Valid from 2024.HS

Module description: Machine Learning and Deep Learning

Module Code	w.MA.XX.MLDL-PiE.22HS
ECTS Credits	9
Language of Instruction/Examination	English
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.
Organizational Unit	IWA Ltg.
Module Coordinator	Bledar Fazlija
Deputy Module Coordinator	Ruben Seiberlich
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
Prerequisite Knowledge	A good understanding of the material from the lectures "Quantitative Methods" and "Advanced Quantitative Methods" is assumed.
Contribution to Program Learning Objectives (by the concerned 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

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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

- We cover several model types (from classical machine learning models to deep learning) and use cases.

Links to other modules

This module is linked to the following modules:
- w.MA.XX.QNM-PiE.19HS
- w.MA.XX.AQM-PiE.19HS

Digital Learning Resources

- Practice and Application Exercises (with Key)
- Jupyter notebooks
- Notes

Methods of Instruction

- Exercises
- Project Work
- Literature Review
- Explorative Learning

Social Settings Used:
- Group Work

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
Talk/oral presentation	Grade	30	50
Written Assignment	Grade	0	50

Classroom Attendance Requirement

None

No

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.