



Pawel Morkisz, PhD – an assistant at the Faculty of Applied Mathematics, AGH University of Science and Technology and RSIMS project manager. His scientific interests are focused on the analysis of computational complexity of continuous problems, in which he uses information-based complexity (IBC) approach. Working for companies like IBM, UBS, Luxoft and NVIDIA Corp. (Santa Clara, USA) allowed him to gain valuable work experience in practical application of machine learning techniques and advanced algorithmics.

The seminar will be a combination of lectures on practical applications of Python, classical machine learning algorithms, and deep learning algorithms, presentations of students and discussions on practical problems arising in implementation of programs solving particular problems. Mathematical roots of each algorithm together with the complexity estimate will be presented. Topics considered during seminar include (but are not limited to):

- Python programming language (including libraries: numpy, pandas, scikit learn, keras).
- Discussion of problems and methods related to classification, regression, and clustering.
- Problem of over- and under-fitting, parameters fine tuning, models validation.
- Usage of decision trees based algorithms, e.g. random forest, XGBoost
- Deep learning algorithms (dense layers, convolutional layers, batch normalization, dropout, LSTM)
- Differences and difficulties of supervised, semi-supervised, and unsupervised learning.

Students will be given some problems for individual solving and discussion during seminar. Each student will pick a short project, i.e. a problem including some freely available data set and well defined purpose, for machine learning algorithms application. Student will construct his own solution based on the obtained knowledge.