Yongho Shin

Dept. of Computer Science, Yonsei University
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Education

Ph.D. in Computer Science, Yonsei University, South Korea — Expected Aug 2024
- Dissertation topic: Competitive algorithms for online algorithms with hard requirements relaxed
- Advisor: Hyung-Chan An

B.S. in Computer Science, Yonsei University, South Korea — Feb 2018
- Awarded *high honors at graduation*

Research Interests

Combinatorial optimization
Approximation algorithms
Online algorithms and competitive analysis
Learning-augmented algorithms
Theoretical computer science

Research Papers

Y. Shin, C. Lee, and H.-C. An. On optimal consistency-robustness trade-off for learning-augmented multi-option ski rental. *arXiv preprint arXiv:2312.02547*, 2023.

Y. Shin, C. Lee, G. Lee, and H.-C. An. Improved learning-augmented algorithms for the multi-option ski rental problem via best-possible competitive analysis. In *ICML 2023: Proceedings of the 40th International Conference on Machine Learning*, PMLR 202, pages 31539-31561, 2023.

K. Kim, Y. Shin, and H.-C. An. Constant-factor approximation algorithms for parity-constrained facility location and k-center. *Algorithmica 85*, pages 1883–1911, 2023.
- The preliminary version has appeared in *ISAAC 2020: Proceedings of the 31st International Symposium on Algorithms and Computation*, pages 21:1-21:17, 2020.
- *Facility location* is a prominent optimization problem in combinatorial optimization, and has been investigated under various settings. However, little is known on how the problem behaves in conjunction with parity constraints. This shortfall of understanding was rather disturbing when we consider the central role of *parity* in the field of combinatorics. In this paper, we present the first constant-factor approximation algorithm for the facility location problem with parity constraints.

Y. Shin and H.-C. An. Making three out of two: three-way online correlated selection. In *ISAAC 2021: Proceedings of the 32nd International Symposium on Algorithms and Computation*, pages 49:1-49:17, 2021.
- *Two-way online correlated selection (two-way OCS)* is an online algorithm that, at each timestep, takes a pair of elements from the ground set and irrevocably chooses one of the two elements, while ensuring negative correlation in the algorithm's choices. Whilst OCS was initially invented by Fahrbach, Huang, Tao, and Zadimoghaddam to tackle the edge-weighted online bipartite matching problem, it is an interesting technique on its own due to its capability of introducing a powerful algorithmic tool, namely negative correlation, to online

algorithms. As such, Fahrbach et al. posed two tantalizing open questions in their paper, one of which was the following: Can we obtain a nontrivial *n-way OCS* for $n > 2$, in which the algorithm can be given $n > 2$ elements to choose from at each timestep? In this paper, we affirmatively answer this open question by presenting a *three-way OCS*. We also present our OCS yields a 0.5093-competitive algorithm for the edge-weighted online matching, demonstrating its usefulness.

Y. Shin, K. Kim, S. Lee, and H.-C. An. Online graph matching problem with a worst-case reassignment budget. *arXiv preprint arXiv:2003.05175*, 2020.

- We consider the online bipartite matching problem where reassignments are allowed. Bernstein, Holm, and Rotenberg showed that an online algorithm can maintain a matching of maximum cardinality by performing *amortized* $O(\log^2 n)$ reassignments per arrival. We propose to consider the general question of *how requiring a* non-amortized *hard budget on the number of reassignments affects the algorithms' performances* under various models. Through a simple algorithm exploiting a shortest augmenting path of length within the given budget, we demonstrate that even a small hard budget can yield significant performance advantage, compared to those algorithms that do not perform reassignments. Moreover, we further show that this algorithm is a best-possible deterministic algorithm for all those models.

Awards

High honors at graduation, Yonsei University — Feb 2018

Teaching

Teaching assistant, Yonsei University

CSI3108 (Algorithm analysis)	Fall 2018-2021, 2023
AIC2130 (Computer algorithms for AI applications)	Fall 2023
GEK6205 (Design and analysis of optimization algorithms)	Fall 2023
CCO2103 (Data structures)	Spring 2023
CSI2103 (Data structures)	Spring 2018-2021

Experience

Visiting research intern, Cornell University — Sep 2022 - Dec 2022
Host: David B. Shmoys

Research intern, Yonsei University — Jan 2017 - Feb 2018
Advisor: Hyung-Chan An

Programmer, Republic of Korea Air Force — Nov 2013 - Aug 2015