



基于弱监督学习的单张深度图像三维人手外形恢复

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Weakly Supervised Learning for Single Depth-Based Hand Shape Recovery

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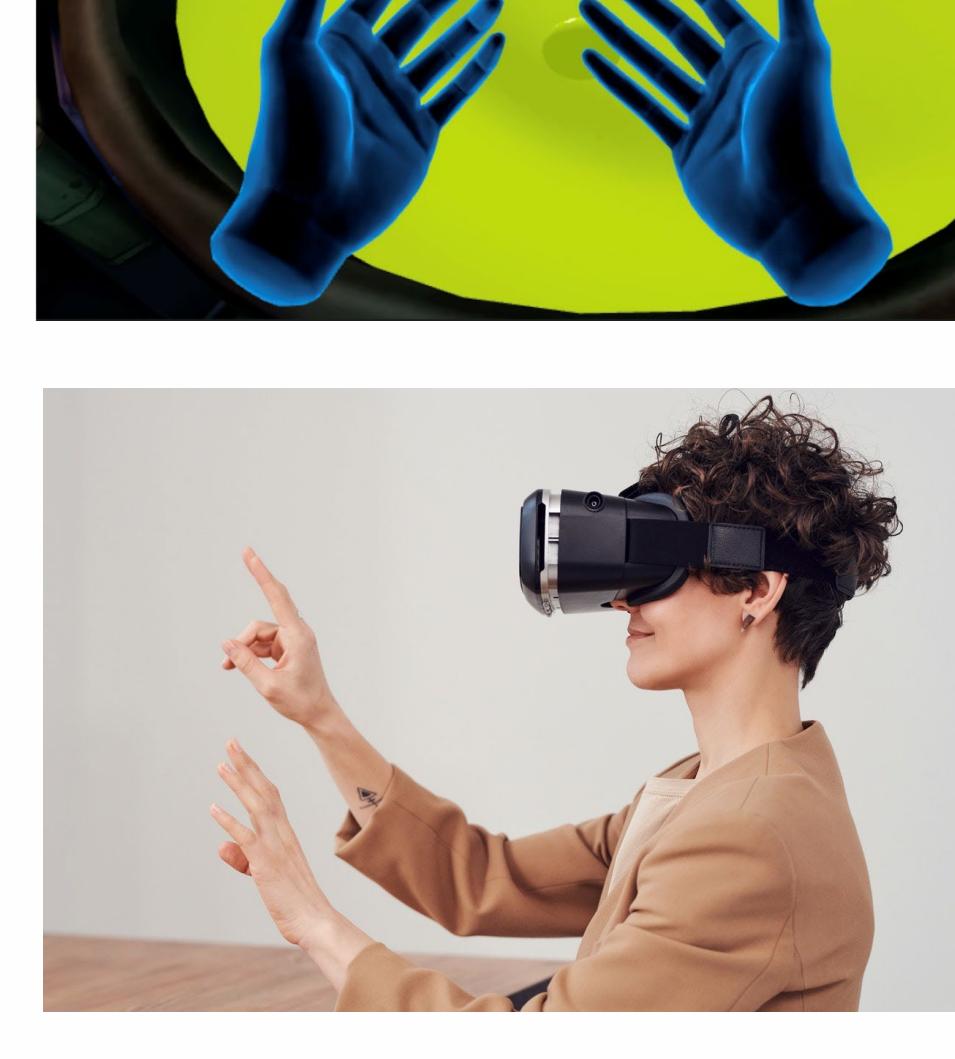
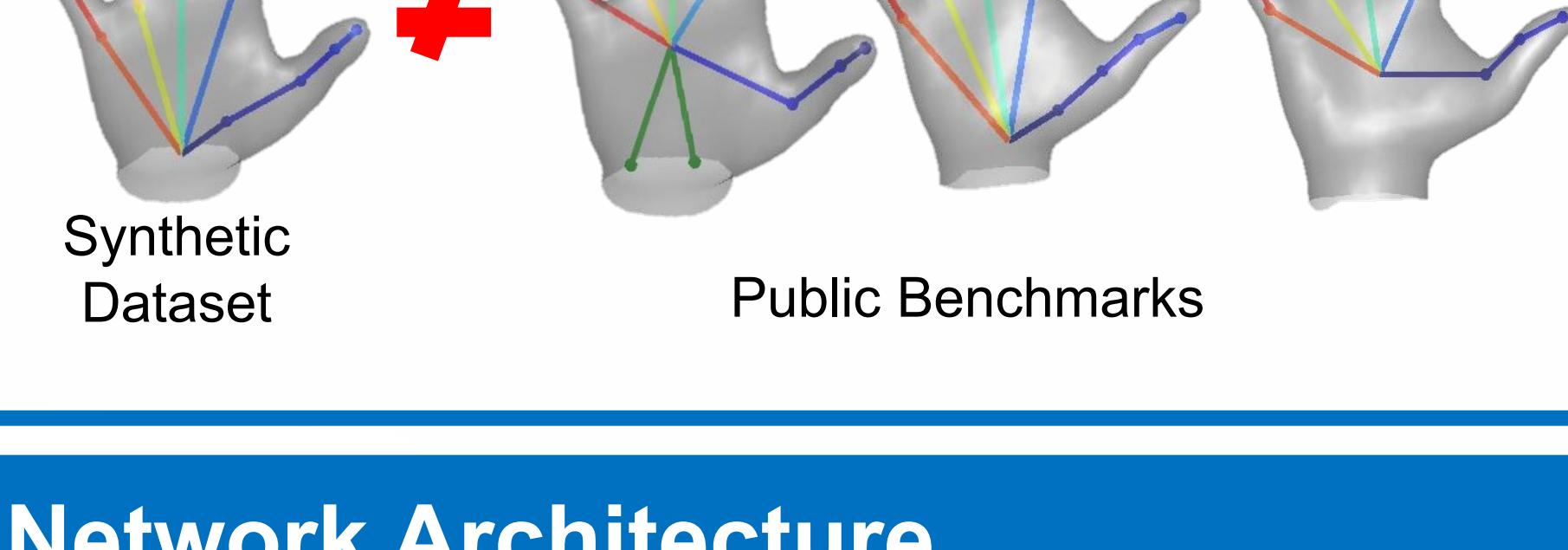
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Motivation

Recent emerging technologies such AR/VR and HCI are drawing high demand on more comprehensive hand shape understanding, requiring not only 3D hand skeleton pose but also hand shape geometry.

The current difficulties include:

1. No annotation of the hand shape.
2. Different datasets have different keypoint labels.



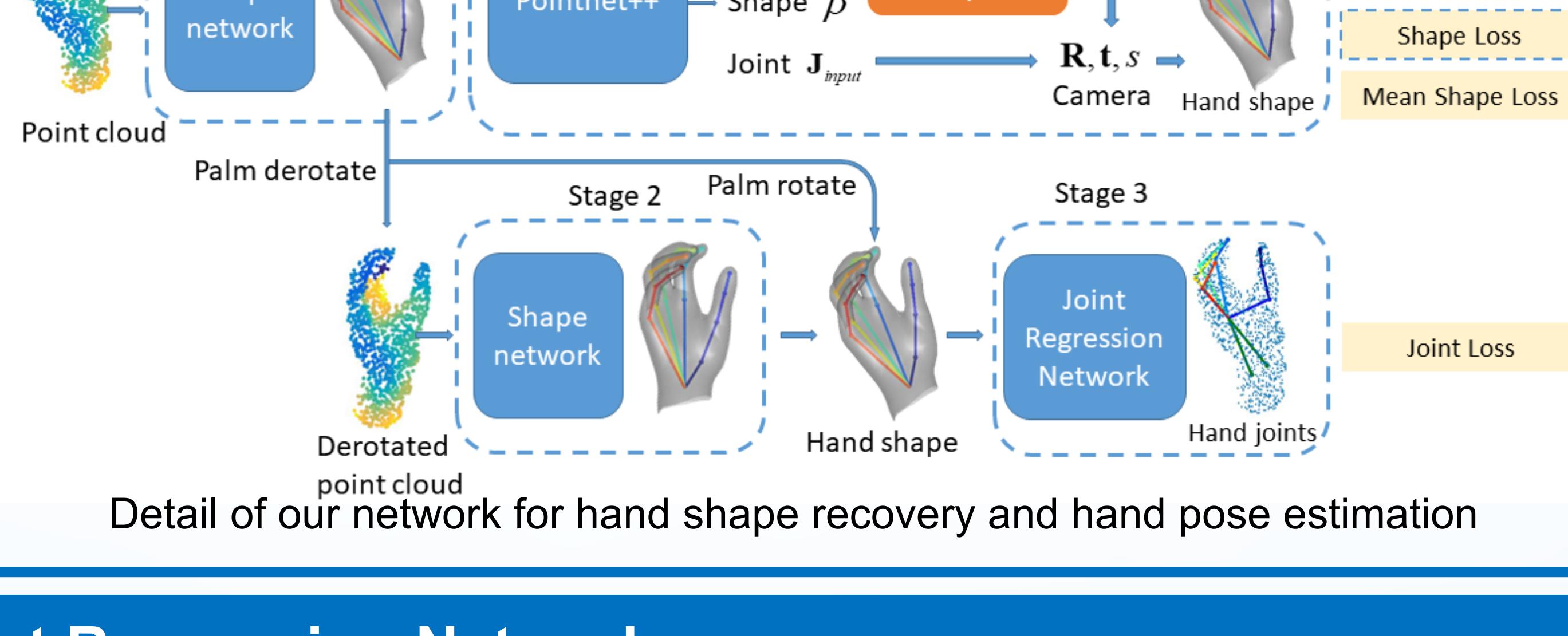
Introduction

We propose a deep learning framework to produce 3D hand shape from a single depth image.

Our main contributions:

1. We propose a deep learning framework for hand shape reconstruction with easy-to-access weak supervisions of hand pose and point cloud from the input depth;
2. We present a joint regression network, which uses hand shape as input to predict hand joints and facilitates the hand pose adaptation of different hand skeleton definitions;

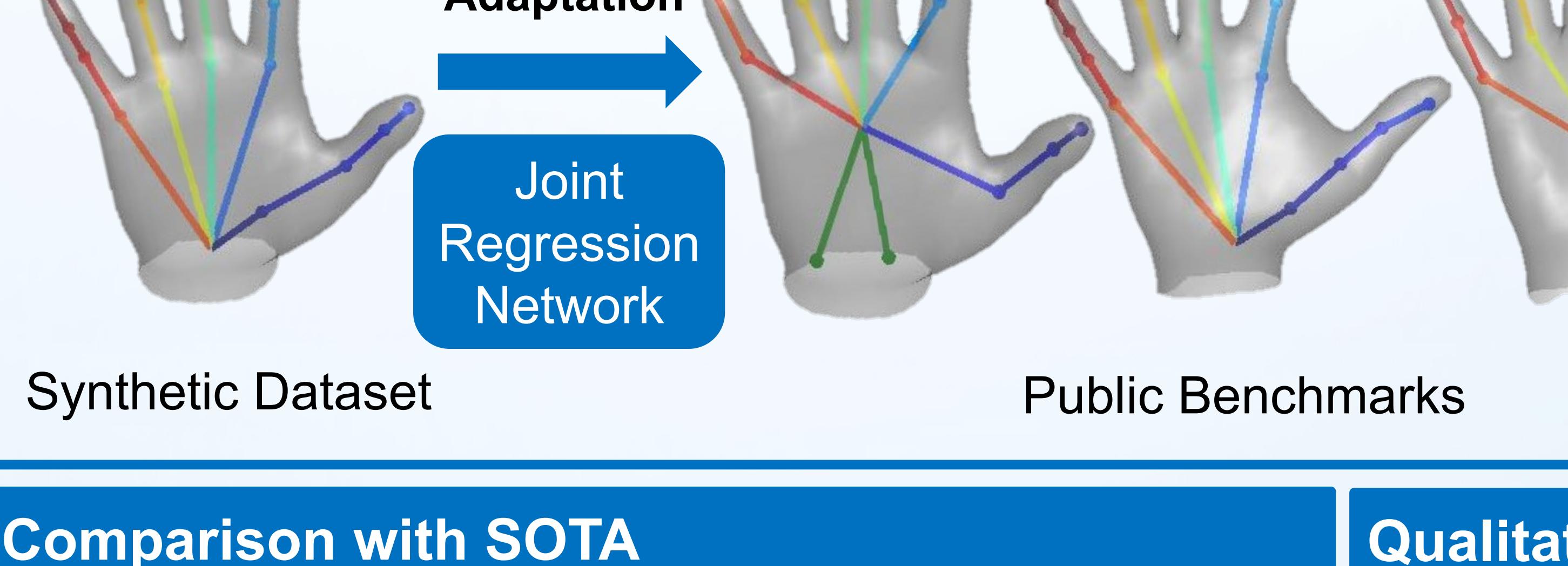
Network Architecture



Detail of our network for hand shape recovery and hand pose estimation

Detail of our network for hand shape recovery and hand pose estimation. Our method consists of three stages, takes point cloud as input and generates the 3D hand shape of a hand and its 3D joints. Stage 1 and Stage 2 are named as hand shape reconstruction network, and Stage 3 is named as joint regression network.

Joint Regression Network

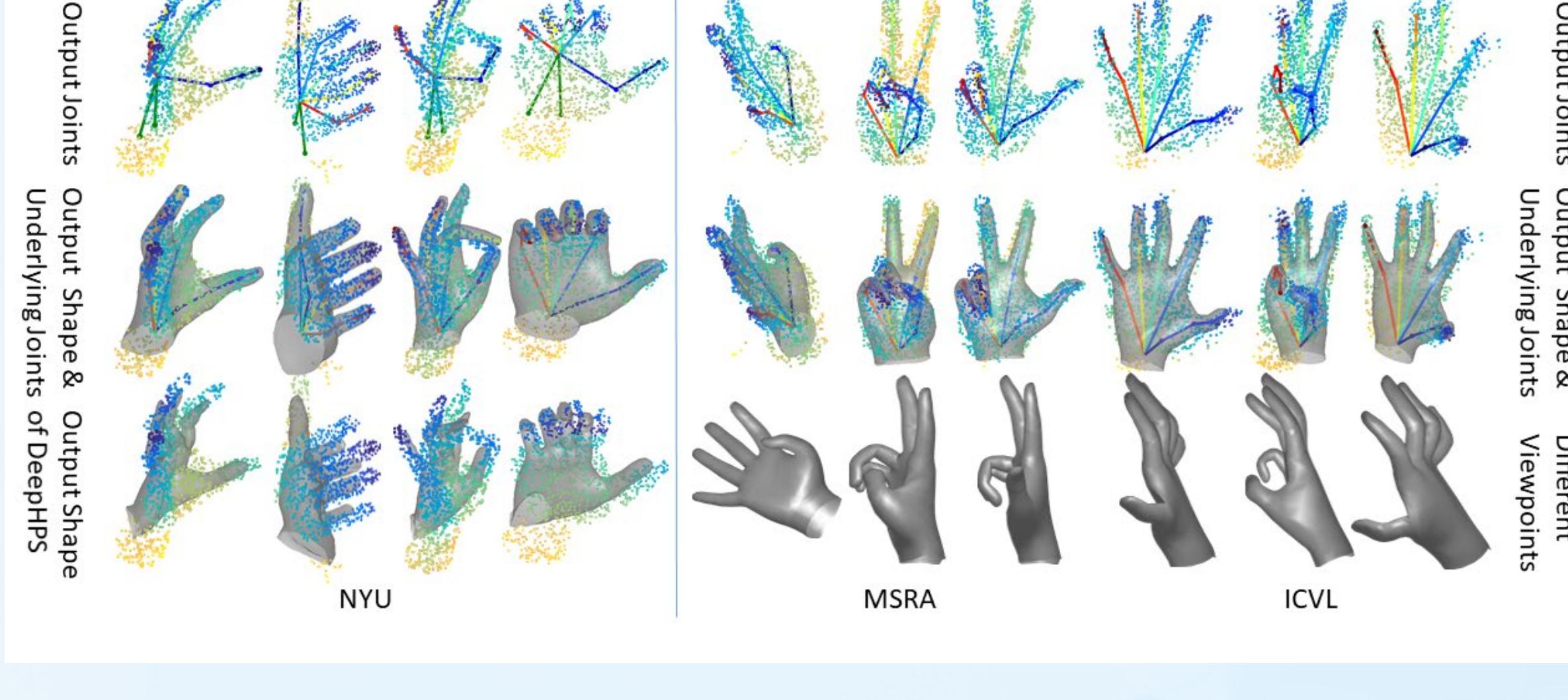


We propose a joint regression network to bridge the domain gap of hand pose between synthetic dataset and real data. It can support more diverse and effective joint adaptation and achieve good generalization performance.

Synthetic Dataset

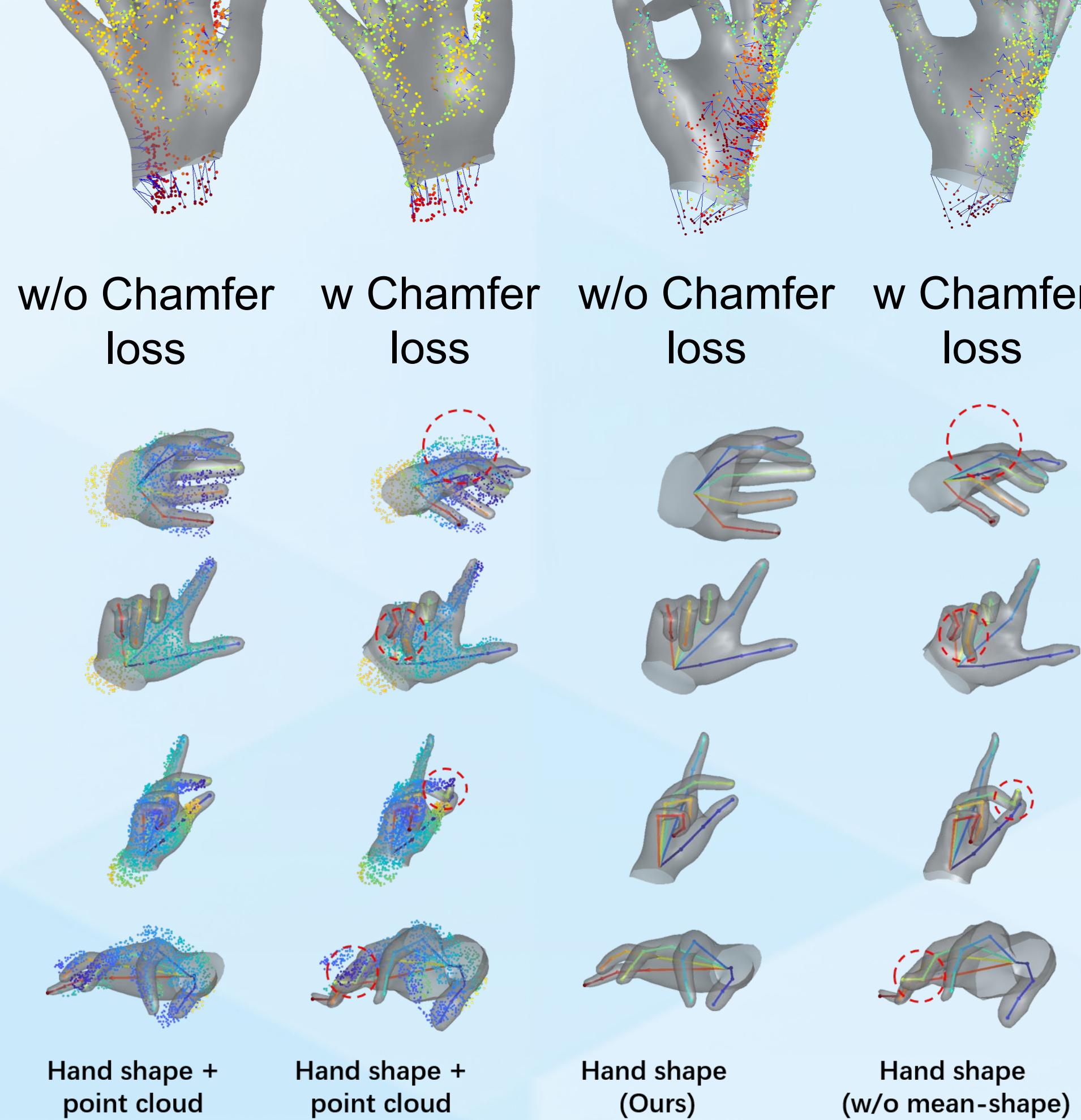
Public Benchmarks

Comparison with SOTA



Comparisons with hand shape recovery methods on NYU and ICVL datasets

Qualitative results



w/o Chamfer loss

w Chamfer loss

w/o Chamfer loss

w Chamfer loss

Hand shape + point cloud (Ours)

Hand shape + point cloud (w/o mean-shape)

Hand shape (Ours)

Hand shape (w/o mean-shape)