



Convolutional Neural Networks for Novice (CNN4N)

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OITE CNN4N Journal Club
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CNN4N Description

- This journal club aims to give an overview of common deep convolutional neural networks (CNN).
- The journal club will run on **Fridays** from June 16 to July 21 at **3 PM**.
- The journal club is virtual and will run through ZOOM.
- The journal club link can be found **here**.

Journal Club Outline

June 16 Neural Networks.

June 23 Classification Networks.

June 30 Autoencoders.

July 07 Semantic Segmentation Networks.

July 14 Siamese Networks.

July 21 Generative Adversarial Networks.

Neural Networks

- Basically, we will cover an introductory paper to convolutional neural networks (CNN) [1].
- Additionally, you can read this paper about understanding CNN [2].

Classification Networks

- This is the basic application of CNN for prediction tasks that require simple label annotations, e.g., the network answers a simple question "is there some disease or not?".
- We will cover the famous VGG16 network [3].

Autoencoders and Convolutional Autoencoders

- We will cover autoencoders and their application in medical image desnoising [4].
- This can be useful to clean and compress your data to a meaningful representation.
- Additionally, you can read this review paper [5].

Semantic Segmentation Networks

- Segmentation means to be able to classify (i.e., predict the label) of each pixel in an image.
- E.g., we may want to extract some lesion area from an image.
- We will cover the famous segmentation network, UNet [6].
- Additionally, you may read this paper about fully convolutional networks (FCN) [7].

Siamese Networks

- Siamese networks as their name suggests are identical networks that are used to compare two inputs simultaneously. This can be important in anomaly detection.
- We will cover a paper about one shot learning using Siamese networks [8]. Few shot learning is extremely important when the data is small, which is the case in medical data.
- Additionally, you may read this classical paper about Siamese networks [9].

Generative Adversarial Networks (GAN)

- You can think of GAN as interpolation or extrapolation of your data but in higher dimensions.
- We will cover the mother paper about GANs [10].
- There are many useful applications of GANs that include simulating realistic data if your data is small (i.e., to increase your data size).

Additional Resources

- For the interested, you can read about AutoPyTorch [11] and AutoKeras [12], which are frameworks to develop models for the non-experts in coding.
- You may also read more advanced frameworks such as Keras [13] and PyTorch [14].

References I

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- [7] Jonathan Long, Evan Shelhamer, and Trevor Darrell. "Fully convolutional networks for semantic segmentation". In: *Proceedings of the IEEE conference on computer vision and pattern recognition*. 2015, pp. 3431–3440.

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- [9] Sounak Dey et al. "Signet: Convolutional siamese network for writer independent offline signature verification". In: *arXiv preprint arXiv:1707.02131* (2017).
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- [14] *PyTorch tutorials*. <https://pytorch.org/tutorials/index.html>.