

Computational Intelligence Based Scheduling

Ling WANG

Tsinghua University, Beijing, China

Abstract: As the theme of Industry 4.0, Smart Factory and Smart Manufacturing have attracted increasing attention recently. Production scheduling is one of the most common and significant problems faced by the manufacturing industry. Production scheduling is to allocate limited resources to tasks over time and to determine the sequence of operations so that the constraints of the manufacturing system are met and the performance criteria are optimized. From the problem-solving perspective, usually scheduling can be viewed as a complex combinatorial optimization problem with strong precedence constraints and huge search space. Due to the NP-hardness, computational intelligence (CI) based methods have become powerful solution techniques for solving the large-scale scheduling problems.

Over the past few decades, an impressive number of CI-based optimization algorithms were reported. From a systematic perspective, this talk will first introduce a unified framework for the population-based meta-heuristics. Then, some powerful memetic algorithms based on particle swarm optimization, harmony search, artificial bee colony, quantum-inspired computing and shuffled frog leaping will be presented for solving some specific scheduling problems with different features and complexities. Some generalized work and applications in different manufacturing industrial fields will be shown. The primary aim of this talk is to show that CI-based algorithms are powerful and general solution tools for solving scheduling problems while it is more important to incorporate the problem-specific knowledge into the CI-based algorithms in solving specific complex problems. It also illustrates the opportunities and challenges to generalize the CI-based algorithms to different areas other than that the inventors originally focused on.