Course description:

Neural networks allow you to create programs in which instead of specific algorithms are played correctness spotted in large data sets. The process of finding patterns in data is called teaching. For example, translation programs (including the popular Google Translate) apply recursive multilayer neural networks trained on a collection of translated texts. Similarly detectors operate face recognition software which is in the picture, and even forging painting styles.

Subject to the basics of state will introduce the use of neural networks and deep learning (ang. Deep Learning) leading from simple linear models, convolution networks used for pattern recognition, until the recursive network used eg. Google Translate. I will tell a new network applications, including robotic control systems. During the course I will discuss a classical machine learning methods, such as linear and logistic regression, and support vector method (Support Vector Machine), and intuitively present the theoretical foundations of machine learning.

The lectures will be accompanied by a workshop on:

- Key issues will be illustrated small tasks.
- The library will be introduced to create a neural network (Tensorflow / Theano).
- Bigger project alone will help you in learning to deal with a large neural network solves some specific issue (of recognition by default, but can be any other intriguing about you).

These issues:

- Introduction to machine learning, learning algorithms, artificial neural networks.
- Single- and multi-layer perceptron networks, network convolution.
- Learning algorithms (numerical optimization) for neural network operating in batch mode and on-line.

- Przeuczenie and niedouczenie model. Methods of regularization networks.
- Support vector machine (Support Vector Machines).
- Learning theory, the theory of the PAC.
- Unsupervised: matrix factorization method, self-organizing network in neural autoenkodery.

- Recursive neural networks, cell LSTM.
- New trends and directions of development of neural networks: learning reinforcement in games of skill and control.

In Angielski description:

Neural Networks and other Deep Learning techniques allow creation of programs That are learned rather than written. This Means That instead of Implementing a concrete algorithm, the program That Applies patterns are automatically box found in the data. In example, a translation system dry as the Google Translate can be created by applying a deep neural network is a

large corpus of translated documents. The lecture will start with the introduction of single- and multilayer perceptron networks that solve classification and regression problems. Nextwe will speak about convolutional networks - the workhorse of modern image recognition. Finally, we will introduce recurrent networks, and speak about, New Developments, dry as using neural nets for robotic ocntrol. We will also discuss classical algorithms, dry as linear and logistic regression and Support Vector Machines, as well as the PAC learning theory.

The lecture will be accompanied by computer exercises:

- Key topics will be illustrated by small exercises.
- We wil introduce the Tensorflow Theano and deep learning frameworks.
- A larger project will give you the opportunity that tackle real world and machine learning problem.

Tentative curriculum:

- Introduction to learning from data, machine learning, and artificial neural networks.
- Single and multi-layer perceptron networks.
- optimization methods for training neural networks, both online and batch oriented.
- Overfitting and underfitting, regularization network.
- Support Vector Machines.
- Learning Theory: PAC.
- Unsupervised learning: a matrix factorization methods, self-organizing maps, neural autoencoders.
- Recurrent Neural Networks, LSTM cells.
- New Developments: applications of reinforcement learning in game playing and control.