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Special Issue on Approximation and Online Algorithms

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Approximation and online algorithms are fundamental tools for dealing with computationally hard problems and problems in which the input is gradually disclosed over time or is affected by other kinds of uncertainty. Both kinds of problems arise from a large number of applications in a variety of fields. There is extensive research on approximation and online algorithms, and advances made in one of these fields often contribute to new discoveries in the other.

This special issue of *Theory of Computing Systems* is devoted to selected papers from the Sixteenth International Workshop on Approximation and Online Algorithms (WAOA 2018), which was held in Helsinki, Finland, on 23–24 August 2018. Of the 44 papers submitted to WAOA 2018, 19 were accepted for presentation at the workshop, and revised and expanded versions of five papers appear in this special issue. All the contributions presented here were invited to this special issue, but went through the standard refereeing process of *Theory of Computing Systems*.

The diverse topics of the five papers in this special issue reflect the wide range of problem areas in which the techniques from approximation and online algorithms are crucial.

In their contribution *Deterministic Min-Cost Matching with Delays*, Azar and Jacob-Fanani study a model where points in a metric space arrive online over time and need to be matched eventually, with the objective of minimizing the cost of the resulting perfect matching plus the total waiting times of the requests. They present the first deterministic algorithms with sublinear competitive ratio for this problem.

In their article *Advice Complexity of Priority Algorithms*, Borodin et al. study the combination of priority algorithms, which are essentially online algorithms that can choose the order in which the inputs arrive, and the model of advice complexity, where

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one assumes that a limited amount of information about the future is made available to the algorithm. They develop a general framework of reductions that enables lower bound proofs in this model.

Byrka et al., in their contribution *Approximating Node-Weighted k-MST on Planar Graphs*, present a $(4+\varepsilon)$-approximation algorithm for the problem of finding a minimum weight connected subgraph spanning at least k vertices in a planar, node-weighted graph. They also show that their result is essentially best possible among algorithms that use the Lagrangian-multiplier preserving framework as a black box.

In their contribution *An Optimally-Competitive Algorithm for Maximum Online Perfect Bipartite Matching with i.i.d. Arrivals*, Chang et al. study a variant of online bipartite matching, without reassignments, where jobs are drawn independently at random from a probability distribution known in advance and must be assigned to workers. They give a simple and elegant algorithm and show that it is optimally competitive.

Finally, in her contribution *Longest Increasing Subsequence under Persistent Comparison Errors*, Geissmann considers a model where every comparison between two elements can return the wrong result with some fixed probability and cannot be repeated. She presents an algorithm that outputs an $O(\log n)$-approximation of the longest increasing subsequence of n distinct elements in $O(n \log n)$ time with high probability and shows that this is essentially best possible.

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