

Thesis proposal, computer science, University of Dauphine
Studying the Social Impact of Recommendation Systems:
(between game theory, online optimization and machine learning)

Rida Laraki

Lamsade, University of Dauphine, January 2018

The ability of a website to present personalized content recommendations has a great impact in our economic and democratic life. Platforms design every day very sophisticated algorithms that, from past data choices, predict future likes and dislikes of each user. For example, Amazon.com use the overlap between customers past purchases and browsing activity to recommend products while the TiVo digital video system recommends TV shows and movies on the basis of correlations in users viewing patterns and ratings.

Clearly, there is a subtle *game* between the platform, users, producers and the advertisers. Different algorithms generate different best responses and so have different individual and social impacts.

For example, each algorithm can induce more or less novelty and more or less diversity. A system that promotes novel results tends to generate more diversity. But most used systems decrease diversity. The risk for users is to be exposed to a narrowing band of popular objects, while niche items that might be very relevant will be overlooked. The same problem appears for media recommendation systems which have tendency to diffuse fake news and polarize opinions.

The objectifs of this proposal are to: model formally this game, identify the fundamental failures of the existing algorithms, propose new mechanisms to fix the problems, and test them on real data. The thesis will combine tools from game theory, online optimization, machine learning and economics. The candidate should send his CV, a motivation letter, 3 recommendation letters, a copy of an academic work, his undergraduate and master grades to: rida.laraki@dauphine.fr

References:

- Aggarwal (2016). *Recommender Systems: The Textbook*. Springer.
- Cesa-Bianchi & Lugosi (2006). *Prediction, Learning, and Games*. Cambridge University Press.
- Nisan, Roughgarden, Tardos & Vazirani (2007). *Algorithmic Game Theory*. Cambridge University Press.