Joint Learning of 3D Shape Retrieval and Deformation

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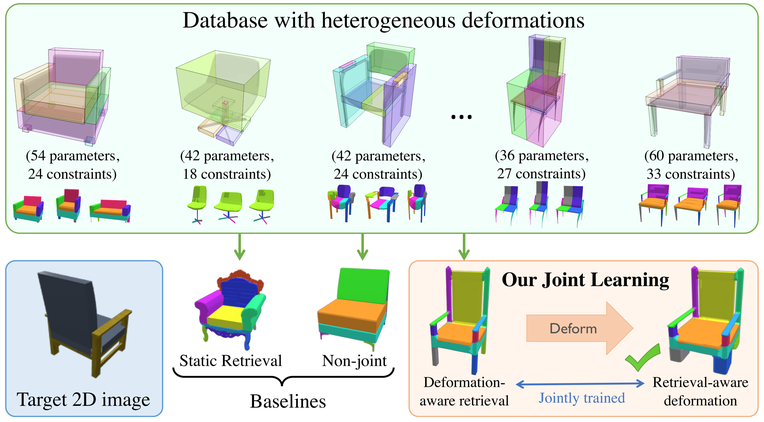
Project page!

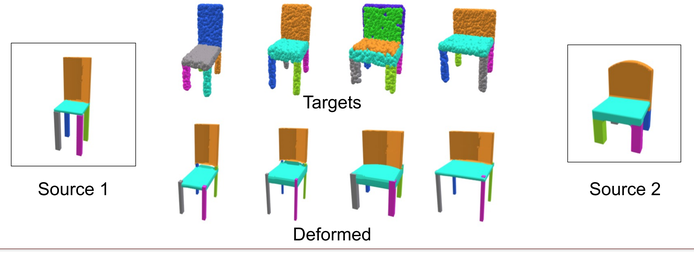
PROBLEM OVERVIEW



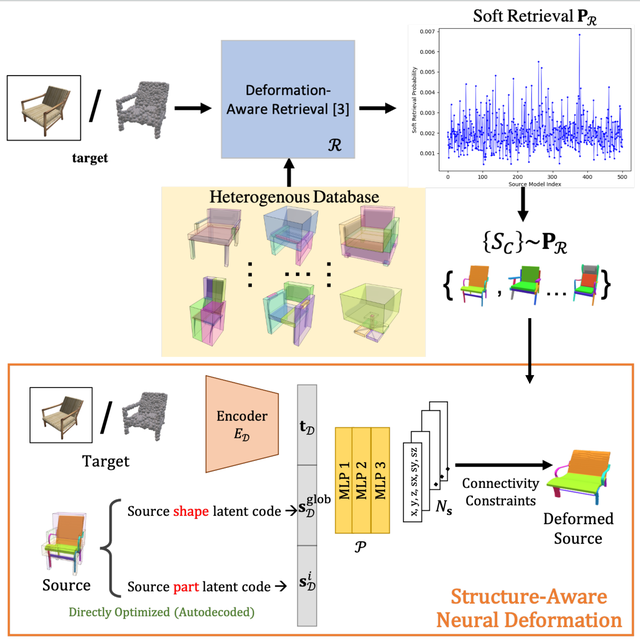
- **Retrieval** and **Deformation** are **equal citizens** in a **joint problem.**

WHY JOINT LEARNING?

- **Deformation-aware Retrieval**
  - embedding that retrieves models that fit **after** deformation
- **Retrieval-aware Deformation**
  - embedding can aid the selection of better source-target pairs
- Two modules that are trained **jointly** optimizing network capacity.



OUR APPROACH



Soft Retrieval

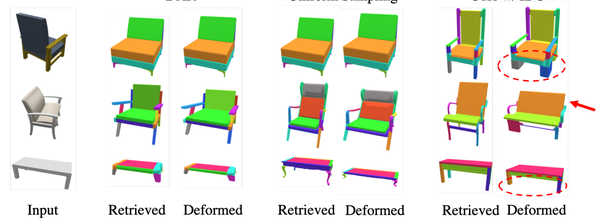
- Distance to the target in latent space $\mathcal{R}$ reflects the probability of selecting each source.
- Sample source candidates based on this distribution
- Retrieval and deformation modules alternately optimized with these pairs.

Structure-Aware Neural Deformation

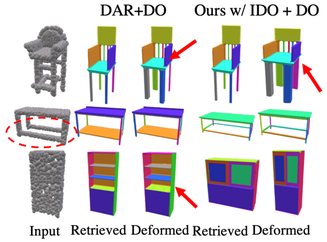
- Trained on source-target pairs selected by soft retrieval.
- Able to handle a **heterogeneous database**:
  - Varying number of parts for each source models
  - Manual (PartNet) and automatic (ComplementMe) segmentations
  - Source dependent part-to-part connectivity constraints

RESULTS

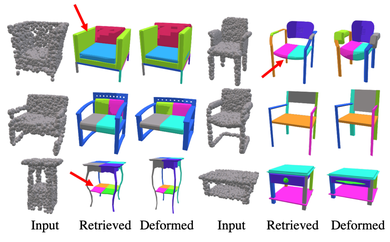
Image-to-Mesh



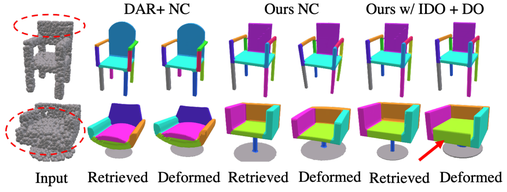
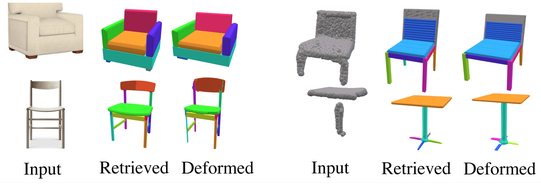
Point Cloud-to-Mesh



Automatic Segmentation



Joint Training on Neural Cages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