SYLLABUS

1. Information on the study programme

1.1. Higher education institution	West University of Timisoara
1.2. Faculty	Mathematics and Computer Science
1.3. Department	Computer Science
1.4. Study program field	Computer Science
1.5. Study cycle	Master
1.6. Study programme / Qualification	ARTIFICIAL INTELIGENCE AND DISTRIBUTED COMPUTING

2. Information on the course

2.1. Course title			Machine Learning				
2.2. Lecture instructor			Darian M. Onchis				
2.3. Seminar / laboratory instructor			Darian M. Onchis				
2.4. Study year	II	2.5. Semester	I	2.6. Examination type	E	2.7. Course type	Opt

3. Estimated study time (number of hours per semester)

3.1. Attendance hours per week	3	out of which: 3.2 lecture	2	3.3. seminar / laboratory	1
3.4. Attendance hours per semester	42	out of which: 3.5 lecture	28	3.6. seminar / laboratory	14

Distribution of the allocated amount of time*	**Hours**
Study of literature, course handbook and personal notes	23
Supplementary documentation at library or using electronic repositories	23
Preparing for laboratories, homework, reports etc.	50
Exams	6
Tutoring	6
Other activities…	

3.7. Total number of hours of individual study	108
3.8. Total number of hours per semester	150
3.9. Number of credits (ECTS)	5

4. Prerequisites (if it is the case)

4.1. curriculum	Algorithmics, Probability and Statistics, Programming
4.2. competences	Undergraduate knowledge of Algorithmics and Statistics

5. Requirements (if it is the case)

5.1. for the lecture	Lecture room
5.2. for the seminar / laboratory	Computer room

6. Specific acquired competences

Professional competences	• Machine learning algorithms design, Applications in signal processing
Transversal competences	• Project work, team work

7. Course objectives

7.1. General objective	Introduction in Machine Learning
7.2. Specific objectives	Presentation of selected topics of Machine Learning and specific applications

8. Content

8.1. Lecture	**Teaching methods**	**Remarks, details**
Introduction in Machine Learning. Association Rules.	Lecture, exemplification, demonstration	2h
Machine learning types and application domains	Lecture, exemplification, demonstration	2h
Kernel based learning I, II	Lecture, exemplification, demonstration	4h
Support Vector Machines	Lecture, exemplification, demonstration	2h
Reinforcement learning I, II	Lecture, exemplification, demonstration	4h
Neural networks and deep learning I, II, III	Lecture, exemplification, demonstration	6h
Sparse dictionary learning	Lecture, exemplification, demonstration	4h
Machine learning for signal and image processing I, II	Lecture, exemplification, demonstration	4h
Final recap. Project checking. Exam preparation.	Lecture, exemplification, demonstration	2h

Recommended literature

„Machine Learning”, Tom Mitchell; McGraw-Hill, 1997
„Support Vector Machines and other kernel-based methods”, Nello Cristianini, John Shawe-Taylor, Cambridge University Press, 2000
„Foundations of Statistical Natural Language Processing”, Christopher Manning, Hinrich Schuetze; MIT Press, 2009
„Financial Signal Processing and Machine Learning”, Ali N. Akansu (Editor), Sanjeev R. Kulkarni (Editor), Dmitry M. Malioutov (Editor), Wiley-IEEE Press, May 2016
http://ai.stanford.edu/~nilsson/mlbook.html
http://web.cs.iastate.edu/~honavar/Courses/cs673/machine-learning-courses.html

https://www.coursera.org/learn/machine-learning
„Space -Variant Gabor Decomposition for Filtering 3D Medical Images", D Onchis, C Istin, P Real, International Conference on Computer Analysis of Images and Patterns, 455-461, 2017
„A deep learning approach to condition monitoring of cantilever beams", D Onchis, Computers in Industry, 2018

8.2. Seminar / laboratory	Teaching methods	Remarks, details
Introduction in Machine Learning. Implementation of the Apriori algorithm.	Dialog, Problem posing, Implementation	2h
Kernel based learning. Applications.	Dialog, Problem posing, Implementation	2h
Reinforcement learning. Applications.	Dialog, Problem posing, Implementation	2h
Neural networks and deep learning. Applications.	Dialog, Problem posing, Implementation	4h
Sparse dictionary learning. Applications.	Dialog, Problem posing, Implementation	4h
Machine learning for signal processing.	Dialog, Problem posing, Implementation	2h

Recommended literature

„Machine Learning", Tom Mitchell; McGraw-Hill, 1997
„Support Vector Machines and other kernel-based methods", Nello Cristianini, John Shawe-Taylor, Cambridge University Press, 2000
„Foundations of Statistical Natural Language Processing", Christopher Manning, Hinrich Schuetze; MIT Press, 2009
„Financial Signal Processing and Machine Learning", Ali N. Akansu (Editor), Sanjeev R. Kulkarni (Editor), Dmitry M. Malioutov (Editor), Wiley-IEEE Press, May 2016
https://www.slicer.org/, https://imagej.net/
http://scikit-learn.org/stable/, https://www.tensorflow.org/

9. Correlations between the content of the course and the requirements of the professional field and relevant employers.

The course contents are not overlapping with the Data Mining course. The course is intended to follow the needs of the IT companies active in the field.

10. Evaluation

Activity	10.1. Assessment criteria	10.2. Assessment methods	10.3. Weight in the final mark
10.4. Lecture	Knowledge of machine learning	Written exam	40%

	algorithms		
	Applications of selected algorithms	Project	40%
10.5. Seminar / laboratory	Usage of specific Machine Learning software	Computer lab practice	20%
10.6. Minimum needed performance for passing			
Knowledge of basic machine learning algorithms Apriori algorithm, Kernel based learning and SVM, specific neural networks Correct usage of Machine Learning software packages.			

Date of completion 24.09.2018 | Signature (lecture instructor) | Signature (seminar instructor)

Date of approval | Signature (director of the department)