



COURSE DESCRIPTION CARD - SYLLABUS

Course name

Machine learning

Course

Field of study

Computing

Area of study (specialization)

Inteligentne technologie informacyjne

Level of study

Second-cycle studies

Form of study

full-time

Year/semester

1/1

Profile of study

general academic

Course offered in

Polish

Requirements

compulsory

Number of hours

Lecture

30

Laboratory classes

30

Other (e.g. online)

-

Tutorials

-

Projects/seminars

-

Number of credit points

5

Lecturers

Responsible for the course/lecturer:

Jerzy Stefanowski, Inst. Informatyki
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tel: 61 665-2933

Responsible for the course/lecturer:

Prerequisites

Students should have knowledge covering basics of artificial intelligence, optimization, statistical data analysis and mathematical algebraic calculus. Moreover, they should attend earlier non-obligatory 1st degree courses on elements of computational intelligence, including artificial neural networks. With respect to other competence, they should be sufficiently good at programming (Python and Java) and they should be able to apply analytical and experimental methods, carry out an experimental analysis of algorithms, analyse their results and use statistical tests. Finally student should understand the needs to extend their knowledge and competences.

Course objective

Provide students knowledge on learning systems from examples – more advanced than in preliminary courses during the first degree (such as AI or elective courses).

Develop students' skills in solving real life problems related to applying machine learning methods to



engineering and natural life sciences.

Develop students' skills to carry out experiments with machine learning and using software libraries.

Course-related learning outcomes

Knowledge

Students should have:

1. well organized and theoretically founded knowledge related to key issues in the field of computer science, including machine learning (K2st_W2)
2. knowledge about supervised, unsupervised and other learning methods + experimental evaluation of classifiers or regression algorithms (K2st_W3)
3. knowledge about development trends and the most important cutting edge achievements in computer science and other selected and related scientific disciplines (K2st_W4)
4. knowledge about advanced methods, techniques and tools used to solve complex tasks and conduct research in a selected area of computer science (K2st_W6)

Skills

1. is able to obtain information from literature, and other sources (both in Polish and English), integrate them, interpret and critically evaluate them, draw conclusions (K2st_U1)
2. can use analytical, simulation and experimental methods to formulate and solve simple research problems corresponding to machine learning (K2st_U4)
3. can integrate knowledge from domains of computer sciences and related ones (K2st_U5)
4. is able to assess the suitability and the possibility of using new achievements (methods and tools) and new IT products (K2st_U6)
5. is able - using among others conceptually new methods - to solve complex tasks, including a research component (K2st_U10)
6. can determine the directions of further learning and implement the process of self-education, including machine learning and data mining (K2st_U16)

Social competencies

1. understands that in the field of machine learning the knowledge and skills quickly become obsolete (K2st_K1)
2. understands the importance of using the latest knowledge in the field of computer science in solving research and practical problems (K2st_K2)

Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

Lecture: based on a written or online test including several questions on the scope of course

Laboratory: evaluation of student's knowledge necessary to carry out the lab tasks; monitoring students' activities during classes; evaluation of lab reports (partly started during classes, finished after them).

Programme content

It covers the following topics: Selected methods from supervised learning (decision rules, k-NN and Bayesian classifiers). An experimental evaluation of prediction models (measures and estimation). Overfitting of classifiers or regression predictors and technique for managing it. Support vector machines



and kernel methods. Ensembles classifiers. Some practical issues of data pre-processing. Unsupervised learning (clustering, EM, Kohonen neural networks, association rules). Basics of active learning

Teaching methods

Lecture - learning methods based on multimedia presentations, illustrated with examples or case studies, solving together simple tasks

Laboratories – tasks – using earlier prepared instructions, practical exercises also with programming, discussion, teamwork, case studies.

Bibliography

Basic

1. Machine Learning: The Art and Science of Algorithms that Make Sense of Data, P.Flach, Cambridge University Press, 2012.
2. Machine Learning. Tom Mitchell, 1997
3. Introduction to machine leaning. E. Alpaydin, MIT Press (3rd ed.), 2014.

Additional

1. Statystyczne systemy uczące się. J.Koronacki, J.Ćwik, EXIT, Warszawa 2008.
2. Uczenie maszynowe i sieci neuronowe, K.Krawiec, J.Stefanowski, Wydawnictwo PP, Poznań, 2004.

Breakdown of average student's workload

	Hours	ECTS
Total workload	120	5
Classes requiring direct contact with the teacher	65	3
Student's own work (literature studies, preparation for laboratory classes/tutorials, preparation for tests/exams, project preparation) ¹	55	2

¹niepotrzebne skreślić lub dopisać inne czynności