The Complexity of Interactively Learning a Stable Matching by Trial and Error

For any set of men and women, a stable matching always exists. Proof: constructive algorithm that requires full access to all preferences.

But, starting with some matching and iteratively resolving one blocking pair at a time may cycle (and not reach a stable matching).
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But (even for one-to-one matchings) this may take \textit{exponentially many} steps

But, if the blocking pair is chosen \textit{uniformly at random}, a stable matching is reached w.p. 1

Also for many-to-many matchings

Kojima & Ünver ‘06
Gale & Shapley ‘62
Roth & Vande Vate ‘90
Ackermann et al. ‘08
Knuth ‘71
The Complexity of Interactively Learning a Stable Matching by Trial and Error

Is there a “smarter” interactive_learning algorithm with better query complexity?

Must still work in the same query model:

- Algorithm proposes a matching
- stable
- Done
- unstable
- Blocking pair revealed (adversarially chosen)

Econ
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Kojima & Ünver ‘06

EconCS

CS
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Ackermann et al. ‘08

Emamjomeh-Zadeh, Gonczarowski, Kempe, ‘20 (#this_paper)
Is there a “smarter” interactive_learning algorithm with better query complexity?

Yes! $O(n^2 \log n)$ queries, poly runtime (Despite extremely coarse queries)

And this is essentially tight!

What about many-to-many matchings?

Still yes! Though much more delicate, and there is still an open question here about runtime. Talk to us for the details!

Econ

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