Marco Gori

A Constrained-Based Approach to Machine Learning

Abstract:
In this talk I propose a unified view of machine learning that relies on modeling the environment as an appropriate collection of constraints that the agent is expected to satisfy. Nearly every task, which has been faced in machine learning can be modeled under this mathematical framework. Linear and linear threshold machines, neural networks, and kernel machines are mostly regarded as adaptive models that need to softly-satisfy a set of point-wise constraints corresponding to the training set. The classic risk, in both the functional and empirical forms, can be regarded as a penalty function to be minimized in a soft-constrained system. Unsupervised learning can be given a similar formulation, where the penalty function somewhat offers an interpretation of the data probability distribution. While regarding symbolic knowledge bases as a collection of constraints, I draw a path towards a deep integration with machine learning that relies on the idea of adopting multivalued logic formalisms, like in fuzzy systems. A number of case studies are discussed to facilitate the acquisition of the theory.

Biosketch:
Marco Gori received the Ph.D. degree in 1990 from Università di Bologna, Italy, working partly at the School of Computer Science (McGill University, Montreal). In 1992, he became an Associate Professor of Computer Science at Università di Firenze and, in November 1995, he joined the Università di Siena, where he is currently full professor of computer science. His main interests are in machine learning with applications to pattern recognition, Web mining, and game playing. He is especially interested in bridging logic and learning and in the connections between symbolic and sub-symbolic representation of information.
He was the leader of the WebCrow project for automatic solving of crosswords, that outperformed human competitors in an official competition which took place during the ECAI-06 conference. As a follow up of this grand challenge he founded QuestIt, a spin-off company of the University of Siena, working in the field of question-answering. He is co-author of "Web Dragons: Inside the myths of search engines technologies," Morgan Kauffman (Elsevier), 2006, and "Machine Learning: A Constrained-Based Approach," Morgan Kauffman (Elsevier), 2018.
Dr. Gori serves (has served) as an Associate Editor of a number of technical journals related to his areas of expertise, he has been the recipient of best paper awards, and keynote speakers in a number of international conferences. He was the Chairman of the Italian Chapter of the IEEE Computational Intelligence Society, and the President of the Italian Association for Artificial Intelligence.
He is a fellow of the IEEE, ECCAI, IAPR. He is in the list of top Italian scientists kept by the VIA-Academy (http://www.topitalianscientists.org/top_italian_scientists.aspx).