[THU-AM-025]

DA Wand: Distortion-Aware Selection using Neural Mesh Parameterization

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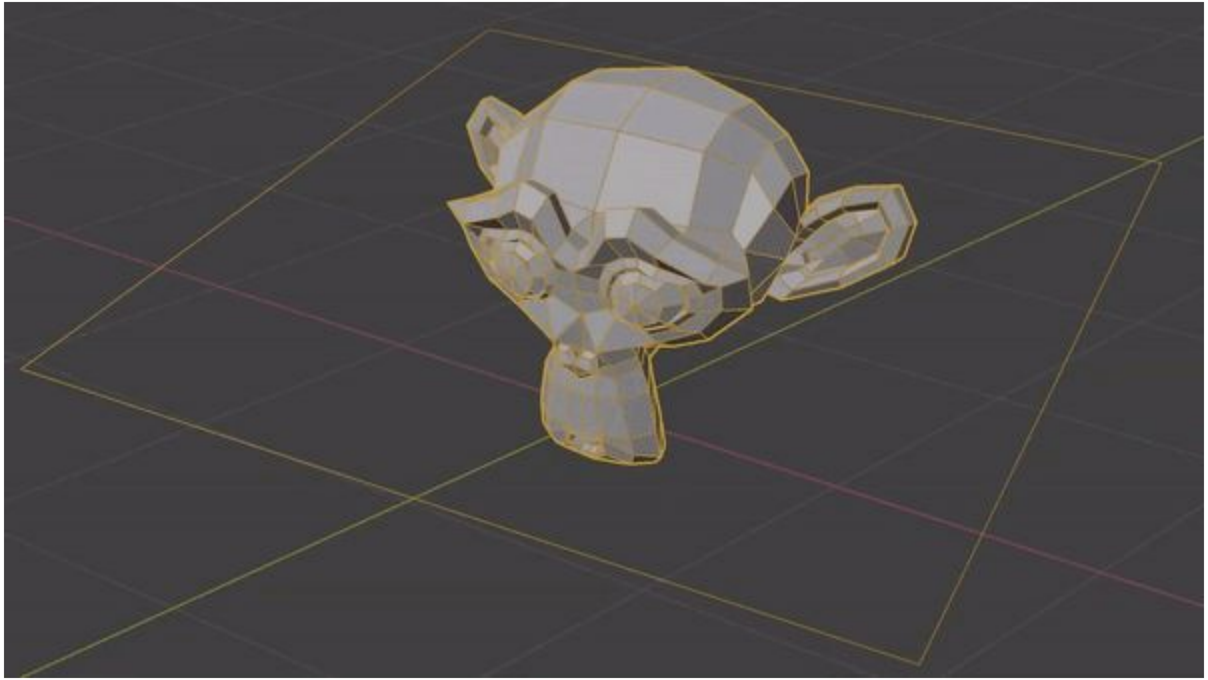
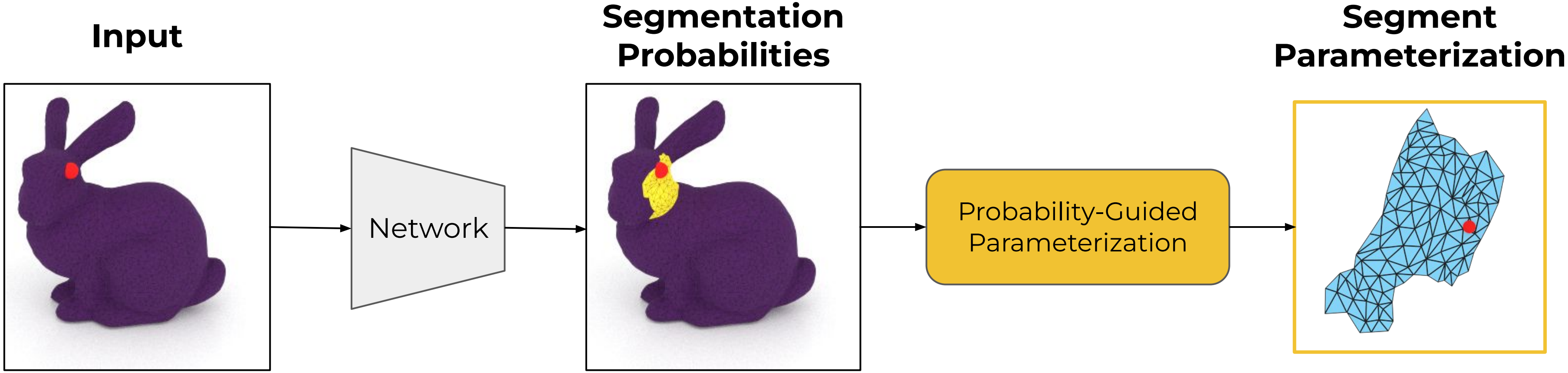
Mesh Parameterization

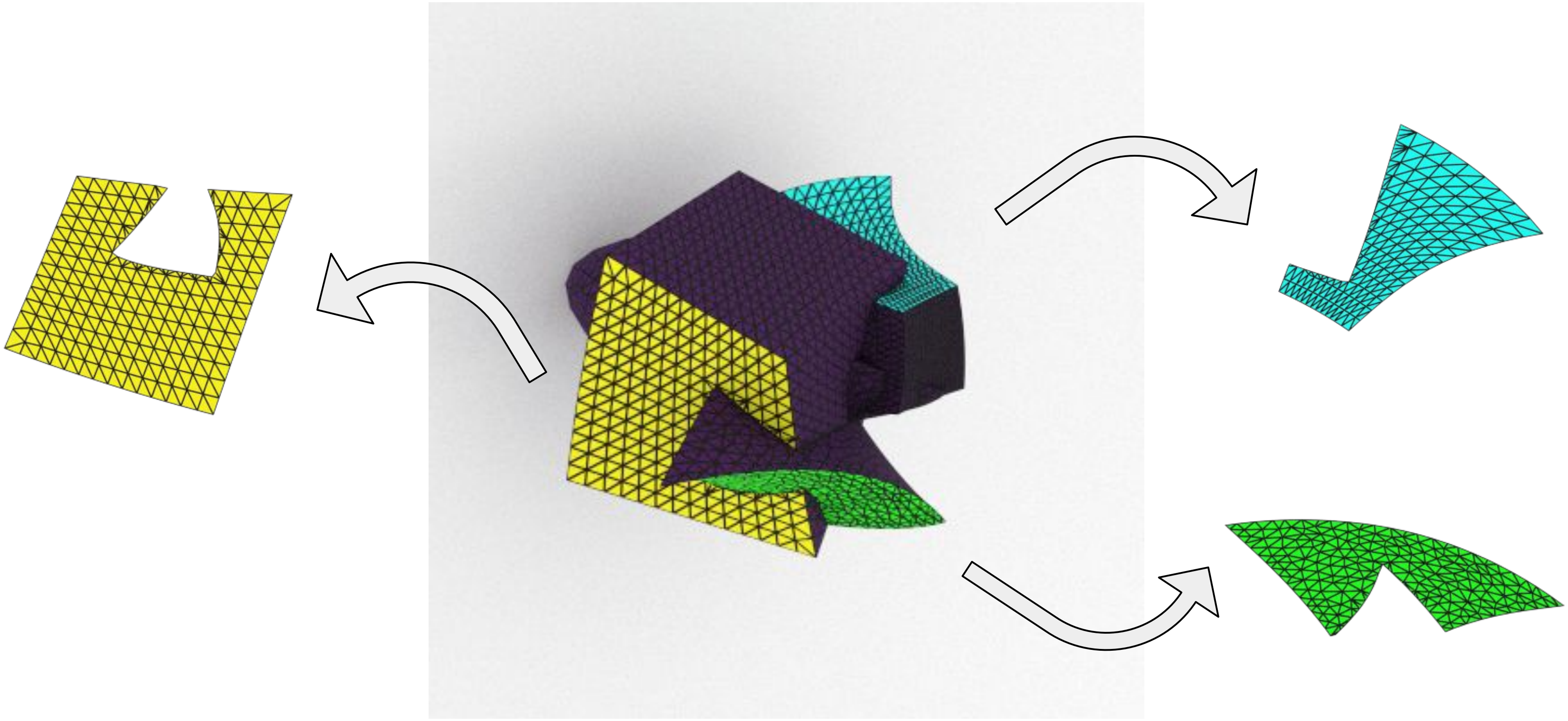


Example Application of DA-Wand

DA-Wand High-Level Overview



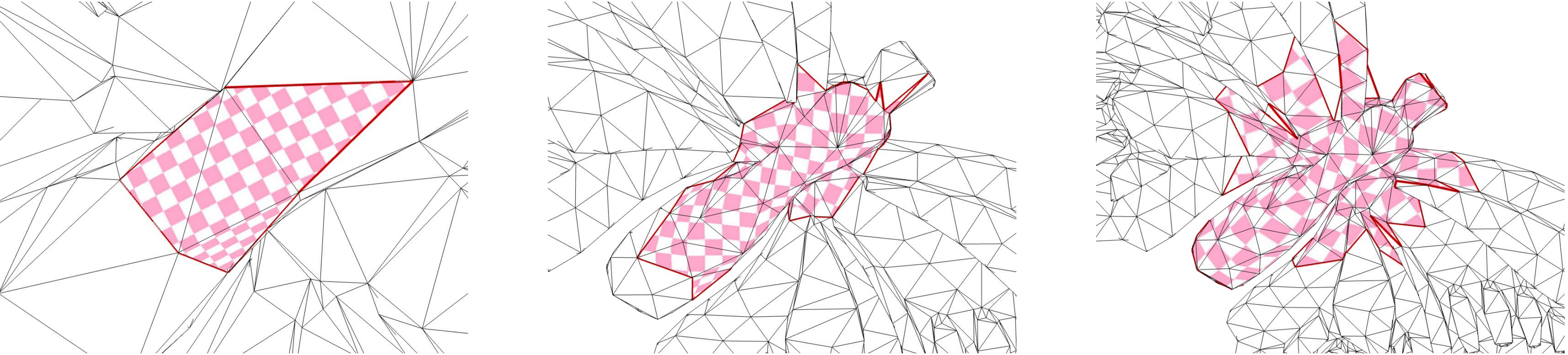
Synthetic Segmentation Dataset



End of Preview

Segmentation for Parameterization Objectives

- Maximize size of segmentation
- Minimize parameterization distortion



Parameterization distortion increases
with segmentation size

Limitations of Existing Methods

LogMaps

Segmentation stops at high curvature boundaries

DCharts

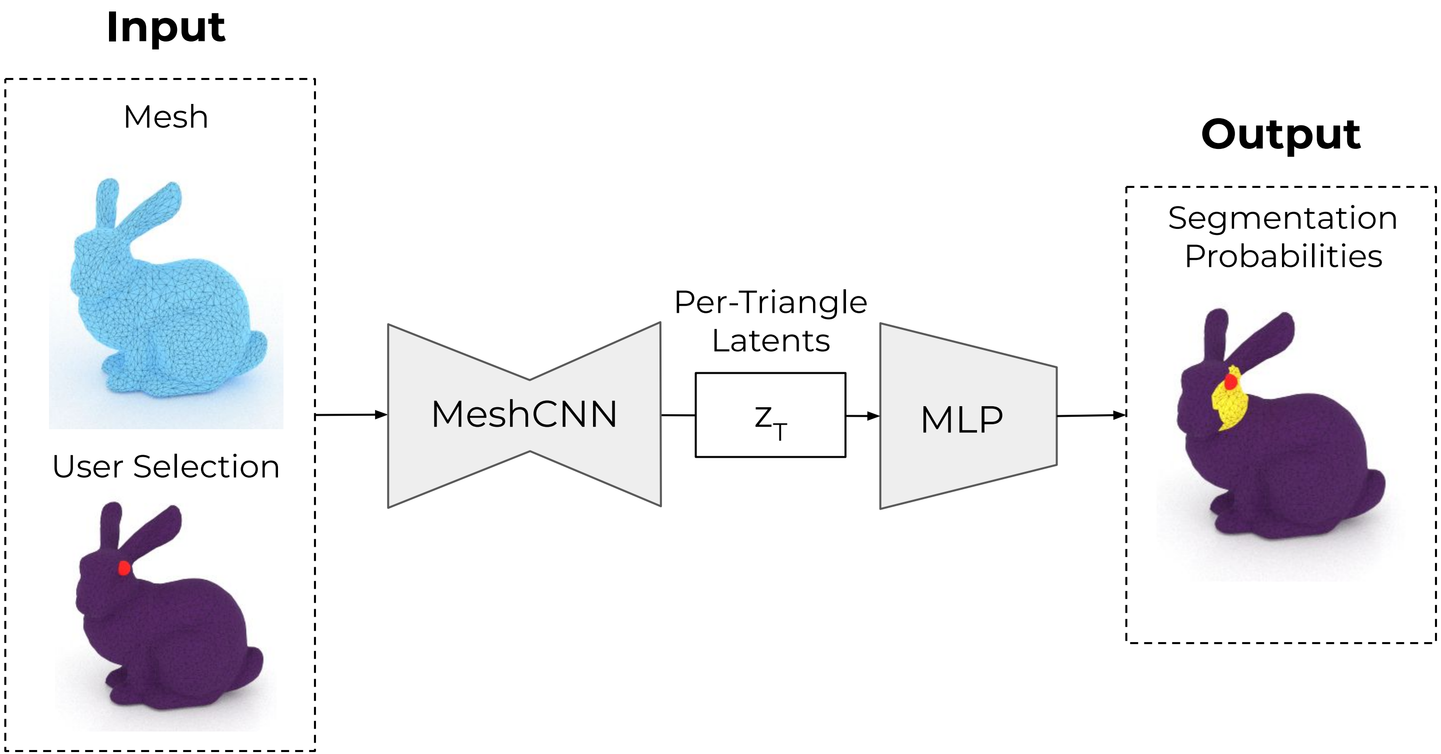
Segmentation results in high distortion parameterization

DA-Wand

DA-Wand

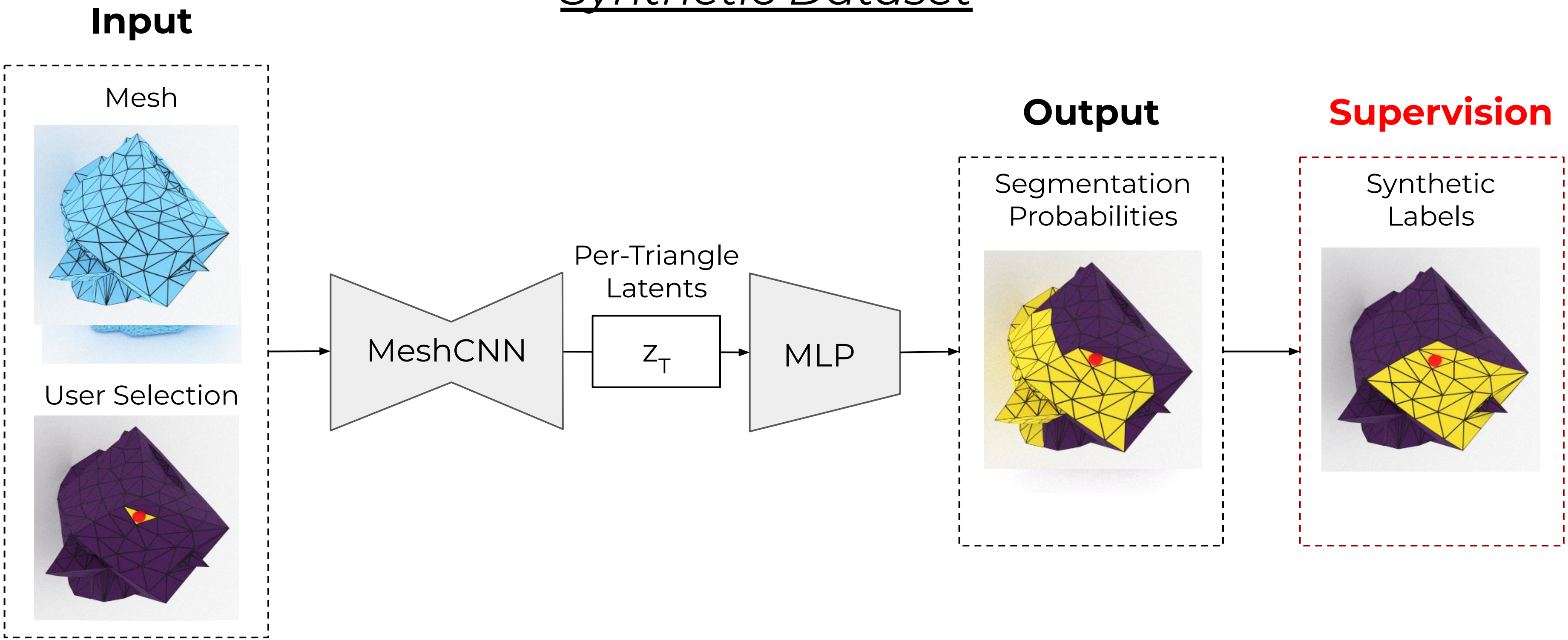
Our method learns **distortion-aware** segmentations with a wide receptive field.

DA-Wand Network Diagram



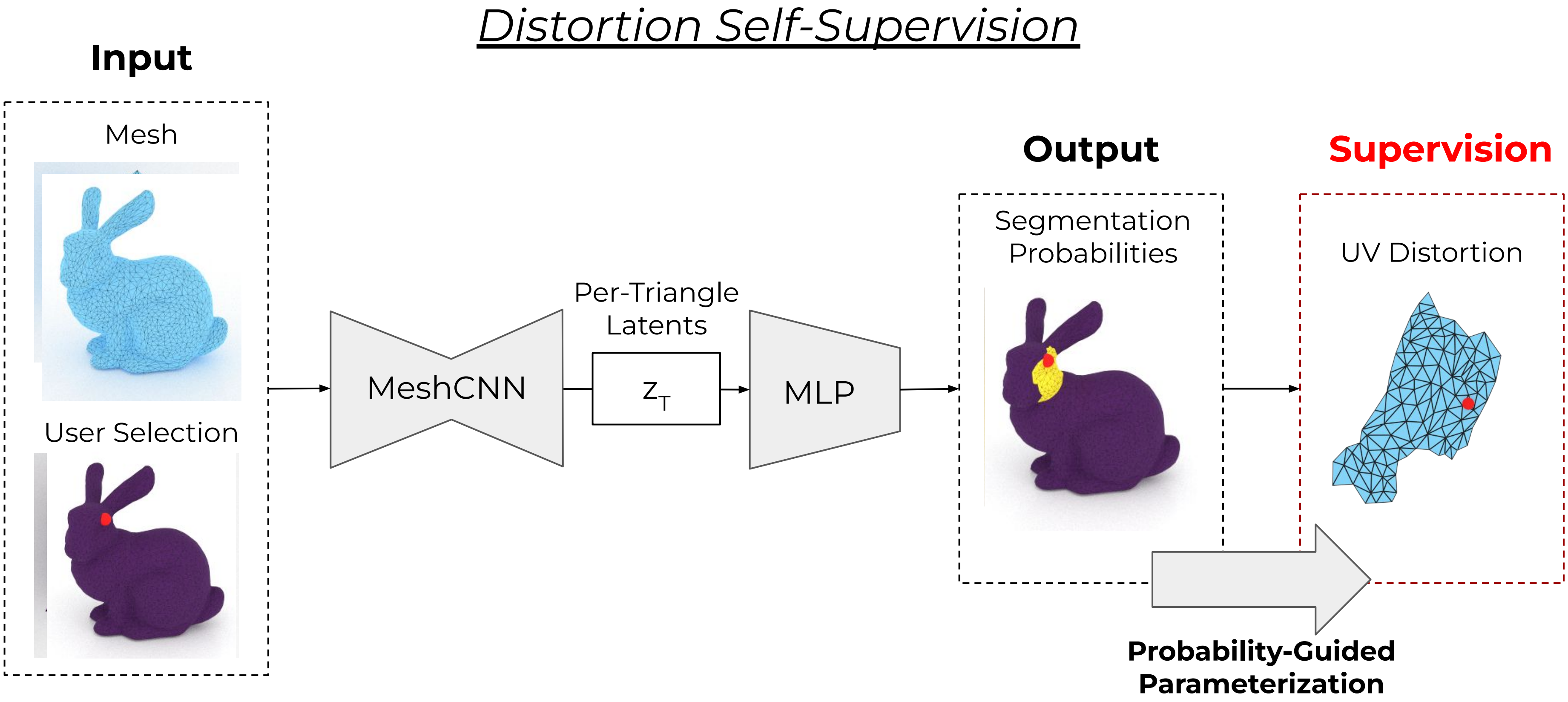
Dealing with Lack of Training Data

Synthetic Dataset

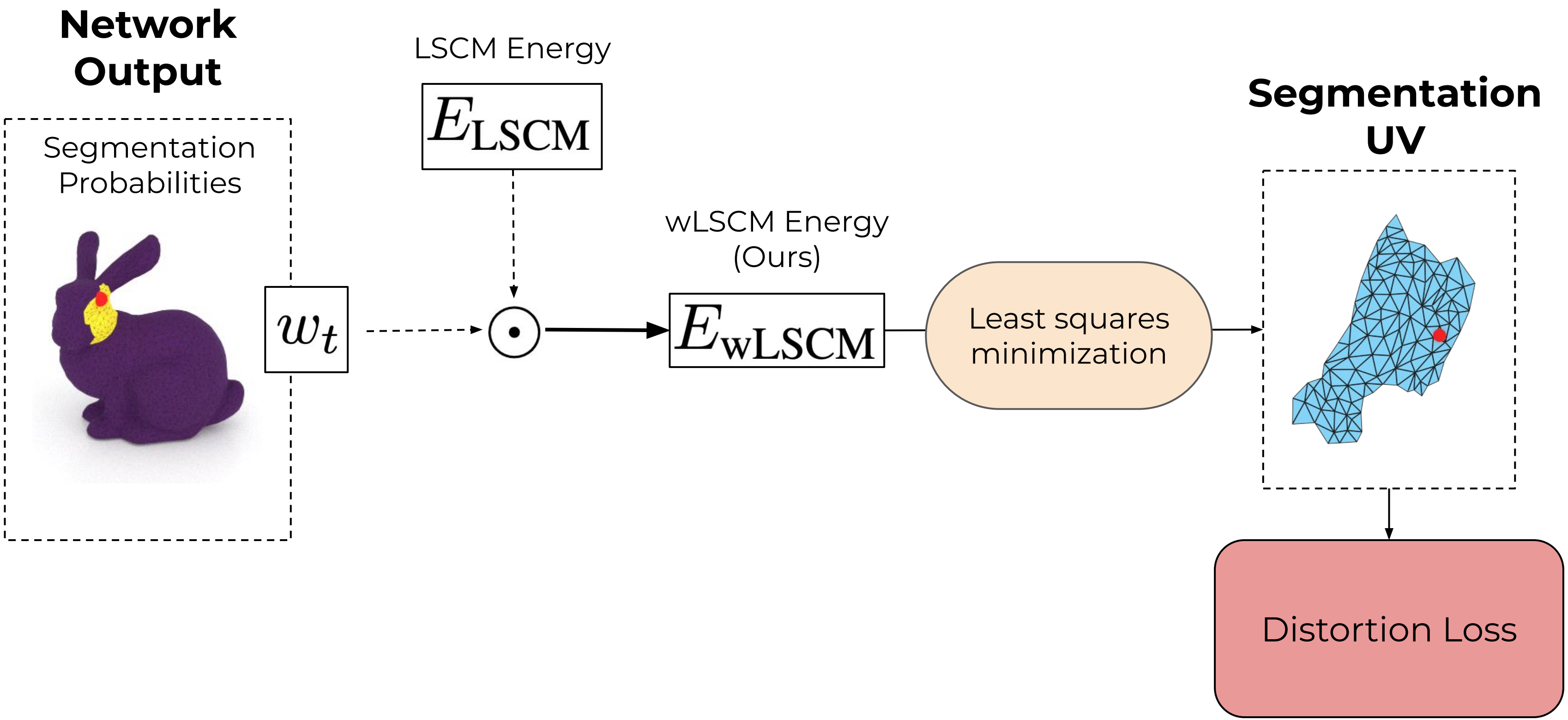


Synthetic Dataset Generation

Dealing with Lack of Training Data



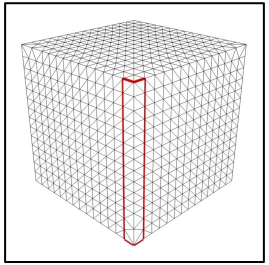
Probability-Guided Parameterization



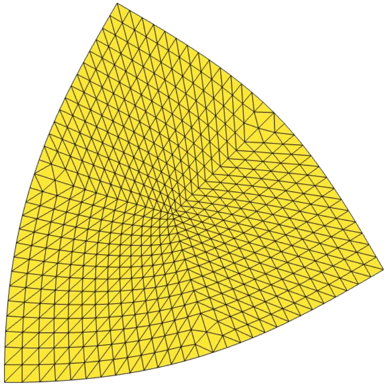
wLSCM Equivalence to LSCM

Theorem: As wLSCM weights converge to a binary segmentation, the wLSCM solution for triangles with nonzero weights converges to the LSCM solution for those triangles.

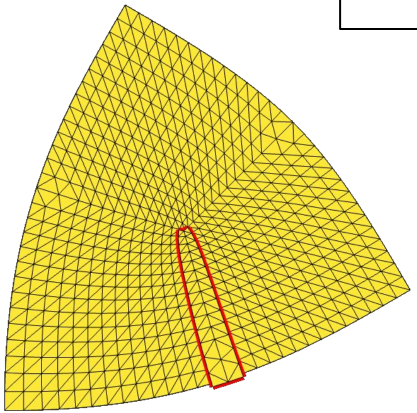
wLSCM Equivalence to LSCM



LSCM

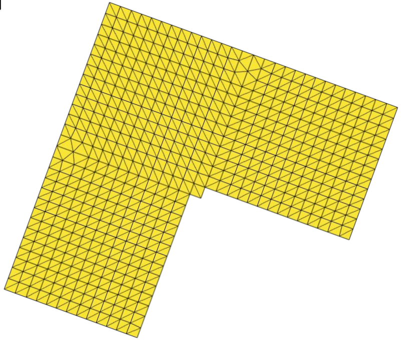


wLSCM

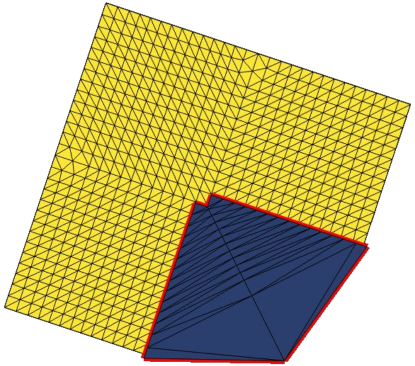


Weights = 1

LSCM

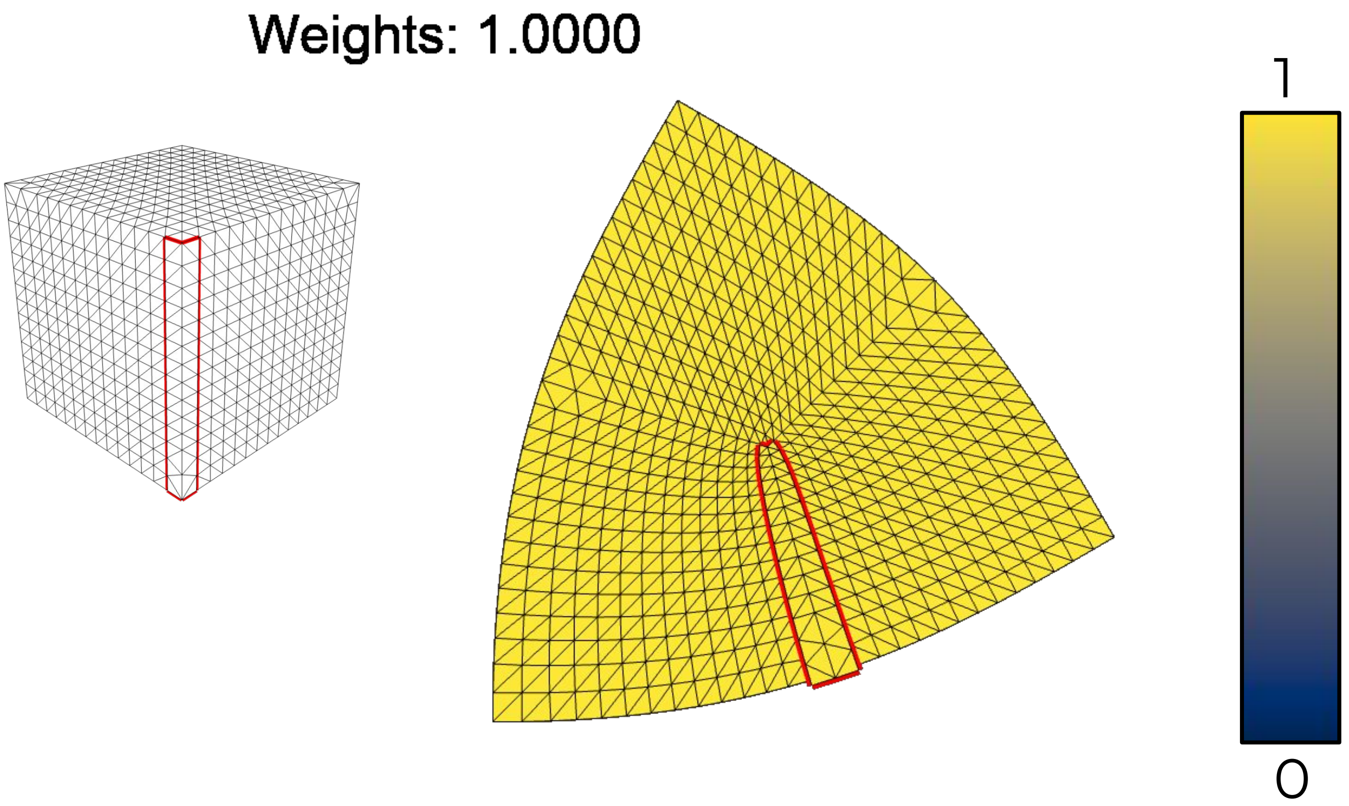


wLSCM



Weights = 0

wLSCM Equivalence to LSCM



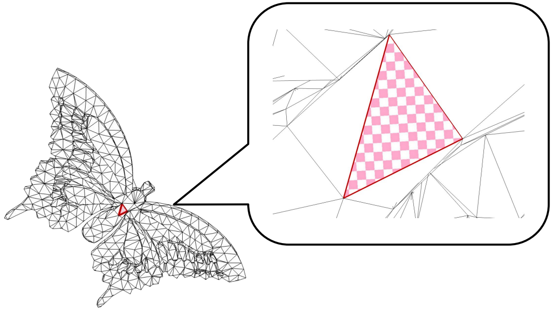
Natural Shape Dataset

Q. Zhou & A. Jacobson. 2016, “Thingi10K: A Dataset of 10,000 3D-Printing Models”

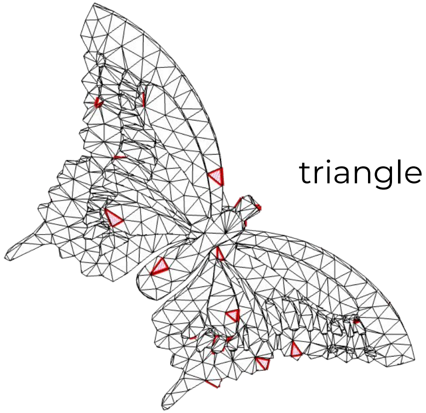
Size and Compactness Priors

Thresholded-distortion loss: maximize # triangles underneath a given distortion threshold

Smoothness loss: coplanar triangles should have same segmentation weight



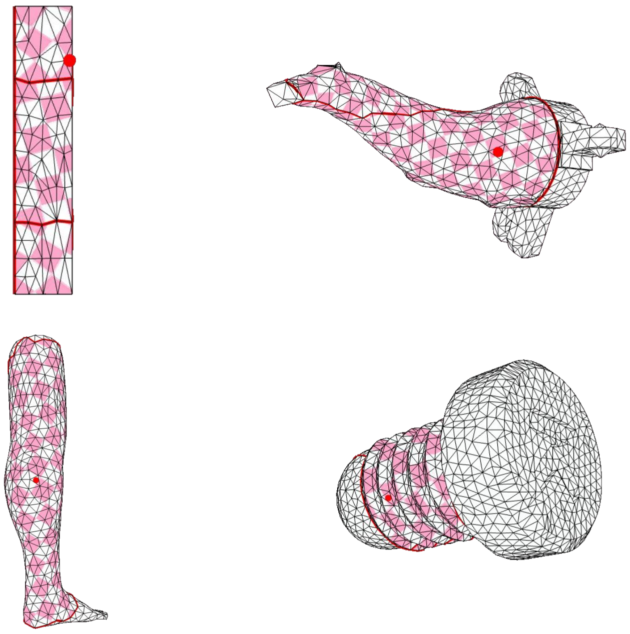
single triangle: no distortion



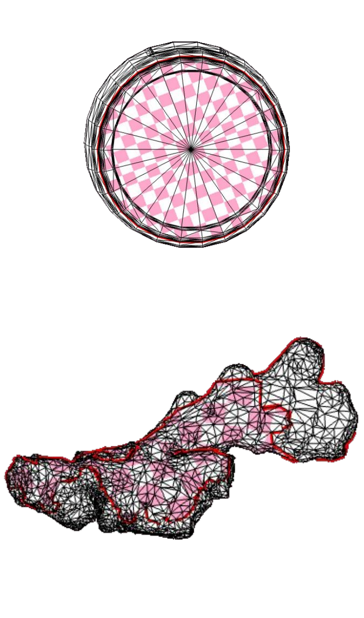
triangle soup: no distortion

Segmentation Results

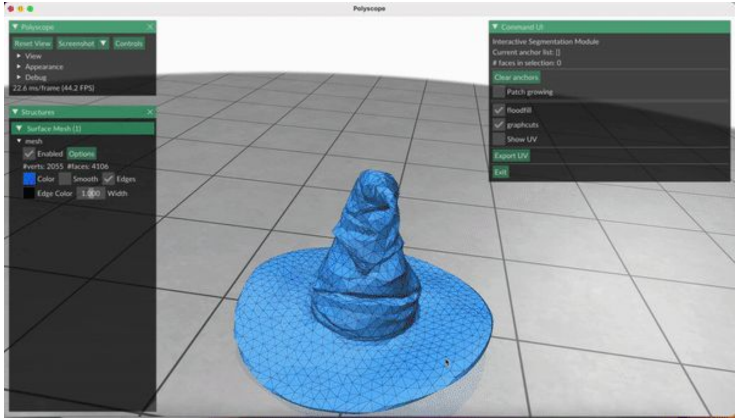
Thingi10k

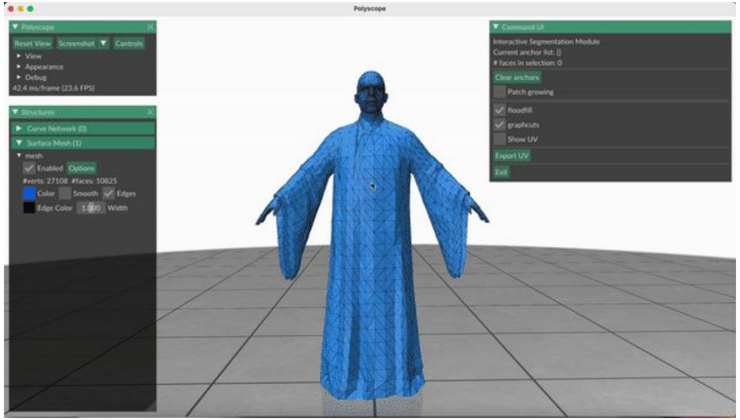


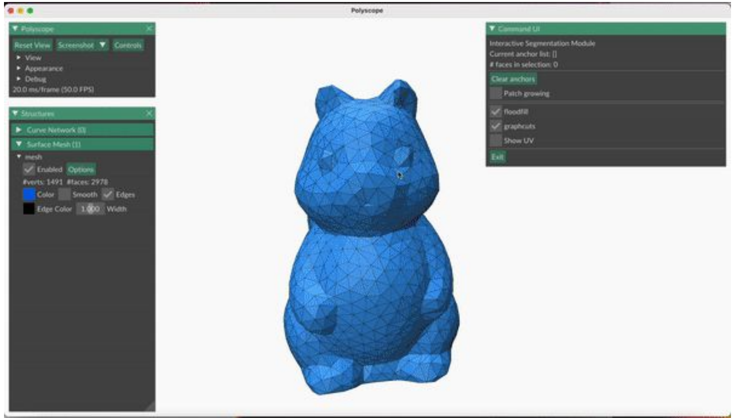
Parameterization Benchmark



Interactive Application



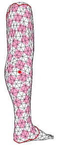


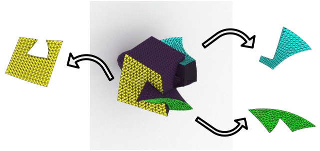


No GPU required

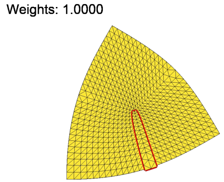
DA-Wand Summary

Neural framework for distortion-aware mesh segmentation conditional on user selection.

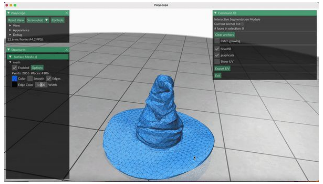




Automatic synthetic dataset generation with near-developable segmentation labels.



Probability-guided parameterization for distortion self-supervision



Interactive application for real-time mesh segmentation

Project Page

Paper

Code