

Learning to Detect and Exploit Structure in Real-world Problems

Project Description

Techniques from the field of machine learning can be used to discover and exploit many forms of hidden structure in highly complex combinatorial search problems. For example, one of the most important forms of hidden structure discovered recently is the notion of a backdoor set of variables in satisfiability; these are variables that when properly assigned render the problem tractable. Preliminary work we have carried out seems to support the hypothesis that entropy-based machine learning algorithms are good at finding such back-doors. Another hypothesis we intend to study is that standard decision tree classifiers are excellent at deciding whether satisfiability problems are satisfiable or not (the classic NP-Complete decision problem) using very little information that can be gathered very quickly from a problem instance. Our hypothesis here is that classification algorithms reveal hidden structures in such problems. We intend to explain what these structures are, and show how they can be exploited in a search algorithm.

Project Coordinator

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[Postgraduate Research Award to David Devlin](#)

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