

Internship proposal (research): *Online assignment games – trading off mis-match and waiting costs*

Keywords: assignment markets, online matching

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Project description

Assignment markets are ubiquitous: From assigning sellers to buyers, workers to jobs, or workload to machines. Shapley and Shubik (1972) introduce a model where each seller is looking for exactly one buyer and vice versa. They show that, generically, there exists a unique and optimal matching.

This projects will study online assignment markets, where buyers and sellers arrive to the market over time. Such markets may be classic labor markets or market institutions that emerged in recent years such as ride sharing applications. For any market, modern technology allows the market designer to vary (at low cost) at what points in time to clear the market (Emek et al., 2016; Akbarpour et al., 2017). On the one end of the scale, she can immediately match buyers and sellers (and remove them from the market). On the other end of the scale, she can wait until all buyers and sellers have arrived and then apply the optimal matching. We shall call this design decision of the market designer the *clearing schedule*. This project seeks to understand:

1. How does the expected payoff change dependent on the clearing schedule?
2. What are (optimal) clearing schedules with respect to a specific cost function of the waiting time?

The outcome of this research will ideally be presented at an international conference with both academics and market design practitioners.

Required skills: Mandatory knowledge of basic probability theory and combinatorics. In addition, simulation skills can be of use.

Additional information: The internship may be continued as a PhD.

References

- Akbarpour, M., S. Li, and S. Oveis Gharan (2017), "Thickness and information in dynamic matching markets." Working paper.
- Emek, Y., S. Kuten, and R. Wattenhofer (2016), "Online matching: Haste makes waste!" In *Proceedings of the forty-eighth annual ACM symposium on Theory of Computing*, 333–344.
- Shapley, L. S. and M. Shubik (1972), "The assignment game 1: The core." *International Journal of Game Theory*, 1, 111–130.