

Deepdenoising of Fingerprints

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1 Team details

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2 Contribution details

- Deepdenoising of Fingerprints
- Final score

MSE	PSNR	SSIM
0.02311	16.9688	0.8092

- Deep neural network with Encoder-Decoder styled architecture along with skip connections in between different levels of encoder and decoder.

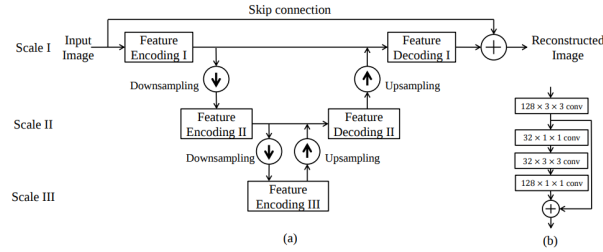


Figure 1: : (a) Overview of our proposed denoising network. (b) Architecture of the feature encoding module. (c) Architecture of the feature decoding module. Note: There have been modification to this base architecture.

- Gray scaled images are used to train the deepdenoising model.

3 Method description

3.1 Features / Data representation

Gray scaled images have been used.

3.1.1 Learning strategy

Base learning rate = $1e-4$
 Max iteration = 1500000
 Momentum = 0.9
 Weight decay = 0.0005

3.1.2 Other techniques

As the ridges of the finger prints, image re-sizing will cost a lot and damages the information.

This model is also vulnerable for padding we are adding its encoding level output with decoding level output using skip connection will introduce noise. So the network is designed to not to include any padding at the end.

3.2 Method Description

- This solution uses dilated convolution networks and preserves a relation between input at encoder level and output at decoder level. This network conducts feature contraction and expansion through downsampling and upsampling operations, respectively. Each pair of downsampling and upsampling operations brings the feature representation into a new spatial scale, so that the whole network can process information on different scales.

- Compared to the base-line version of this model, the results are as follows,
Note: Even the base-line model is modified to adjust to this challenge. And this result is on validation set and not on test set.

	MSE	PSNR	SSIM
Base-line model	0.02581	16.4782	0.78892
Improvised model	0.02357	16.8623	0.8040

- The base-line model was developed for normal images and the model was composed of convolution network. But the new model has been adapted for images particular to finger-prints and the model has been improvised with dilated convolution networks along with removal of padding. The kernel sizes have also been modified to provide good results.

4 Other details

- Platform - DeepLab and caffe
GPU - 12GB (Trained with)
RAM - 128 GB (System RAM)
- Considerable amount of time has been spent on implementation and tweaking the model for better performance. Training and validation just takes system time does not require much of human intervention.
- Training - 5 days Testing - 2 hours
- The challenge highly depends on the data and its inherent characteristics. And if the researcher could correctly analyze these two things, then creating a model for such a challenge is much easier.