<table>
<tr><td>NAME OF THE COURSE</td><td colspan="5">Deep Learning</td></tr>
<tr><td>Code</td><td>PMII15</td><td>Year of study</td><td colspan="3">GU-2</td></tr>
<tr><td>Course teacher</td><td>doc.dr. sc. Željko Agić</td><td>Credits (ECTS)</td><td colspan="3">5,0</td></tr>
<tr><td rowspan="2">Associate teachers</td><td rowspan="2"></td><td rowspan="2">Type of instruction (number of hours)</td><td>L</td><td>S</td><td>E</td><td>F</td></tr>
<tr><td>30</td><td></td><td>30</td><td></td></tr>
<tr><td>Status of the course</td><td></td><td>Percentage of application of e-learning</td><td colspan="3"></td></tr>
<tr><td colspan="6">COURSE DESCRIPTION</td></tr>
<tr><td>Course objectives</td><td colspan="5">Neural networks and deep learning are recently changing the landscape of machine learning, especially when considering the range of applications in which they offer state-of-the-art performance, but also with respect to their overall application potential in the industry. This course offers a practical overview of modern deep learning.</td></tr>
<tr><td>Course enrolment requirements and entry competences required for the course</td><td colspan="5"></td></tr>
<tr><td>Learning outcomes expected at the level of the course (4 to 10 learning outcomes)</td><td colspan="5">- identify basic deep learning models: convolutional (CNN), recurrent (RNN, LSTM, GRU), and generative adversarial networks (GAN)
- describe basic learning algorithms: backpropagation, stochastic gradient descent
- explain regularization in neural networks, especially dropout
- analyze and evaluate neural networks for performance
- implement deep learning within a modern Python-based framework with Keras, Tensorflow, etc.
- oblikovati rješenja temeljena na dubinskim neuronskim mrežama, s primjenom na obradu slike, teksta, i sličnih nestrukturiranih masivnih izvora podataka</td></tr>
<tr><td>Course content broken down in detail by weekly class schedule (syllabus)</td><td colspan="5">- intro and course overview (2+2)
- multilayer perceptron (MLP) and backpropagation (BP) (2+2)
- regularization (2+2)
- learning optimization for deep networks (2+2)
- convolutional neural networks (CNN) (2+2)
- recurrent neural networks (RNN) and backpropagation through time (BPTT) (2+2)
- recursive neural networks (2+2)
- vanishing gradients and advanced recurrent networks: long short-term memory (LSTM), gated recurrent unit (GRU) (2+2)
- generative adversarial networks (GAN) (2+2)
- multi-task learning (MTL) (2+2)
- word embeddings (2+2)
- deep learning for text, images, and other data (2+2)
- limitations of deep learning and active lines of research (2+2)
- exam preparation (2+2)</td></tr>
<tr><td>Format of instruction</td><td colspan="3">☒ lectures
☒ seminars and workshops
☒ exercises
☐ on line in entirety
☒ partial e-learning
☐ field work</td><td colspan="2">☒ independent assignments
☐ multimedia
☐ laboratory
☒ work with mentor
☒ homework assignments</td></tr>
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<tr><td>Student responsibilities</td><td colspan="6">homework
seminar
exam</td></tr>
<tr><td rowspan="6">Screening student work (name the proportion of ECTS credits for each activity so that the total number of ECTS credits is equal to the ECTS value of the course)</td><td>Name</td><td>Ects</td><td>Name</td><td>Ects</td><td>Name</td><td>Ects</td></tr>
<tr><td>Class attendance</td><td>1.5</td><td>Research</td><td></td><td>Experimental work</td><td></td></tr>
<tr><td>Oral exam</td><td>2.5</td><td>Report</td><td></td><td>Homework assignments</td><td></td></tr>
<tr><td>Seminar essay</td><td>1</td><td>Essay</td><td></td><td></td><td></td></tr>
<tr><td>Tests</td><td></td><td>Practical training</td><td></td><td></td><td></td></tr>
<tr><td>Written exam</td><td></td><td>Project</td><td></td><td></td><td></td></tr>
<tr><td>Grading and evaluating student work in class and at the final exam</td><td colspan="6">exam (80%), participation (20%)</td></tr>
<tr><td rowspan="3">Required literature (available in the library and via other media)</td><td colspan="2">Title</td><td>Number of copies in the library</td><td colspan="2">Availability via other media</td></tr>
<tr><td colspan="2">Goodfellow, Bengio, Courville: Deep learning. 2016.</td><td>0</td><td colspan="2"></td></tr>
<tr><td colspan="2">Daume III: A Course in Machine Learning. 2015.</td><td>0</td><td colspan="2"></td></tr>
<tr><td>Optional literature (at the time of submission of study programme proposal)</td><td colspan="6">relevant research papers</td></tr>
<tr><td>Quality assurance methods that ensure the acquisition of exit competences</td><td colspan="6">student evaluations, in-course reflection, self-assessment</td></tr>
<tr><td>Other (as the proposer wishes to add)</td><td colspan="6"></td></tr>
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