Shaowei Liu

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Education

UC San Diego — **San Diego, USA**
M.S. in Computer Science, ***GPA: 4.0/4.0*** — *Sep. 2019 – Present*

Tsinghua University — **Beijing, China**
B.S. in Electronic Engineering, ***GPA: 3.69/4.0*** — *Aug. 2015 – July. 2019*

Research Interests

My research interests lie in applying computer vision and machine learning to model the physical world and interact with it. In particular, I am interested in 3D vision, hand-object interaction, and affordance reasoning. I would like to develop models using limited supervision and interacting with the environment.

Publications

Semi-Supervised 3D Hand-Object Poses Estimation with Interactions in Time

- **Shaowei Liu***, Hanwen Jiang* (equal contribution), Jiarui Xu, Sifei Liu, Xiaolong Wang
- Conference of Computer Vision and Pattern Recognition. **CVPR 2021**

Hand-Object Contact Consistency Reasoning for Human Grasps Generation

- Hanwen Jiang*, **Shaowei Liu*** (equal contribution), Jiashun Wang, Xiaolong Wang
- Under Review

Light and Fast Hand Pose Estimation From Spatial-Decomposed Latent Heatmap

- **Shaowei Liu**, Guijin Wang, Pengwei Xie, Cairong Zhang
- IEEE Access 2020

Research Experience

Robotic Grasping from Human Demonstration — **CSE Department, UCSD**
Advised by Prof. Xiaolong Wang — *Nov. 2020 – Present*

- Building a large scale video dataset of hands manipulating objects in 3D.
- Imitation learning of dexterous manipulation from the human video demonstration.

Semi-Supervised 3D Hand-Object Pose Estimation — **CSE Department, UCSD**
Advised by Prof. Xiaolong Wang — *Feb. 2020 – Nov. 2020*

- Built a joint learning framework for estimating 3D hand shapes and 6D object poses simultaneously.
- Designed a contextual reasoning module between hand and object representations.
- Leveraged the spatial-temporal consistency constraint in large-scale hand-object videos to generate pseudo labels used for semi-supervised learning.

Natural 3D Human Grasps Generation — **CSE Department, UCSD**
Advised by Prof. Xiaolong Wang — *Feb. 2020 – Nov. 2020*

- Proposed a Conditional Variational Auto-Encoder for coarse human grasps generation and a ContactNet for fine-tuning.

- Designed two novel objectives in training to encourage the prior hand contact points to be close to the object surface and the object common contact regions to be touched by the hand at the same time.
- Formulated the grasp generation as a self-supervised task and adapted it during test time.

Depth-based 3D Hand Pose Estimation **Visual Computing Lab, Tsinghua**
Advised by Prof. Guijin Wang *Dec. 2018 – May. 2019*

- Presented a light and efficient approach for fast and accurate hand pose estimation from a single depth map.
- Decomposed 3D joint regression into 2D plane localization and 1D axis estimation from different spatial perspectives.
- Designed multiple latent heatmap regression branches to predict hand pose separately and a fusion network to output the final result.

Binocular Fingertip Estimation **Visual Computing Lab, Tsinghua**
Advised by Prof. Guijin Wang *Sep. 2017 – June. 2018*

- Used Leap Motion, an interactive equipment, to collect finger binocular images.
- Applied deep learning techniques in near-field estimation to predict disparity between right and left images.
- Calculated 3D position of fingertips by using stereo vision and binocular cue.

Internship

Noah's Ark Lab **Beijing, China**
Advised by Bailan Feng *July. 2018 – Oct. 2018*

- Researched image quality assessment and built a prototype system for automatic human face image quality assessment.
- Introduced human face template matching into siamese network to conduct one-class classification in the deep feature space of input human faces.

Baidu Institute of Deep Learning **Beijing, China**
Advised by Ming Sun *July. 2017 – Sep. 2017*

- Established a high efficient and accurate pipeline for fine-grained flower image classification.
- Proposed an improved version of softmax loss thus enabled to make use of false recognized uncertain samples to achieve better training.
- Raised the accuracy of top-3 from 59% to 61%, and that of top-5 from 75% to 78%, while ensuring the recall rate at 90%.

Award

Outstanding Undergraduate Thesis (top 5%), Tsinghua University. 2019

Skills

Programming Language: Python, C++, Java, MATLAB, Go, Cuda, Bash, Latex, SQL, HTML/CSS, JavaScript, Verilog, Assembly language

Hardware: FPGA, Modelsim, Multisim, Vivado, Jetson Nano, and Single-chip Development

Software: Git, Docker, OpenCV, OpenGL, Weka, Scikit-Learn, PyTorch, Caffe, TensorFlow