COURSE DESCRIPTION – ACADEMIC YEAR 2019/2020

Course title	**Machine Learning**
Course code	73006
Scientific sector	INF/01
Degree	Master in Computational Data Science (LM-18)
Semester	1
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	
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 with focus on text mining and web data processing. 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	Piazza Domenicani 3, Room 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)	--
Contact LA	--
Office hours LA	--
List of topics	• Concept learning • Resampling and model selection • Unsupervised learning • Supervised learning • Deep learning • Reinforcement learning
Teaching format	Frontal lectures, labs, and assignments.

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. Assignments: consist in four homeworks with written questions and tasks that require some programming using Matlab/Octave/R.
Assessment language	English
Assessment Typology	Monocratic
Evaluation criteria and criteria for awarding marks	**Evaluation criteria** • Written final exam: 60% of the mark. • Assignments: 40% of the mark (10% each homework) **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. • Assignments: 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

Software used	MATLAB/Octave/R