

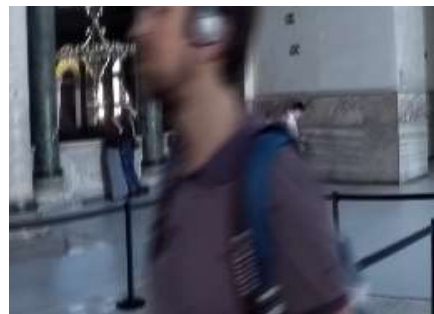


Image Restoration and Super resolution using Deep Convolutional Neural Networks

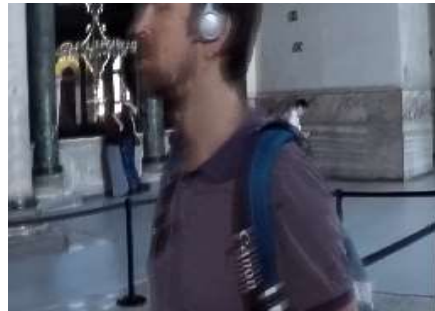
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OVERVIEW AND AIM

The main aim of the project is to correct motion blur and reduce noise using Very Deep Convolutional Encoder-Decoder Networks with Symmetric Skip Connections.



Blurry Image



Prediction



Ground Truth

Source: GOPRO dataset [3]

RESEARCH QUESTION : DETERMINING A BETTER ARCHITECTURE

- 10 Convolutional and 10 Deconvolutional Layers.
- Alternate convolutional layers down sample image by two and Deconvolutional layers up sample by two.
- Batch Normalization after each layer.
- Skip connections b/w every 2 convolutional layers to corresponding Deconvolutional layers.
- PRELU activation function

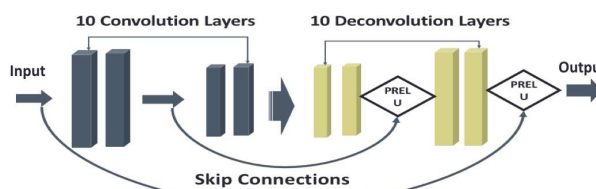


Fig. Fully Connected Deep Neural Network with skip connections

MOTIVATION

- Improve the quality of images captured from non-expensive devices.

INTUITION

- Traditionally, a network can learn the mapping from the corrupted image to the clean version directly.
- However, our network learns for the additive corruption from the input since there is a skip connection between the input and the output of the network.

TRAINING THE MODEL

- We reshape the images to 256 x 256.
- Normalized input pixels between 0 and 1.
- We are using Adam optimizer for our network.
- Hyper-Parameters tuned :
 - Learning rate , # epoch, optimizer, activation functions, kernel size and # filters

DATASET AND TOOLS.

- Dataset: GOPRO dataset [3]
- Language: Python
- Framework: Keras with Tensorflow

CONCLUSION

- Skip connections are useful to retrieve clean image and help solve gradient vanishing in deeper networks.

REFERENCES

- [1]Image Restoration Using Convolutional Auto-encoders with Symmetric Skip Connections Xiao-Jiao Mao, Chunhua Shen, Yu-Bin Yang
- [2]Deep Multi-scale Convolutional Neural Network for Dynamic Scene Deblurring: Seungjun Nah Tae Hyun Kim Kyoung Mu Lee.
- [3]https://github.com/SeungjunNah/DeepDeblur_release