Assessing the Speedup of Optimized Necessary Winner and Possible Winner Algorithms Using Real-World Datasets

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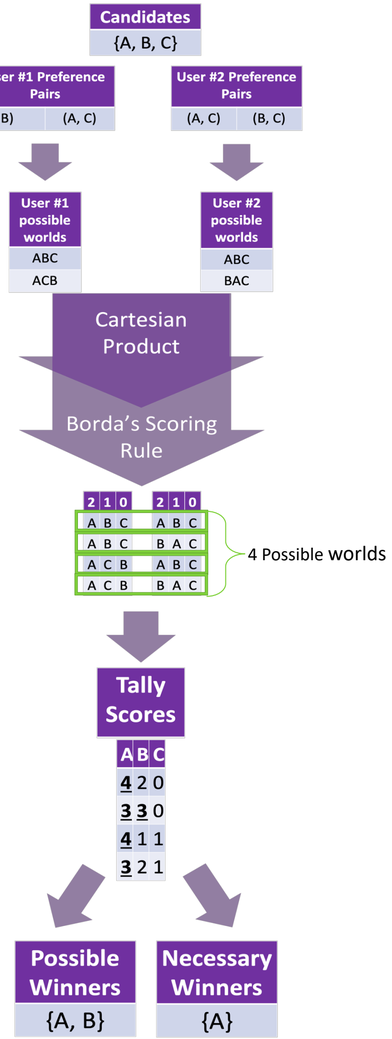
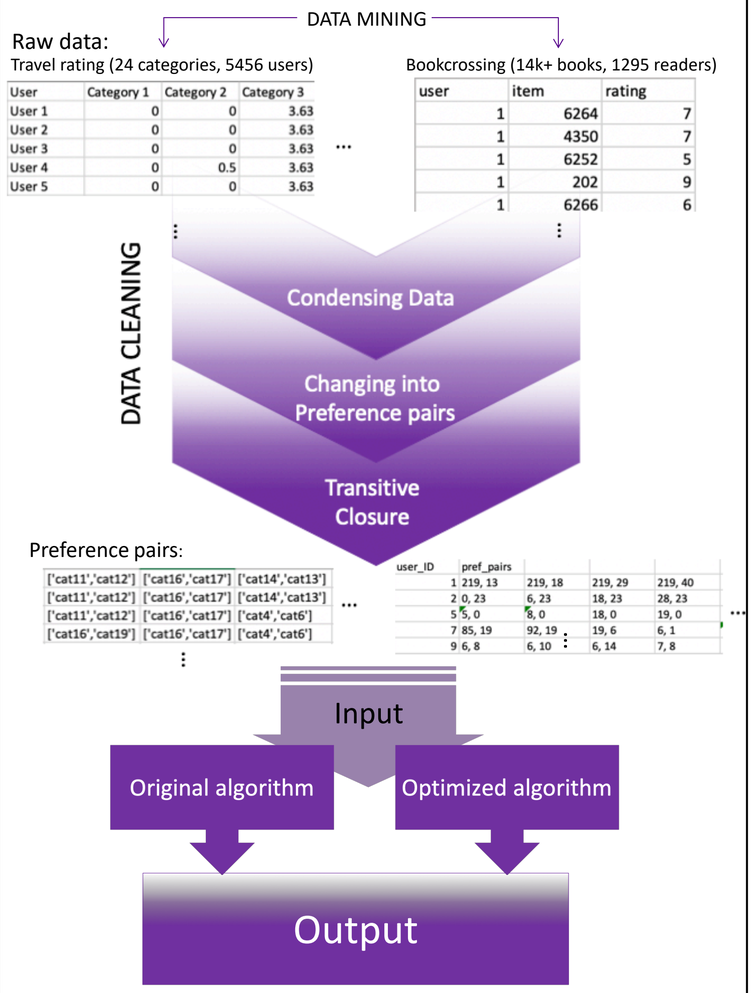
Introduction

Computational Social Choice:

- Aggregating preferences of individuals to reach society-wide consensus



Method



Results

Winners of Travel Rating Dataset

Scoring Rule	Necessary Winner	Possible Winner
Borda	None	4,5,6,8,9
3-approval	None	All except 0,7,11,15
Plurality	None	All
Veto	3,4,5,6,7,8,9	0,1,2,3,4,5,6,7,8,9

Winners of Bookcrossing Dataset

Scoring Rule	Necessary Winner	Possible Winner
Borda	None	All
3-approval	None	All
Plurality	None	All
Veto	None	All

Efficiency comparison

	Original Algorithm	Optimized Algorithm	Speedup (original / optimized)
Travel dataset	3.79 second	0.54 second	7.02
Bookcrossing	308.23 second	15.29 second	20.16

Conclusion and Discussion

Discussion

- Optimized algorithm executed the result faster than the original algorithm
- Optimization was better when there was no necessary winner

Future Work

- More optimization
  - Parallelize the implementation
- Finding other approach
- Test the algorithm with larger dataset

References

Kimelfeld, Benny, Phokion G. Kolaitis, and Julia Stoyanovich. "Computational social choice meets databases." *IJCAI* (2018).

Xia, Lirong and Vincent Conitzer. "Determining Possible and Necessary Winners Given Partial Orders." *Journal of Artificial Intelligence Research* (2011).

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