Machine Learning

Lecturer: Zyryanov Alexander.

Semester: 2   **Duration**: 15 weeks

Workload (h): 144   **Presence** (h + CH): 62 (4)   **Self-Study** (h): 82

Contents:

Background and relations to other courses: Operation Research, Statistic, Real Analysis.

Main topics and learning objectives:

- Fundamental ML algorithms. Deep mathematical bases of ML algorithm such as: Naïve Bayes Classifier, kNN, Logistic Regression, Decision Tree, Least Squares, k-means, Hierarchical Clustering.
- Advanced Machine Learning Algorithms. Principles of work and mathematical base of algorithm such as: Random Forest, Neural Networks, EM, SVM, Boosting, Bagging.
- Associative rules. Base methods of finding associative rules.
- Reinforcement Learning.
- Times series prediction.
- Learning to Rank.

Lecture plan:

1. Regression/Classification problem, (non) linear and logistic regression.
2. Cross Validation, Overfitting problem and Regularization.
3. kNN algorithm.
4. Naïve Bayes.
5. Neuron Networks.
6. Boosting and Bagging.
7. Decision Tree and Random Forest.
8. SVM
9. Cauterization problem, K-means and Hierarchical Clustering.
10. EM algorithm.
11. Associative rules.
12. Reinforcement Learning.
13. Times series prediction.
14. Learning to Rank.
15. Deep Learning.
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Assessment:

Formative: in interaction with lecturer and tutor during learning period. On site, skype, email are preferable.

Summative:

Number and Type; Connection to Course	Duration	Part of final mark in %
Oral Exam	90 min	100%

Learning outcomes:

Academic: The students have insight into basic algorithms and methods ML.

Prerequisites for Credit Points: The credit points will be granted when the course has been successfully completed, i.e. all parts of the examination are passed.