

Visualising the diversity of benchmark instances and generating new test instances to elicit insights into algorithm performance

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Objective assessment of optimization algorithm performance is notoriously difficult, with conclusions often inadvertently biased towards the chosen test instances. Rather than reporting average performance of algorithms across a set of chosen instances, we discuss a new methodology to enable the strengths and weaknesses of different optimization algorithms to be compared across a broader instance space. Results will be presented on timetabling, graph colouring and the TSP to demonstrate: (i) how pockets of the instance space can be found where algorithm performance varies significantly from the average performance of an algorithm; (ii) how the properties of the instances can be used to predict algorithm performance on previously unseen instances with high accuracy; (iii) how the relative strengths and weaknesses of each algorithm can be visualized and measured objectively; and (iv) how new test instances can be generated to fill the instance space and provide desired insights into algorithmic power.

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