Valid for 2023.HS

Module Name: Machine Learning and Deep Learning	
Module Code	w.MA.XX.MLDL-PiE.22HS
Module Description	This module introduces students to the fundamentals of machine learning and deep learning, which are techniques that allow computers to learn without being explicitly programmed. Students will learn the two main categories of techniques, namely supervised learning and unsupervised learning. Possible tasks that will be considered include prediction, classification, and clustering. Classical and important topics such as linear models, support vector machines, decision trees, and ensemble learning will be discussed. The second part of this module deals with (deep) artificial neural networks, which are strongly simplified representations of biological neural networks. This module covers mathematical and algorithmic aspects, rules and heuristics about selecting and evaluating appropriate models, model parameters, and interpreting results. Python Jupyter notebooks, implementing algorithms, and models will be provided.
Program and Specialization	Banking and Finance (PiE)
Legal Framework	Academic Regulations MSc in Banking and Finance dated 29.09.2011, Appendix to the Academic Regulations for the degree program in Banking and Finance, first adopted on 28.08.2012
Module Category	**Module Type:** Compulsory
ECTS	9
Organizational Unit	W Institut für Wealth & Asset Management
Module Coordinator	Bledar Fazlija (fazl)
Deputy Module Coordinator	Ruben Seiberlich (seib)
Prerequisite Knowledge	A good understanding of the material from the lectures "Quantitative Methods" and "Advanced Quantitative Methods" is assumed.
Contribution to Program Learning Goals (Affected by Module)	§ Professional Competence § Methodological Competence § Social Competence § Self-Competence
Contribution to Program Learning Objectives	Professional Competence § Knowing and Understanding Content of Theoretical and Practical Relevance § Apply, Analyze, and Synthesize Content of Theoretical and Practical Relevance § Evaluate Content of Theoretical and Practical Relevance Methodological Competence § Problem-Solving & Critical Thinking § Scientific Methodology § Work Methods, Techniques, and Procedures § Information Literacy § Creativity & Innovation Social Competence § Written Communication § Oral Communication § Teamwork & Conflict Management § Intercultural Insight & Ability to Change Perspective Self-Competence § Self-Management & Self-Reflection § Ethical & Social Responsibility § Learning & Change
Module Learning Objectives	Students... § know how to select the right machine learning model for a given problem. § know how to evaluate the performance of a machine learning model. § know how to implement simple algorithms and models in Python. § are able to distinguish between supervised and unsupervised learning. § are able to interpret the results calculated with different performance metrics. § know how to combine several machine learning models to achieve higher predictive performance.
Module Content	§ The main techniques of machine learning and some aspects of deep learning § How to implement machine learning models in Python using libraries such as NumPy, Pandas, Sklearn, etc. § Selection and assessment of the performance of different machine learning models (accuracy, precision, confusion matrix, etc.) § Different validation techniques (hold-out, bootstrapping, cross-validation, etc.)

Links to other modules	The content of this module is linked to the following modules: w.MA.XX.AQM-PiE.19HS		
	w.MA.XX.QNM-PiE.19HS		
Methods of Instruction	§ Exercises § Project Work § Explorative Learning § Literature Review	**Social Settings Used:** Group Work	
Digital Resources	Teaching Materials		

Type of Instruction	**Classroom Instruction**	**Guided Self-Study**	**Autonomous Self-Study**
Lecture	-	270 h	
Excercise	-	-	
Project Work	-	-	
Seminar	-	-	
Total	**0 h**	**270 h**	**0 h**

Performance Assessment

End-of-module exam	**Form**	**Length (min.)**	**Weighting**
-	-	-	-
Permitted Resources	-		

Others	**Assessment**	**Length (min.)**	**Weighting**
Written Assignment	Grade	-	50,00 %
Talk/oral presentation	Grade	30	50,00 %

Students are not allowed to revise and resubmit performance assessment tasks.

Classroom Attendance Requirement	Mandatory Attendance: None No
Language of Instruction/Examination	English
Compulsory Reading	-
Recommended Reading	Specific literature is mentioned at the beginning of each Jupyter notebook.
Comments	Performance Assessment The overall grade of this module is composed of the grades awarded for a project-based paper (weighted 50%) and a 30-min. oral technical discussion (weighted 50%). Grades may differ within a group.