MODELLO D (inglese)			
General Information			
Academic subject	Machine Learning		
Degree course	Computer Science (second-level degree in Computer Science)		
Curriculum			
ECTS credits	7+2		
Compulsory attendance	No		
Language	English		
Subject teacher	Name Surname	Mail address	SSD
	Nicola Di Mauro	nicola.dimauro@uniba.it	INF/01
	Claudia d'Amato	claudia.damato@uniba.it	INF/01
ECTS credits details		SSD	
Lecturers, workshops and project	6 credits	ING-INF/05	
Class schedule			
Period	Second semester		
Year	First year		
Type of class	Lecture- workshops		
Time management			
Hours	225		
Hours of lectures	56 + 119		
Tutorials and lab	30 + 20		
Academic calendar			
Class begins	February, 2021		
Class ends	June, 2021		
Syllabus			
Prerequisites/requirements	Basic knowledge in Probability Theory, Discrete Mathematics and Calculus, Computer Science		
Expected learning outcomes (according to Dublin Descriptors) (it is recommended that they are congruent with the learning outcomes contained in A4a, A4b, A4c tables of the SUA-CdS)	*Knowledge and understanding* The class provides the students with theoretical and methodological skills on machine learning. The class focuses on supervised and unsupervised learning, regression and generative models. *Applying knowledge and understanding* The students will be able to use the acquired knowledge to: a) find the method fitting the problem to be solved; b) adopt the appropriate machine learning tool for tackling real world problems; c) evaluate the obtained results *Making informed judgements and choices* The class gives the students the ability to model real world data with machine learning tools and making predictions on new data. The exam requires the student to solve a real world machine learning problem. *Communicating knowledge and understanding* The student will improve their knowledge in building machine learning systems for solving complex problems. Their ability in using the appropriate method will be evaluated in the exam. *Capacities to continue learning*		

	The content provided in the class will be useful to study in depth machine learning papers appearing in international conferences.
Contents	• Introduction to Machine Learning including symbolic and numerical methods • Model selection and validation • Linear regression, classification, Logistic regression • Naive Bayes classifier and K-nearest neighbors • Kernel and support vector machines • Classification and regression trees. Random forest. Boosting and Ensemble methods • Symbolic Models • Unsupervised learning: K-means, K-medoids, mixture models, EM • Probabilistic graphical models • Intro to Deep Learning • Feed-Forward Neural Networks. Training Feed-Forward NNs: gradient descent and back-propagation • Convolutional Networks. Recurrent Networks. • Autoencoders. • Embeddings and Knowledge Graphs • Bayesian methods • Density estimation and generative models • Reinforcement Learning
Course program	
Bibliography	- Logical and Relational Learning: From ILP to MRDM by Luc De Raedt, 2008 - Pattern Recognition and Machine Learning by Christopher M. Bishop, 2018 - The Elements of Statistical Learning: Data Mining, Inference, and Prediction by Trevor Hastie and Robert Tibshirani, 2016 - Machine Learning: A Probabilistic Perspective by Kevin P. Murphy, 2012 - Deep Learning by Ian Goodfellow and Yoshua Bengio, 2016 - Deep Learning with Python by Francois Chollet, 2018 - Python Machine Learning: Machine Learning and Deep Learning with Python, scikit-learn, and TensorFlow, by Sebastian Raschka and Vahid Mirjalili, 2017
Notes	
Teaching methods	Lectures, exercises in the classroom
Assessment methods (indicate at least the type written, oral, other)	Oral
Evaluation criteria (Explain for each expected learning outcome what a student has to know, or is able to do, and how many levels of achievement there are.	- Ability to explain the differences among different ML methods - Ability to choose the correct ML approach for a given problem - Ability to evaluate the results of a ML approach
Further information	