Voting methods in grant panel review setting

Mia (Minghe) Zhang, Terry Yuan

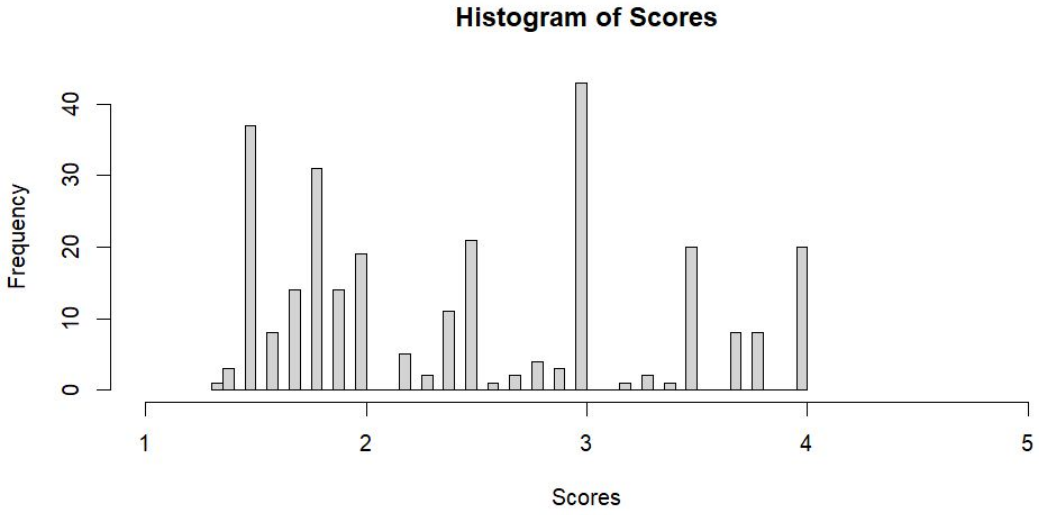
UNIVERSITY of WASHINGTON

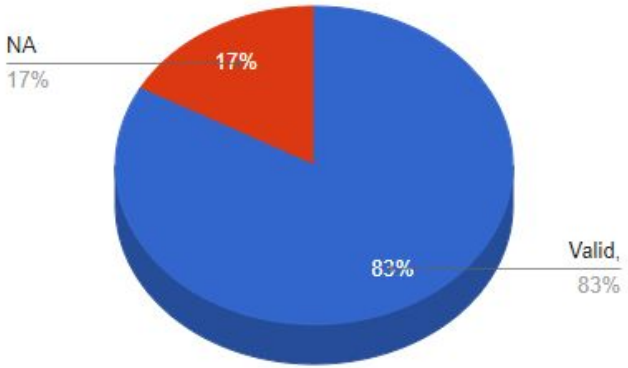
Introduction

- What is Social Choice Theory?
- What is grant panel review setting?
- What are the challenges that we are facing in peer review setting?

Our panel review data

- 28 candidates, 12 voters
- Range of scores: 1 (best) - 5 (worst); increments of 0.1





Overview of voting methods

Our selected voting methods:

- Score method
- Condorcet method
- Majority judgement

Other methods: plurality voting, approval voting, single transferable vote, Borda count, Copeland's method, etc.

Implementation and Results: modified score method

Score method Modified Algorithm:

- accounts for missing data
- calculates the average score of all the valid votes for each candidate

Advantages:

- Deal with the missing-data situation
- All the votes would be accounted for

Caveats:

- Hard to break ties in the final averaged scores
- Mean might be heavily affected by extreme outliers

Implementation and Results: modified Condorcet method

Condorcet method Modified Algorithm

- Break ties in ranks by assigning every tied element to the lowest rank
  E.g. scores (1.0, 1.1, 1.5, 1.5, 3, 4) → (1, 2, 3, 3, 5, 6)

- Calculate the proportion of the number of times where one's rank is over the other in comparisons
- Create a Condorcet comparison matrix to record the proportions
- An entry (i, j) in the matrix records the proportion of the number of times where the ith candidate's rank is higher than the jth candidate's.
  E.g. entry (2, 3) has proportion of 0.6 means: 60% of 2nd candidate's ranks are over the 3rd candidate's

Implementation and Results: modified Condorcet method

Advantages:

- Deal with the missing-data situation
- Proportion can hardly yield ties (but it can happen)

Caveats:

- Lose part of the data as we would ignore the comparisons that involve any missing data
- Lose the numerical scores when converting them to ranks

Majority Judgement

Advantages:

1. No matter how many missing data there is.
2. All the ballots are valid.

Caveats:

1. Adding a new voter with the same preference toward all candidates will change the algorithm result.
2. Cannot get a winner if two candidates have different number of valid scores but same median.

	Voter1	Voter2	Voter3	Voter4	Voter5	Voter6
Candidate1	1	1.5	2	3.5	4	3
Candidate2	1.8	1.9	2.1	2.7	3.9	3

Table 1: : New Data With Adding A Voter With No Preference

Candidate1	1	1.5	2	3	3.5	4
Candidate2	1.8	1.9	2.1	2.7	3	3.9

Table 2: : Sorted New Data

	Voter1	Voter2	Voter3	Voter4	Voter5	Voter6	Voter7
Candidate1	1.5	1.5	1.5	NA	NA	NA	NA
Candidate2	1.2	1.5	1.5	1.5	1.5	4	NA

Table 3: Table 1: Who is the winner?

	Voter1	Voter2	Voter3	Voter4	Voter5	Voter6	Voter7
Candidate1	1.5	1.5	1.5	NA	NA	NA	NA
Candidate2	1.5	1.5	1.5	1.5	1.5	1.5	1.5

Table 4: Who is the winner?

Comparison

	1st winner	2nd winner	3rd winner	4th winner	5th winner
Score	17	19	25	21	4
Condorcet	17	25	19	21	4
MJ	17	19	25	21	4

Thanks for listening!