Fakultät für Ingenieurwesen
Facoltà di Ingegneria
Faculty of Engineering

COURSE DESCRIPTION – ACADEMIC YEAR 2025/2026

Course title	**AI and machine learning**
Course code	42801
Scientific sector	IINF-05/A
Degree	Master in Smart Technologies for Sports and Health (LM-32)
Semester	1
Year	1
Credits	9
Modular	No

Total lecturing hours	60
Total lab hours	30
Attendance	Preferrable. Non-attending students should contact the lecturer at the start of the course to agree on the modalities of the independent study
Prerequisites	Knowledge in mathematical analysis and fundamentals of statistics
Course page	Teams

Specific educational objectives	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.

Lecturers	Dr. Floriano Zini, Prof. Oswald Lanz, Prof. Antonio Liotta
Contact	floriano.zini@unibz.it, oswald.lanz@unibz.it, antonio.liotta@unibz.it
Scientific sector of lecturers	IINFO-01/A Informatics, IINF-05/A Information Processing Systems
Teaching language	English
Office hours	After consultation and agreement with lecturers
Lecturing assistant (if any)	-
Contact LA	-
Office hours LA	-
List of topics	• 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.
Teaching format	Frontal lectures, homework, exercises, and laboratories.

Learning outcomes	**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.

Assessment	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 verifies whether the student is able to apply the concepts taught or 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. It is discussed during the oral exam, and it counts for 50% of the total mark.
Assessment language	English
Assessment Typology	Monocratic

Evaluation criteria and criteria for awarding marks	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.

Required readings	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.
Supplementary readings	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.
Software used	Python, Scikit-Learn, PyTorch