Learning to see in the dark

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Task and Motivation

- Task: Correct images captured in low light conditions using end to end deep learning
- Motivation: Smartphones are unable to capture good night time images or low light images due to limitations of the sensor. The way to improve results would be by using deep learning similar to Google's night sight feature.
- Related Work: Chen Chen et al, "Learning to See in the Dark", in CVPR, 2018.

Figure from Chen Chen et al

Goals

- Implement and improve the Chen Chen et al model to correct images captured in low light conditions.
  - Implement Fully convolutional network.
  - Improve by adding batch norm, dropout and early stopping.
  - Possibly implement a GAN to do the same task.
  - Experiment with different architectures such as ResNets for the task to yield better image quality.
  - Runtime optimization - try to achieve a runtime comparable with the baseline model
- What you want to have completed by the mid-term
  - Setup code for batch norm, dropout, early stopping.
  - Subset and downsample data.
  - Setup baseline Fully CNN model.

Methods

- Primary model:
  - UNET architecture from Ronneberger, O., Fischer, P. & Brox, T., 2015. U-Net: Convolutional Networks for Biomedical Image Segmentation.
  - Chen Chen et al, "Learning to See in the Dark", in CVPR, 2018.
- What tools/ code is already available, that you will use.
  - A tensorflow implementation of the Fully CNN model is available on Github

Data

- Dataset:
  - Chen Chen et al developed a new dataset of images in RAW format.
  - Available on their github page.
  - There are 2 subsets: We plan to use the 4k resolution subset as it is of lesser resolution.
  - Any advice about datasets are definitely welcome.
- What simplifications if any you will perform
  - We plan to use a subset of the data
  - We also plan to downsample along the spatial dimensions to bring down the resolution from 4k to 720p. Is that a good idea or will we lose too much information?

Evaluation

- How is your method going to be evaluated. What metrics are suitable?
  - Peak Signal to Mean Noise Power Ratio
  - Structural Similarity
  - User study/ crowdsourcing

References

- Chen, C. et al., 2018. Learning to See in the Dark. 2018 IEEE/CVF Conference on Computer Vision and Pattern Recognition. Available at: http://dx.doi.org/10.1109/cvpr.2018.00347.
- Ronneberger, O., Fischer, P. & Brox, T., 2015. U-Net: Convolutional Networks for Biomedical Image Segmentation. Medical Image Computing and Computer-Assisted Intervention – MICCAI 2015, pp.234–241. Available at: http://dx.doi.org/10.1007/978-3-319-24574-4_28.