

Description for the general public

In the modern world we deal with huge amounts of data generated, for example, in telecommunication, banking, medicine and social networks, such as Twitter, Facebook, LinkedIn or Youtube. For the analysis and processing of such data, various machine learning techniques have been used. Recently, the most dynamic machine learning techniques include a whole group of tools known in the literature under the name "deep learning". These tools include structures such as Boltzmann machines, autoencoders, convolutional networks (CNN), recurrent networks and multi-layer perceptron networks, as well as various combinations of these components. Although these structures work well in practice, their training is very slow what causes a serious cost-benefit tradeoff. Besides, in literature, there is also lack of deep learning solutions dealing with streaming data. Examples of data streams include monitoring street traffic, sensory networks or financial transactions on the Internet. In order to meet these problems, the aim of this project is to develop fast algorithms for supervised learning of deep neural networks. Moreover, as part of the project implementation, it is planned to develop unsupervised and semi-supervised deep learning techniques for streaming data analysis. A spectacular example of applications will be original hybrid deep learning structures for designing recommendation systems, for example, for personalizing an effective teaching path for students or for recommending films and music to Internet users, and hybrid structure for segmenting and searching images in large data sets. The block diagram below shows the original structure designed using various deep learning techniques to search for images in large data sets.

