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Preface

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Published in:
Evolutionary Computation in Combinatorial Optimization

DOI:
[10.1007/978-3-030-72904-2](https://doi.org/10.1007/978-3-030-72904-2)

Publication date:
2021

Citation for published version (APA):
Zarges, C., & Verel, S. (2021). Preface. In C. Zarges, & S. Verel (Eds.), Evolutionary Computation in Combinatorial Optimization: 21st European Conference, EvoCOP 2021, Held as Part of EvoStar 2021, Virtual Event, April 7–9, 2021, Proceedings (Vol. 12692, pp. v-vii). (Lecture Notes in Computer Science; Vol. 12692). Springer Nature. <https://doi.org/10.1007/978-3-030-72904-2>

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Preface

Combinatorial optimization is one of the main research areas in the context of algorithmic problem solving. A combinatorial optimization problem is solved when one or several solutions optimizing one or several objective functions are found from a large finite set of candidate solutions. This ubiquitous approach is successful in many real-world applications such as applications in the domains of transportation, energy, planning, resource management, scheduling, system design, and many more. With new challenges from these domains, the complexity and size of combinatorial optimization problems increase, and therefore, new research questions arise in order to understand and design more efficient search algorithms. Evolutionary algorithms and related methods, which can be more or less bio-inspired, are intuitive, flexible, and powerful approaches able to solve such problems. They are also capable of dealing with the trade-off between solution quality and running time, which makes such approaches very attractive. Thus, the task for the scientific community and practitioners is to develop efficient evolutionary algorithms able to reach high-quality solutions within the available computation resources according to the properties of the combinatorial problem under consideration. The following papers show the most recent theoretical and experimental research in this area.

This volume contains the proceedings of EvoCOP 2021, the 21th European Conference on Evolutionary Computation in Combinatorial Optimisation. Originally planned as a hybrid conference with on-site participation in Seville, Spain, the conference was later turned into an online-only event due to the COVID-19 pandemic.

The EvoCOP conference series started in 2001, with the first workshop specifically devoted to evolutionary computation in combinatorial optimization. It became an annual conference in 2004. EvoCOP 2021 was organized together with EuroGP (the 24th European Conference on Genetic Programming), EvoMUSART (the 10th International Conference on Artificial Intelligence in Music, Sound, Art and Design), and EvoApplications (the 24th International Conference on the Applications of Evolutionary Computation, formerly known as EvoWorkshops), in a joint event collectively known as EvoStar 2021. Previous EvoCOP proceedings were published by Springer in the *Lecture Notes in Computer Science* series (LNCS volumes 2037, 2279, 2611, 3004, 3448, 3906, 4446, 4972, 5482, 6022, 6622, 7245, 7832, 8600, 9026, 9595, 10197, 10782, 11452, and 12102). The table on the next page reports the statistics for each of the previous conferences.

This year, 14 out of 42 papers were accepted after a rigorous double-blind reviewing process, resulting in a 33% acceptance rate. We would like to acknowledge the high-quality and timely work of our diverse Program Committee members, who each year donate their time and expertise to maintain the high standards of EvoCOP and provide constructive feedback to help authors improve their papers. Decisions considered both the reviewers' report and the evaluation of the program chairs. The 14 accepted papers cover a wide spectrum of topics, ranging from the foundations of

evolutionary algorithms and other search heuristics to their accurate design and application to combinatorial optimization problems. Fundamental and methodological aspects deal with runtime analysis, the structural properties of fitness landscapes, the study of core components of metaheuristics, the clever design of their search principles, and their careful selection and configuration. Applications cover problem domains such as scheduling, routing, search-based software engineering, and general graph problems. We believe that the range of topics covered in this volume of EvoCOP proceedings reflects the current state of research in the fields of evolutionary computation and combinatorial optimization.

| EvoCOP | LNCS vol. | Submitted | Accepted | Acceptance (%) |
|--------|-----------|-----------|----------|----------------|
| 2021 | 12692 | 42 | 14 | 33.3 |
| 2020 | 12102 | 37 | 14 | 37.8 |
| 2019 | 11452 | 37 | 14 | 37.8 |
| 2018 | 10782 | 37 | 12 | 32.4 |
| 2017 | 10197 | 39 | 16 | 41.0 |
| 2016 | 9595 | 44 | 17 | 38.6 |
| 2015 | 9026 | 46 | 19 | 41.3 |
| 2014 | 8600 | 42 | 20 | 47.6 |
| 2013 | 7832 | 50 | 23 | 46.0 |
| 2012 | 7245 | 48 | 22 | 45.8 |
| 2011 | 6622 | 42 | 22 | 52.4 |
| 2010 | 6022 | 69 | 24 | 34.8 |
| 2009 | 5482 | 53 | 21 | 39.6 |
| 2008 | 4972 | 69 | 24 | 34.8 |
| 2007 | 4446 | 81 | 21 | 25.9 |
| 2006 | 3906 | 77 | 24 | 31.2 |
| 2005 | 3448 | 66 | 24 | 36.4 |
| 2004 | 3004 | 86 | 23 | 26.7 |
| 2003 | 2611 | 39 | 19 | 48.7 |
| 2002 | 2279 | 32 | 18 | 56.3 |
| 2001 | 2037 | 31 | 23 | 74.2 |

We would like to express our appreciation to the various people and institutions making EvoCOP 2021 a successful event. First, we thank SPECIES, the Society for the Promotion of Evolutionary Computation in Europe and its Surroundings, which aims to promote evolutionary algorithmic thinking within Europe and wider, and more generally to promote inspiration of parallel algorithms derived from natural processes. We extend our acknowledgments to Nuno Lourenço from the University of Coimbra, Portugal, for his dedicated work with the submission and registration system, to João Correia from the University of Coimbra, Portugal, and Francisco Chicano from the University of Málaga, Spain, for EvoStar publicity, social media, and website, and to Sérgio Rebelo from the University of Coimbra, Portugal, for his important graphic design work. We wish to thank our prominent keynote speakers, Darrell Whitley from Colorado State University, USA, and Susanna Manrubia from the Spanish National

Centre for Biotechnology (CSIC), Madrid, Spain. Finally, we express our continued appreciation to Anna I. Esparcia-Alcázar from SPECIES, Europe, whose considerable efforts in managing and coordinating EvoStar helped towards building a unique, vibrant, and friendly atmosphere.

Special thanks go to the members of the EvoCOP Steering Committee (Christian Blum, Francisco Chicano, Carlos Cotta, Peter Cowling, Jens Gottlieb, Jin-Kao Hao, Jano van Hemert, Bin Hu, Arnaud Liefoghe, Manuel López-Ibáñez, Peter Merz, Martin Middendorf, Gabriela Ochoa, Luís Paquete, and Günther Raidl) for their hard work and dedication to past editions of EvoCOP, making it one of the reference international events in evolutionary computation and metaheuristics for combinatorial optimization.

April 2021

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