

“Dark arts”: exploration of the techniques and theory for processing and interpretation of low light images

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CO421 project proposal (initial submission)

Research in image processing has been carried out for decades and established techniques with a solid theoretical background. Image interpretation, while being a relatively new field of research has gained a large momentum in the past decade and given rise to a wide range of techniques. Some of these techniques are supported by strong theoretical justifications while some are supported by empirical benchmarks.

But most of these research has been done on the images with good lighting conditions. The image qualities reduce drastically with low light conditions. This results in images with less information and more noise. The techniques developed for generic images do not perform well on these conditions.

This project intends to explore the suitable techniques for both processing and interpretation of low light images. Later a theoretical analysis of the results will be done. The project intends to seek answers for a **subset** among the set of questions given below as much as time permits.

- What are the standard datasets for regular image processing tasks and for low light image processing tasks?
- Is it possible to transform regular images to realistic low light images?
- How to enhance the light in low light image?
- What are the performance metrics that can be used to compare performance of algorithms in both regular and low light image datasets?
- How do standard image processing and interpretation algorithm performance change between regular images and low light images?
- What hyper parameter tuning of algorithms give better performance in low light images?

- How to design new algorithms to perform image processing/interpretation tasks equally good on different lighting conditions?
- How to improve the application areas of low light image processing/interpretation?
- Low light images are comparable to low SNR signals in many domains. What other domains can be benefited by the algorithms developed for low light images?
- How to use GPUs to execute these algorithms fast enough so the processing and interpretation latency will not be the bottlenecks in a pipeline?

Proposed group

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