HAW Kiel
Hochschule für Angewandte Wissenschaften Kiel
Kiel University of Applied Sciences

MI116 - Neural Networks and Deep Learning

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Allgemeine Informationen	
Modulkürzel oder Nummer	MI116
Eindeutige Bezeichnung	
Modulverantwortlich(e)	Prof. Dr. Meyer, Carsten (carsten.meyer@haw-kiel.de)
Lehrperson(en)	Prof. Dr. Meyer, Carsten (carsten.meyer@haw-kiel.de)
Wird angeboten zum	Sommersemester 2020
Moduldauer	1 Fachsemester
Angebotsfrequenz	Regelmäßig
Angebotsturnus	In der Regel im Sommersemester
Lehrsprache	Englisch
Empfohlen für internationale Studierende	Ja
Ist als Wahlmodul auch für andere Studiengänge freigegeben (ggf. Interdisziplinäres Modulangebot - IDL)	Ja

Studiengänge und Art des Moduls (gemäß Prüfungsordnung)
Studiengang: M.Sc. - MIE - Information Engineering (PO 2022, V3) Vertiefungsrichtung: Information Technology and Systems Modulart: Wahlmodul Fachsemester: 1, 2, 3
Studiengang: M.Sc. - MIE - Information Engineering (PO 2022, V3) Vertiefungsrichtung: IT Security Modulart: Wahlmodul Fachsemester: 1, 2, 3
Studiengang: M.Sc. - MIE - Information Engineering (PO 2022, V3) Vertiefungsrichtung: Intelligent Systems Modulart: Wahlmodul Fachsemester: 1, 2, 3

Kompetenzen / Lernergebnisse
Kompetenzbereiche: Wissen und Verstehen; Einsatz, Anwendung und Erzeugung von Wissen; Kommunikation und Kooperation; Wissenschaftliches Selbstverständnis/Professionalität.

Neural Networks and Deep Learning recently have gained strong interest (Deep Learning has been considered one of 10 breakthrough technologies by the MIT Technology Review 2013). The aim of the course is to provide a fundamental understanding of important concepts, algorithms, techniques and architectures of neural networks and deep learning.

After completing the course, students should
have a basic overview over neural network and deep learning concepts, algorithms and architectures, suitable applications capabilities and limitations,
be able to apply suitable neural network and deep learning techniques to new problems, analyze the outcome of neural network and deep learning experiments and explore potential methods to improve performance.

Since the lab work is being done in teams, the students learn to communicate in teams about scientific contents and to express and justify their opinion about suitable problem solutions and conclusions drawn from experiments.

The students learn to apply selected algorithms of neural networks and deep learning to given (toy and real)
problems, to analyze the results, draw conclusions and report the results in a scientific way.

Angaben zum Inhalt	
Lehrinhalte	- Biological neurons - Artificial neuron models - Artificial neural networks: Architectures and the learning problem - Feedforward neural networks and backpropagation - Deep learning: Motivation and concepts - Convolutional neural networks - Unsupervised learning: Example autoencoders - Recurrent neural networks: Long Short-Term Memory (LSTM) and (if time permits) Hopfield networks - (If time permits) Advanced topics - (If time permits) Self-organizing (Kohonen) maps
Literatur	- Ian Goodfellowet al., "DeepLearning", MIT Press, 2016 - Michael Nielsen: „NeuralNetworks andDeepLearning", 2017 (More literature in the course)

Lehrformen der Lehrveranstaltungen	
Lehrform	**SWS**
Lehrvortrag	2
Labor	2

Arbeitsaufwand	
Anzahl der SWS	4 SWS
Leistungspunkte	5,00 Leistungspunkte
Präsenzzeit	48 Stunden
Selbststudium	102 Stunden

Modulprüfungsleistung	
Voraussetzung für die Teilnahme an der Prüfung gemäß PO	Keine

MI116 - Übung	Prüfungsform: Übung Gewichtung: 0% wird angerechnet gem. § 11 Absatz 2 PVO: Ja Benotet: Nein
MI116 - Klausur	Prüfungsform: Klausur Dauer: 120 Minuten Gewichtung: 100% wird angerechnet gem. § 11 Absatz 2 PVO: Ja Benotet: Ja

Sonstiges	
Empfohlene Voraussetzungen	- strong interest in neural networks and deep learning - conceptual and analytical skills - mathematical skills desired (linear algebra, analysis, calculus), although not absolutely necessary - programming skills desired (Python language), although not absolutely necessary - ability to work with software libraries (in Python)
Sonstiges	Especially suited for focus areas “A: Intelligent Systems” and “C: Information Technology and Systems Development” Lecture will be offered at CAU Kiel (14 lectures during the regular semester at CAU Kiel, which is shifted with respect to the semester at Fachhochschule Kiel). NOTE THAT THE EXAM WILL BE OFFERED DURING THE REGULAR EXAMINATION PERIOD OF CAU KIEL, WHICH IS SHIFTED WITH RESPECT TO THE EXAMINATION PERIOD OF FACHHOCHSCHULE KIEL! Students are asked to bring their own laptops to the laboratory classes. Laboratory assignments are encouraged to be solved in teams of two or three students.