

Internship Proposal (Research): “Matching markets: the role of correlation on efficiency and equity”

Keywords: Matching markets, Algorithmic monoculture, Fairness, Correlation in rankings

Host team: FairPlay team (Inria Saclay) and Maison Française d’Oxford, UK

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Background

Matching theory describes market and non-market institutions where it is important who matches with whom. This is in contrast to markets for homogeneous goods and services where agents only care about the price at which they trade but not with whom they trade. Understanding matching markets is crucial as they model many important problems such as labor markets, the matching of refugees to host countries, or the matching of students to universities.

To fix ideas, consider the example of matching students to universities. Universities make independent decisions of who to offer a place to and candidates decide where to apply and which place to accept. Decisions are based on test scores from high school, their CV, interviews, recommendation letters etc. Universities also increasingly use AI tools to aid decision making [2]. Moreover, affirmative action policies may be implemented to increase intake of certain groups (that often have historically been marginalized and underrepresented).

In this context, a recent literature studies the effect of correlation of rankings in matching markets. Correlation may vary due to the use of standardized tests, differences between different groups (e.g., local versus foreign students), or due to the use of AI tools that are trained on the same or similar data sets. In particular, in [1], we analyzed the effect of correlation on the efficiency and inequality (between different groups) of stable matchings (a particular solution concept for matching).

Goal of the internship

The starting point of the internship is to extend the analysis from [1] to other classical solution concepts for matching markets. We will first consider the popular top trading cycle mechanism that yields an efficient matching and use its cutoff characterization [3]. We will address questions such as:

- How does correlation of rankings impact the efficiency of the matching?
- If there are several (socio-demographic) groups with different correlation of rankings:
 - How does it impact the inequality of the matching?
 - How does it impact segregation?

Ultimately the goal is to understand how correlation affects inequality using mathematical models, so as to propose appropriate corrective measures.

Expected ability of the student and practical information

A strong mathematical background is necessary, in particular in probability theory. Familiarity with economic modelling is advantageous but not necessary. However, the candidate should be interested in theoretically modelling phenomena that can help explain pressing real-world issues.

The internship will take place in the FairPlay team, a joint team between Inria, Criteo and ENSAE. The team is hosted at CREST (in the ENSAE building) and works from the Criteo offices in Paris every Friday. The candidate will have the opportunity to spend part of their internship at the Maison Française d'Oxford at the University of Oxford.

It may be continued as a PhD.

For more information, please contact `patrick.loiseau@inria.fr` and `bary.pradelski@cners.fr`.

References

- [1] R. Castera, P. Loiseau, and B. Pradelski. “Correlation of rankings in matching markets”. In: *preliminary version in EC 2022* (2024). URL: <https://hal.science/hal-03672270>.
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- [3] J. D. Leshno and I. Lo. “The cutoff structure of top trading cycles in school choice”. In: *The Review of Economic Studies* (2021). URL: https://jleshno.weebly.com/uploads/3/7/4/6/37467639/leshno_lo-ttc_cutoffs.pdf.