NAME OF THE COURSE	MACHINE LEARNING METHODS FOR CLASSIFICATION AND PREDICTION					
Course professor	Tea Šestanović	Credits (ECTS)	6 ECTS			
Associates		Method of teaching (number of hours)	Guided process of teaching			
			L	S	E	F
			20		20	
			Independent student activities			
			20%			
Status of the course /educational activity		E-learning percentage of application	20%			

COURSE DESCRIPTION

Course/educational activity objectives	The main objective of the course is to provide students with the skills and abilities to critically judge the possibility of application of certain machine learning methods in a business context, including their advantages and disadvantages.
Course/educational activity enrolment requirements and entry competences required	Grade C or higher in the complimentary subjects Basic Statistics or similar.
Learning outcomes expected at the level of course/ educational activity (4 to 10 outcomes)	Completing this course/educational activity, students will be able to: 1. Identify and analyze the fundamental concepts of the machine learning methods. 2. Distinguish different machine learning methods for different types of data. 3. Evaluate a suitable machine learning method for analyzing and solving business problems using software support. 4. Analyze and compare the results of selected machine learning models. 5. Choose the optimal machine learning model using appropriate tests.

Course/educational activity's syllabus broken down in detail by weekly class schedule

	Lectures		***Exercises***	
No.*	***Topics***	***Hours***	***Topics***	***Hours***
1	Introduction to machine learning models. A brief history and development of machine learning models. Advantages and disadvantages of machine learning models.	2	Introduction to machine learning models. A brief history and development of machine learning models. Advantages and disadvantages of machine learning models.	2
2	Methods of supervised learning.	2	Methods of supervised learning.	2
3	Methods based on decision trees.	2	Methods based on decision trees.	2
4	Support vector machines.	2	Support vector machines.	2
5	Simple and multi-layered perceptron.	2	Simple and multi-layered perceptron.	2
6	Learning algorithms.	2	Learning algorithms.	2
7	Feedforward neural networks.	2	Feedforward neural networks.	2
8	Measures of appropriateness of machine learning models.	2	Measures of appropriateness of machine learning models.	2
9	Recurrent neural networks.	2	Recurrent neural networks.	2
10	Selected methods of unsupervised learning.	2	Selected methods of unsupervised learning.	2

**One week of instruction includes 4 hours of lectures and 4 hours of exercises. The entire course takes place over 5 weeks.*

Format of instruction	☐ **lectures** ☐ **seminars** ☐ workshops ☐ **exercises** ☐ *on line* in entirety ☐ partial e-learning ☐ field work	☐ **independent assignments** ☐ multimedia ☐ laboratory ☐ work with mentor ☐ (other types, if there are any)

<table>
<tr><td>Student responsibilities</td><td colspan="6">Students are required to attend at least 70% of classes and complete assignments properly. The material is practiced and checked on a computer using the R software.</td></tr>
<tr><td rowspan="5">Student work-participation (name the proportion of ECTS credits for each activity, so that the total number of ECTS credits matches the ECTS value of the course/educational activity)</td><td>Class attendance</td><td>1</td><td>Research</td><td></td><td>Practical work</td><td></td></tr>
<tr><td>Experimental work</td><td></td><td>Workshop</td><td></td><td>(Other, specify what)</td><td></td></tr>
<tr><td>Essay</td><td></td><td>Seminar paper</td><td>2</td><td>(Other)</td><td></td></tr>
<tr><td>Tests</td><td>3*</td><td>Oral exam</td><td></td><td>(Other)</td><td></td></tr>
<tr><td>Written exam</td><td>3*</td><td>Project</td><td></td><td>(Other)</td><td></td></tr>
<tr><td>Grading and evaluating student work and accomplishments</td><td colspan="6">• Students during the semester have to do two tasks in individual or group work:
- write two mid-term exams
- write a final paper assignment in form of project task together with the presentation of the results (the project task is individual or group work which implies selection of the suitable machine learning method for a particular problem, analysis and comparison of the results and selection of the optimal model)
• The total final student’s success is calculated on the basis of the weighted results achieved by the tasks:
- The average grade of the passed two mid-term exams (minimum 50 % of correct answers to pass) is multiplied by a weight of 0.5,
- The average grade of the final paper assignment and the presentation of the results is multiplied by a weight of 0.5.
* Attending the final (cumulative) exam is obligatory for students who haven’t past the mid-term exams during semester.
- The final exam is in written form, and final success grade is formed as follows:
 the average grade from written exam is multiplied by 0,5
 the average grade from the fulfilled project task and the presentation of the results is multiplied by a weight of 0,5.
• Grading scale: <50 points = Insufficient, 50-62 = Sufficient, 63-75 = Good, 76-88 = Very Good and 89-100 = Excellent.
Exam Format: There will be two mid-term exams given during the semester and a cumulative final exam. Each exam will cover material presented in class. The exam format will be provided prior to the exam. You should bring a pencil/pen with you to each exam.</td></tr>
<tr><td>Required literature</td><td colspan="6">Required Materials:
• Hyndman, R.J., Athanasopoulos, G. (2018) Forecasting: Principles and Practice, OTexts, Melbourne, Australia.
• James, G., Witten, D., Hastie, T., Tibshirani, R. (2015) An Introduction to Statistical Learning with Applications in R, Springer

Recommended Background Reading:
• Patterson, D.W. (1995) Artificial neural networks. Theory and applcations, Prentice Hall
• Šestanović, T., Arnerić, J. (2020) Neural network structure identification in inflation forecasting. Journal of Forecasting, 39 (6); pp. 935-952. DOI: 10.1002/for.2698.
• Šestanović, T., Arnerić, J. (2021) Can recurrent neural networks predict inflation in euro zone as good as professional forecasters? Mathematics, 9 (19); 2486, 13. DOI: 10.3390/math9192486.
• Šestanović, T. (2021) Bitcoin Price Direction Forecasting Using Neural Networks. Proceedings of the 16 th International Symposium on Operational Research in Slovenia, SOR'21/ Drobne, S. ; Zadnik Stirn, L. ; Kljajić Borštnar, M. et al. (ur.). Ljubljana, Slovensko društvo informatika, pp. 557-562.

Recommended Websites:
• Eurostat database
• FRED database
• Croatian National Bank database
• Croatian Bureau of Statistics database
• Orbis Europe database</td></tr>
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