ETH
Eidgenössische Technische Hochschule Zürich
Swiss Federal Institute of Technology Zurich

Distributed Computing

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Bachelor's thesis:

Ranking alternatives offline

In a large variety of circumstances, we want to find a social choice as the result of the preferences of those making the choice. This problem arises when groups try to decide for a movie to watch, what restaurant to go to, in recommendation systems, when choosing the winner of a "best paper" award for a conference, and a myriad of other situations. The question is: how to rank the available options efficiently, given the preferences of the members of the group?

A number of methods have been proposed regarding how to rank, and we would like to compare their performance. Which produce rankings that perform best? Can we maybe combine them to breed better solutions? How do they perform on real-world data? Could we use them to build successful recommendation systems? All interesting methods of ranking are NP-hard, so we are planning to have a look at heuristics. Another possible direction is adapting them to an online scenario where we don't know all preferences initially, and they are revealed/learned over time.

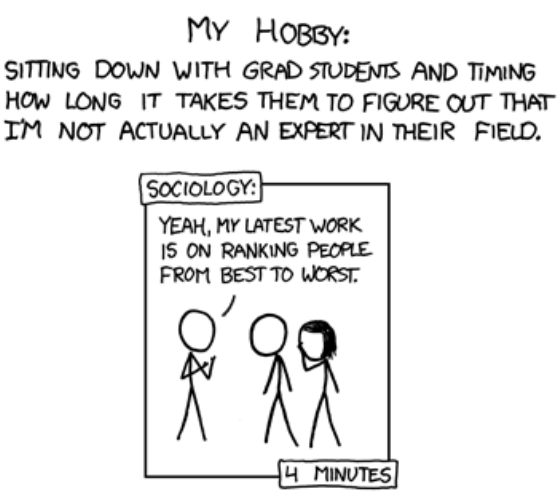

Figure 1: from http://xkcd.com/451/

We have a number of ideas for you to work on, and we will be excited to hear about any ideas you might have yourself! The topic is pretty large both in depth and width, so you can explore the niche that interests you most.

Requirements:

- In this thesis, you will write code, most likely in Java.
- An interest in algorithmic thinking will be helpful.
- You should be able to work independently on this topic.

Interested? If you are interested, we will be happy to hear from you and to have a small chat.

Contacts

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Detailed Project Outline
In the following, we outline the tasks of the student.

- Implement optimal offline algorithms for the following social welfare functions: Kemeny, Slater, FLAP (for definition cf. advisor). ($\star\star$)
- Develop and implement heuristics for the online version of those social welfare functions. ($\star\star\star$)
- Evaluate heuristics: ($\star\star$)
  - with respect to running time
  - optimal offline solution vs. heuristic online results
  - differences between results of the three social welfare functions

Additional Work
If the student makes good progress, additional work can be considered. A non-exhaustive enumeration of the possibilities follows:

- Look at additional social welfare functions.
- Prove competitiveness of developed online algorithms.
- Compare results with minimum weighted feedback arc - all three social welfare functions have a close relationship with this problem.

The Student's Duties

- One meeting with the advisor per week.
- A final presentation (15 min) of the work and results obtained.
- A final report (English or German), presenting work and results.