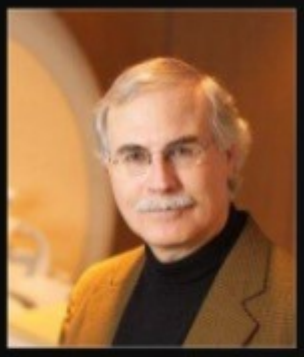
Deep Learning & Modern Medical Image Analysis



Lecturer : Prof. Bart ter Haar Romeny,
Eindhoven University of Technology, Netherlands
Honorary professor at NTUST

Introduction to Principles of Deep Learning

22th Oct. 2019 (Tue.) 8:10- 11:10 am at IB601-1

Modern Medical Image Analysis and Neuro-Mathematics of Visual Perception

24th Oct. 2019 (Thu.) 9:10- 12:00 am at IB610

The course on Deep Learning by prof. Bart Romeny will be split into two parts:

In the first part the structure and the layers of modern convolutional networks will be explained, as well as several applications (inferences) of trained networks. We will discuss the mechanisms of convolution, error backpropagation, layer differentiability, fully connected, cross-entropy and softmax layers and many others. The emphasis is on the understanding what the layers do, not just building the applications. We demonstrate hands-on surgical software tools to dissect the network layers and look inside what they compute, and explain state-of-the-art visualization tools, like t-SNE. The software used for the interactive demos is Mathematica 12.

In the second part we will discuss the intrinsic mechanisms of the black box of Deep Learning. After an overview of modern medical imaging techniques, we study current functional brain imaging tools, both in the retina as in the visual cortex. We take a deep look into the neuro-mathematics of the human visual system as nature's magnificent example, in particular the notions of self-organization, representation learning and contextual processing.

All essential mathematics is explained in an intuitive way, with many visual and hands-on examples.

The course can be followed by all interested in deep learning, with an emphasis on trying to understand what happens inside.
All Mathematica code of all examples is given to the participants.

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