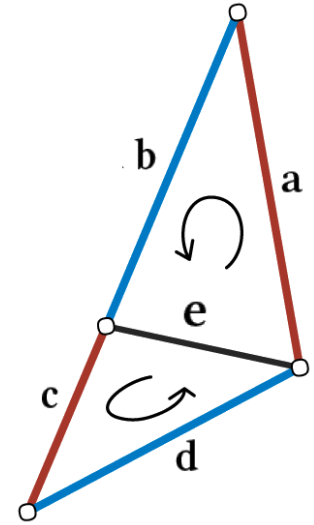
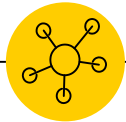
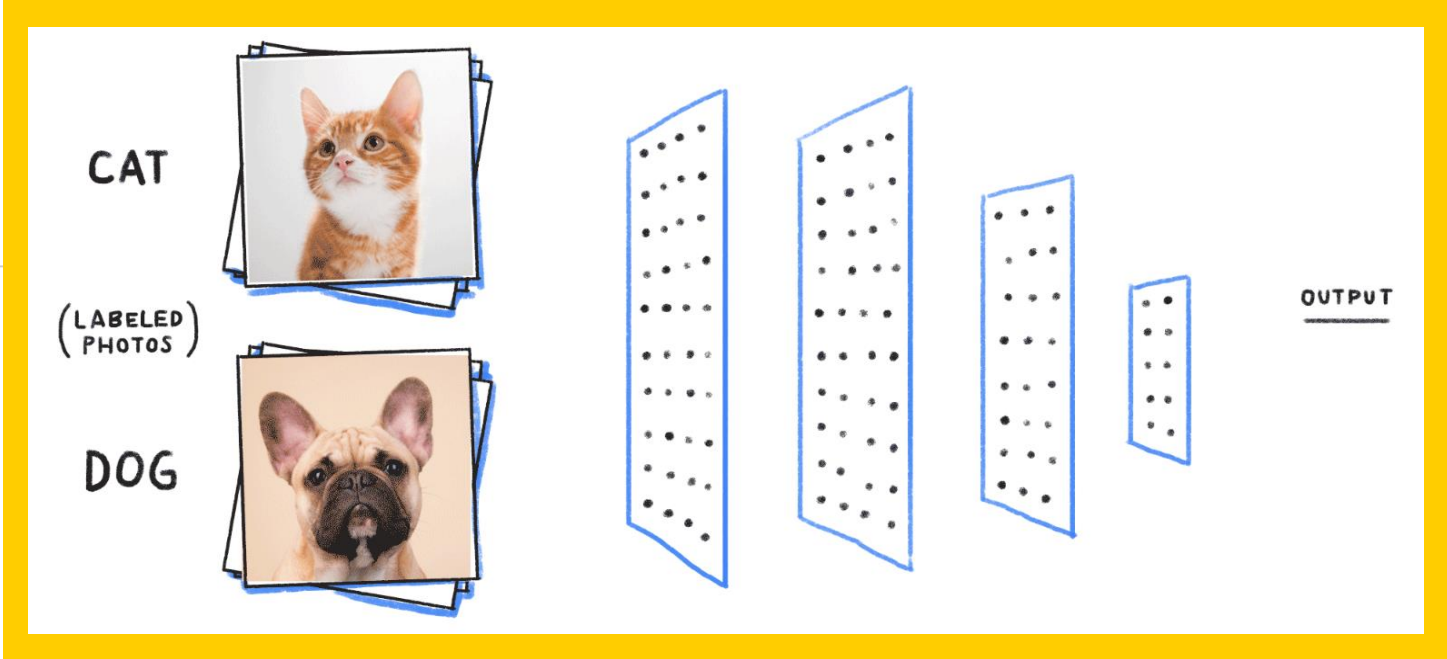


MeshCNN: A Network with an Edge

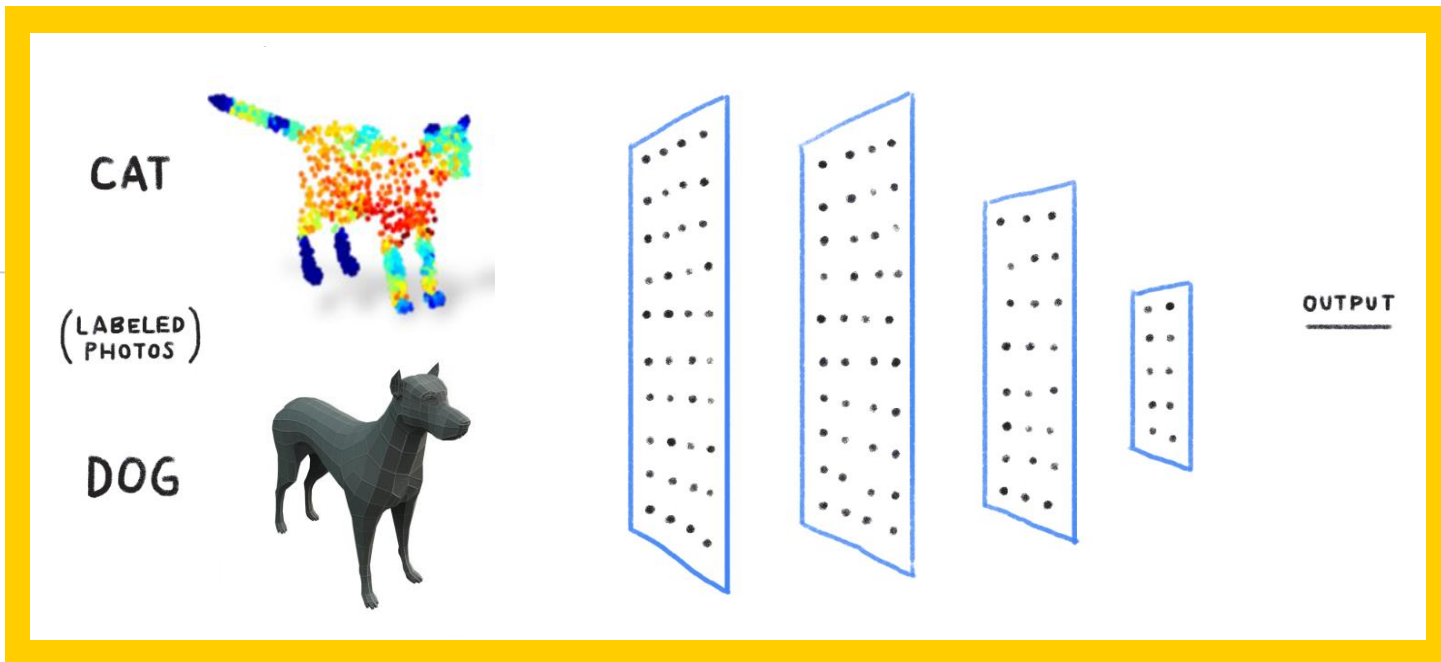
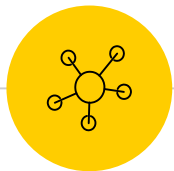


Rana Hanocka, Amir Hertz, Noa Fish, Raja Giryes, Shahar Fleishman and Daniel Cohen-Or



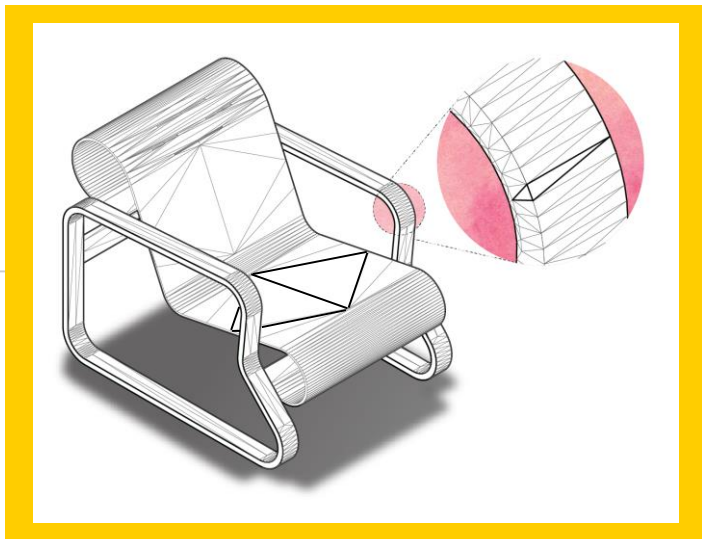
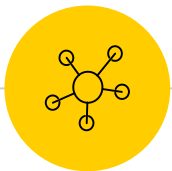
CNNs on Images

Great for Classification & Segmentation

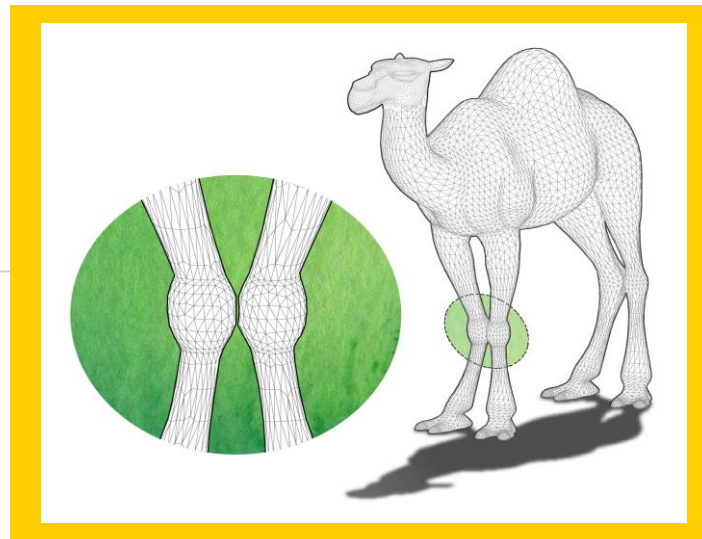


3D Deep Learning

Classification & Segmentation on Shapes



Adaptive & Efficient

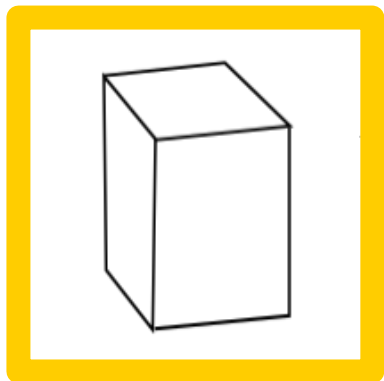


Contains Surface

Polygonal Mesh



Mesh Representation



Vertices

$\langle x, y, z \rangle$



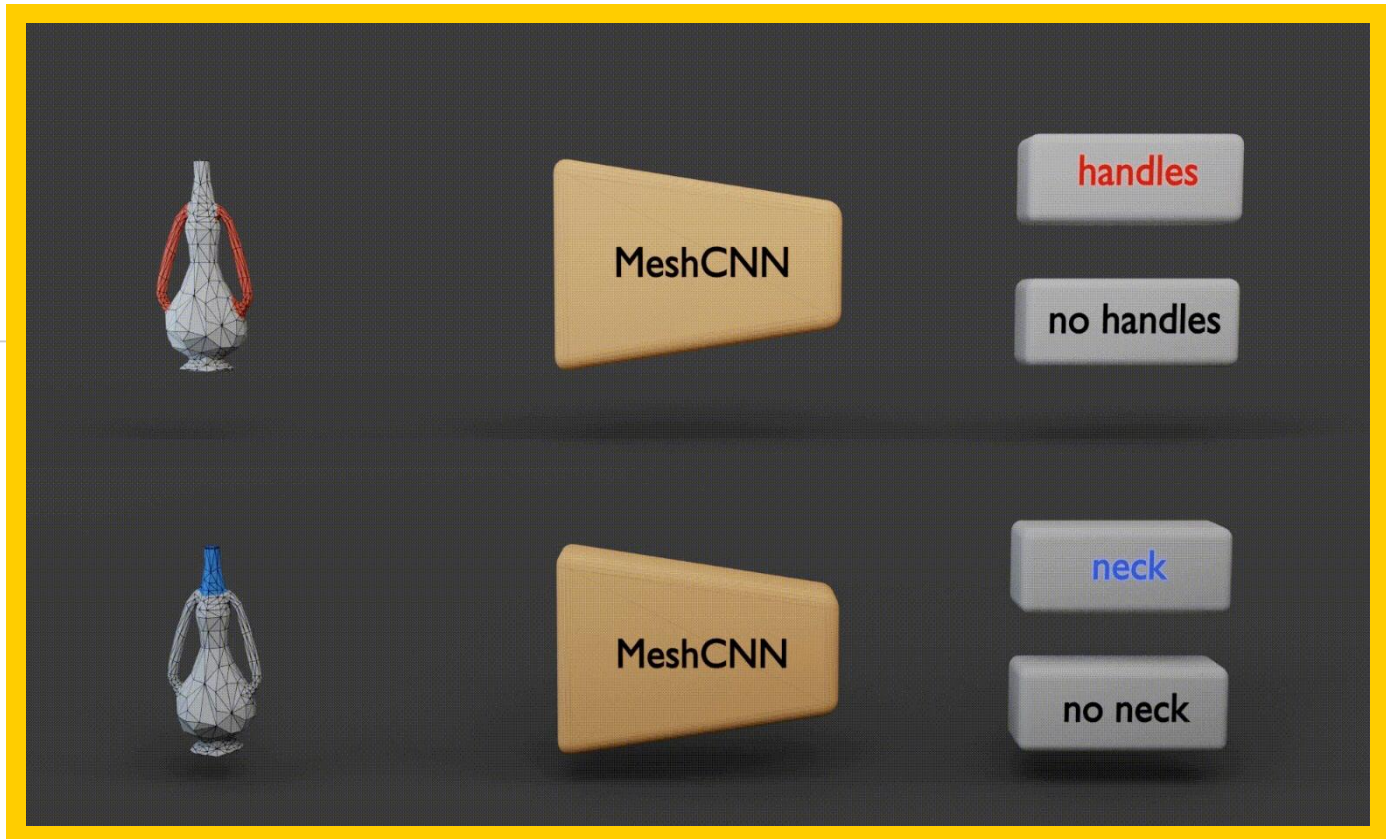
Edges

$\langle v_i, v_j \rangle$



Faces

$\langle v_i, v_j, v_k \rangle$



Different Tasks

Different Simplifications



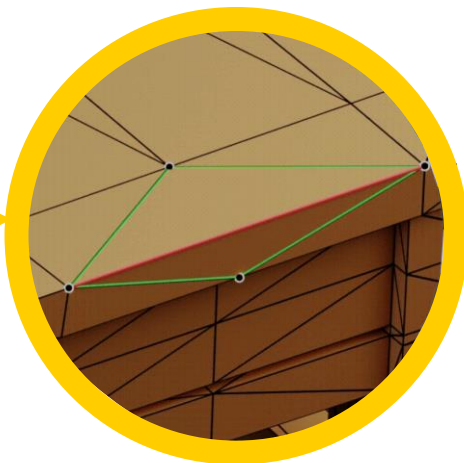
MeshCNN Overview



**Geometric
Features**



Mesh Convolution

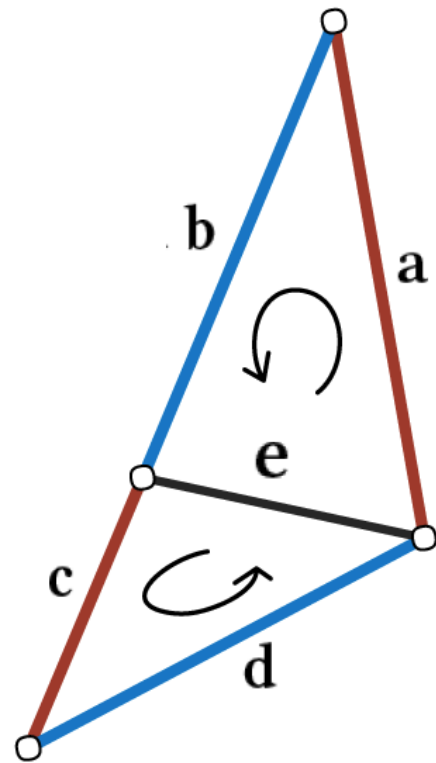


Mesh Pooling



Mesh Convolution

- Each edge has 4 conv-neighbors
- Face normal consistent ordering
- Learn convolutional filters



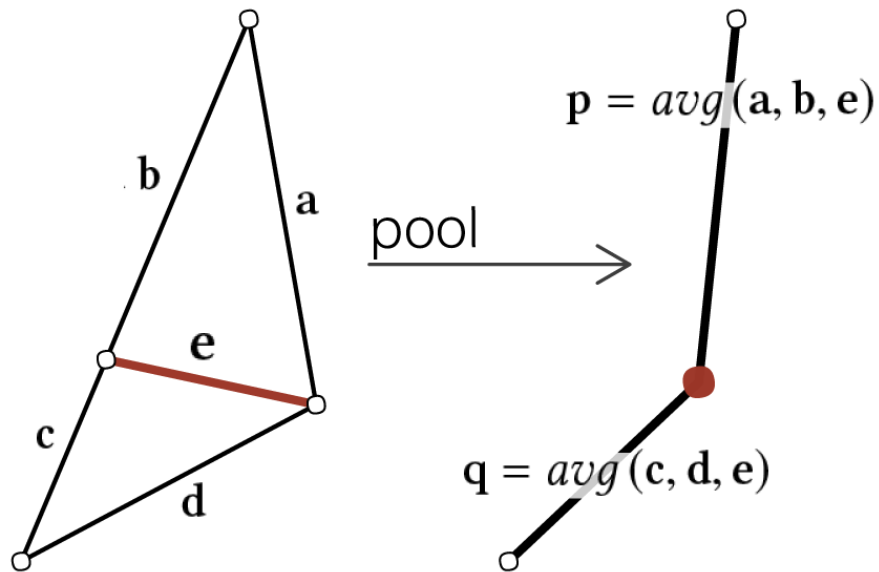


Mesh Pooling

Delete edge with smallest feature activations

→ Aggregate features

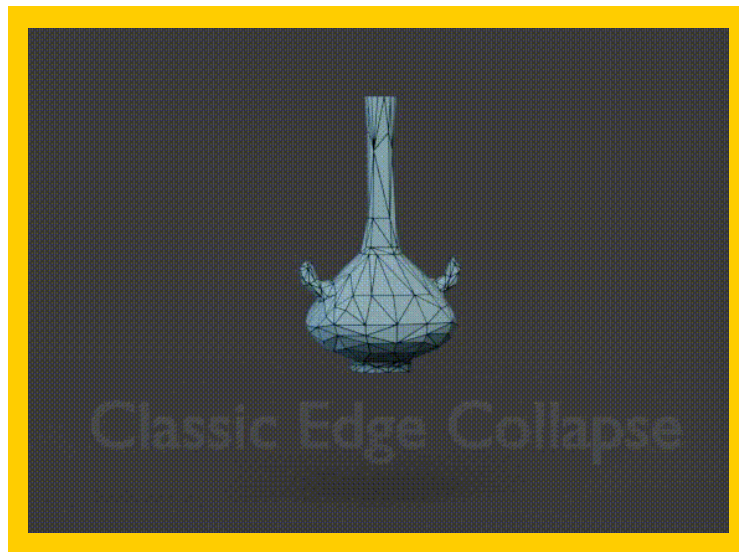
→ Update topology





Learned **Edge** Collapse

- Network decides collapse
- Strengthens the learned representation
- Visual insights from network

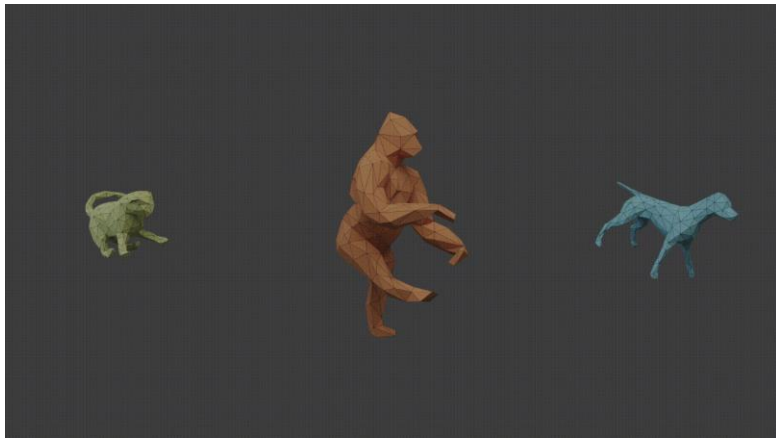




Applications of MeshCNN

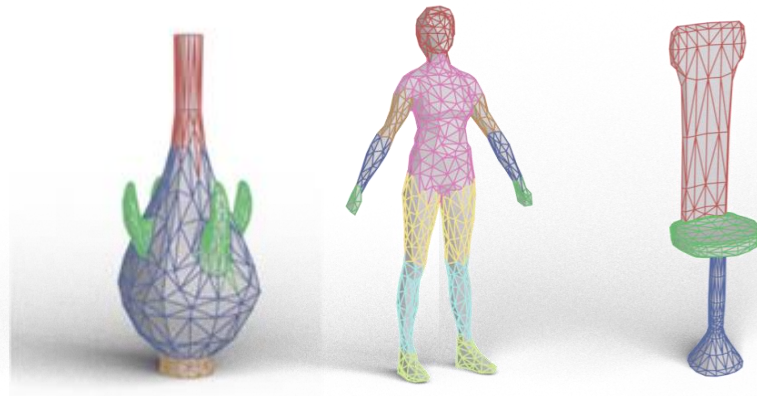
Classification

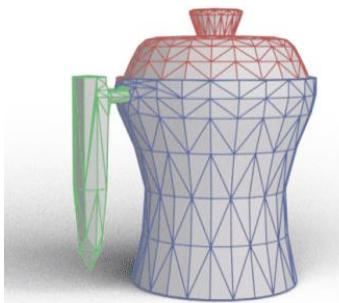
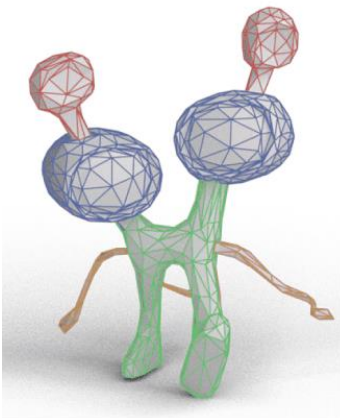
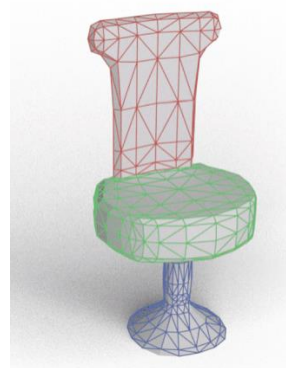
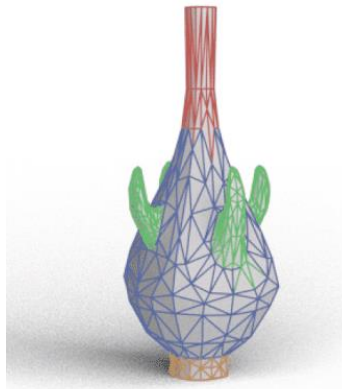
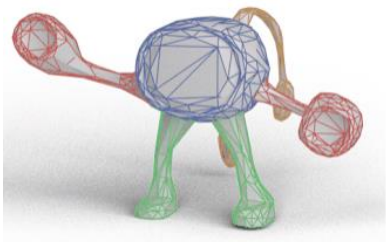
- Conv & Pooling Layers
- Fully-Connected Layers



Segmentation

- Fully convolutional
- Conv & Pooling & Unpooling





Segmentation





Summary

CNN directly on triangular mesh

→ Equivariant Convolution

Mesh Pooling

→ Visual insights into network behavior

→ Adapts to task

Future Works

→ Generative models

→ Graphs



Thanks!

Any *questions* ?

paper: bit.ly/meshcnn

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