

# CIDSE Invited Talk

## with Roni Khardon

### Stochastic Planning and Probabilistic Inference



**Friday, November 15<sup>th</sup>, 2019**  
**10:00 AM**  
**BYENG 510**

#### Abstract:

Stochastic Planning and Probabilistic Inference are two core areas in AI. The talk will give an overview of these problems and show how solutions taking advantage of the connections between them can improve the state of the art in both fields. In stochastic planning an agent must choose its actions so as to optimize long term reward, where the outcomes of actions are non-deterministic. The problem is computationally challenging when the world has many states and each state has many possible actions to choose among. It is even more challenging when the agent does not know the state of the world when choosing actions and thus must rely on indirect partial observations. Probabilistic inference can be seen as an abstraction of many problems where, given observations on some random variables, one has to infer some properties of other random variables.

I will review several approaches developed in my group but will mainly focus on our recent work which is based on aggregate simulation. The key idea is to compute an approximate outcome of the system symbolically and to solve the optimization problem by combining this representation with symbolic gradient based search. With some more technical work this idea provides state of the art solutions for stochastic planning with full and partial observability and the same approach provides a state-of-the-art solver for difficult Marginal MAP inference problems. The work shows how inference can be used to improve planning and how planning algorithms can be used to solve challenging inference problems.

#### BIO

Roni Khardon is a professor in the Department of Computer Science at Indiana University, Bloomington. He holds a Ph.D. in Computer Science from Harvard University, and M.Sc. and B.Sc. degrees from the Technion. Prior to moving to Bloomington he held faculty positions at the University of Edinburgh (1997-2000) and at Tufts University (2000-2018). His research interests are in developing agents that can learn from data, build representations of their world, use such knowledge for reasoning and decision making, and act in their environment so as to optimize their objectives. His recent work spans topics in AI (probabilistic planning, knowledge representation), machine learning (graphical models, approximate inference, computational learning theory) and the connections between these areas. Khardon is an associate editor for the Artificial Intelligence Journal. He served as an associate editor for the Journal of Artificial Intelligence Research (2011-2017), and the Machine Learning Journal (2006-2019). He regularly serves on program committees for leading conferences in AI and machine learning.

Hosted by: Siddharth Srivastava

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