Population-based Algorithm Portfolios for Numerical Optimization

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Abstract

In the real-world, we are often given a time budget, within which we have to optimise a problem. In this case, it is essential that we spend our time wisely in order to come up with the best possible solution. Although a wide range of population-based algorithms, such as evolutionary algorithms, particle swarm optimizer and differential evolution, have been developed and studied in recent years, the performance of an algorithm may vary significantly from one problem instance to another. This implies that there is an inherent risk associated with the selection of algorithms. If we adopt an inappropriate algorithm, we will not be able to find a good solution within the given time budget. In this talk, we propose that, instead of choosing a single algorithm and investing the entire time budget in it, it would be better and less risky to distribute the time among multiple different algorithms. A new approach named population-based algorithm portfolio (PAP), which takes multiple algorithms as its constituent algorithms, is proposed based on this idea. PAP runs each constituent algorithm with a portion of the given time budget and encourages interactions among the constituent algorithms with a migration scheme. As a general framework rather than a specific algorithm, PAP is easy to implement and can accommodate any existing population-based search algorithms. This talk will explain the PAP framework and demonstrate its
instantiations on challenging benchmark functions. The experimental results have shown that the PAP algorithms can advance the state-of-the-art by outperforming its constituent as well as other strong algorithms.

**About the Speaker**

**Xin Yao** is a Chair (Professor) of Computer Science and the Director of CERCIA (Centre of Excellence for Research in Computational Intelligence and Applications) at the University of Birmingham, UK. He is an IEEE Fellow and the President (2014-15) of IEEE Computational Intelligence Society (CIS). His work won the 2001 IEEE Donald G. Fink Prize Paper Award, 2010 and 2015 IEEE Transactions on Evolutionary Computation Outstanding Paper Awards, 2010 BT Gordon Radley Award for Best Author of Innovation (Finalist), 2011 IEEE Transactions on Neural Networks Outstanding Paper Award, and many other best paper awards. He won the prestigious Royal Society Wolfson Research Merit Award in 2012 and the 2013 IEEE CIS Evolutionary Computation Pioneer Award. His major research interests include evolutionary computation, ensemble learning, and their applications, especially in software engineering.

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