D – Description of Course

Course	Probabilistic models of learning				
Type				**Recommended year/term**	5/W
Time extent	2+0	**credits**	2	**Completion**	examination
Form				**Code**	
Teacher	Ing. F. Hakl, CSc.				

Goals

Acquired knowledge: The theoretical foundation of mathematical statistics, probability and functional analysis.
Acquired skills: Advanced ability to suggest convenient number of patterns for supervised learning (including artificial neural networks models learning) regard to predefined expected accuracy of learning results.

Outline

1. Basics of supervised learning model scenario and Probably Approximately Correct learning.
2. VC-dimension and its calculation for basic concept classes (halfspaces, balls, intervals,...).
3. VC-dimension of union and intersection of concept classes.
4. VC-dimension of composed mappings.
5. Lower and upper bound of pattern complexity of PAC learning model.
6. Examples of PAC learning for PERCEPTRON, computational complexity versus pattern complexity.

Keywords

supervised learning, Vapnik-Chervonenkis-dimension, Probably Approximately Correct Learning

Extent of individual work

Literature and auxiliary tools

Compulsory literature:
[1] M. Anthony, P. L. Bartlett. Neural Network Learning: Theoretical foundations. Cambridge university Press, 2009.
[2] G. James, D. Witten, T. Hastie, R. Tibshirani. An Introduction to Statistical Learning: Springer Text in Statistics, 2017.

Optional literature:
[3] M. Vidyasagar. A theory of Learning and Generalization. Springer 1997.
[4] V. Roychowdhury, K-Y. Siu, A. Orlitsky. Theoretical advances in neural computation and learning. Kluwer Academic Publishers. 1994.