Social Choice – Theory 1:

1) a. compute the number of voting rules with n voters and m candidates.

b. What is the number of dictatorial rules?

c. (bonus) What is the number of Onto rules?

2) Prove that STV voting does not have the Condorcet property for m=3.

3) Prove that with m=3, n=3, there is a positional scoring rule with the Condorcet property. Use lexicographic tie-breaking.

4) In Georgia there are 5M voters, and each one is voting T w.p. 0.5, and otherwise B. The state has 16 electoral votes.

In California there are 14M voters, and each one is voting T w.p. 1/3, and otherwise B. The state has 55 electoral votes.

In Louisiana there are 2M people, and each one is voting T w.p. 0.6, and otherwise B. The state has 8 electoral votes.

For each state (and a fourth state you can select), compute the probability of a single additional voter to be pivotal.

What is the relative power of a voter in each of these states? (By an argument similar to Penrose?)

Social Choice - Programming Assignment 1

In this exercise we will implement some of the voting rules that we have learned and examine their outcome on a real set of preferences.

The dean of the faculty asks you to find which course is the fairest of them all. So you asked students to rank the courses in a complete, strict order.

1) Write code that receive a profile and outputs the scores of each alternative and the winner for the following voting rules:

a) Plurality
b) Borda
c) Nanson
d) Single transferable vote
e) Copeland

- Ties break lexicographic.
- Before computing, check for a Condorcet winner, if such exists, print: "alternative 'c' is a Condorcet winner", then remove 'c' from the dataset.

2) The dean is confused by all the different voting rules, she ask you for a single rule that will rank courses by their popularity in the best possible way. This rule can be a new rule or a combination of other rules.

a) Explain using various arguments (axiomatic, statistic, normative) how it combines the advantages of other rules.
b) Create the voting rule the dean wishes and Run it on the dataset.
c) If you had more time and resources, would your answer be any different?
d) What would you check in order to possibly get an even better voting rule?

Dataset:

Course preferences of students at AGU University. Each student provided a rank ordering over all the courses with no missing elements. There are 9 courses to choose from in 2003 and 7 in 2004.

Data can be found at http://www.preflib.org/data/election/agh/

Or at the attached files.

Data structure: there are 2 profiles. The first (11 or 9) lines contain metadata: i.e., number of alternatives, name of each alternative, (number of voters, number of rankings, and number of unique rankings). Beneath is the voters' preference. The first number in each preference is the number of voters with the same ranking.

3) The Bader-Ofer method is used to finalize the party mandate partition in Israeli elections. https://he.wikipedia.org/wiki/חוק_בדר-עופר

You are given a dataset of the last 7 Israeli elections, with the amount of votes each party received. There is a python wrapper for reading the data, with the function bader_ofer not implemented. Implement it, so that it correctly predicts the election outcomes.

When surplus agreements are considered, the two parties are treated virtually as a unified party for the purpose of calculating the votes per seats ratio, and if their virtual union wins the seat, the party with the higher votes per seats in the union gets the seat.

Data format:

You are given two files.

Votes.csv - Contains for each of the last seven election, the votes and mandates each party received. Notice we include only parties that passed the voting threshold, so you do not have to implement this element.

Agreements.csv - Contains for each election the pairs of parties that had surplus agreements.