Declarative Modeling for Machine Learning and Data Mining

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Abstract. Despite the popularity of machine learning and data mining today, it remains challenging to develop applications and software that incorporates machine learning or data mining techniques. This is because machine learning and data mining have focussed on developing high-performance algorithms for solving particular tasks rather than on developing general principles and techniques. I propose to alleviate these problems by applying the constraint programming methodology to machine learning and data mining and to specify machine learning and data mining problems as constraint satisfaction and optimization problems. What is essential is that the user be provided with a way to declaratively specify what the machine learning or data mining problem is rather than having to outline how that solution needs to be computed. This corresponds to a model + solver-based approach to machine learning and data mining, in which the user specifies the problem in a high level modeling language and the system automatically transforms such models into a format that can be used by a solver to efficiently generate a solution. This should be much easier for the user than having to implement or adapt an algorithm that computes a particular solution to a specific problem. Throughout the talk, I shall use illustrations from our work on constraint programming for itemset mining and probabilistic programming.

Bio

Luc De Raedt is a full professor (of research) at the University of Leuven (KU Leuven) in the Department of Computer Science and a former chair of Machine Learning at the Albert-Ludwigs-University in Freiburg. Luc De Raedt has been working in the areas of artificial intelligence and computer science, especially on computational logic, machine learning and data mining, probabilistic reasoning and constraint programming and their applications in bio- and chemoinformatics, vision and robotics, natural language processing, and engineering. His work has typically crossed boundaries between different research areas, often working towards an integration of their principles. He is well-known for his early work on inductive logic programming (combining logic with learning). Since 2000, he has been working towards a further integration of logical and relational learning with probabilistic reasoning (statistical relational learning and probabilistic programming) and on inductive querying in databases. During the last three

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years he has been fascinated by the possibility of combining constraint programming principles with data mining and machine learning. He is currently coordinating a European IST FET project in this area (ICON Inductive Constraint Programming) and is the program chair of the 20th European Conference on Artificial Intelligence (Montpellier, 2012). He was a program co-chair of ICML 2005 and ECML/PKDD 2001.