Syllabus

Kursbeschreibung

Titel der Lehrveranstaltung	Artificial intelligence and machine learning
Code der Lehrveranstaltung	42801
Zusätzlicher Titel der Lehrveranstaltung	
Wissenschaftlich-disziplinärer Bereich	IINF-05/A
Sprache	Englisch
Studiengang	Master in Smarte Technologien für Sport und Gesundheit
Andere Studiengänge (gem. Lehrveranstaltung)	
Dozenten/Dozentinnen	Dr. Floriano Luca Zini, floriano.zini@unibz.it https://www.unibz.it/en/faculties/engineering/academic-staff/person/29416 Prof. Antonio Liotta, Antonio.Liotta@unibz.it https://www.unibz.it/en/faculties/engineering/academic-staff/person/41903 Prof. Dr. Oswald Lanz, Oswald.Lanz@unibz.it https://www.unibz.it/en/faculties/engineering/academic-staff/person/46208
Wissensch. Mitarbeiter/Mitarbeiterin	
Semester	Erstes Semester
Studienjahr/e	1
KP	9
Vorlesungsstunden	60
Laboratoriumsstunden	30
Stunden für individuelles Studium	135

Vorgesehene Sprechzeiten	27
Inhaltsangabe	• Agent technologies; • Search space exploration; • Automated planning: • Data analysis; • Model selection; • Supervised and unsupervised learning; • Reinforcement learning; • Foundations of deep learning; • Computer vision. Examples of applications in the fields of health and sport will be given for each topic.
Themen der Lehrveranstaltung	• What is artificial intelligence • Agents situated in Environments • Designing agents • What is data mining • Data curation, preparation, and augmentation • Feature engineering • State space search • Uninformed and Informed searching algorithms • Deterministic planning • Planning with uncertainty • Supervised learning: general concepts • Supervised learning: overfitting, model selection and evaluation • Supervised learning: classification algorithms • Supervised learning: ensamble algorithms • Unsupervised learning: general concepts • Unsupervised learning: clustering algorithms • Unsupervised learning: anomaly detection algorithms • Reinforcement learning basics • Social impact of Artificial intelligence • Neural networks • Deep learning basics • Computer vision basics A selection may be made from these topics during the course based on the teaching needs that arise. Examples of applications in the fields of health and sport will be given for each topic.
Stichwörter	Artificial Intelligence, Data Mining, Machine Learning, Health, Sport

Empfohlene Voraussetzungen	Knowledge in mathematical analysis and fundamentals of statistics
Propädeutische Lehrveranstaltungen	
Unterrichtsform	Frontal lectures, homework, 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 • Knowledge and understanding of the basic methods of artificial intelligence and machine learning and their implementation. Applying knowledge and understanding • Application of the basic methods of artificial intelligent for the design of intelligent systems in the fields of health and sport. Making judgments • Ability to plan and re-plan the work of a technical project and to complete it within specified deadlines and objectives; • Ability to set work objectives that are realistic and compatible with available resources; • Ability to pursue project objectives, resolve conflicts and make compromises without losing sight of costs, resources, time, knowledge or risks; Communication skills • Ability to organize and write scientific and technical documentation for project descriptions; • Ability to develop and present technical content in English; • Ability to synthesize knowledge acquired through reading and studying scientific and technical documentation; preparation of reports and presentations. Learning skills: • Ability to independently expand on knowledge acquired during study by reading and understanding scientific and technical documentation in English; • Ability to independently and continuously update oneself on developments in the most important areas of smart systems for sport and health; • Ability to expand knowledge, including incomplete knowledge, in the area of problem solving, taking into account the primary

	objective of the project.
Spezifisches Bildungsziel und erwartete Lernergebnisse (zusätzliche Informationen)	The course belongs to the type "caratterizanti". Basic knowledge of supervised and unsupervised learning methods, reinforcement learning and deep learning, as well as their applications in the fields of sport and health
Art der Prüfung	Each lecturer will propose a project and conduct an oral exam, assessing the two parts with a score between 18 and 30 or a fail. The amount of work required for each part will be proportional to the number of teaching hours of the lecturer. Each part counts for 50% of the mark awarded by the lecturer. The exam is considered passed if the marks for all parts fall within the range 18-30. If the exam is passed, the student's final mark will be the average of the marks given by the lecturers, weighted according to the number of teaching hours of each. Otherwise, any valid marks for individual parts are retained for all 3 regular exam sessions, until all other parts are also completed with a valid mark. After the 3 regular exam sessions, all marks become invalid. The project verifies whether the student is able to apply the concepts presented in the course to solve concrete problems in the fields of health and sports. 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. The oral exam comprises questions to assess the knowledge acquired during the course and its application. Non-attending students have the same assessment criteria and requirements for passing the exam as attending students.
Bewertungskriterien	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. Copy of the slides will be available as well.
Weiterführende Literatur	David Poole and Alan Mackworth. Artificial Intelligence: Foundations of Computational Agents. Cambridge University Press, 3rd Edition, 2023. ISBN: 9781009258197. Pang-Ning Tan, Michael Steinbach, Anuj Karpatne and Vipin Kumar. Introduction to Data Mining. Pearson, 2nd Edition, 2019. ISBN: 9780273775324.
Weitere Informationen	Software used: Python, Scikit-Learn, PyTorch, Colab
Ziele für nachhaltige Entwicklung (SDGs)	Menschenwürdige Arbeit und Wirtschaftswachstum, Gesundheit und Wohlergehen