

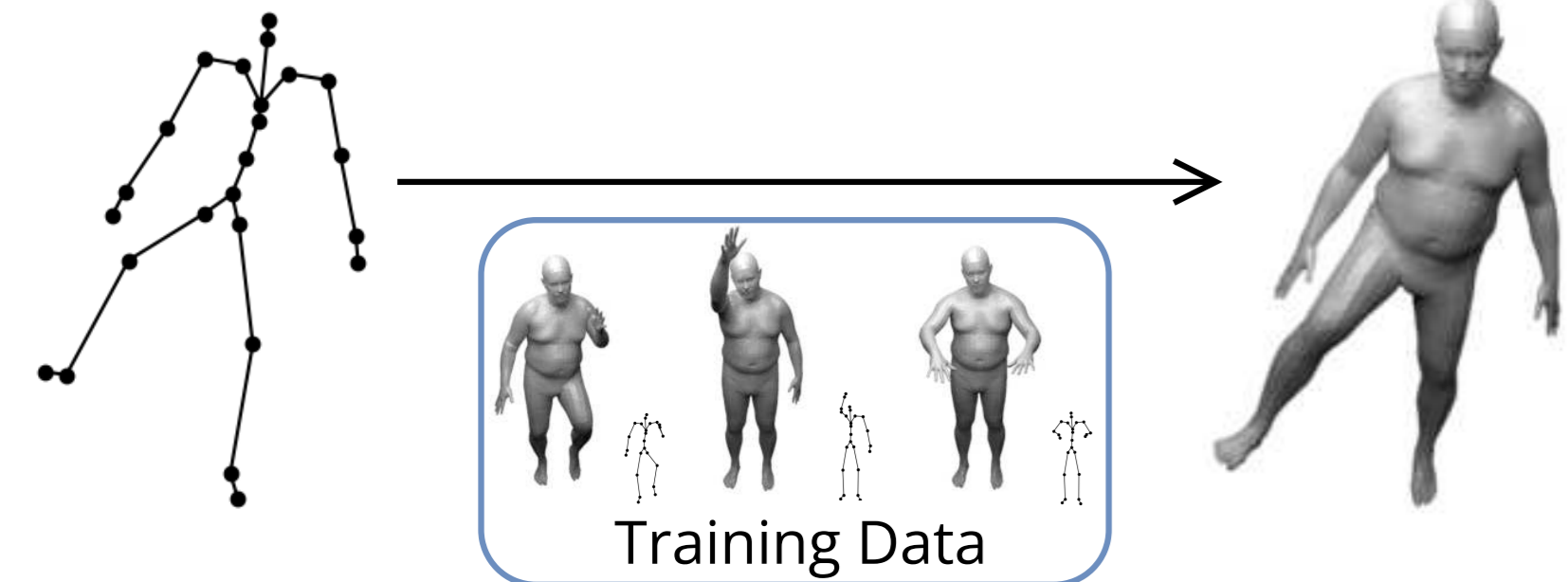
SNARF: Differentiable Forward Skinning for Animating Non-Rigid Neural Implicit Shapes

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Goal

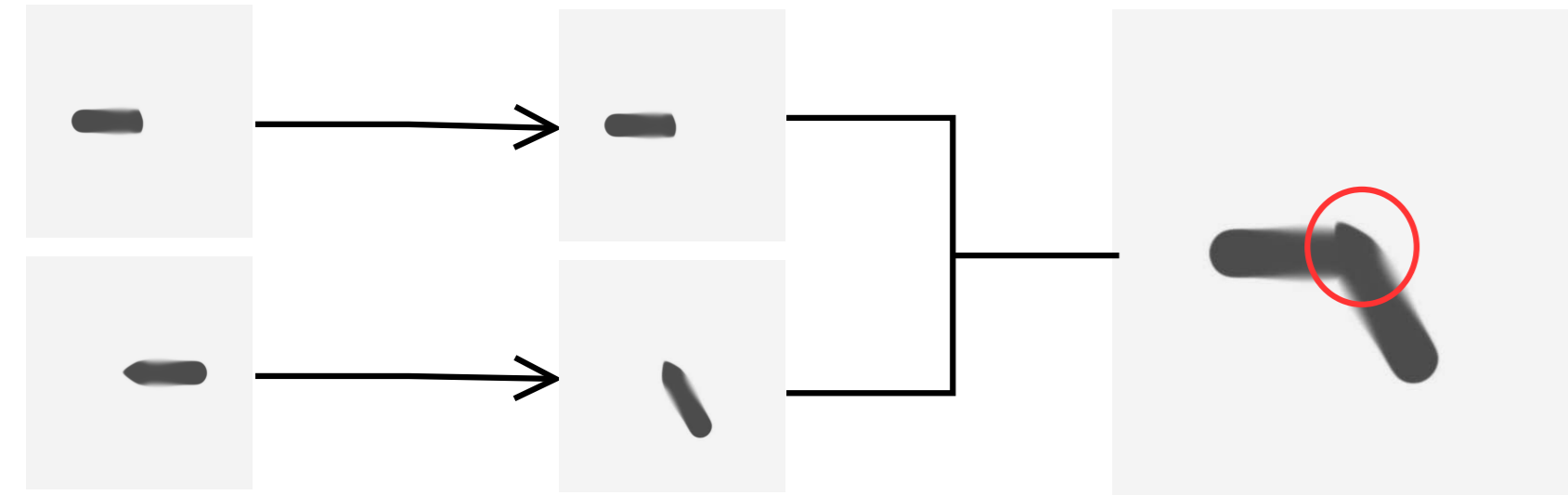
Generate implicit shapes in any pose by learning from deformed meshes.



Problem

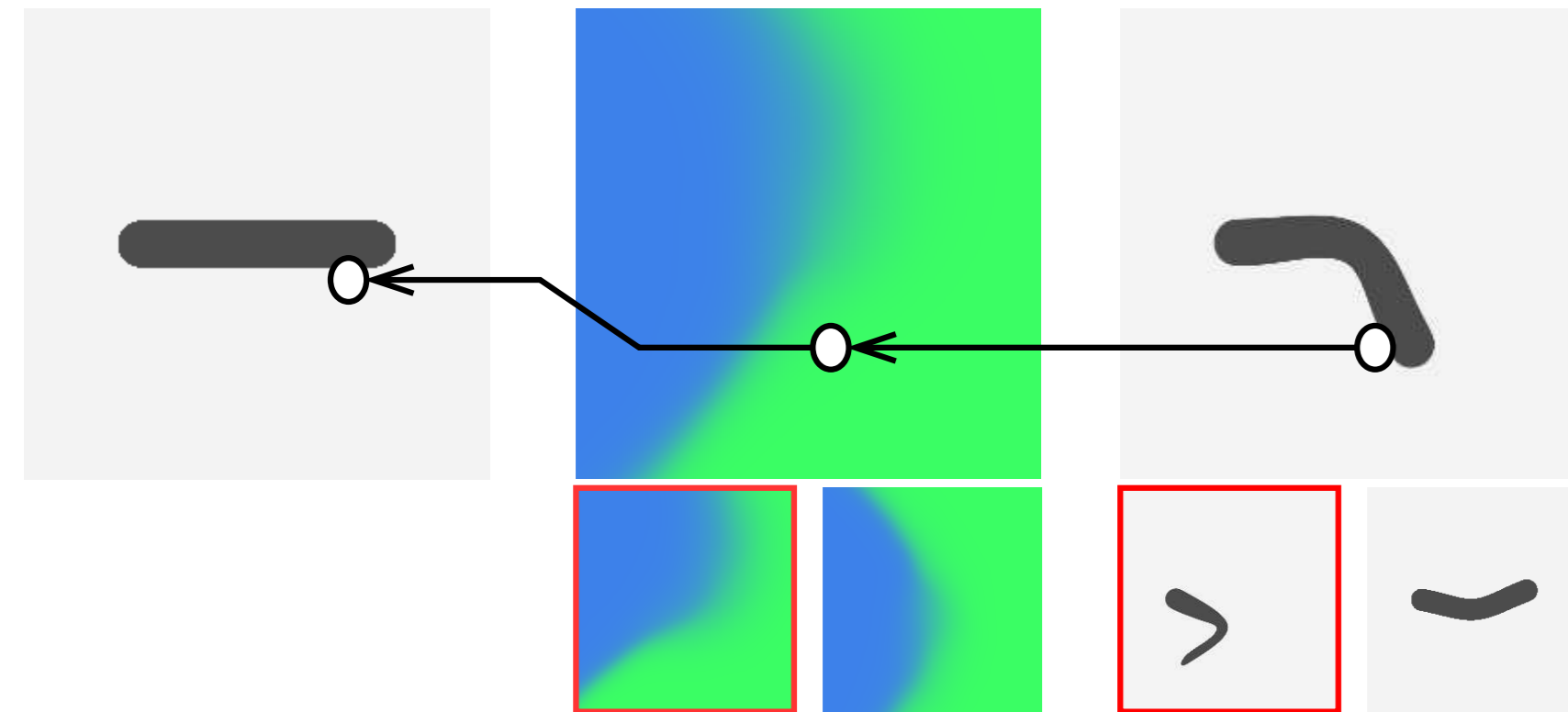
Existing Articulated Implicit Representations

A. Part-based:
Artifacts at joints



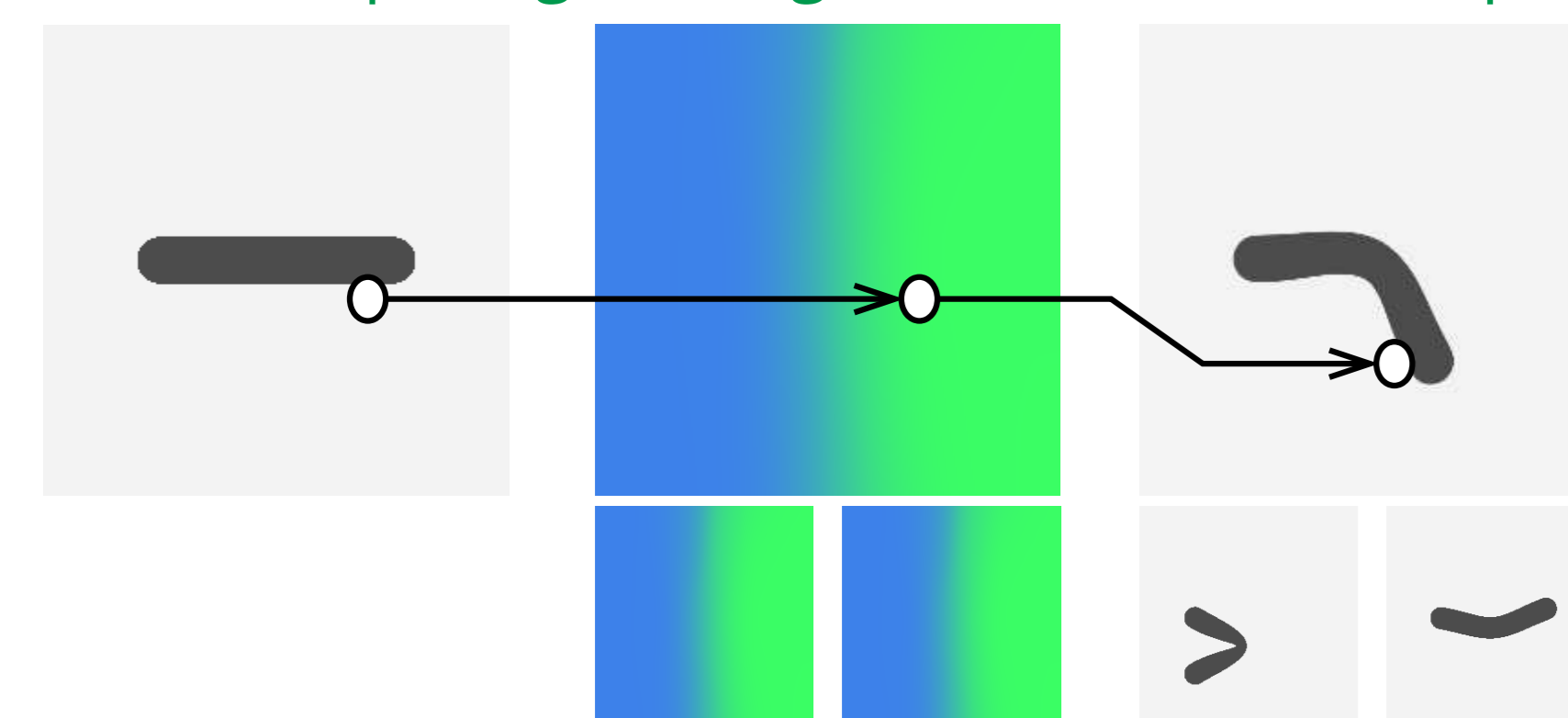
B. Backward LBS:

Pose-dep. LBS weights \rightarrow limited generalization



Our Solution - Forward LBS:

Pose-indep weights \rightarrow generalize to unseen poses



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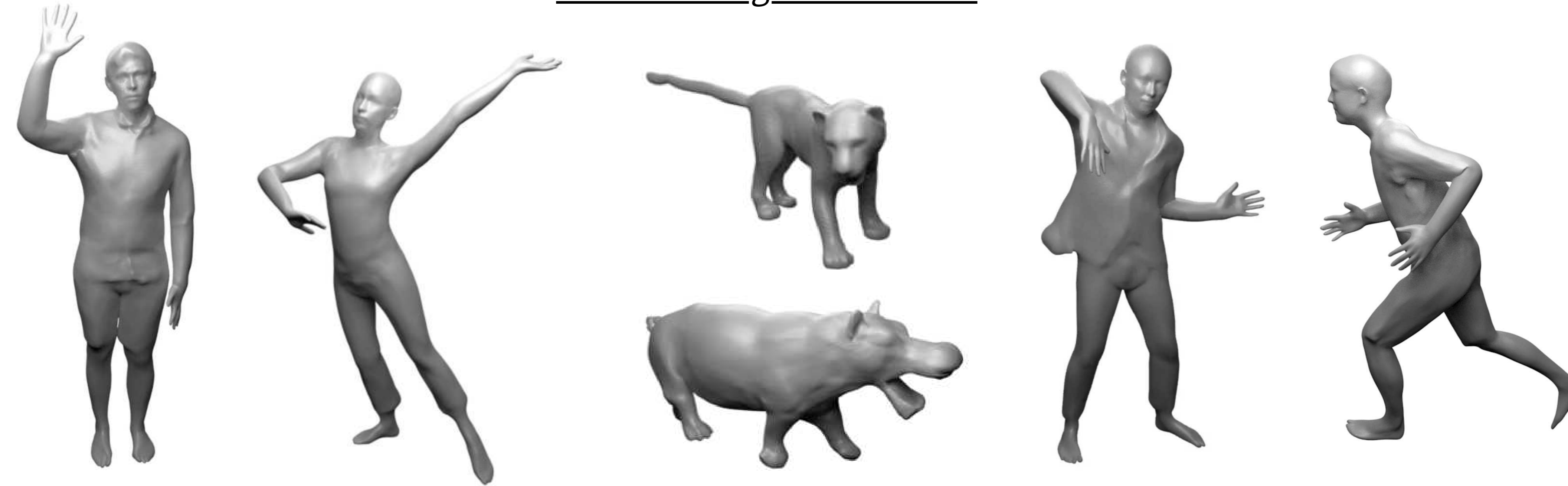
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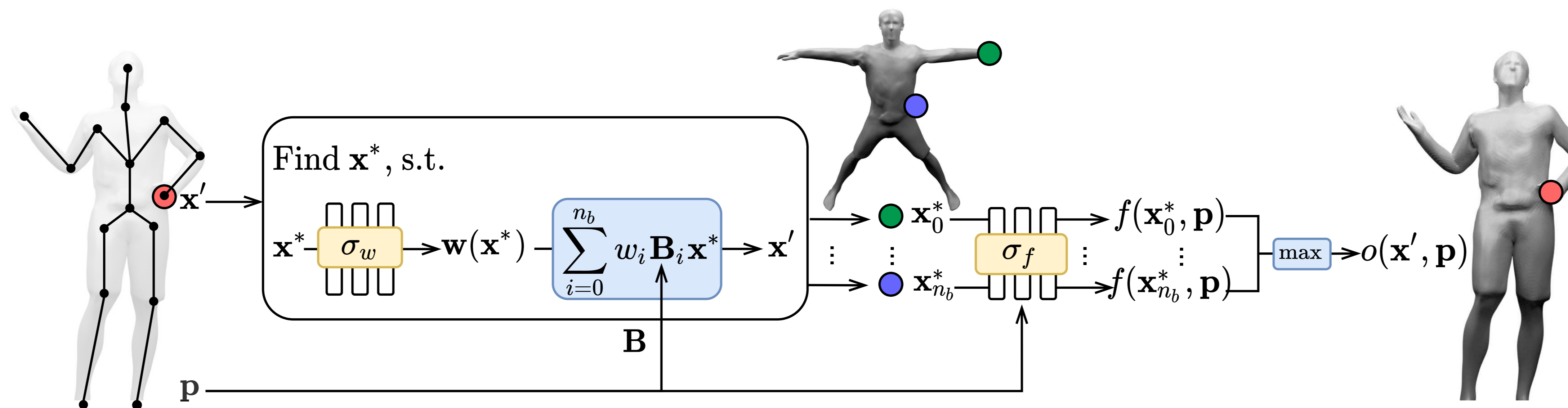
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xuchen-ethz.github.io/snarf



Method

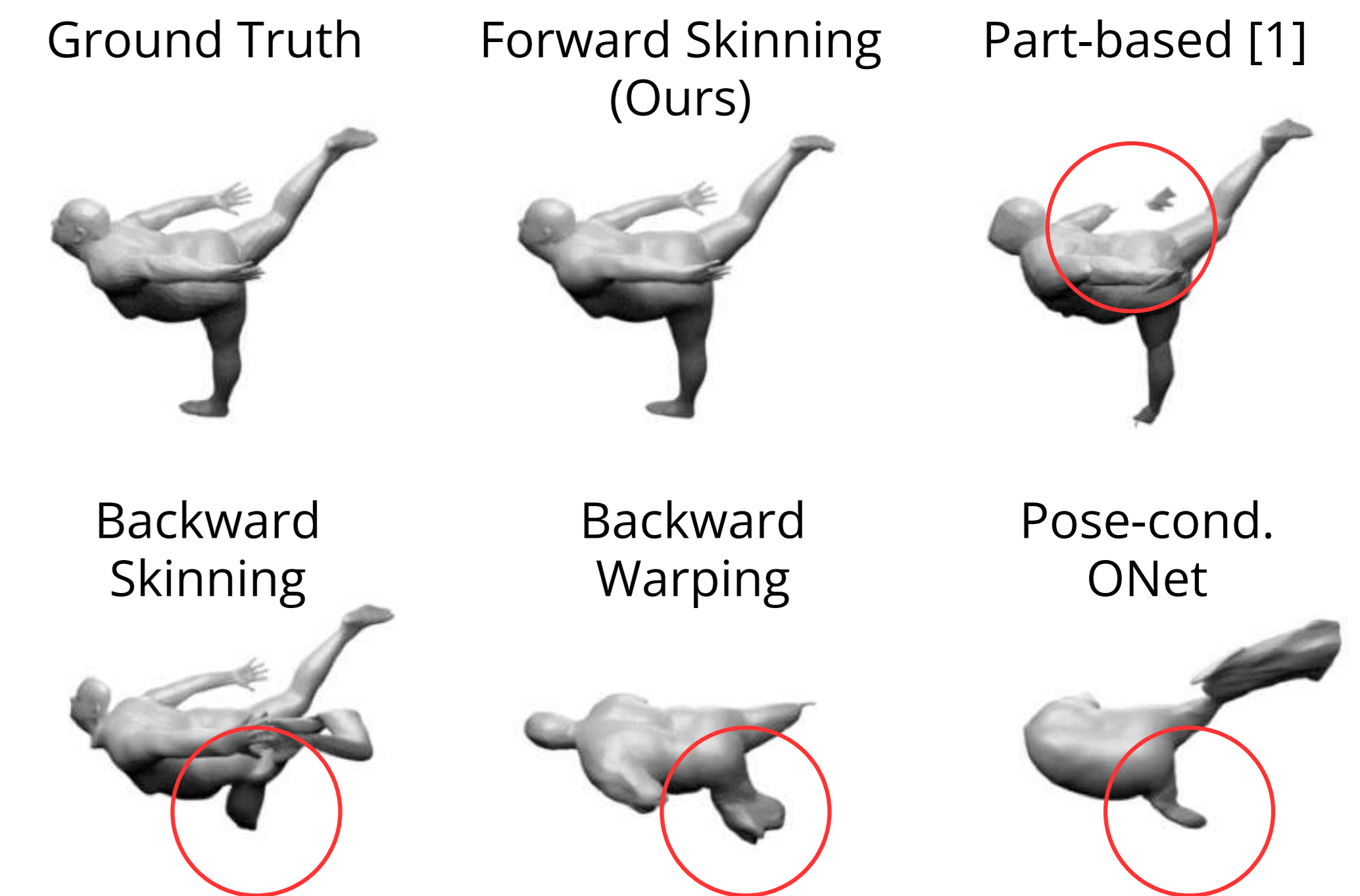


- Search canonical correspondence via iterative root finding;
- Handle multiple correspondences with multiple initialization for root finding;
- Aggregate multiple correspondences with max operator;
- Condition shape on pose to learn non-linear deformations (e.g. clothing);
- Implicit differentiation to avoid back-propagation through root finding.

Result

Minimally Clothed Human (IoU)

	Pose Within Training Distribution	Pose Outside Training Distribution
Pose-conditioned ONet	79.34%	49.21%
Backward Warping	82.08%	59.46%
Backward Skinning	81.68%	66.93%
Part-based Model [1]	96.14%	83.16%
Forward Skinning (Ours)	97.31%	93.97%



[1] NASA: Neural Articulated Shape Approximation

Learned Non-Linear Deformations

