Mini course + Project on “Deep learning”

(Course number 236757 - “Project in machine learning”)

A course focused on the newly revived field of neural networks for machine learning also known as “Deep Learning”. The course will introduce neural network as a machine learning model for vision, time-domain and reinforcement learning tasks, and will cover recent advancements in the field.

The course will be given as 5 lectures and tutorials (using the Torch framework), followed by independently assigned projects (groups of 2 students).

Students are expected to be familiar in basic machine learning concepts and techniques (previous courses - “Intro to ML” / “AI” / “NLP”)

Registration will need to be approved by course supervisor. Note that the number of approved projects will be limited and based on previous background and grades.

Course time: Tuesday 10:30-12:30

***Additional changes may occur.**

Week 1-2 – Introduction

- Neural networks as a learning model: ML estimation and regression, over-fitting, backpropagation, classification, auto-encoders.
- Non convex optimization techniques: SGD variants, regularization, heuristics.

Tutorial 1-2: Torch introduction: manipulating Tensors and data, the NN and optimization packages and GPU usage.

Weeks 3-4 – Deep learning for vision

- The convolutional networks – motivation and basic structure elements.
- Classifying images using CNNs – survey of methodology and techniques.
- Localization and object detection.

Tutorials 3-4: Training a convolutional network, “Tricks of the trade”, Image package and use cases.

Week 5 – Recurrent networks

- Solving time domain problems with recurrent networks.
- The vanishing and exploding gradients problem -> LSTM and gated architectures.
- Memory augmented architectures and modern usages.

Tutorial 5: Training recurrent networks on text. Implementing recurrent models, and optimization techniques.