

Visual Machines Candidate Project

The Visual Machines Group aims to give the gift of sight to robots. In contrast to ordinary computer vision, the group takes a holistic approach: all the way from the physics of light rays to the deep neural networks. The group believes that superhuman imaging will usher in an era of superhuman robotics.

1 Problem Description

Photometric Stereo (PS) is a technique that estimates surface normals of an object by using its images under different lighting conditions. Recently, with the development of deep learning, there have been several neural network models that utilized the idea of PS for surface normal reconstruction [1, 2, 3]. PS-FCN [2] is one of the examples in this field. Please read this paper, implement PS-FCN by yourself, and report your performance on the DiLiGenT [4] dataset. You can also try to improve the model with your own ideas. Here is the official link for this paper: <http://gychen.org/PS-FCN/>

2 Submission Requirement

If your interest continues, here are some basic requirements for the submission:

1. Please implement the model by yourself in Python with PyTorch and Jupyter Notebook, and submit the Jupyter Notebook that includes all the necessary information with a README on how to run your codes.
2. Please construct a PDF write-up about your results, findings, and how you improve the performance of the original model. Include ideas for extending the previous works.
3. Please submit a ZIP file that contains all the files to Prof. Kadambi (achuta@ee.ucla.edu). Include the tagline "xcandidatex" in the email, as well as (simply for records) your CV/resume, submitted SoP and transcript.

Whether you are selected into our group, we hope that this assignment (on the level of a short problem set) proves didactic.

References

- [1] Hiroaki Santo, Masaki Samejima, Yusuke Sugano, Boxin Shi, and Yasuyuki Matsushita. Deep photometric stereo network. In *Proceedings of the IEEE International Conference on Computer Vision*, pages 501–509, 2017.
- [2] Guanying Chen, Kai Han, and Kwan-Yee K Wong. Ps-fcn: A flexible learning framework for photometric stereo. In *Proceedings of the European Conference on Computer Vision (ECCV)*, pages 3–18, 2018.
- [3] Satoshi Ikehata. Cnn-ps: Cnn-based photometric stereo for general non-convex surfaces. In *Proceedings of the European Conference on Computer Vision (ECCV)*, pages 3–18, 2018.
- [4] Boxin Shi, Zhe Wu, Zhipeng Mo, Dinglong Duan, Sai-Kit Yeung, and Ping Tan. A benchmark dataset and evaluation for non-lambertian and uncalibrated photometric stereo. In *Proceedings of the IEEE Conference on Computer Vision and Pattern Recognition*, pages 3707–3716, 2016.