Proportionality Press:
Illustrating Proportionality through Comment Selection

Demonstration Track

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ABSTRACT

We present the Proprotionality Press, a website developed to illustrate how proportional multi-winner voting rules can be applied to real-world online discussions. The Proportionality Press presents different articles that have been commented on by users. For each article several ways of selecting the comments are presented, illustrating the effect of different voting rules.

KEYWORDS

Computational Shoice Choice, Decision-Making in Action

1 INTRODUCTION

Proportional representation in multi-winner voting has been one of the most active areas of research in Computational Social Choice in the last decade [8]. This research has brought tremendous progress in our understanding of proportionality in complex decision scenarios [1–3, 10]. However, there has been a lack of real-world application outside of the related area of participatory budgeting [5, 11]. One potential reason for this might be the difficulty to clearly demonstrate the benefits of proportional representation in multi-winner voting scenario. Proportionality Press[1] aims to close this gap by demonstrating the effect of using proportional voting rules to select comments in online discussions.

This is a natural application of multi-winner voting which is ubiquitous in daily life–from comment sections, to social media and deliberative democracy platforms–and which has important societal implications. For instance, a lack of representativeness and diversity in comment selection has been linked to the formation of echo chambers and increased polarization in social media [4, 6].

More technically, we consider the problem of selecting a fixed number of comments based on user's opinions expressed for example in the form of thumb-up/thumb-down votes. This closely resembles the standard multi-winner voting setting: users submit their preferences over the comments which are used to determine an ordering/selection of the comments.

The Proportionality Press mimics the design of a news website with its articles, comments under the articles and thumb-ups and thumb-downs votes on the comments. Crucially, the articles, comments and votes are taken from real-world online discussion data provided by the platform pol.is. For each article, we present different subsets of the comments, each corresponding to the result of a different voting rule. Exploring the selections allows the user to get a taste of what different rules try to achieve and how concepts such as popularity, proportionality, and inclusion interact. A video demonstration of Proportionality Press can be found here: https://youtu.be/G6JhDP97TCo.

2 FROM ARTICLES TO VOTING SCENARIOS

The articles presented in the Proportionality Press correspond to pol.is polls. Quoting their main page, pol.is "is a real-time system for gathering, analyzing and understanding what large groups of people think in their own words". It is a polling platform in which users can submit opinions on a topic and react to the submissions of the other users. The data resulting from some pol.is polls is available as part of a GitHub repository[2].

For a given article, we define a voting scenario as follows: the comments correspond to the alternatives, the thumbs up and down votes to the preferences of the voters, and the goal is to select a subset of representative comments from the discussion. We consider two voting scenario: the approval-based setting (ABC hereafter) [8] in which only the thumb-ups are considered, and the trichotomous case (TBC hereafter) [7, 12] in which both the positive and the negative votes are considered. We mostly focus on the ABC setting since the literature on TBC is still rather sparse.

2.1 Voting Rules

In the approval voting case, Proportionality Press offers seven standard rules. The three default rules are **Approval Voting (AV)** which selects the alternatives with the highest number of approvals. This is called *Popularity-Based Selection* on the website. **Method of Equal Shares (MES)** which selects alternatives based the share of representation their approvers deserve. We considered its two standard variants: MES with approval voting completion and MES with increment completion (the default). This is called the *Representation-Based Selection*. **Chamberlin–Courant (CC)** which selects the

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[1]https://simon-rey.github.io/ProportionalityPress/

[2]https://github.com/compdemocracy/openData

How do you think the new minimum wage law will affect Seattle? Will it be for the better or for the worse? Why?

Original Polis poll: https://pol.is/2demo

Summary of the Comment Section

This section highlights various methods for selecting a small set of comments that best capture the broader conversation (see the comment section below).

Each method focuses on a different perspective, emphasizing principles such as popularity, representation, or diversity. This leads to different voices being represented. Explore the section below to get a sense of the impact these approaches have.

[Change Selection Methods]

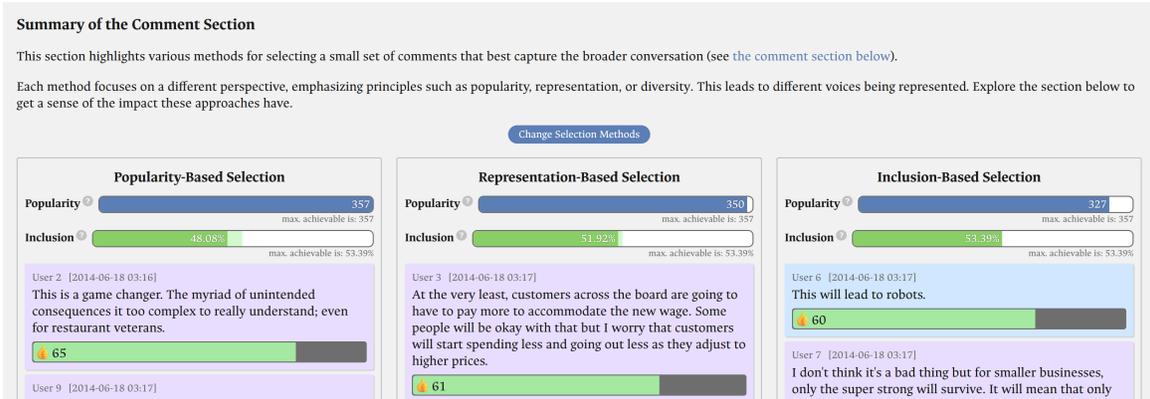| **Popularity-Based Selection**	**Representation-Based Selection**	**Inclusion-Based Selection**
Popularity ⓘ 357	Popularity ⓘ 350	Popularity ⓘ 327
max. achievable is: 357	max. achievable is: 357	max. achievable is: 357
Inclusion ⓘ 48.08%	Inclusion ⓘ 51.92%	Inclusion ⓘ 53.39%
max. achievable is: 53.39%	max. achievable is: 53.39%	max. achievable is: 53.39%
User 2 [2014-06-18 03:16] This is a game changer. The myriad of unintended consequences it too complex to really understand; even for restaurant veterans. 👍 65	User 3 [2014-06-18 03:17] At the very least, customers across the board are going to have to pay more to accommodate the new wage. Some people will be okay with that but I worry that customers will start spending less and going out less as they adjust to higher prices. 👍 61	User 6 [2014-06-18 03:17] This will lead to robots. 👍 60
User 9 [2014-06-18 03:17]		User 7 [2014-06-18 03:17] I don't think it's a bad thing but for smaller businesses, only the super strong will survive. It will mean that only

Figure 1: Screenshot from one of the article.

alternatives that maximise the number of represented voters. This is called the *Inclusion-Based Selection.*

The additional rules are SAV, Sequential PAV and two variants of Phragmén's rule. We refer the reader to Lackner and Skowron [8] for a formal description of the rules. In the trichotomous case we consider several generalizations of PAV, MES and Phragmén's rules that have been introduced in the literature [7, 12].

2.2 Popularity and Inclusion

For a quick assessment of the different selections, we include two simple measure: *popularity* and *inclusion.* The popularity of a selection, often called utility or satisfaction score in the literature, sums up the approval score of the selected comments in the ABC case and the net support (approvals minus disapprovals) in the TBC case. The inclusion of a selection, also known as exclusion ratio or CC-score, counts the number of voters with positive satisfaction for the selection, *i.e.* the number of voters with: at least one approved comment in the ABC setting, and strictly more approved comments than disapproved ones in the TBC setting.

3 USE CASE

The main use case of Proportionality Press is as a demonstration tool for the effects and trade-offs of using different voting rules. It can be used in outreach activities, teaching or just to build intuition for researchers. Using real online discussions allows users to get a feeling of the quality of the selection beyond the numerical measures used with synthetic data: we can assess whether comments repeat themselves, whether they really show different opinion etc.

Consider, for example, the *Operation Marching Orders* dataset, in which a group of activists discusses what political messages to prioritize. Using the default settings of selecting $k = 5$ comments we can see clear differences between the rules: The most popular comments all relate to policy questions. When using MES instead, we replace the least popular policy message with a more personality-based message on impeaching the then-current president Donald Trump. While this message is significantly less popular (around 10% less approvals) it increases the participation score from 66%

to 71%, indicating that it represents a significant number of voters that disagree with the more policy focused messages. CC leads to an even higher inclusion score of 79%, but at the cost of selecting seemingly more random and severely less popular comments.

On other datasets, the differences are, however, much less pronounced. Indeed, for $k = 5$, AV and MES produce the same outcome for 10 out of 20 datasets. The CC outcome always differs from the other two, but also often selects comments that seem less relevant.

4 IMPLEMENTATION

The Proportionality Press is a static website whose generation is done via Python scripts. It is fully integrated with the tools developed by the computational social choice community. The data from pol.is has been cleaned and converted into a Preflib dataset [9]. The outcomes of the voting rules are computed using the abcvoting Python package for the ABC setting and the trivoting Python package for the TBC setting. The website is generated using the jinja templating library for Python. The project is distributed open-source via a GitHub repository.

This implementation makes Proportionality Press highly modular. A user can easily fork Proportionality Press to build a website that uses their preferred datasets in the Preflib format. Similarly, a demonstration site for any voting rule that is implemented in accordance with the abcvoting or trivoting package can easily produced with minimal changes to the code.

5 CONCLUSION

We have presented Proportionality Press, a website demonstrating the impact of different voting rules for selecting comments in online discussions. We believe that Proportionality Press can be a useful tool in popularizing the use of fairer multi-winner voting rules in practice by showing their impact in a easily understandable way. Its modular implementation means that researchers can easily adapt it to their specific needs.

In the future, we plan to include more datasets. Additionally, we plan to implement voting rules that can actively take the incompleteness of the ballots in the pol.is dataset into account.

REFERENCES

[1] Haris Aziz, Markus Brill, Vincent Conitzer, Edith Elkind, Rupert Freeman, and Toby Walsh. 2017. Justified Representation in Approval-Based Committee Voting. *Social Choice and Welfare* 48, 2 (2017), 461–485.

[2] Haris Aziz, Edith Elkind, Shenwei Huang, Martin Lackner, Luis Sánchez-Fernández, and Piotr Skowron. 2018. On the Complexity of Extended and Proportional Justified Representation. In *Proceedings of the 32rd AAAI Conference on Artificial Intelligence (AAAI)*. 902–909.

[3] Markus Brill and Jannik Peters. 2023. Robust and Verifiable Proportionality Axioms for Multiwinner Voting. In *Proceedings of the 24th ACM Conference on Economics and Computation (ACM-EC)*. 301.

[4] Matteo Cinelli, Gianmarco De Francisci Morales, Alessandro Galeazzi, Walter Quattrociocchi, and Michele Starnini. 2021. The echo chamber effect on social media. *Proceedings of the National Academy of Sciences* 118, 9 (2021), e2023301118.

[5] Piotr Faliszewski, Jarosław Flis, Dominik Peters, Grzegorz Pierczyński, Piotr Skowron, Dariusz Stolicki, Stanisław Szufa, and Nimrod Talmon. 2023. Participatory Budgeting: Data, Tools, and Analysis. In *Proceedings of the 32th International Joint Conference on Artificial Intelligence (IJCAI)*. 2667–2674.

[6] Sara B. Hobolt, Katharina Lawall, and James Tilley. 2024. The Polarizing Effect of Partisan Echo Chambers. *American Political Science Review* 118, 3 (2024), 1464–1479.

[7] Sonja Kraiczy, Georgios Papasotiropoulos, Piotr Skowron, et al. 2025. Proportionality in Thumbs Up and Down Voting. *arXiv preprint arXiv:2503.01985* (2025).

[8] Martin Lackner and Piotr Skowron. 2023. *Multi-Winner Voting with Approval Preferences*. Springer-Verlag.

[9] Nicholas Mattei and Toby Walsh. 2013. Preflib: A library for preferences http://www.preflib.org. In *Proceedings of the 3rd International Conference on Algorithmic Decision Theory (ADT)*. 259–270.

[10] Dominik Peters and Piotr Skowron. 2020. Proportionality and the Limits of Welfarism. In *Proceedings of the 21st ACM Conference on Economics and Computation (ACM-EC)*. 793–794.

[11] Jan Maly Simon Rey, Felicia Schmidt. 2025. The (Computational) Social Choice Take on Indivisible Participatory Budgeting. *arXiv preprint arXiv:2303.00621, version 9* (2025).

[12] Nimrod Talmon and Rutvik Page. 2021. Proportionality in committee selection with negative feelings. *arXiv preprint arXiv:2101.01435* (2021).