



ΔΙΑΛΕΞΗ

“Constraint Acquisition: Learning to Learn and to Generalize”

Dimos Tsouros

Post-Doc Researcher
Dept. of Computer Science
KU Leuven



ΠΕΡΙΛΗΨΗ – ABSTRACT

Constraint Programming (CP) has been successfully used to model and solve complex combinatorial problems. However, modelling is often not trivial and requires expertise, which is a bottleneck to the wider adoption of CP technology. In Constraint Acquisition (CA), the goal is to assist the user by automatically learning the model. In (inter)active CA, this is done by interactively posting queries to the user, e.g., asking whether a (partial) example satisfies their (unspecified) constraints or not. While interactive CA methods learn the constraints of a given problem, the learning is related to symbolic concept learning, as the goal is to learn an exact representation. However, a large number of queries is required by most systems to learn the model, which is a major limitation. In this talk, I will discuss how we alleviated this limitation by tightening the connection of CA and Machine Learning (ML), by, for the first time in interactive CA, exploiting statistical ML methods to guide interactive CA queries.

We will see results with different classifiers and show that using this approach decreased the number of queries needed substantially. We will then turn our attention to another limitation of CA: most methods learn a set of individual constraints for a specific problem instance. However, the instances are changing often when some of their parameters change, e.g. if the number of nurses changes in a nurse rostering problem. I will present how to generalize ground CSPs, learning parameterized constraint models that can model multiple instances of the same problem, by using machine learning classifiers for this task.

Finally, I will present results, showing that, even in the presence of noise in the ground CSP, this approach can generalize to unseen instances with high accuracy.

Dimos Tsouros received a diploma in Informatics and Telecommunications Engineering in 2017 from the University of Western Macedonia, Greece. In 2022, he received his PhD from the same University, focusing on Constraint Acquisition. His work for his PhD earned an honorable mention at the Doctoral Dissertation Awards of the Association for Constraint Programming in 2022. He is currently a Post-Doc researcher at the Department of Computer Science at KU Leuven, in the Declarative Languages and Artificial Intelligence (DTAI) section. His research interests include, without being limited to, Constraint Programming, Machine Learning, Artificial Intelligence, Combinatorial Optimization. His main focus is the integration of Constraint Programming and Machine Learning, with his main expertise being on interactive constraint acquisition, which involves developing systems that can learn constraints through interaction with a (human) user. He is one of the developers of the well-known CPMpy Constraint Programming and Modeling library in python. He has served as a PC member in respected AI conferences like IJCAI, AAAI, ECAI, CP, and CPAIOR.

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