UNIVERSITY OF EASTERN FINLAND

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Hands-on convolutional neural networks for image analysis

KUBIAC will organize an intensive course about hands on convolutional neural networks for image analysis on Monday 14th June (10 - 13) and Thursday 17th June (10 - 13) [so 2x 3 h of lectures]. The instructor will be Riccardo De Feo. Please register via below link:

https://forms.office.com/r/KKfnfET9i2

Course objectives:
- Introduction to the basics of neural networks
- Understanding the operation of convolution
- Building blocks of a convolutional neural network
- Implementation of CNNs in the PyTorch framework
- Understanding the pipeline of building a CNN in medical imaging

Course description:

During this course we will introduce the theory of convolutional neural networks and demonstrate their implementation. We will start from toy examples of image classification during which we will introduce the PyTorch framework. In the second lesson, we will follow up with an application in medical imaging segmentation in rat brain MRI, starting from freely available data and ending with a trained neural network. While this course assumes students are familiar with the python language, every implementation step is explained in detail.

Day 1. (3x45 min sessions) Topics:
Introduction to deep neural networks
The operation of convolution
Building a CNN:
- Pooling
- Activation functions
- Datasets
- Loss functions
- Optimization

A practical application with MNIST
Interpretation
Practice: exercise with CIFAR10

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Day 2. (3x45 min sessions) Topics:

Medical imaging segmentation:
- Data overview
- Loading the data: datasets and data loaders in pytorch
- Data augmentation
- Data normalization

More building blocks:
- U-Net architecture
- Unpooling
- Batch normalization
- Leaky ReLU activation
- Dice Loss

PyTorch implementation

Potential questions can be addressed to jussi dot tohka at uef dot fi

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