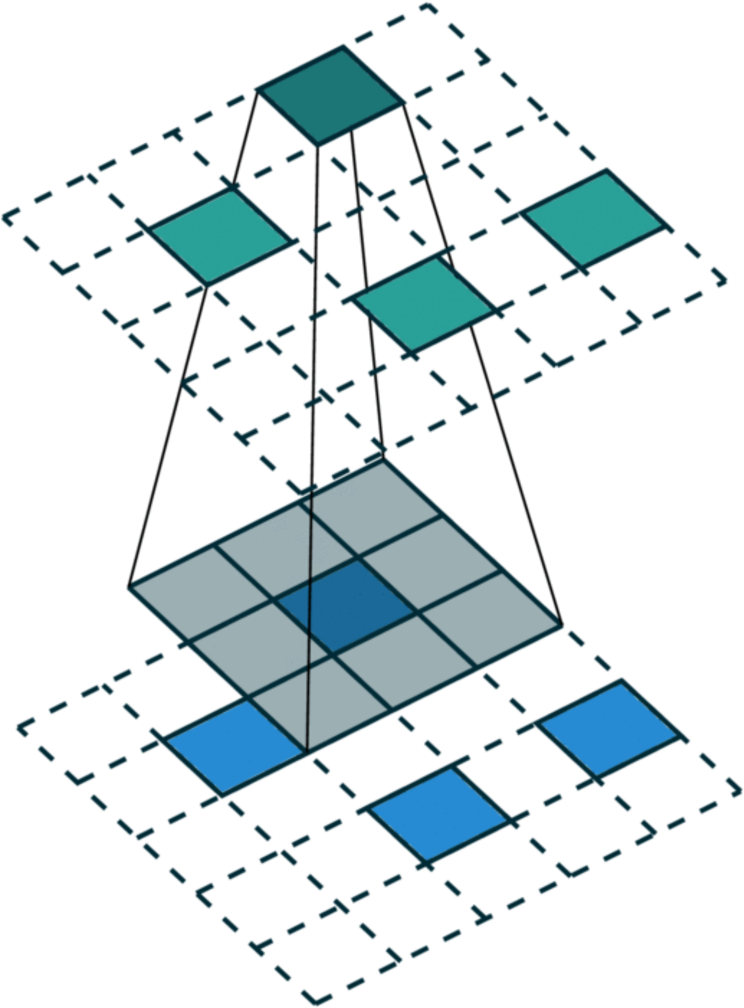
SCNN reduces the spatial coordinates while increasing the feature dimensions.

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

SCNN

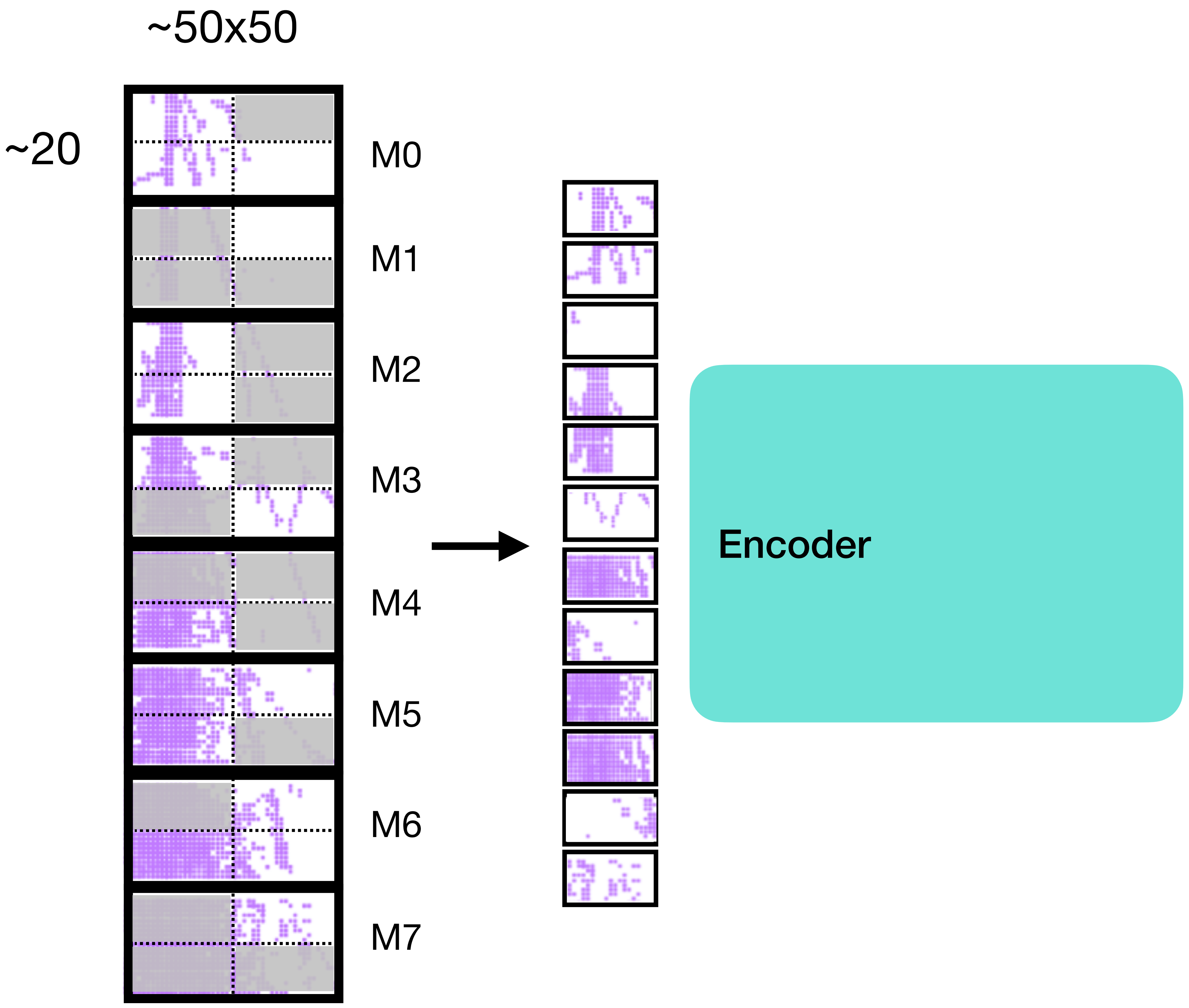
SCNN: Creates a vector embedding for every patch in the input



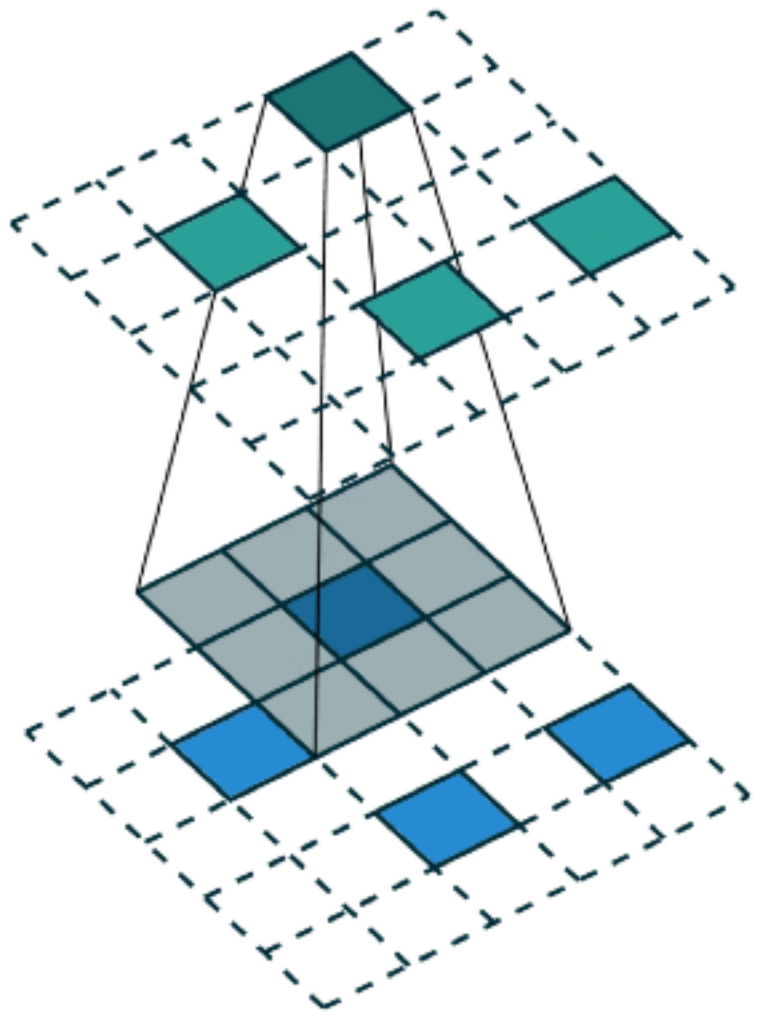


Pre-Training

Sparse Submanifold Neural Network



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



SCNN reduces the spatial coordinates while increasing the feature dimensions.

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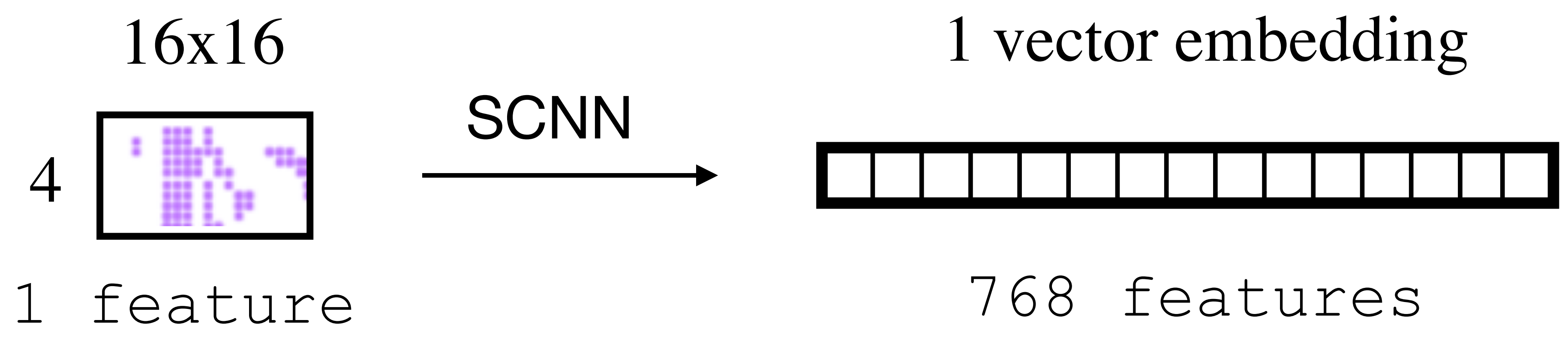
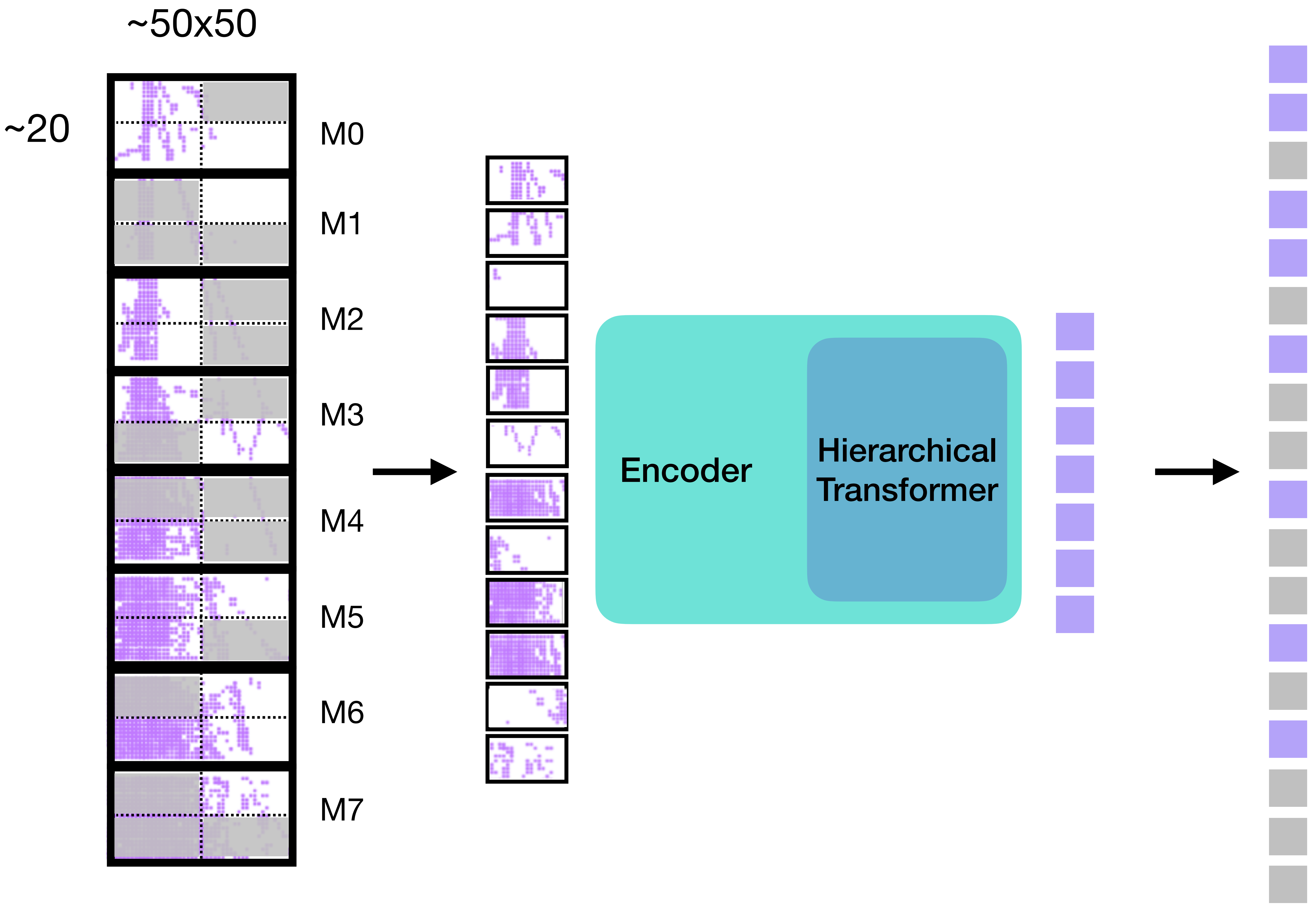


Pre-Training

Hierarchical Transformer



~50x50

~20

M0

M1

M2

M3

M4

M5

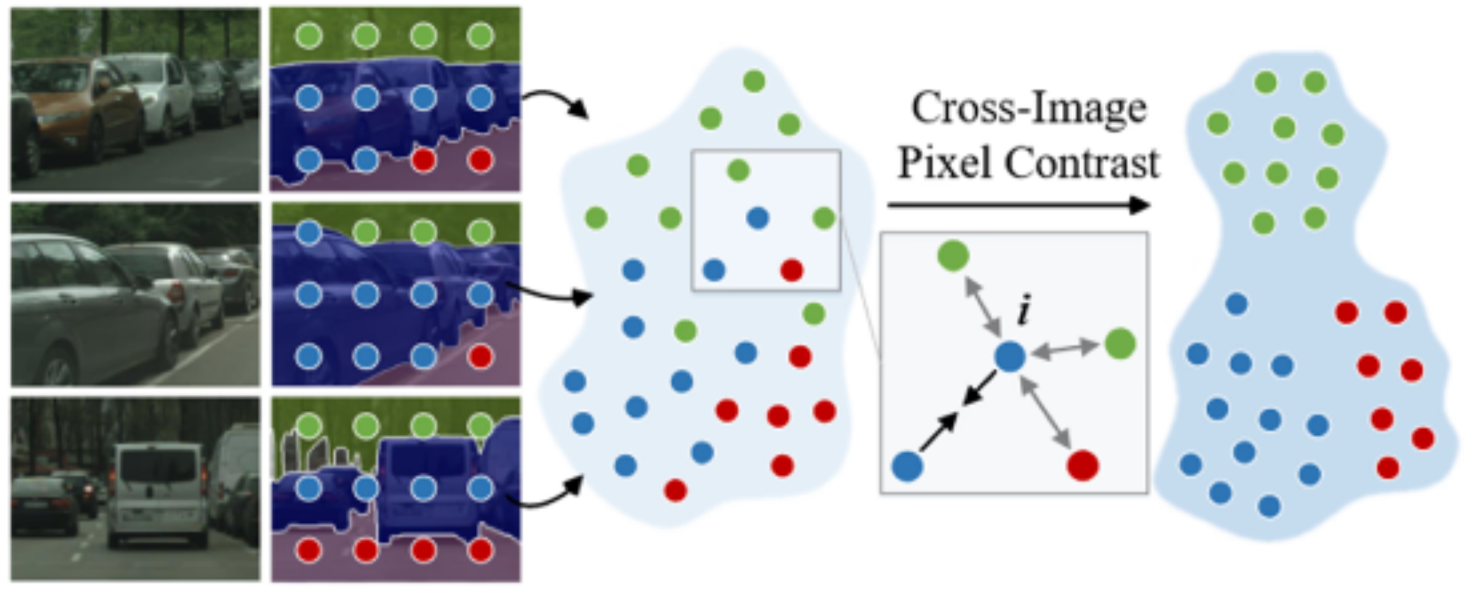
M6

M7

Encoder

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*