COURSE DESCRIPTION – ACADEMIC YEAR 2020/2021

Course title	**Machine Learning**
Course code	73006
Scientific sector	INF/01
Degree	Master in Computational Data Science (LM-18)
Semester	2
Year	1
Credits	6
Modular	No

Total lecturing hours	40
Total lab hours	20
Attendance	The attendance is not compulsory, but students are highly encouraged to attend both lectures and labs.
Prerequisites	Basics of Linear Algebra and Statistics
Course page	https://ole.unibz.it/

Specific educational objectives	The course belongs to the type "caratterizzanti – discipline informatiche" in the curricula "Data Analytics" and "Data Management".
	This course provides an introduction to machine learning concepts and techniques. Topics include: supervised learning (regression analysis, classification, and neural networks); unsupervised learning (clustering and dimensionality reduction); deep learning and reinforcement learning. The course will also discuss recent applications of machine learning in several areas including information extraction, web data processing, and time series.
	In this course, students will learn about the most important machine learning techniques. Together with the theoretical knowledge, students will gain the practical know-how needed to implement the learned techniques and powerfully apply them to new problems.

Lecturer	Mouna Kacimi
Contact	2.08, mouna.kacimi@unibz.it
Scientific sector of lecturer	INF01
Teaching language	English
Office hours	To be arranged beforehand by email.
Lecturing Assistant (if any)	Mouna Kacimi
Contact LA	2.08, mouna.kacimi@unibz.it
Office hours LA	To be arranged beforehand by email.
List of topics	• Concept learning • Resampling and model selection • Unsupervised learning • Supervised learning • Deep learning • Reinforcement learning
Teaching format	Frontal lectures, labs, and projects.

Learning outcomes	Knowledge and understanding: • D1.1 - Knowledge of the key concepts and technologies of data science disciplines • D1.7 - Knowledge of artificial intelligence techniques and methods for the implementation of intelligent systems Applying knowledge and understanding: • D2.1 - Practical application and evaluation of tools and techniques in the field of data science • D2.2 - Ability to address and solve a problem using scientific methods • D2.6 - Ability to apply innovative techniques of data mining and machine learning to extract knowledge from complex and heterogeneous data Making judgments • D3.2 - Ability to autonomously select the documentation (in the form of books, web, magazines, etc.) needed to keep up to date in a given sector Communication skills • D4.1 - Ability to use English at an advanced level with particular reference to disciplinary terminology • D4.3 - Ability to structure and draft scientific and technical documentation

Assessment	Final written exam: with verification questions and problem-solving tests Project: consists in applying/implementing machine learning algorithms using real datasets, running experiments, and presenting the results.
Assessment language	English
Assessment Typology	Monocratic
Evaluation criteria and criteria for awarding marks	**Evaluation criteria** • Written final exam: 60% of the mark. • Project: 40% of the mark Important note: both project and exam need to be passed! **Criteria for awarding marks** Exam: correctness and clarity of answers, the ability to adequately solve machine learning problems and to understand how to choose the right technique. Project: ability to implement and apply machine learning algorithms in a real-world problem, creativity, and ability to work in team.

Required readings	- Introduction to Machine Learning (Alex Smola and S.V.N. Vishwanathan) - Introduction to Machine Learning (Nils J. Nilsson) - Understanding Machine Learning (Shai Shalev-Shwartz and Shai Ben-David) Subject Librarian: David Gebhardi, David.Gebhardi@unibz.it
Supplementary readings	--
Software used	MATLAB/Octave/R