

Guest Editorial

Special Issue on Search-Based Software Engineering

IT IS our pleasure to introduce this Special Issue on Search-Based Software Engineering (SBSE) focusing on the application of evolutionary computation to solve real-world software engineering problems. Evolutionary computation (EC) methods have now become integral part of software engineering. New advancements in EC, such as multi- and many-objective optimization, uncertainty handling for robust and reliable solutions, knowledge discovery and knowledge-augmented EC, dynamic EC, have a great deal of applications in software engineering. Many applications in software engineering have emerged based on the usage of EC for the automation of all phases of the software development process, including the analysis, design, implementation, testing, and maintenance of large software systems. A total of 26 papers were submitted to the Special Issue. Each was subjected to at least three reviews and finally six were accepted for publication as described in the following.

In “Constructing Cost-Aware Functional Test-Suites Using Nested Differential Evolution Algorithm,” Y. Wang *et al.* propose an approach to reduce testing effort based on simulated annealing. The technique has been evaluated with multiple real-world applications and generates time-optimal mixed covering arrays that significantly reduced the testing effort with respect to state-of-the-art algorithms.

In “Multiobjective Testing Resource Allocation Under Uncertainty” authored by Pietrantuono *et al.*, the authors describe a robust multiobjective approach to handle the dynamic nature of software development by finding a trade-off between reliability and release time. The approach has been validated on a real-world industrial project.

Font *et al.* suggest “Achieving Feature Location in Families of Models Through the Use of Search-Based Software Engineering.” Their proposed Genetic Algorithm guided by Latent Semantic Analysis successfully identifies model features using textual similarities as fitness functions. The approach has been validated on several industrial projects.

In “Integrating Weight Assignment Strategies With NSGA-II for Supporting User Preference Multiobjective Optimization,” S. Wang *et al.* observe that user preferences must be incorporated into optimization objectives in a proper manner when guiding search toward finding optimal solutions.

However, existing multiobjective algorithms usually treat all the objectives with equivalent priorities and do not provide a mechanism to reflect various user preferences when guiding search. The proposed preferences-based multiobjective algorithm has been tested on several industrial projects based on various case studies.

Paixao *et al.* propose “An Empirical Study of Cohesion and Coupling: Balancing Optimization and Disruption.” This paper discusses developers’ perception on coupling and cohesion based on ten large different software systems. The results reveal that developers agreed with the fitness functions measured to calculate coupling and cohesion.

In “Genetic Improvement of Software: A Comprehensive Survey,” Petke *et al.* present a literature review on existing studies related to the application of Genetic Improvement to Software Engineering such as program transformation and program repair.

We hope that you will enjoy reading these papers and find that they make a useful contribution to your knowledge and understanding of SBSE. There are many people we would like to thank: the authors who submitted papers to this special issue and the reviewers who did an excellent job of helping to bring these papers to such a high level, and the editorial board of IEEE TRANSACTIONS ON EVOLUTIONARY COMPUTATION.

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