Tutorial Proposal for NaBIC 2014

Title: Evolutionary Algorithm Hyper-Heuristics

Name of the Speaker: Nelishia Pillay

Abstract: Hyper-heuristics is a fairly new field that aims at providing a more generalized solution to combinatorial optimization problems. This is achieved by exploring a space of low-level heuristics or heuristic combinations which is mapped onto a solution space rather than searching the solution space directly. These low-level heuristics can be constructive or perturbative. Hyper-heuristics have been found to be effective in solving combinatorial optimization problems such as university course and examination timetabling, school timetabling, nurse and personnel rostering, packing problems and the travelling salesman problem, amongst others. Evolutionary algorithms such as genetic algorithms and genetic programming have played an important role in the development of the field of hyper-heuristics. Genetic programming in particular is the technique chiefly employed by hyper-heuristics to generate low-level heuristics. This tutorial will provide an introduction to hyper-heuristics and evolutionary algorithm hyper-heuristics, illustrate the application and effectiveness of evolutionary algorithm hyper-heuristics in solving combinatorial optimization problems and highlight directions for future research.

Detailed Outline of Topics to be Presented

- Introduction to hyper-heuristics - will provide an introduction to hyper-heuristics.
- Combinatorial optimization and low-level heuristics - will provide a brief introduction to combinatorial optimization and how low-level constructive and perturbative heuristics are used in this domain.
- Types of hyper-heuristics - the four types of hyper-heuristics will be presented, namely, selection constructive, selection perturbative, generation constructive and generation perturbative.
- Evolutionary algorithm hyper-heuristics - will look at how evolutionary algorithms have been employed by the four different types of hyper-heuristics.
- Application of evolutionary algorithm hyper-heuristics - will examine how evolutionary algorithm hyper-heuristics can be applied to combinatorial optimization problems and the effectiveness of this.
- Why do evolutionary algorithm hyper-heuristics work? - this section will examine why searching of a heuristic space is effective and more effective than searching the solution space directly.
- Growth of the field - a brief overview of the development of evolutionary algorithm hyper-heuristics since its inception, including recent applications and the cross-domain challenge.
- Future research directions for evolutionary algorithm hyper-heuristics.

A Description of the Target Audience and Pre-Requisites of Expected from the Participants

The tutorial is aimed at researchers in the field of evolutionary algorithms and other nature-inspired methods for combinatorial optimization. The tutorial provides an introduction to evolutionary algorithm hyper-heuristics and as such requires an introductory knowledge of evolutionary algorithms and combinatorial optimization.
A Brief CV of the Speaker Indicating his/her Background in the Tutorial Area

The speaker is an active researcher in field of evolutionary algorithm hyper-heuristics and the application thereof to combinatorial optimization problems. This is one of the focus areas of the NICOG research group which the speaker leads. The speaker is a member of IEEE Task Force on Hyper-Heuristics with the Technical Committee of Intelligent Systems and Applications at IEEE Computational Intelligence Society. Research output in this domain produced by speaker includes:


Contact address, phone, E-mail and webpage of the speaker

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Technical requirements

Data projector, white board or flip chart.