EVOLUTIONARY COMPUTATION FOR AUTOMATED ALGORITHM DESIGN

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Computational intelligence systems play an imperative role in in solving real world problems in industry. These systems have contributed to many facets of industry including data mining, transportation, health systems, computer vision, computer security, robotics, software engineering and scheduling amongst others. Computational intelligence systems employ one or more computational intelligence techniques such as neural networks, fuzzy logic, genetic algorithms, multi›agent approaches and rule›based systems. Implementation of these techniques require a number of design decisions to be made, e.g. what architecture to use, what parameter values to use, derivation of problem specific operators. It may also be necessary to employ a hybrid system combining techniques to solve a problem which introduces additional decisions such as which techniques to use and how to combine these techniques. This makes the development of computational systems time consuming, requiring many man hours. Consequently, there have been a number of initiatives to automate these processes.

There has been a fair amount of research into parameter tuning and control. The field of auto-ML aims to automate the design of machine learning algorithms so as to produce off-the-shelf machine learning techniques. Attempts to automate neural network architecture design has led to the field of neuroevolution. Research in this area has also been directed at inducing fuzzy functions, rule-based systems and multi›agent architectures. Hyper-heuristics, which were initially aimed at providing generalized solutions to combinatorial optimization problems, are proving to be effective in the automated development of techniques such as metaheuristics. Evolutionary algorithms such as genetic programming and genetic algorithms have chiefly been used in these initiatives. The aim of this special session is to examine recent developments in the field and future directions including the challenges and how these can be overcome.

Topics

- Parameter control and tuning
- Architecture design, e.g. design of neural network and multi›agent architectures

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- Automated hybridization of intelligent techniques
- Derivation of operators
- Derivation of construction heuristics
- Derivation of evaluation functions
- Automatic system development using hyper-heuristics
- Automatic programming
- Auto-ML
- Search›based software engineering