Editorial: ACM-SIAM Symposium on Discrete Algorithms (SODA) 2016 Special Issue

We are delighted to present a Special Issue of ACM Transactions on Algorithms, containing full versions of seven papers that were presented at the 27th Annual ACM-SIAM Symposium on Discrete Algorithms (SODA 2016) in Arlington, Virginia, on January 10–12, 2016. These papers, selected on the basis of their high ratings by the conference program committee, have been thoroughly reviewed according to the journal's highest standards.

In “Near-Optimal Light Spanners,” Shiri Chechik and Christian Wulff-Nilsen (<https://doi.org/10.1145/3199607>) make fundamental progress on light spanner construction. They show that any graph on n vertices admits a spanner of stretch $(2k-1)(1+\epsilon)$ with $O(n^{1+1/k})$ edges and total weight at most $O(n^{1/k})$ times that of the minimum spanning tree (for any fixed $\epsilon>0$). This result is the best possible up to the $(1+\epsilon)$ factor in the stretch assuming Erdos' girth conjecture.

The paper “Deterministic Algorithms for Submodular Maximization Problems” by Niv Buchbinder and Moran Feldman (<https://doi.org/10.1145/3184990>) resolves an interesting open question on whether randomization is necessary for some of the recent algorithms achieving optimal approximations for submodular maximization problems. Specifically, the paper provides a deterministic $1/2$ -approximation for the unconstrained maximization of a nonnegative submodular function, and a deterministic $1/e$ -approximation for nonnegative submodular maximization under a cardinality constraint, showing randomization is not necessary for achieving these results.

Finding planted cliques in a random graph is a cornerstone average-case problem for which we have not had any recent algorithmic success in finding cliques of size $\omega(\sqrt{n})$. The paper by Samuel B. Hopkins, Pravesh Kothari, Aaron Henry Potechin, Prasad Raghavendra, and Tselil Schramm, titled “On the Integrality Gap of Degree-4 Sum of Squares for Planted Clique,” (<https://doi.org/10.1145/3178538>) gives concrete evidence for such a barrier by presenting integrality gaps against the powerful Sum-of-Squares hierarchy.

An important problem in data analysis is identifying outlier pairs of correlated vectors in a collection of n vectors. The paper by Matti Karppa, Petteri Kaski and Jukka Kohonen, titled “A Faster Subquadratic Algorithm for Finding Outlier Correlations,” (<https://doi.org/10.1145/3174804>) provides a clever sub-quadratic time algorithm based on rectangular matrix multiplication for finding such outlier pairs, which improves upon the breakthrough result of Valiant (JACM, 2015) for this problem.

In “Subtree Isomorphism Revisited,” Amir Abboud, Arturs Backurs, Thomas Dueholm Hansen, Virginia Vassilevska Williams, and Or Zamir (<https://doi.org/10.1145/3093239>) considered the classical subtree isomorphism problem: Given two (rooted, unordered, constant-degree) trees H and G , is H a subtree of G ? For this problem, there is an elegant and old quadratic algorithm. The authors prove that this running time is essentially tight unless the Strong Exponential Time Hypothesis fails.

In “Improved Deterministic Algorithms for Linear Programming in Low Dimensions,” Timothy M. Chan (<https://doi.org/10.1145/3155312>) gave the first new improvements to the running times of deterministic algorithms for low-dimensional linear programming in a long time. The

improvements are based on new, faster ways of constructing ε -nets, which could be of independent interest.

Locality-Sensitive Hashing is one of the main techniques for near neighbor search in high dimensions. But there is one drawback: we are not guaranteed to find a near neighbor if it exists. The paper “CoveringLSH: Locality-Sensitive Hashing without False Negatives” by Rasmus Pagh, (<https://doi.org/10.1145/3155300>) almost matches the performance of the classical LSH, while having the additional strong property that it finds the near neighbor if it exists with probability 1.

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SODA 2016 Guest Editors