Syllabus

Kursbeschreibung

Titel der Lehrveranstaltung	Künstliche Intelligenz und maschinelles Lernen
Code der Lehrveranstaltung	42419
Zusätzlicher Titel der Lehrveranstaltung	
Wissenschaftlich-disziplinärer Bereich	INFO-01/A
Sprache	Englisch
Studiengang	Bachelor in Elektrotechnik und Cyber-Physische Systeme
Andere Studiengänge (gem. Lehrveranstaltung)	
Dozenten/Dozentinnen	Prof. Dr. Oswald Lanz, Oswald.Lanz@unibz.it https://www.unibz.it/en/faculties/engineering/academic-staff/person/46208 dr. Alessandro Torcinovich, Alessandro.Torcinovich@unibz.it https://www.unibz.it/en/faculties/engineering/academic-staff/person/49855
Wissensch. Mitarbeiter/Mitarbeiterin	
Semester	Erstes Semester
Studienjahr/e	3
KP	9
Vorlesungsstunden	60
Laboratoriumsstunden	30
Stunden für individuelles Studium	135
Vorgesehene Sprechzeiten	27
Inhaltsangabe	The course belongs to the type "caratterizzanti – discipline informatiche".

	Students gain an understanding of the theoretical and practical foundations and concepts of Artificial Intelligence and Machine Learning including artificial intelligence and agents, search space exploration, automated planning, data analysis, model selection, supervised learning, unsupervised learning, reinforcement learning, elements of deep learning.
Themen der Lehrveranstaltung	• Artificial intelligence and agents • Search space exploration • Automated planning • Data analysis • Model selection • Supervised learning • Unsupervised learning • Reinforcement learning • Elements of deep learning
Stichwörter	Artificial Intelligence, Machine Learning
Empfohlene Voraussetzungen	Mathematical Analysis I, Mathematical Analysis II, Fundamentals of Statistics
Propädeutische Lehrveranstaltungen	
Unterrichtsform	Frontal lectures, homeworks, exercises, and laboratories
Anwesenheitspflicht	Preferrable. Non-attending students should contact the lecturer at the start of the course to agree on the modalities of the independent study
Spezifische Bildungsziele und erwartete Lernergebnisse	Knowledge and understanding • Know the principles of machine learning and artificial intelligence and potentials and limits in various application domains. Applying knowledge and understanding • Be able to adopt programming techniques of artificial intelligence for state space search and planning; • Be able to adopt machine learning techniques to extract knowledge from data. Making judgments • Be able to work autonomously according to the own level of knowledge and understanding; • Be able to collect and interpret useful data and to judge

	intelligent systems and their applicability; Ability to learn • Have developed learning capabilities to pursue further studies with a high degree of autonomy. Communication skills • Be able to use one of the three languages English, Italian and German, and be able to use technical terms and communication appropriately. • Be able to structure and write technical documentation. • Be able to work in teams for the realization of intelligent systems. Learning skills: • Have developed learning capabilities to pursue further studies with a high degree of autonomy • Be able to follow the fast technological evolution and to learn cutting edge technologies and innovative aspects of last generation intelligent systems
Spezifisches Bildungsziel und erwartete Lernergebnisse (zusätzliche Informationen)	
Art der Prüfung	Oral exam and project work. The mark for each part of the exam is 18-30, or insufficient. The oral exam comprises verification questions, and open questions to test knowledge application skills. It counts for 50% of the total mark. The project consists of a project related to the content of the course and verifies whether the student is able to apply the concepts taught or presented in the course to solve concrete problems. It is assessed through a final presentation, a demo, and a project report and can be carried out either individually or in a group of 2 students. It is discussed during the oral exam, and it counts for 50% of the total mark.
Bewertungskriterien	The final mark is computed as the weighted average of the oral exam and the project. The exam is considered passed when both

	marks are valid, i.e., in the range 18-30. Otherwise, the individual valid marks (if any) are kept for all 3 regular exam sessions, until also all other parts are completed with a valid mark. After the 3 regular exam sessions, all marks become invalid. Relevant for the oral exam: clarity of answers; ability to recall principles and methods, and deep understanding about the course topics presented in the lectures; skills in applying knowledge to solve exercises about the course topics; skills in critical thinking. Relevant for the project: skill in applying knowledge in a practical setting; ability to summarize in own words; ability to develop correct solutions for complex problems; ability to write a quality report; ability in presentation; ability to work in teams. Non-attending students have the same evaluation criteria and requirements for passing the exam as attending students.
Pflichtliteratur	All the required reading material will be provided during the course and will be available in electronic format.
Weiterführende Literatur	David Poole and Alan Mackworth. Artificial Intelligence: Foundations of Computational Agents. Cambridge University Press, 3rd Edition, 2023. ISBN: 9781009258197. Christopher M. Bishop. Pattern Recognition and Machine Learning. Springer, 2006. ISBN: 9780387310732. Ian Goodfellow, Yoshua Bengio and Aaron Courville. Deep Learning. MIT Press, 2016. ISBN: 9780262035613.
Weitere Informationen	Software used: Python, Scikit-Learn, PyTorch
Ziele für nachhaltige Entwicklung (SDGs)	Hochwertige Bildung