COURSE DESCRIPTION – ACADEMIC YEAR 2017/2018

Course title	**Advanced Topics in Machine Learning**
Course code	*Leave blank*
Scientific sector	*Leave blank*
Degree	Master in Computer Science (LM-18)
Semester	*Leave blank*
Year	*Leave blank*
Credits	8
Modular	No

Total lecturing hours	48
Total lab hours	24
Total exercise hours	0
Attendance	Attending the lab is not required but recommended
Prerequisites	Introductory courses on: linear algebra, and probability theory.
Course page	https://ole.unibz.it/

Specific educational objectives	Deep learning is a class of machine learning algorithms which enables computers to learn from examples. Deep learning techniques have been used successfully for variety of applications, including: automatic speech recognition, image recognition, natural language processing, drug discovery, and recommendation systems. In this course, students will learn the fundamentals of deep learning, and the main research activities in this field. Moreover, students will learn to implement, train, and validate their own neural network, and they will improve their understanding of the on-going research in computer vision and multimedia field.

Lecturer	Tammam TILLO
Contact	+39 0471 016026
Scientific sector of lecturer	
Teaching language	English
Office hours	During the lecture times, and Thursday 14:00-16:00, faculty of computer science, Piazza Domenicani 3, Office 1.17
Lecturing Assistant (if any)	*Name with link to lecturer's page*
Contact LA	*office, e-mail, phone*
Office hours LA	
List of topics	• Computer vision • Image classification • Convolutional Neural Networks (CNN) • Back-propagation • Training Neural Networks • Understanding and visualizing Convolutional Neural Networks • Deep Reinforcement Learning • Image segmentation and object detection

Teaching format	This course will be delivered through a combination of formal lectures and lab sessions.

Learning outcomes	Knowledge and understanding • To understand the fundamentals of deep learning. • To know the main techniques in deep learning and the main research in this field. Applying knowledge and understanding • Be able to design and implement deep neural network systems. • Be able to identify new application requirements in the field of computer vision. Making judgments • Be able to identify reasonable work goals and estimate the resources required to achieve the objectives. Communication skills • Be able to structure and prepare scientific and technical documentation describing project activities. Learning skills • Be able to autonomously extend the knowledge acquired during the study course by reading and understanding scientific and technical documentation.

Assessment	• Lab exercises • Final exam (written)
Assessment language	English
Evaluation criteria and criteria for awarding marks	Marks are distributed as follows : 1- 40% for lab exercises 2- 60% for final exam The aim of the written exam is to assess to which degree students have achieved the following learning outcomes : 1) Knowledge and understanding, 2) applying knowledge and understanding, 3) making judgment. The laboratory exercises are designed to assess students' ability to design solutions for practical problems. Lab exercises and the final exam are mandatory.

Required readings	--

Supplementary readings	The course will rely on some research articles which will be updated with time. Suggested book : • Chris Bishop; Pattern Recognition and Machine Learning • Ian Goodfellow, Yoshua Bengio and Aaron Courville; Deep Learning (Adaptive Computation and Machine Learning series)
Software used	The lab experiments will be performed using MATLAB (C/C++ or PYTHON or other software tools could be used).