

Research project and supervisory team

Supervisory Team	Professor Ruibin Bai Dr. Rong Qu
Short introduction & description of research project	<p>Combinatorial optimisation problems (COP) have extensive real-life applications. However, most of them are NP-Hard and finding the optimal solutions is normally computationally prohibitive for large-size instances. The problems become even harder when uncertainties are taken into account to improve the practicality of the solutions.</p> <p>The existing approaches to tackle these types of problems can broadly be classified into analytical model driven methods (typified by mathematical programming methods) and data-driven methods (e.g. genetic programming and reinforcement learning). The former methods focus on the analytical properties of the mathematical model but may suffer from the robustness issues over uncertainties from the input data.</p> <p>The data driven methods often formulate the combinatorial problems as online optimisation problems and try to tackle the problem sequentially based on some policies or rules upon the realisation of random variables and the states of the partial solution at each decision point. One of the main drawbacks of these data driven methods is their inability to efficiently exploit the core structures and properties of the problem.</p> <p>More specifically, existing data driven methods primarily focus on the objectives to be optimised but often neglect various complex inter-dependencies among the decision variables (in the form of constraints) and their collective influence on the objective.</p> <p>In this research, the students shall investigate integrating linear/integer programming methods with the latest deep learning methods, including but not limited to reinforcement learning and graph neural network based learning.</p>
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