Tractable Islands Revisited

Rina Dechter
Donald Bren School of Information and Computer Sciences, UC Irvine

"An important component of human problem-solving expertise is the ability to use knowledge about solving easy problems to guide the solution of difficult ones." - Minsky

A longstanding intuition in AI is that intelligent agents should be able to use solutions to easy problems to solve hard problems. This has often been termed the "tractable island paradigm." How do we act on this intuition in the domain of probabilistic reasoning?

This talk will describe the status of probabilistic reasoning algorithms that are driven by the tractable islands paradigm when solving optimization, likelihood and mixed (max-sum-product, e.g. marginal map) queries. I will show how heuristics generated via variational relaxation into tractable structures, can guide heuristic search and Monte-Carlo sampling, yielding anytime solvers that produce approximations with confidence bounds that improve with time, and become exact if enough time is allowed.