Modulbezeichnung:	**Machine Learning for Engineers II: Advanced Methods (MLE2)** (Machine Learning for Engineers II: Advanced Methods)	**2.5 ECTS**
Modulverantwortliche/r:	Björn Eskofier	
Lehrende:	Nico Hanenkamp, Björn Eskofier, Jörg Franke	

Startsemester: WS 2021/2022	Dauer: 1 Semester	Turnus: halbjährlich (WS+SS)
Präsenzzeit: k.A. Std.	Eigenstudium: 75 Std.	Sprache: Englisch

Lehrveranstaltungen:

Machine Learning for Engineers II: Advanced Methods (WS 2021/2022, Vorlesung, Björn Eskofier et al.)

Machine Learning for Engineers; Advanced Methods and Tools (Vorlesung mit Übung, Online)

Advanced Methods and Tools

Es wird empfohlen, folgende Module zu absolvieren, bevor dieses Modul belegt wird:

Machine Learning for Engineers; Introduction to Methods and Tools

Inhalt:

This course focuses on various aspects of Deep Learning. Theoretical foundations and general concepts are introduced in the first part, while the second part focuses on specific networks used in image analysis as well as time-series analysis, two common tasks in engineering applications. The list of topics covered includes:

- Network optimization
- Regularization
- Convolutional neural networks
- Reccurent neural networks

In the integrated lab sessions, the students will tackle an image classification problem as well as a time-series regression problem using industrial datasets.

Lernziele und Kompetenzen:

Fachkompetenz

Wissen

Students are able to recapitulate different machine learning methods and algorithms.

Anwenden

Students are able to choose and implement a suited deep learning algorithm for a given problem based on the type of data and the general learning task.

Literatur:

The Elements of Statistical Learning: Data Mining, Inference, and Prediction, Trevor Hastie, Robert Tibshirani, Jerome Friedman, Springer, 2009

Verwendbarkeit des Moduls / Einpassung in den Musterstudienplan:

Das Modul ist im Kontext der folgenden Studienfächer/Vertiefungsrichtungen verwendbar:

[1] **International Production Engineering and Management (Bachelor of Science)**
(Po-Vers. 2011 | TechFak | International Production Engineering and Management (Bachelor of Science) | International Production Engineering and Management (Studienbeginn bis 31.03.2020) | Gesamtkonto | International Elective Modules (IEM) | International Elective Modules | Machine Learning for Engineers II: Advanced Methods)

[2] **International Production Engineering and Management (Bachelor of Science)**
(Po-Vers. 2020s | TechFak | International Production Engineering and Management (Bachelor of Science) | International Production Engineering and Management (Studienbeginn SS 2020) | Gesamtkonto | International Elective Modules | Machine Learning for Engineers II: Advanced Methods)

[3] **International Production Engineering and Management (Bachelor of Science)**
(Po-Vers. 2020s | TechFak | International Production Engineering and Management (Bachelor of Science) | International Production Engineering and Management (Studienbeginn SS 2020) | Gesamtkonto | Wahlmodule | Machine

Learning for Engineers II: Advanced Methods)

[4] **International Production Engineering and Management (Bachelor of Science)**
(Po-Vers. 2020w | TechFak | International Production Engineering and Management (Bachelor of Science) | International Production Engineering and Management (Studienbeginn WS 2020/21) | Gesamtkonto | International Elective Modules | Machine Learning for Engineers II: Advanced Methods)

[5] **International Production Engineering and Management (Bachelor of Science)**
(Po-Vers. 2020w | TechFak | International Production Engineering and Management (Bachelor of Science) | International Production Engineering and Management (Studienbeginn WS 2020/21) | Gesamtkonto | Wahlmodule | Machine Learning for Engineers II: Advanced Methods)

[6] **International Production Engineering and Management (Bachelor of Science)**
(Po-Vers. 2022s | TechFak | International Production Engineering and Management (Bachelor of Science) | Gesamtkonto | International Elective Modules | Machine Learning for Engineers II: Advanced Methods)

[7] **International Production Engineering and Management (Bachelor of Science)**
(Po-Vers. 2022s | TechFak | International Production Engineering and Management (Bachelor of Science) | Gesamtkonto | Wahlmodule | Machine Learning for Engineers II: Advanced Methods)

[8] **International Production Engineering and Management (Bachelor of Science)**
(Po-Vers. 2022w | TechFak | International Production Engineering and Management (Bachelor of Science) | Gesamtkonto | International Elective Modules | Machine Learning for Engineers II: Advanced Methods)

[9] **International Production Engineering and Management (Bachelor of Science)**
(Po-Vers. 2022w | TechFak | International Production Engineering and Management (Bachelor of Science) | Gesamtkonto | Wahlmodule | Machine Learning for Engineers II: Advanced Methods)

[10] **Maschinenbau (Bachelor of Science)**
(Po-Vers. 2009w | TechFak | Maschinenbau (Bachelor of Science) | Maschinenbau | Gesamtkonto | Wahlmodule | Technische Wahlmodule | Machine Learning for Engineers II: Advanced Methods)

[11] **Maschinenbau (Master of Science)**
(Po-Vers. 2007 | TechFak | Maschinenbau (Master of Science) | Studienrichtungen Allgemeiner Maschinenbau, Fertigungstechnik, und Rechnergestützte Produktentwicklung | Gesamtkonto | Wahlmodule | Technische Wahlmodule | Machine Learning for Engineers II: Advanced Methods)

[12] **Maschinenbau (Master of Science)**
(Po-Vers. 2013 | TechFak | Maschinenbau (Master of Science) | Studienrichtung International Production Engineering and Management | Gesamtkonto | International Elective Modules | International Elective Modules | Machine Learning for Engineers II: Advanced Methods)

[13] **Mechatronik (Master of Science)**
(Po-Vers. 2012 | TechFak | Mechatronik (Master of Science) | Mechatronik (Studienbeginn bis 30.09.2020) | Gesamtkonto | M3 Technische Wahlmodule | Machine Learning for Engineers II: Advanced Methods)

[14] **Mechatronik (Master of Science)**
(Po-Vers. 2020w | TechFak | Mechatronik (Master of Science) | Mechatronik (Studienbeginn ab 01.10.2020) | Gesamtkonto | M3 Technische Wahlmodule | Machine Learning for Engineers II: Advanced Methods)

[15] **Mechatronik (Master of Science)**
(Po-Vers. 2021w | TechFak | Mechatronik (Master of Science) | Mechatronik (Studienbeginn ab 01.10.2021) | Gesamtkonto | M3 Technische Wahlmodule | Machine Learning for Engineers II: Advanced Methods)

[16] **Wirtschaftsingenieurwesen (Bachelor of Science)**
(Po-Vers. 2009 | TechFak | Wirtschaftsingenieurwesen (Bachelor of Science) | Studienrichtung Informations- und Kommunikationssysteme | weiterer Bachelorprüfungen | Ingenieurwissenschaftlicher Bereich | Wahlbereich | Technische Wahlmodule | Technische Wahlmodule | Machine Learning for Engineers II: Advanced Methods)

[17] **Wirtschaftsingenieurwesen (Bachelor of Science)**
(Po-Vers. 2009 | TechFak | Wirtschaftsingenieurwesen (Bachelor of Science) | Studienrichtung Maschinenbau | weitere Bachelorprüfungen | Ingenieurwissenschaftlicher Bereich | Wahlbereich | Technische Wahlmodule | Technische Wahlmodule | Machine Learning for Engineers II: Advanced Methods)

[18] **Wirtschaftsingenieurwesen (Bachelor of Science)**
(Po-Vers. 2018w | TechFak | Wirtschaftsingenieurwesen (Bachelor of Science) | Studienrichtung Maschinenbau (Studienbeginn ab 01.10.2018) | Gesamtkonto | Technische Wahlmodule und Hochschulpraktikum | Technische Wahlmodule | Machine Learning for Engineers II: Advanced Methods)

[19] **Wirtschaftsingenieurwesen (Bachelor of Science)**

(Po-Vers. 2018w | TechFak | Wirtschaftsingenieurwesen (Bachelor of Science) | Studienrichtung Elektrotechnik (Studienbeginn ab 01.10.2018) | Gesamtkonto | Technische Wahlmodule und Hochschulpraktikum | Technische Wahlmodule | Machine Learning for Engineers II: Advanced Methods)

[20] **Wirtschaftsingenieurwesen (Master of Science)**
(Po-Vers. 2009 | TechFak | Wirtschaftsingenieurwesen (Master of Science) | Masterstudiengang Wirtschaftsingenieurwesen (bis 30.09.2018) | Gesamtkonto | Ingenieurwissenschaftliche Studienrichtungen | Technische Wahlmodule | Technische Wahlmodule | Machine Learning for Engineers II: Advanced Methods)

[21] **Wirtschaftsingenieurwesen (Master of Science)**
(Po-Vers. 2018w | TechFak | Wirtschaftsingenieurwesen (Master of Science) | Masterstudiengang Wirtschaftsingenieurwesen (Studienbeginn ab 01.10.2018) | Gesamtkonto | Studienrichtung Maschinenbau | Technische Wahlmodule und Hochschulpraktikum | Technische Wahlmodule | Machine Learning for Engineers II: Advanced Methods)

[22] **Wirtschaftsingenieurwesen (Master of Science)**
(Po-Vers. 2018w | TechFak | Wirtschaftsingenieurwesen (Master of Science) | Masterstudiengang Wirtschaftsingenieurwesen (Studienbeginn ab 01.10.2018) | Gesamtkonto | Studienrichtung Elektrotechnik | Technische Wahlmodule und Hochschulpraktikum | Technische Wahlmodule | Machine Learning for Engineers II: Advanced Methods)

[23] **Wirtschaftsingenieurwesen (Master of Science)**
(Po-Vers. 2021w | TechFak | Wirtschaftsingenieurwesen (Master of Science) | Masterstudiengang Wirtschaftsingenieurwesen Studienrichtung Elektrotechnik (Studienbeginn ab 01.10.2021) | Studienrichtung Elektrotechnik | Technische Wahlmodule und Hochschulpraktikum | Technische Wahlmodule | Machine Learning for Engineers II: Advanced Methods)

[24] **Wirtschaftsingenieurwesen (Master of Science)**
(Po-Vers. 2021w | TechFak | Wirtschaftsingenieurwesen (Master of Science) | Masterstudiengang Wirtschaftsingenieurwesen Studienrichtung Maschinenbau (Studienbeginn ab 01.10.2021) | Studienrichtung Maschinenbau | Technische Wahlmodule und Hochschulpraktikum | Technische Wahlmodule | Machine Learning for Engineers II: Advanced Methods)

Studien-/Prüfungsleistungen:

Machine Learning for Engineers II: Advanced Methods (Prüfungsnummer: 50681)
(englische Bezeichnung: Machine Learning for Engineers II: Advanced Methods)

Prüfungsleistung, Klausur, Dauer (in Minuten): 60
Anteil an der Berechnung der Modulnote: 100% Prüfungssprache: Englisch

Erstablegung: WS 2021/2022, 1. Wdh.: SS 2022
1. Prüfer: Björn Eskofier
