Module Description/Syllabus

BE IM HM CfPS

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Module	Deep Learning	Module-Number	
Course Title	Deep Learning	Overall grade weighting (in %)	2,4
Recommended alternative modules or courses			
Course of Studies	Digital Enterprise Management		
Examination No. (SuP)	100699	**valid SER**	20212 v. 28.04.2022
Mode of Study	☒ full-time ☐ part-time		
Study Cycle EQF-Level	◉ Bachelor ○ Master		
Frequency	○ winter term ◉ summer term ○ each semester		
Language Competence Level and Course code SAP ☐			
Responsible for the module	Prof. Dr. Stefan Faußer		
Lecturer/s	Prof. Dr. Stefan Faußer		
Typ of course	◉ compulsory ○ optional		
Mode of delivery	face-to-face		
Language of instruction	◉ English ○ German	**Level of course**	6th semester
Teaching Methods	Lecture	**Duration**	1 semester
	Practical exercises on computer		
	Group work		

Work parameters

HNU-Workload-Calculator

contact hours in lecture form	exercises (hours)	self-studies (hours)	total (hours)
60		60	120
eLearning (hours)	**examination pre-paration (hours)**	**Transfer (hours)**	**Units ("UE")**
			160

Number of participants min./max.	10 / 40	**ECTS-Points**	05	**Volume** (hours per semester week)	04
Use for other studies	Could be offered as an elective for the bachelor's degree programs "Information Management Automotive" and "Digital Enterprise Management".				

Prerequisites/ Required competencies	Successful participation in "Machine Learning" is required as well as the willingness to learn new contents and to work together on tasks.
Learning Outcome **1) Knowledge** **2) Skills** **3) Responsibility and autonomy** Description eight EQF Levels and Learning Outcome (1-3)	After successful participation in the module courses, students will be able to, 1) Technical-methodological competencies: - Name, categorically classify and understand, realize and apply methods from the field of Deep Learning, - Evaluate and explain Deep Learning results, - To know and understand the possibilities and limitations of Deep Learning, - Understand new scientific articles in the field of Machine Learning, especially Deep Learning, and apply the included knowledge, - To select an appropriate Deep Learning method for real-world problems. 2) Personal competencies: - to learn in a self-directed way, - to assess one's own abilities and learning progress when working out solutions, - to ask specific technical questions and to reflect on the answers, - to work in teams, to support each other and to present own results, - to practice time management.
Content	Deep learning, a novel part of machine learning, essentially includes deep artificial neural networks that are able to recognize and utilize complex patterns in large data sets. This allows to even accomplish some tasks that previously only humans were capable to do. Examples are to recognize objects from images or emotions from speech. The outline of this course is as follows: 1) Image classification and object detection with convolutional neural networks 2) Deep learning for small data: Transfer learning, one-shot learning 3) Sequence models with recurrent neural networks and transformers 4) Explainable deep learning 5) Generative models

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Particular admission requirements **(if applicable)**	
Curriculum semester, in which the student has to be mandatorily registered for the first attempt of examination	9th semester
Assessment method(s)	Portfolio assessment, see course catalog
Assessment criteria	
Required reading resources	Ian Goodfellow, Yoshua Bengio and Aaron Courville: Deep Learning, MIT Press (2016) Francis Chollet: Deep Learning with Python, Manning (2017) Stuart Russel and Peter Norvig: Artificial Intelligence: A Modern Appoach, 4th edition, Pearson (2020) Johannes Ernesti and Peter Kaiser: Python 3, 6. Auflage, Rheinwerk Computing (2020)
Additional (module) information	
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