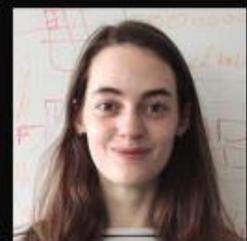
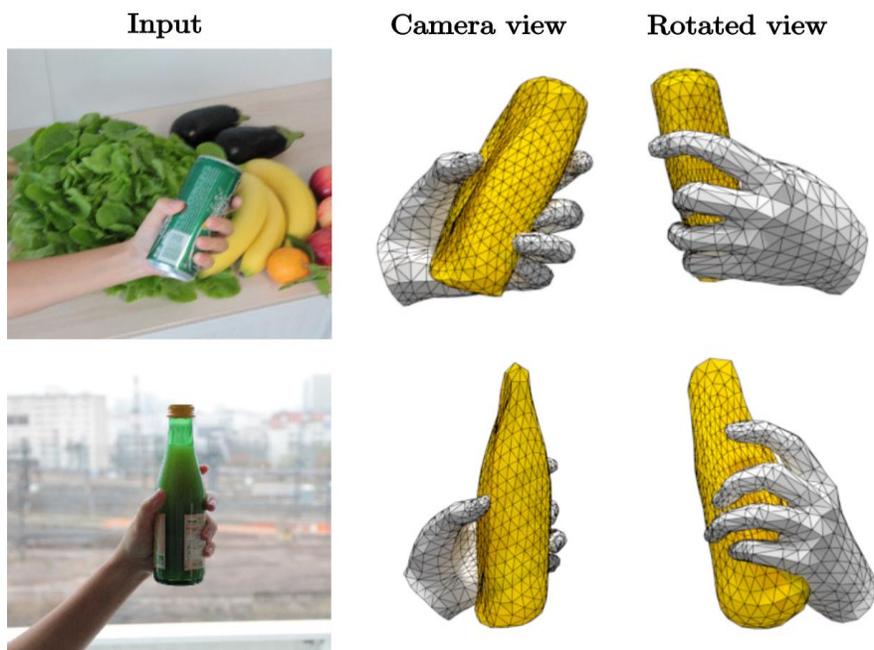


Learning joint reconstructions of hands and manipulated objects



Yana
Hasson



Gül
Varol



Dimitris
Tzionas



Igor
Kalevatykh



Michael J.
Black



Ivan
Laptev



Cordelia
Schmid

Motivation



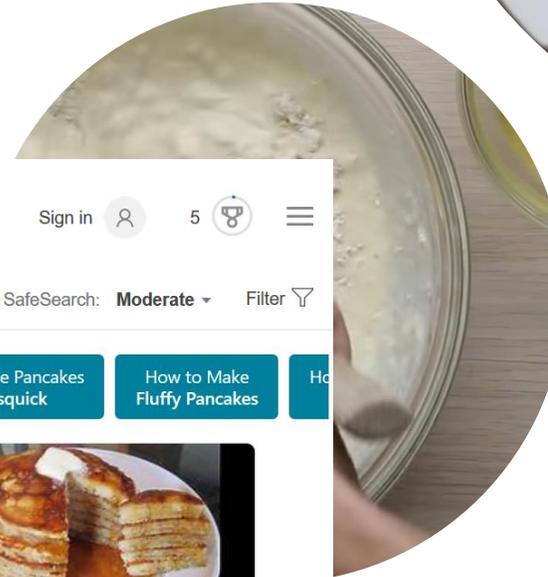
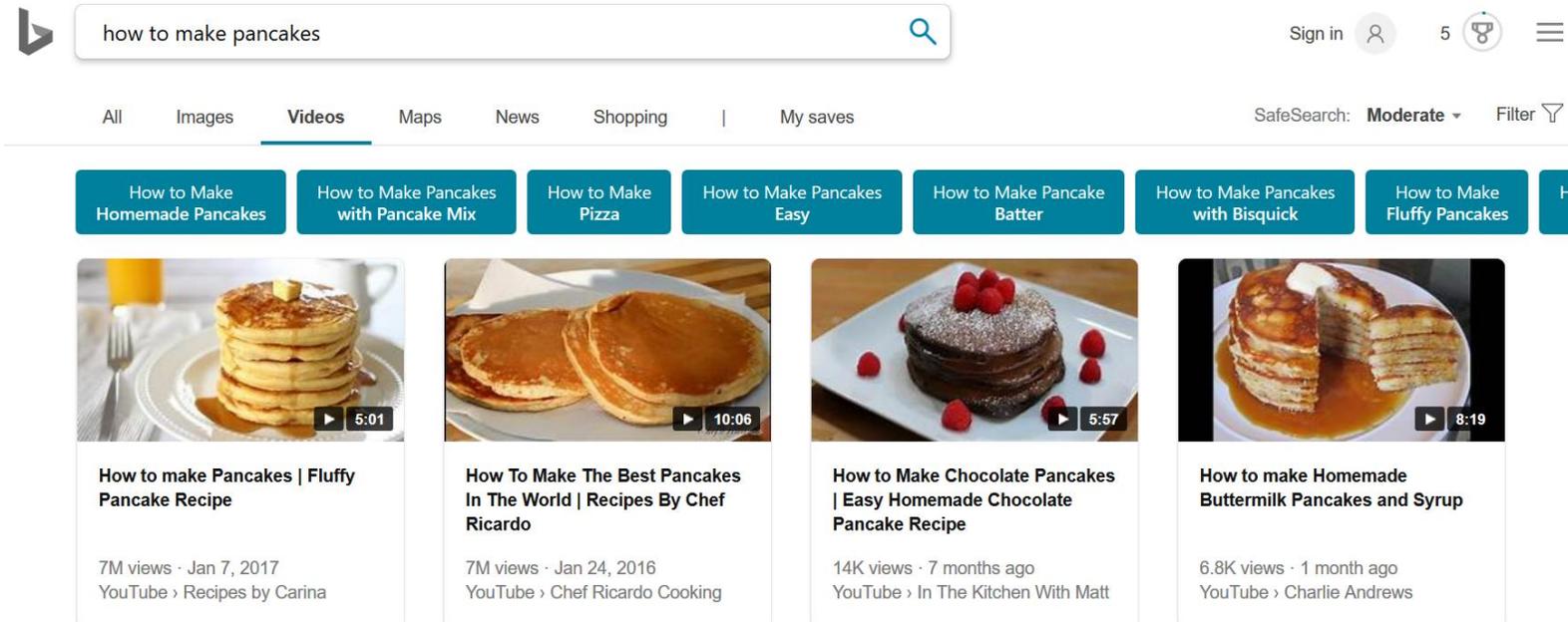
Motivation

- Learn human rules of object manipulation
- A first step : hand-object reconstruction from a single rgb frame



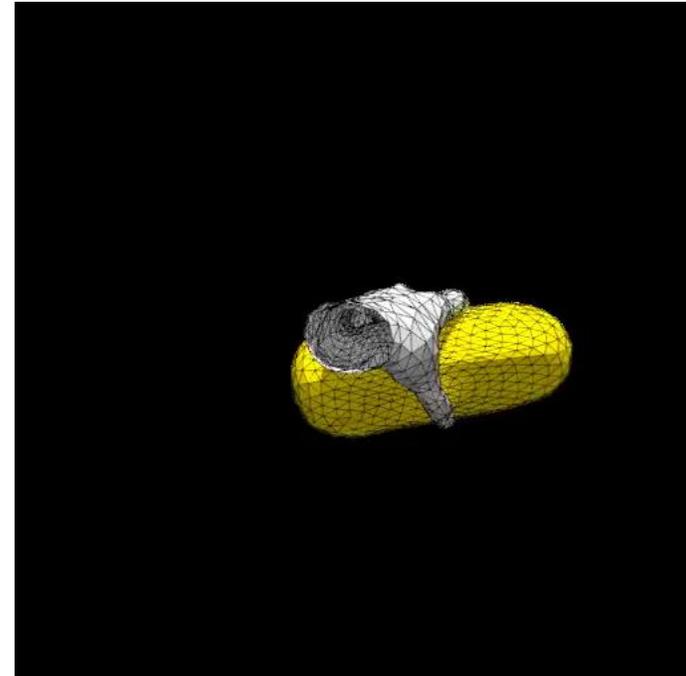
Motivation

- Learn human rules of object manipulation
- A first step : hand-object reconstruction from a single rgb frame



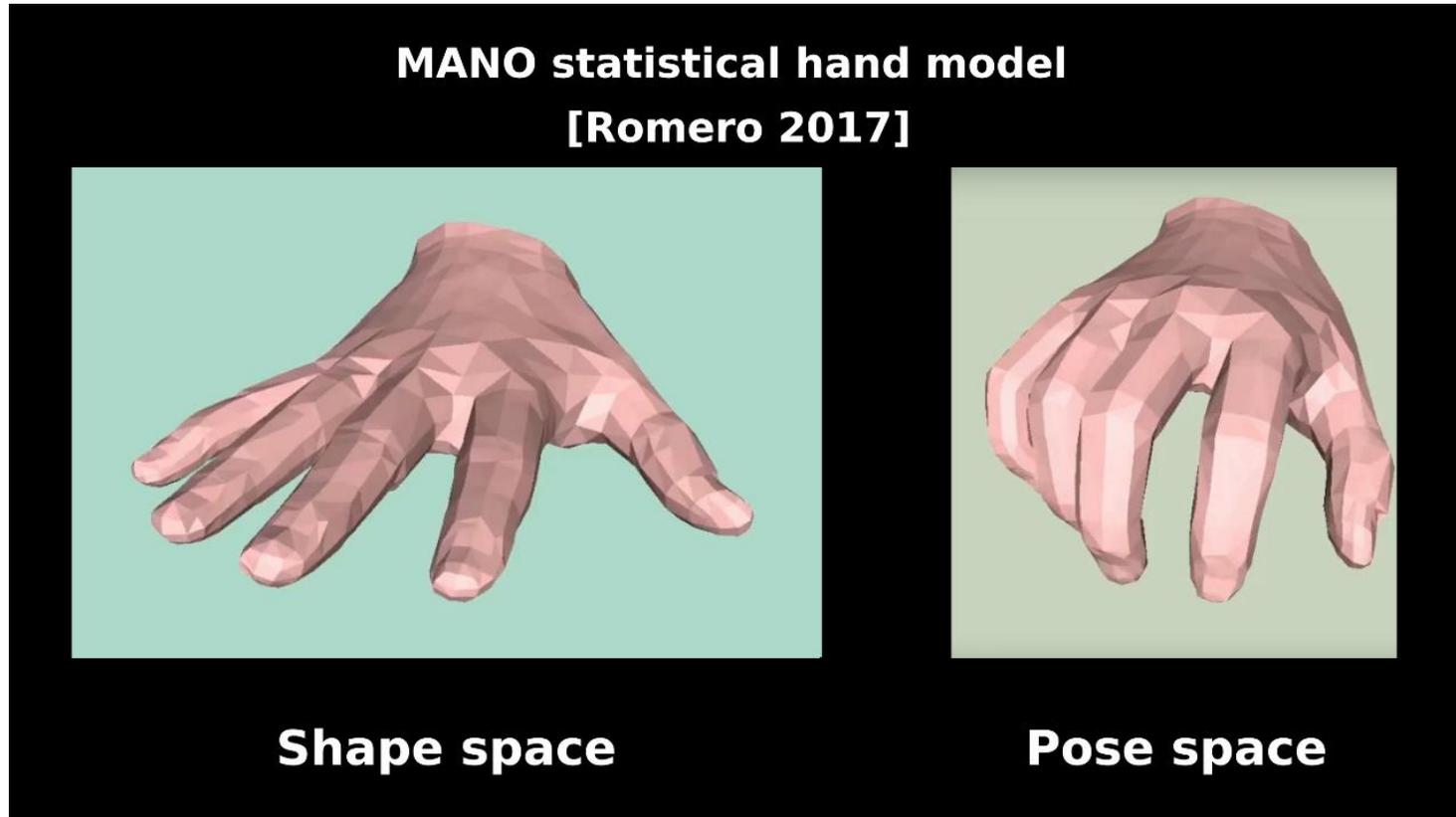
Our approach

- Reconstruct hand and object meshes in an end-to-end learning framework



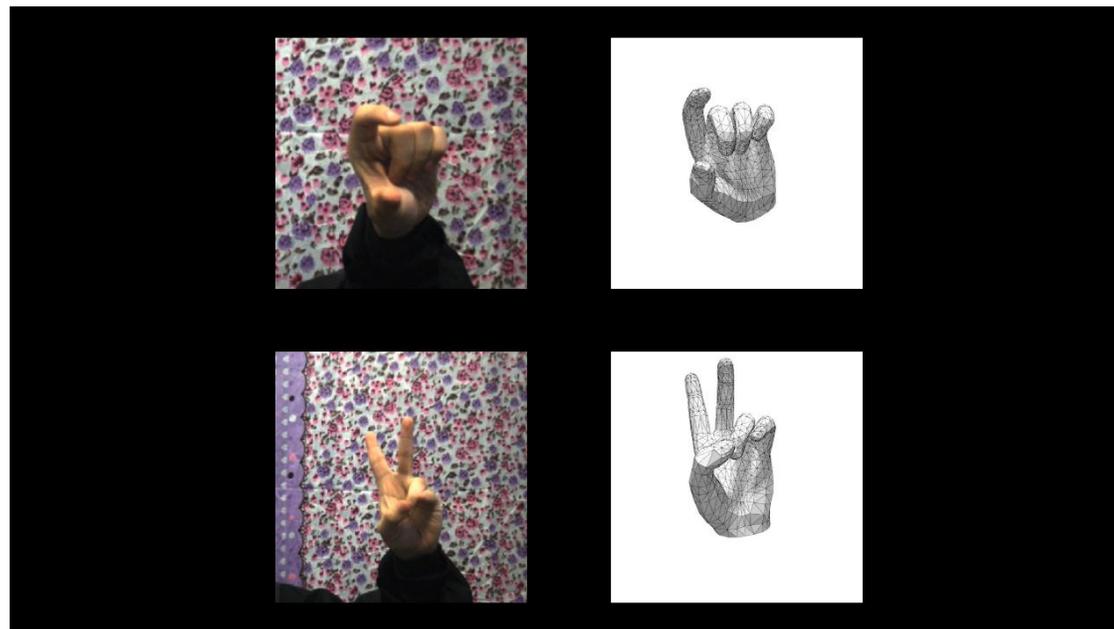
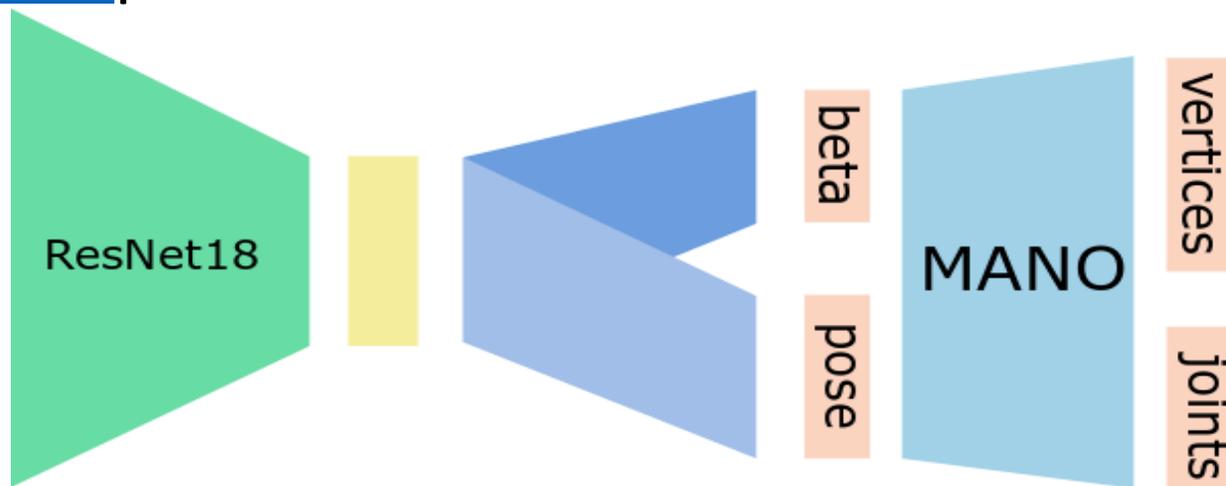
Hand reconstruction

- Integrate the [MANO](#) parametric hand model as a differentiable layer



Hand reconstruction

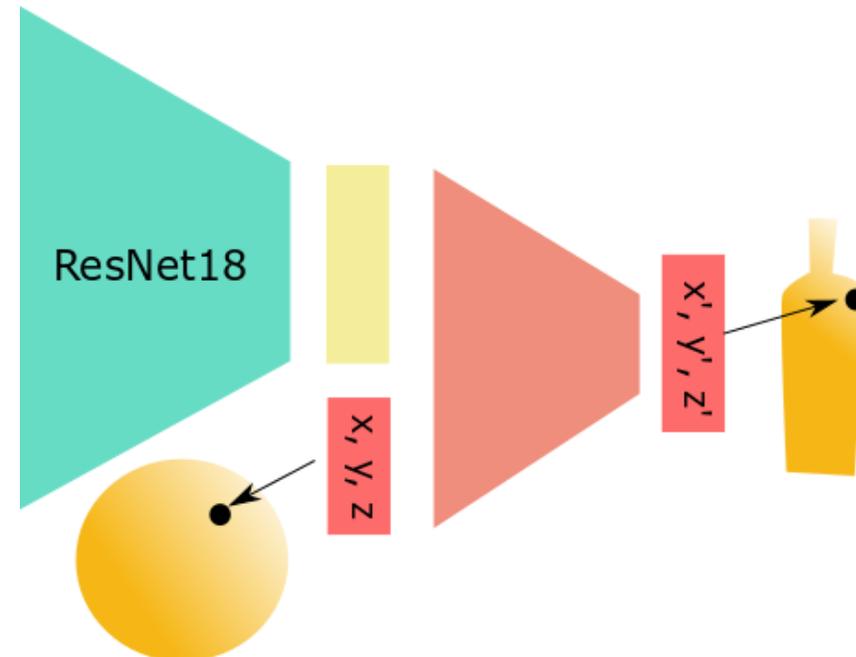
- Integrate the [MANO](#) parametric hand model as a differentiable layer



Object reconstruction

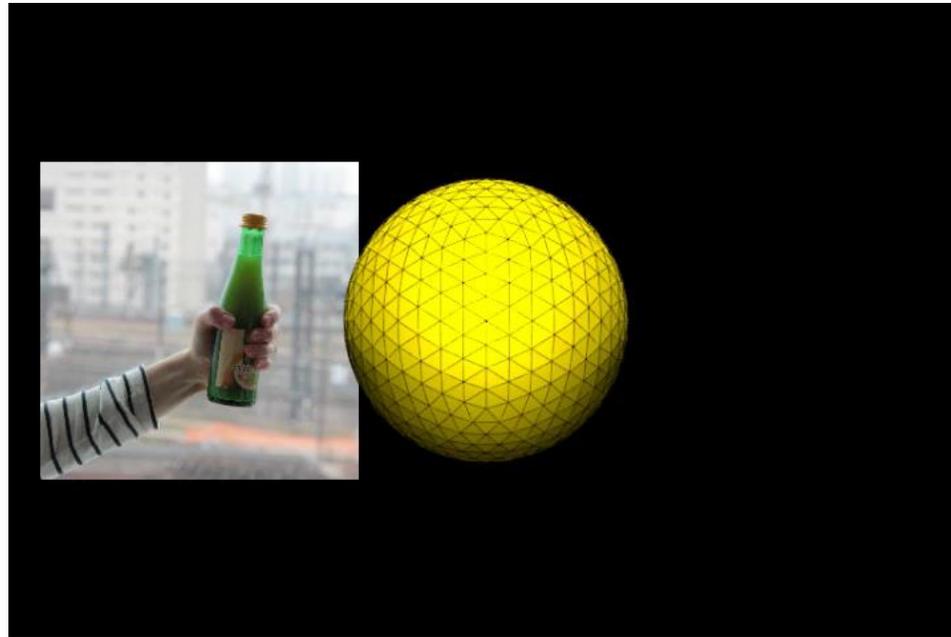


- Deform a sphere into the target shape
- Baseline from [AtlasNet](#)

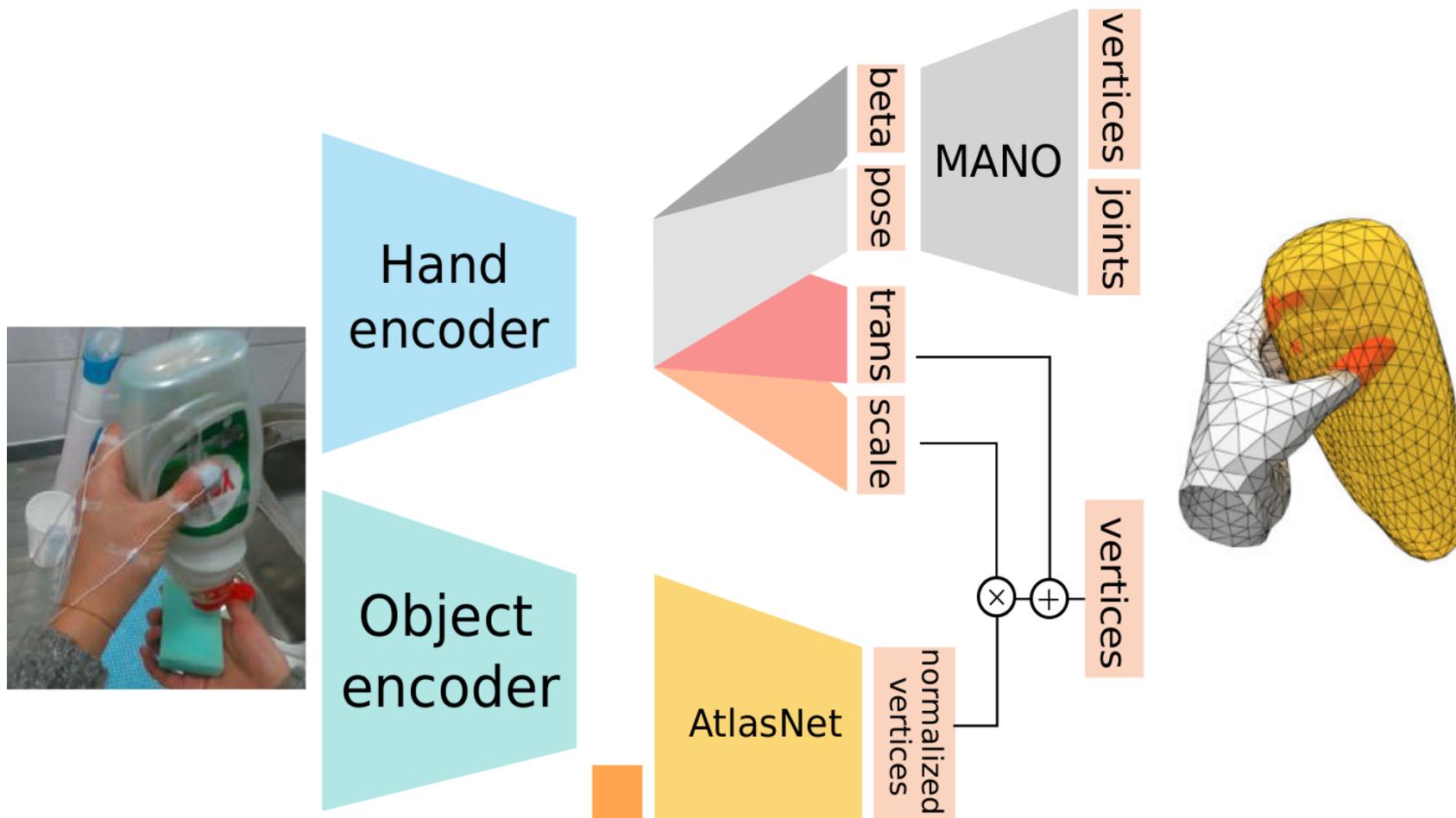


Object reconstruction

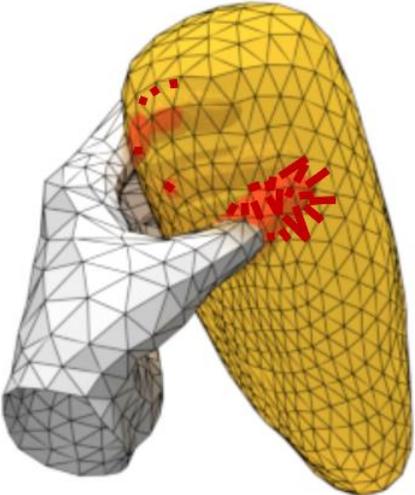
- Predict scale and translation relative to hand



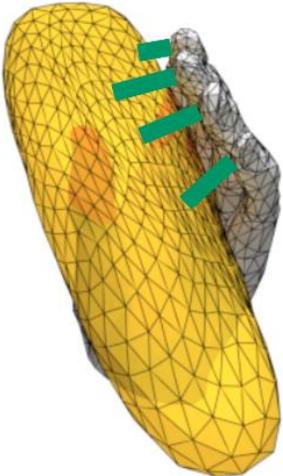
Full architecture



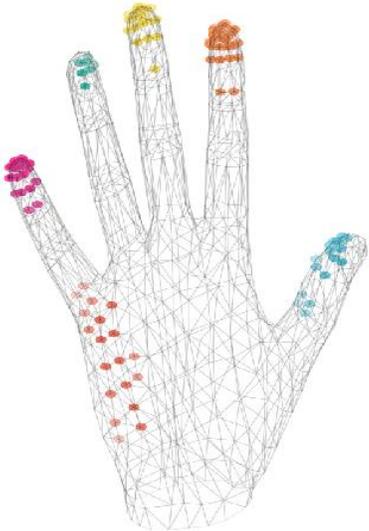
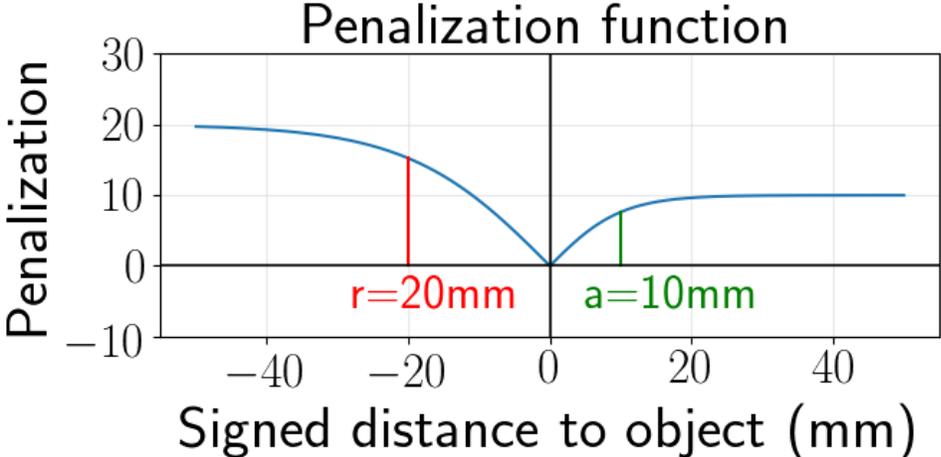
Interaction terms



Repulsion loss



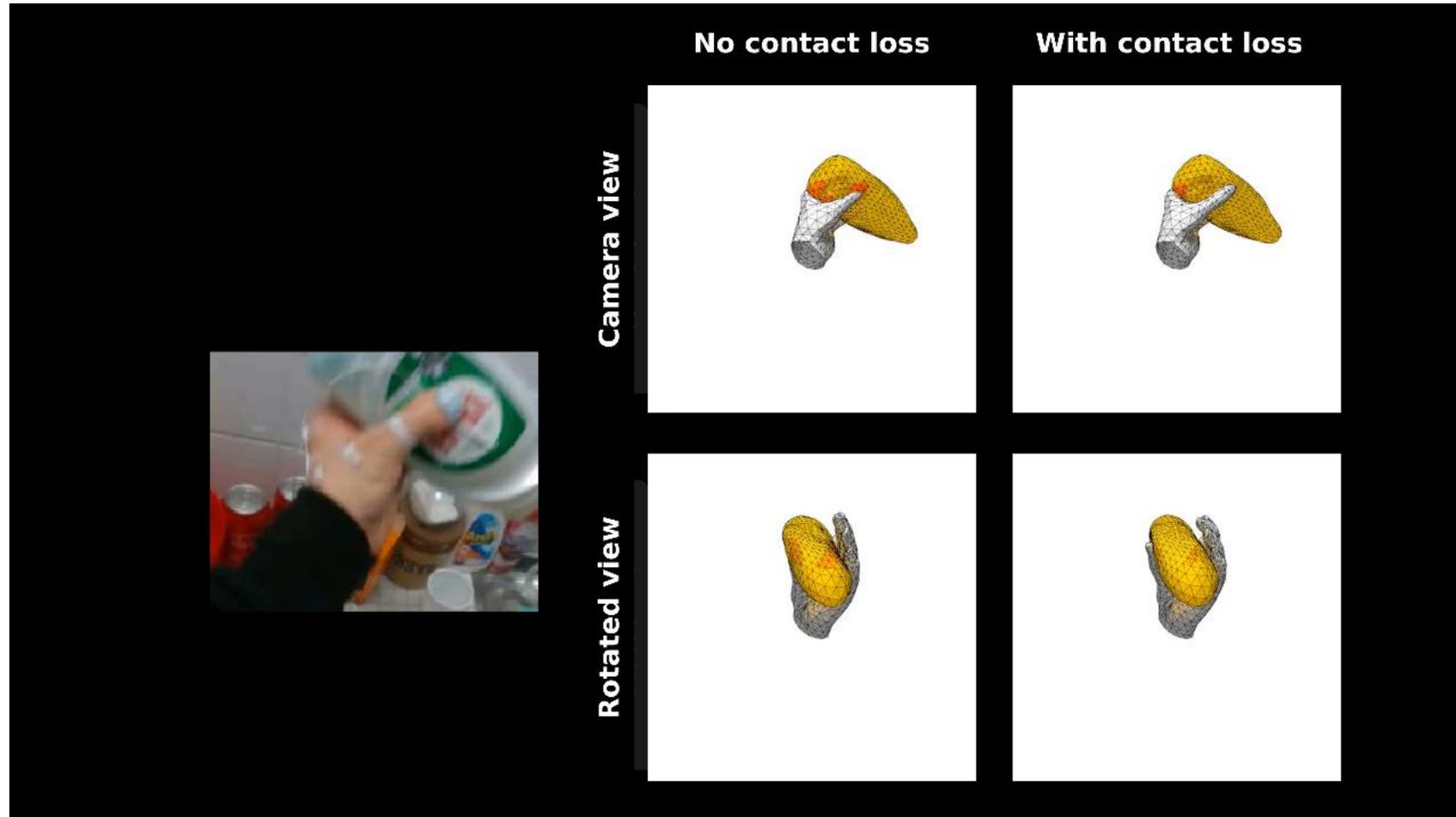
Attraction loss



Contact zones

Qualitative results

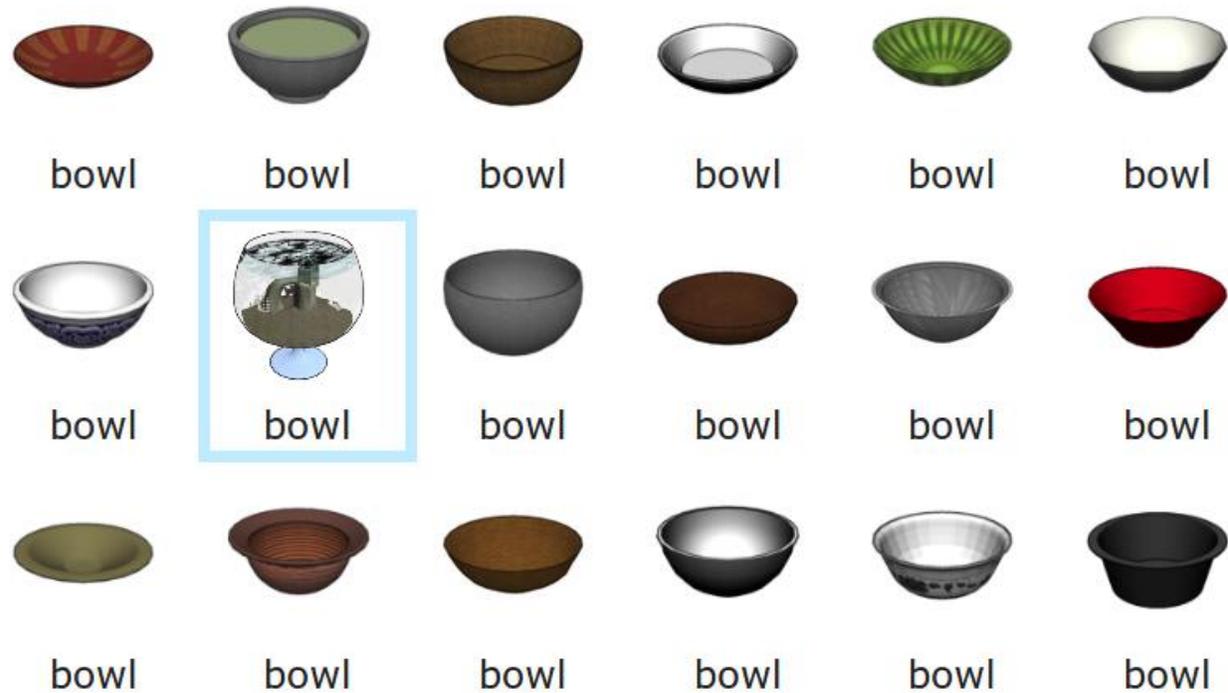
First Hand Action Benchmark dataset



Object model collection

Selected "Graspable" objects from [ShapeNet](#)

- 8 object categories (bowls, bottles, ...)
- 2.7K object instances

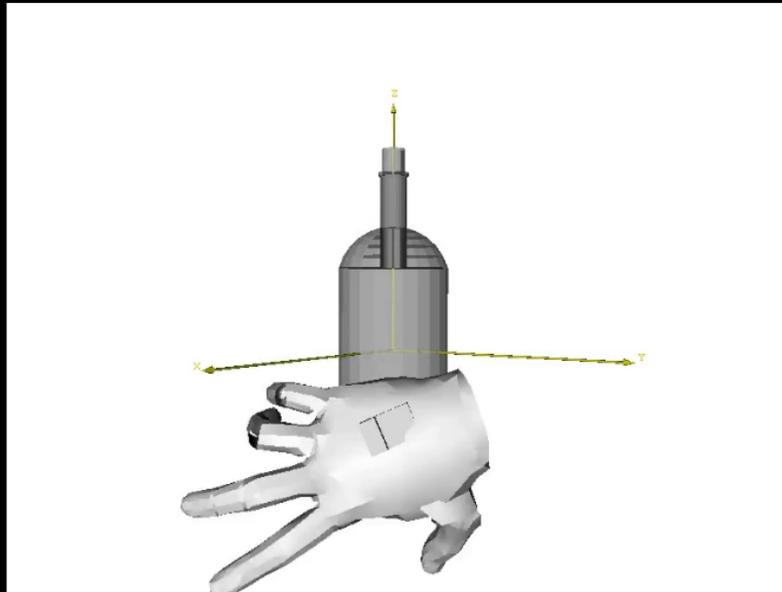


Robotic grasps

Transformed MANO to a fixed articulated model

Use Graspl software to automatically generate grasp

**Grasping object models with MANO
in Graspl [Miller 2004]**

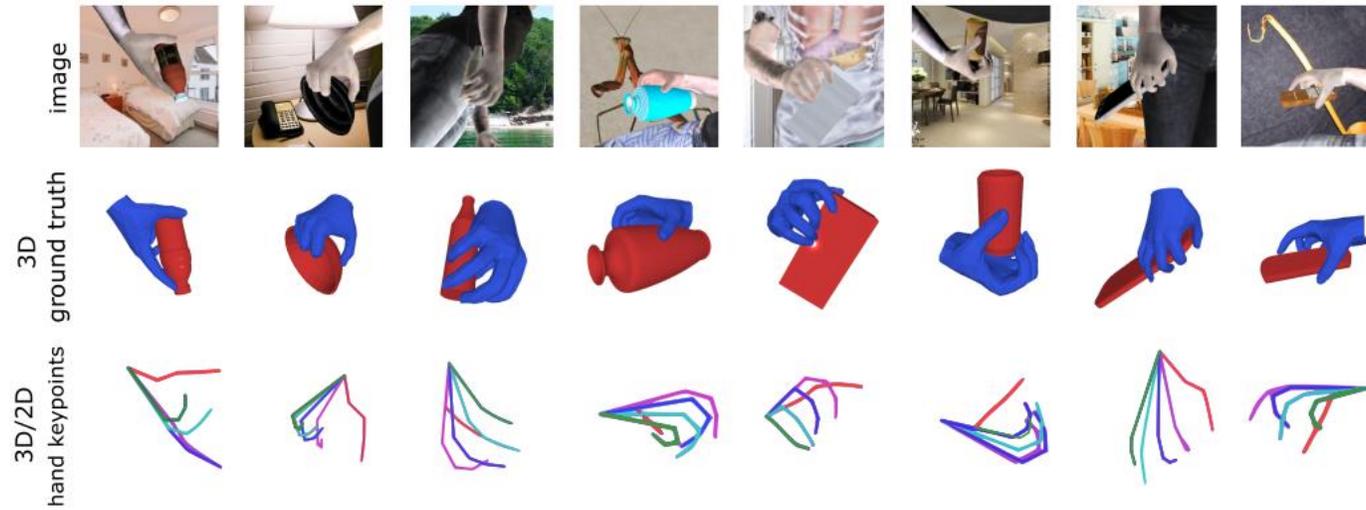


Rendering

Random object textures from ShapeNet and image backgrounds

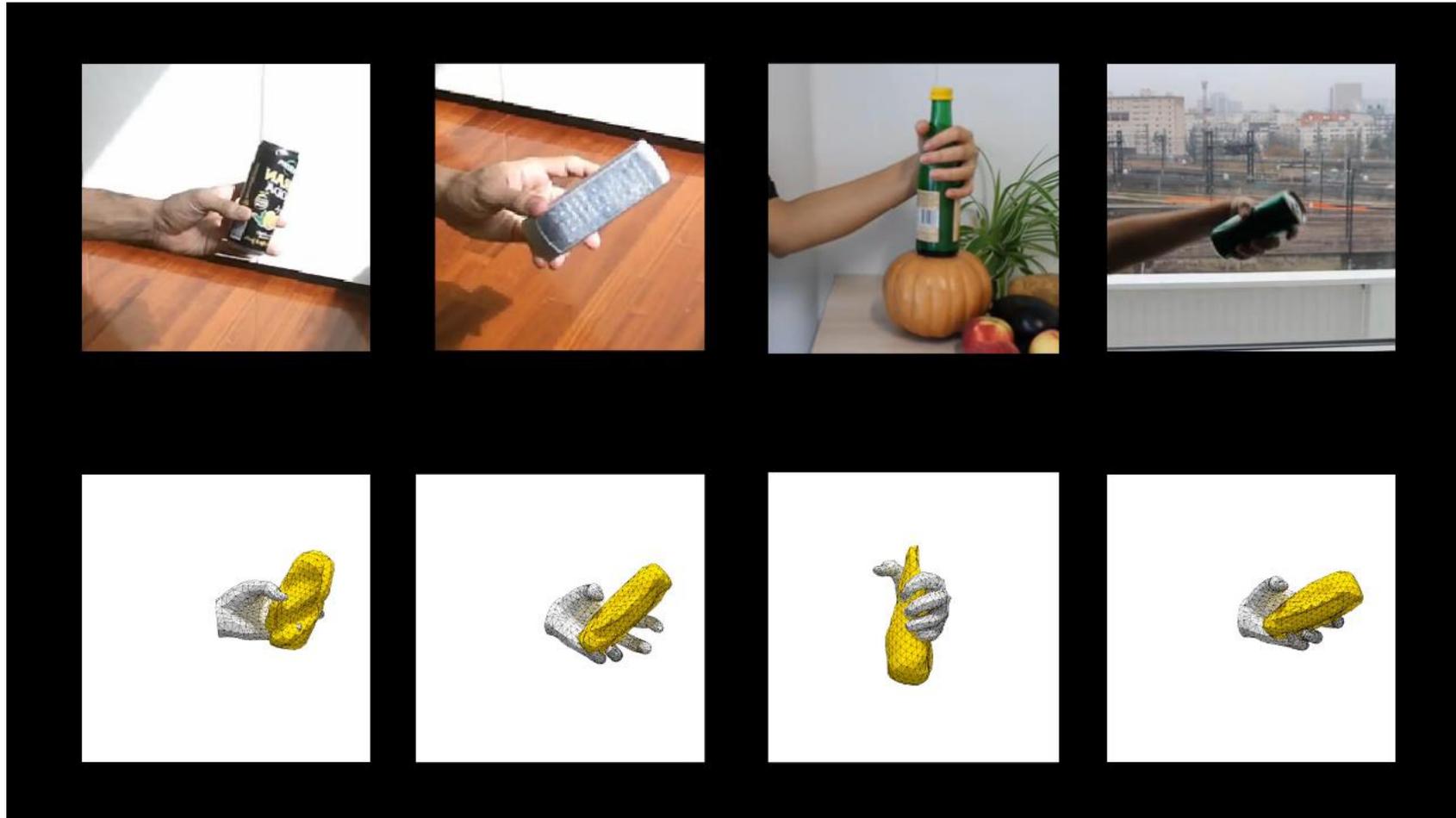
Random lighting, body pose, global orientation

Samples from the generated ObMan dataset

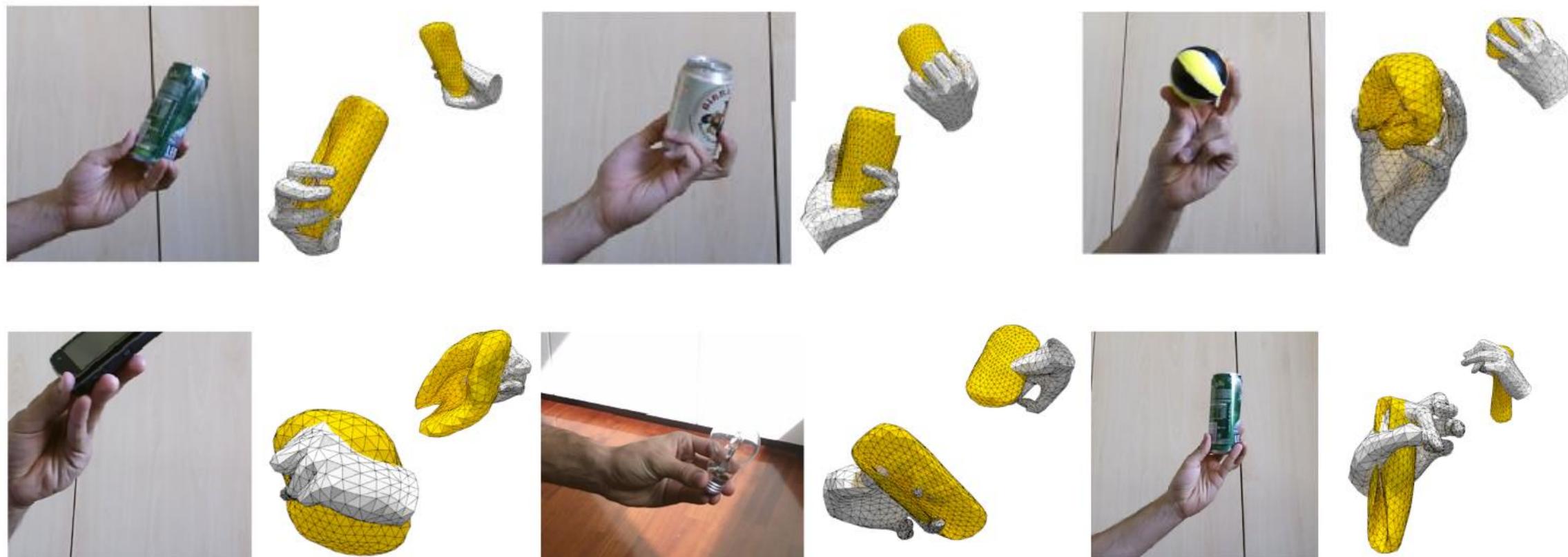


Qualitative results

CORe50 dataset and custom sequences



Failure cases

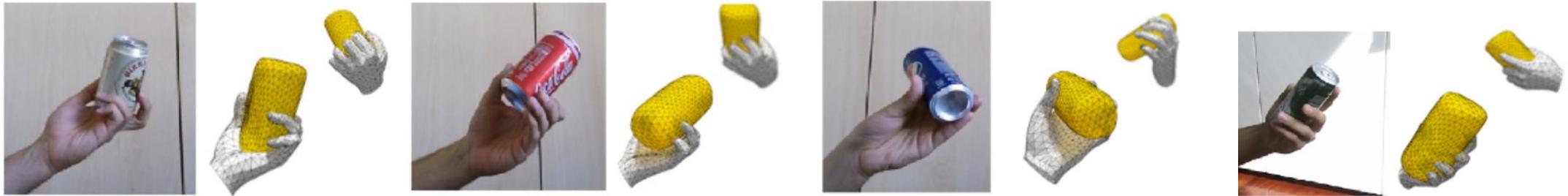


Model robustness

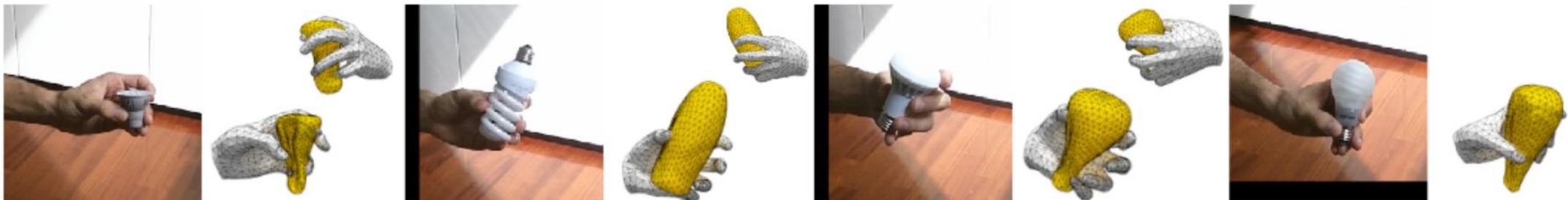
Background variation



Object textures



Unseen categories



Future work...

