**ShanghaiTech University**

**CS276: Computational Photography Fall 2020**

**Paper List**

Choose one if you decide to reproduce the paper.

1. Estimate interacting hand pose from a video.

“InterHand2.6M: A Dataset and Baseline for 3D Interacting Hand Pose Estimation from a Single RGB Image” is an excellent work from Facebook and tries to estimate the hand poses under inter-hands situations. InterHand2.6 has already released their datasets and the whole project (code and model). However, InterHand2.6M only estimated the 3D poses from a single image and the results contained too much noise.

Goal: 1. Adding some body priors like MANO into the model.

2. Taking the sequential information into consideration.

1. 3D human pose estimation.

“HuMoR: 3D Human Motion Model for Robust Pose Estimation” is a brilliant work from Stanford and accepted by ICCV 2021. HuMoR has already released the whole project and the results from HuMoR achieve SOTA. The idea HuMoR applied is breakthrough which uses an encoder to take the sequential information from the whole motion sequence into calculation. However, HuMoR is not real-time and time consumed.

Goal: 1. Try to speed up the HuMoR by modifying the model.

2. Achieve a high accuracy ( HuMoR is a baseline)

1. Project: NLOS Human Pose Estimation.

Almost all existing methods estimation human pose from direct lights of view, limiting its application in scenarios such as autonomous driving or emergency rescue. In this project, we aim to estimate human pose in non-line-of-sight(NLOS) domain. An algorithm is to run the human pose estimation algorithm from line-of-sight (LOS) scenes with the luminance map and depth feature of the NLOS scene reconstruction results.

Goal：1. Implement a version of the light cone transform algorithm corresponding to the programming language used for your network structure.

2. Hire an existing algorithm of LOS Human Pose Estimation to predict human pose.

1. Project: Neural Surface Reconstruction.

“NeuS: Learning Neural Implicit Surfaces by Volume Rendering for Multi-view Reconstruction” aims to address geometry reconstruction shortcomings in the state-of-the-art method NeRF (Neural Radiance Field). By introducing SDF (Sign Distance Function), NeuS achieves high-quality surface reconstruction while keeps photo-realistic rendering ability.

Goal：1. Understand theoretical proof in this project and implement your version of NeuS.

2. Based on your understanding, make some improvements.

1. Project: Object Reflectance Recovering.

“NeRFactor: Neural Factorization of Shape and Reflectance Under an Unknow Illumination” aims to recovers 3D neural fields of surface normals, light visibility, albedo, and Bidirectional Reflectance Distribution Functions (BRDFs) without any supervision, using only a re-rendering loss, simple smoothness priors, and a data-driven BRDF prior learned from real-world BRDF measurements.

Goal：1. Reproduce NeRFactor and test on your own datasets.

2. Show the insufficiencies in this method and make improvements.

1. Project: Portrait Shadow Manipulation

Portrait OLAT data can be used not only for relighting, but also for other aspects. Portrait Shadow Manipulation is a good application. The author proposed a training method which makes the neural network to automatically remove the shadows in a portrait.

Goal: Use our OLAT datasets and half open-sourced code on the Github to reproduce the method.

Github: <https://github.com/google/portrait-shadow-manipulation>

1. Project: Deep Video Portrait

The proposal of DVP brings neural rendering to a new level. The method is intuitive: use CG rendering pictures based on parameterized models and real pictures based on real shots for neural network training, and use the network as a neural renderer to synthesize portrait images under new actions.(You may use DECA as your parameterized model's estimator.)

Goal: 1.Reproduce DVP and test on your own datasets.

2.Show the insufficiencies in this method and make improvements.