Low Light Imaging using CNNs
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Introduction

Low-light imaging using imaging processing techniques such as deblurring, denoising etc cannot get rid of the low SNR and low photon count. In recent years, various CNN architectures have been implemented to get good results for low light images using raw sensor images as the datasets, where the traditional pipeline fails to produce good images. The goal of this project is to create one such pipeline using PyTorch as the framework. CNNs for low-light imaging can constantly be improved with bigger datsets and deeper frameworks and hyperparameter tuning. Techniques such as AWB, demosaicing and denoising will be implemented in the architecture. The training and implementation of the at least a basic pipeline will be presented as the final project with milestones being getting a good training accuracy with a small dataset and then expanding the project to incorporate more images to train/test on as needed and more layers to the network can also be added and based on that, the hyperparameters can be tuned. AWS credits that I have from another class can be used towards training the model once the CNN has more layers and a larger training set.

I have not decided on what network I will be finally using along with the number of layers, but will start off by replicating papers already out there, and tune the hyperparameters to see if I can get better results.

Related Work and Datasets

There are plenty of resources and papers which have implemented their own architectures and even used inception modeling and transfer learning using different architectures and datasets. Based on the camera and its settings, there are various datasets out there such as the See In the Dark (SID) dataset and raw sensor images can also be collected if based on the specifications, a certain camera is to be used as a requirement.

References

[1] Chen, Chen, Koltun & Xu. "Learning to See in the Dark". May 2018.
[2] Tao, Li & Zhu, Chuang & Xiang, Guoqing & Li, Yuan & Jia, Huizhu & Xie, Xiaodong. LLCNN: A convolutional neural network for low-light image enhancement. 1-4. VCIP.2017