



## Selected Papers of the 32nd International Workshop on Combinatorial Algorithms, IWOCA 2021

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IWOCA (International Workshop on Combinatorial Algorithms) is an annual conference series covering all aspects of combinatorial algorithms. This special issue contains the extended version of selected papers from those presented at the 32nd International Workshop on Combinatorial Algorithms (IWOCA 2021), which took place (virtually) in Ottawa on July 5–7, 2021. Due to the ongoing COVID-19 pandemic, the conference was run online only, with the help of the Fields Institute for Research in Mathematical Sciences; their web site is hosting all the videos of the talks and the program.

The program of IWOCA 2021 contained 38 strong and diverse original contributions in the areas of graph algorithms, computational complexity, approximation algorithms, parameterized algorithms, combinatorial search and generation, combinatorial optimization, computational geometry, hypergraphs and dynamic graphs. Based on the program committee discussions and the presentations during the conference, the editors invited some of the papers to be submitted for this special issue. All the submissions underwent a new and thorough reviewing and revision process, in accordance with the high standards of *Algorithmica*.

The selected articles illustrate the breadth of algorithmic topics and techniques presented at IWOCA 2021.

The paper “Combinatorics and Algorithms for Quasi-Chain Graphs”, by Bogdan Alecu, Aistis Atminas, Vadim Lozin and Dmitriy Malyshev, provides a decomposition theorem for quasi-chain graphs which yields efficient algorithms for various problems that are generally intractable for general bipartite graphs. They also prove, among other results, that the induced subgraph isomorphism problem is NP-complete for quasi-chain graphs.

In the paper “Composed Degree-Distance Realizations of Graphs”, by Amotz Bar-Noy, David Peleg, Mor Perry and Dror Rawitz, the authors study network realization

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problems where, given a specification for some network parameters (in particular, degrees and distances), a network conforming to the combination of those specifications must be constructed. Several variants of the setting are considered, and NP-hardness or polynomial algorithms are provided for each situation.

The paper “Edge Exploration of Temporal Graphs”, by Benjamin Merlin Bumpus and Kitty Meeks, shows that determining whether a given temporal graph has a temporal Eulerian circuit is NP-hard, even under very restricted conditions on the structure of the temporal graph. The authors also define a new parameter (interval-membership-width) which restricts the times assigned to different edges, and they show the existence of efficient algorithms with respect to this parameter.

In the paper “Hamiltonicity of  $k$ -Sided Pancake Networks with Fixed-Spin: Efficient Generation, Ranking, and Optimality”, Ben Cameron, Joe Sawada, Wei Therese and Aaron Williams study orderings of  $k$ -colored permutations where one permutation differs from the next by a prefix reversal that increments the colour number (modulo  $k$ ) of each element in the reversal. The authors give a greedy loop-free algorithm for the exhaustive generation, a successor algorithm that runs in constant amortized time, among other algorithms, as well as results for the fixed spin generalization of this problem.

In the paper “Approximating Multistage Matching Problems”, by Markus Chimani, Niklas Troost and Tilo Wiedera, the problem of finding a sequence of matchings for a given sequence of graphs that minimizes the difference between successive matchings is studied. The problem is shown to be NP-hard, and approximation algorithms are proposed.

In the paper “Structure and Complexity of 2-Intersection Graphs of 3-Hypergraphs”, by Niccoló Di Marco, Andrea Frosini, William Lawrence Kocay, Elisa Pergola and Lama Tarsissi, the authors prove that the decision problem of reconstructing a 3-hypergraph from its 2-intersection graph is NP-complete. They also show how this problem relates to null labelings of hypergraphs and prove some structural properties of 2-intersection graphs.

In the paper “Minimum Eccentricity Shortest Path Problem with Respect to Structural Parameters”, by Martin Kučera and Ondřej Suchý, the authors study the problem of finding a shortest path such that the distance from every vertex in a graph and the nearest vertex in the path is at most a given integer  $k$ , which is known to be NP-complete. They give fixed parameter tractable algorithms for the problem parameterized by various structural parameters.

In the paper “Non-Preemptive Tree Packing”, Stefan Lendl, Gerhard Woeginger and Lasse Wulf consider a variation of the tree packing problem where each edge of a graph must be activated for an interval of time such that the graph remains connected for the longest total time. They derive NP-hardness and hardness of approximation results, and show fixed parameter tractability results with respect to a number of parameters.

The paper “Eulerian Walks in Temporal Graphs”, by Andrea Marino and Ana Silva, studies decision problems on the existence of temporal walks and other temporal structures in dynamic graphs. A complete taxonomy of the problems considered is given, providing NP-completeness results and polynomial-time algorithms parametrized in the lifetime of the system.

All the articles in this special issue are included in the Online Collection for the Special Issue on Combinatorial Algorithms (2021) <https://link.springer.com/collections/hgjaieehid>. However, the printed version of the volume does not contain one of the papers (“Approximating Multistage Matching Problems”), which was erroneously printed in another volume.

We thank the authors for contributing to this special issue, the reviewers for the hard work they put in reviewing the papers, and Ming-Yang Kao, the former editor-in-chief of *Algorithmica*, for his support and the opportunity to edit this special issue.

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