Learning to See in the Dark (Low-Light Image Enhancement Using Deep Learning)

# Team Members

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# Project Report:

During this project, I learned how to solve a real-world computer vision problem: making very dark images clear and colorful using deep learning. The main idea was to train a neural network that can take extremely dark, noisy raw images from a camera and turn them into clean, bright images—like what a long exposure photo would look like.

I discovered the importance of **raw images**, which contain much more information than regular JPEG or PNG files. Raw files keep the original sensor data before any editing or compression, and that makes them essential for low-light photography. I learned how to **read and preprocess these raw files** using tools like rawpy.

To build the solution, I used a **U-Net model**, which is a type of neural network that’s good at understanding images and preserving fine details. I learned how to **train the model end-to-end**, meaning the network learns to do everything—like denoising, demosaicing, and color correction—just by looking at examples.

One of the biggest challenges was understanding the whole image processing pipeline, from raw sensor data to the final RGB output. I also had to learn how to **handle high noise levels**, understand the meaning of **amplification ratio**, and train a model that works with different camera sensors.

By working on this project, I improved my skills in:

* Deep learning (especially CNNs and U-Net)
* Image processing and raw image handling
* Python, TensorFlow/PyTorch
* Research paper implementation and interpretation

This project gave me a real taste of how AI can solve complex visual problems, and I now have a much better understanding of low-level vision tasks. I feel more confident in both theory and coding after this experience.