

EVOLUTIONARY ALGORITHMS AND HYPER-HEURISTICS

Nelishia Pillay

Hyper-heuristics is a rapidly developing domain which has proven to be effective at providing generalized solutions to problems and across problem domains. Evolutionary algorithms have played a pivotal role in the advancement of hyper-heuristics, especially generation hyper-heuristics. Evolutionary algorithm hyper-heuristics have been successfully applied to solving problems in various domains including packing problems, educational timetabling, vehicle routing, permutation flowshop and financial forecasting amongst others. The aim of the tutorial is to firstly provide an introduction to evolutionary algorithm hyper-heuristics for researchers interested in working in this domain. An overview of hyper-heuristics will be provided. The tutorial will examine each of the four categories of hyper-heuristics, namely, selection constructive, selection perturbative, generation constructive and generation perturbative, showing how evolutionary algorithms can be used for each type of hyper-heuristic. A case study will be presented for each type of hyper-heuristic to provide researchers with a foundation to start their own research in this area. The tutorial will also demonstrate the use of the EvoHyp toolkit for the implementation of evolutionary algorithm selection and generation hyper-heuristics. Challenges in the implementation of evolutionary algorithm hyper-heuristics will be highlighted. An emerging research direction is using hyper-heuristics for the automated design of computational intelligence techniques. The tutorial will look at the synergistic relationship between evolutionary algorithms and hyper-heuristics in this area. The use of hyper-heuristics for the automated design of evolutionary algorithms will be examined as well as the application of evolutionary algorithm hyper-heuristics for the design of computational intelligence techniques. The tutorial will end with a discussion session on future directions in evolutionary algorithms and hyper-heuristics.