

Data:	MLMS MA Nr. 3659 / Examination number: 44510	Version: 23.03.2022	Start Year: SoSe 2019
Module Name:	Machine Learning for Materials Scientists		
(English):	Machine Learning for Materials Scientists		
Responsible:	Eidel, Bernhard / Prof. Dr.-Ing. habil.		
Lecturer(s):	Prakash, Aruna / Dr.-Ing. Eidel, Bernhard / Prof. Dr.-Ing. habil.		
Institute(s):	Institute of Mechanics and Fluid Dynamics		
Duration:	1 Semester(s)		
Competencies:	Students will be exposed to fundamental knowledge in stochastics, statistics and combinatorics and will be able to apply this knowledge using the programming language Python. They will acquire an overview over machine learning approaches and algorithms and will be able to choose the appropriate algorithm for a specific problem. Furthermore, they will be able to use existing machine learning libraries and to independently solve problems of materials scientific relevance. Students will be able to judge the quality of their results.		
Contents:	<ul style="list-style-type: none"> • basics of stochastics and statistics: events, probability, conditional probability, variance, mean, median, likelihood • fundamentals of regression and classification • concepts of linear approaches, neural networks, Bayesian methods, convolutional networks, support vector machines • training validation, testing, overfitting • selection of appropriate algorithms • implementation, e.g., using PyTorch, scikit-learn, or TensorFlow 		
Literature:	<ol style="list-style-type: none"> 1. M. P. Deisenroth, A.A. Faisal, Ch.S. Ong: Mathematics for Machine Learning, 2019, Cambridge University Press, UK 2. Sebastian Raschka, Vahid Mirjalili, Python Machine Learning, 2017, Packt Publishing, Birminham, UK 3. Phuong Vo. T. H, Martin Czygan, Getting Started with Python Data Analysis, 2015, Packt Publishing, Birminham, UK 		
Types of Teaching:	S1 (SS): Lectures (2 SWS) S1 (SS): Exercises (1 SWS)		
Pre-requisites:	Recommendations: Good foundation in mathematics and Python programming (as, e.g., acquired during "Software Tools for Computational Materials Scientists 1")		
Frequency:	yearly in the summer semester		
Requirements for Credit Points:	For the award of credit points it is necessary to pass the module exam. The module exam contains: MP/KA (KA if 5 students or more) [MP minimum 30 min / KA 90 min] PVL: Coding PVL have to be satisfied before the examination.		
Credit Points:	4		
Grade:	The Grade is generated from the examination result(s) with the following weights (w): MP/KA [w: 1]		
Workload:	The workload is 120h. It is the result of 45h attendance and 75h self-studies.		