Probabilistic Planning and Control by Probabilistic Programming: Semantics, Inference and Learning

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Abstract

Automated planning is a major topic of research in artificial intelligence, and enjoys a long and distinguished history. The classical paradigm assumes a distinguished initial state, comprised of a set of facts, and is defined over a set of actions which change that state in one way or another. Planning in many real-world settings, however, is much more involved: an agent's knowledge is almost never simply a set of facts that are true, and actions that the agent intends to execute never operate the way they are supposed to. Thus, probabilistic planning attempts to incorporate stochastic models directly into the planning process. In this article, we briefly report on probabilistic planning through the lens of probabilistic (logic) programming: a programming paradigm that aims to ease the specification of structured probability distributions. In particular, we provide an overview of the features of two systems, HYPE and ALLEGRO, which emphasise different strengths of probabilistic programming that are particularly useful for complex modelling issues raised in probabilistic planning. Among other things, with these systems, one can instantiate planning problems with growing and shrinking state spaces, discrete and continuous probability distributions, and non-unique prior distributions in a first-order setting. In the last part of the talk, we discuss some ongoing work on how to learn the parameter and structure of probabilistic (logic) programs.

openEASE can be used by KR&R researchers using a browser-based query and visualization interface, but also remotely by robotic via a WebSocket API.

About the Author

Vaishak Belle is a Chancellor's Fellow/Lecturer at the School of Informatics, University of Edinburgh, an Alan Turing Institute Faculty Fellow, and a member of the RSE (Royal Society of Edinburgh) Young Academy of Scotland. Vaishak's research is in artificial intelligence, and is motivated by the need to augment learning and perception with high-level structured, commonsensical knowledge, to enable AI systems to learn faster and more accurate models of the world. He is interested in computational frameworks that are able to explain their decisions, modular, re-usable, and robust to variations in problem description. He has co-authored over 40 scientific articles on AI, and along with his co-authors, he has won the Microsoft best paper award at UAI, and the Machine learning journal award at ECML-PKDD. In 2014, he received a silver medal by the Kurt Goedel Society.

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