



DEEP LEARNING

Anno immatricolazione	2020/2021
Anno offerta	2021/2022
Normativa	DM270
SSD	ING-INF/05 (SISTEMI DI ELABORAZIONE DELLE INFORMAZIONI)
Dipartimento	DIPARTIMENTO DI INGEGNERIA INDUSTRIALE E DELL'INFORMAZIONE
Corso di studio	COMPUTER ENGINEERING
Curriculum	Computer Science and Multimedia
Anno di corso	2°
Periodo didattico	Secondo Semestre (07/03/2022 - 17/06/2022)
Crediti	6
Ore	45 ore di attività frontale
Lingua insegnamento	English
Tipo esame	ORALE
Docente	PIASTRA MARCO (titolare) - 6 CFU
Prerequisiti	Foundations of linear algebra and multivariable calculus. Practical experience with at least one programming language. Some acquaintance with Python and Numpy.
Obiettivi formativi	The course follows a conceptual pathway that starting from simple linear regression to the sophisticated aspects of state-of-art of deep convolutional neural networks, deep recurrent networks and deep reinforcement learning. A unifying mathematical approach is followed throughout this path, to encompass and make it possible to understand the basic features of modern software frameworks for deep learning, such as TensorFlow.
Programma e contenuti	1) Deep Supervised Learning Algebraic model, foundations of tensor calculus

	<p>Learning as representation, evaluation and optimization</p> <p>Single-layer networks as universal approximators</p> <p>Dataset in tensor representation for calculus</p> <p>Flow diagrams, automatic differentiation</p> <p>Regression and classification, softmax</p> <p>Deep layered representation, modularity</p> <p>Ottimizzazione</p> <p>2) Deep Convolutional Neural Networks</p> <p>Convolutional layers and complex architectures</p> <p>Data augmentation and Transfer learning</p> <p>Layered learning, different optimization processes</p> <p>Fallibility and adversarial models</p> <p>Classification, object detection, segmentation</p> <p>3) Deep Recurrent Networks</p> <p>Temporal unfolding, shared-parameters layers</p> <p>Long-Short Term Memory (LSTM)</p> <p>4) Deep Reinforcement Learning</p> <p>On-policy and off-policy learning</p> <p>Actor critic and advance function</p> <p>Neural MCTS: AlphaZero e MuZero</p>
Metodi didattici	<p>Lectures (hours/year in lecture theatre): 30</p> <p>Practical class (hours/year in lecture theatre): 16</p> <p>Practicals / Workshops (hours/year in lecture theatre): 0</p>
Testi di riferimento	<p>See the home page of the course (http://vision.unipv.it/DL) for lecture slides, suggested readings and software for the exercises.</p>
Modalità verifica apprendimento	<p>The evaluation includes the realization of a project, to be agreed in advance. The final exam is an interview about the theory, together with the discussion of the project.</p>
Altre informazioni	
Obiettivi Agenda 2030 per lo sviluppo sostenibile	<p>\$Ibl legenda sviluppo sostenibile</p>