

1 Theory

1.1 Convolution

1.2 Batch normalization

2 Methodology

2.1 Pixel classification

2.2 Image to image classification

Architectures such as Krizhevsky et al. (2012) could be used for semantic segmentation, given a sliding windows approach across the image to be classified. However, this approach would prove to be time consuming, as each pixel would have to be classified independently, each pixel would only have a receptive field limited by the extent of the sliding window and the edges would be difficult to classify. Thus, network architectures such as Long et al. (2014) and Ronneberger et al. (2015) provide a translation invariant framework for image to image prediction.

The U-Net architecture was originally proposed by Ronneberger et al. (2015) in 2015.

References

Krizhevsky, A., Sutskever, I., and Hinton, G. E.: ImageNet Classification with Deep Convolutional Neural Networks, in: Advances in Neural Information Processing Systems, edited by Pereira, F., Burges, C., Bottou, L., and Weinberger, K., vol. 25, Curran Associates, Inc., URL <https://proceedings.neurips.cc/paper/2012/file/c399862d3b9d6b76c8436e924a68c45b-Paper.pdf>, 2012.

Long, J., Shelhamer, E., and Darrell, T.: Fully Convolutional Networks for Semantic Segmentation, 2014.

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Ronneberger, O., Fischer, P., and Brox, T.: U-Net: Convolutional Networks for Biomedical Image Segmentation, 2015.