UNIVERSITÀ DELLA CALABRIA | DIPARTIMENTO DI **MATEMATICA E INFORMATICA**

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PH.D. IN MATHEMATICS AND COMPUTER SCIENCE

COURSE SCHEDULE

ACADEMIC YEAR 2020/2021

LOGIC-BASED LEARNING FOR INTERPRETABLE AI: RECENT ADVANCEMENTS AND FUTURE DIRECTIONS

PROF. ALESSANDRA RUSSO, DR. MARK LAW
IMPERIAL COLLEGE

27 April - 7 May

Logic-based learning is a type of Machine Learning that aims at learning interpretable models of the world from observations (positive and negative), using also any existing relevant knowledge and/or integrity constraints. The learned models, also called hypotheses or theories, are guaranteed to explain the positive observations, classify them from negative observations, and because of their generalisation property, accurately predict unseen observations. A key characteristic of logic-based learning is that logic is used as the underlying unifying representation language for observations, background knowledge and hypotheses, which makes the learned models human interpretable. Various approaches have been developed in AI since the 1980 and recent advances have also seen an increased application of this form of machine learning in real world problems domains including privacy and security, software engineering, automata learning, language grammars definition, etc. This course is divided into three parts. The first part aims at providing an in-depth presentation of the current state-of-the-art of logic-based learning, starting from its key foundation concepts and principles, categorisation of logic-based learning tasks, and some key algorithmic aspects that are common to a variety of logic-based learning systems. The second part will focus on approaches to learning under the answer set semantics, beginning with the traditional methods of brave and cautious learning. In this part, students will see that these traditional methods are incapable of learning general answer set programs, and that a more advanced method, Learning from Answer Sets (LAS), is required. This part will conclude by demonstrating recent real-world applications of the state-of-the-art systems for learning answer set programs. The third part of the course will identify open challenges in the area of logic-based learning, including also future directions on integration of logic-based learning into hybrid neural symbolic architectures.