

Societal Impact of Computational Social Choice

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Abstract

Computational Social Choice (COMSOC) is an interdisciplinary field between social choice theory in economics and theoretical computer science. The focus is to study algorithms for collective decision-making problems, such as political elections, the allocation of resources, and so on. In this Dagstuhl Seminar “Societal Impact of Computational Social Choice” (25401), we focused on three main topics. The first one was data, which has become an essential element for COMSOC research. In fact, thanks to the availability of open libraries, datasets and tools, researchers can now implement and test their algorithms for collective decision-making on real-life data, complementing their theoretical results. The second one was participation, as in recent years many municipalities and public institutions have moved towards various forms of participatory and digital democracy, with the goal of increasing the citizens’ engagement in the public life of their communities. The third one was time, as although many collective decision-making problems have an underlying repeated nature, this dimension had thus far not received the deserved attention within standard COMSOC models. We addressed these topics under the two overarching themes of domain restrictions and societal impact: while domain restrictions can be seen as a methodological question over the input of our problems, societal impact can be seen as part of their output, i.e., the applications originating from theoretical research.

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1 Executive Summary

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The Dagstuhl Seminar 25401 on “Societal Impact of Computational Social Choice” gathered 41 participants, from 11 countries and 4 continents. Most of the participants’ primary area of research was Computational Social Choice (COMSOC), an interdisciplinary field which brings together computer scientists, economists, mathematicians, philosophers and

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political scientists. The field is primarily concerned with designing algorithms and systems for collective decision-making, and analysing these algorithms and systems from an axiomatic, strategic, and computational perspective. Moreover, one of the seminar participants, Mathijs Kemp, brought a perspective from outside of academia, as he is the founder of the Parta platform for collective decision-making.

The seminar program focused on the three main topics of *data*, *participation*, and *time* in computational social choice, under the two overarching themes of *domain restrictions* and *societal impact*:

- **Data** has become an essential element for COMSOC research. In fact, by using open repositories and datasets (such as the PrefLib and PabuLib libraries), synthetic datasets, as well as tools (such as PrefPy, ABC Voting Rules and many others), COMSOC researchers can now implement and test their algorithms for collective decision-making. On the one hand, the results of these tests can inform recommendations on which methods actually perform better on desirable objectives in practice. On the other hand, they may highlight the presence of some underlying structure, which could lead to a more refined theoretical analysis.
- **Participation** has been formalized and studied in classical social choice theory by means of various mathematical axioms capturing the intuitive idea that a voting mechanism should incentivize voters to actually express their opinions. More recently, many municipalities and public institutions have moved towards various forms of participatory and digital democracy, with the goal of increasing the citizens' active role and engagement in the public life of their communities. Perhaps the main such example is that of participatory budgeting, where the citizens can propose and then vote on how to spend a percentage of a public budget – a practice that has been implemented in many cities around the world, and that has attracted the interest of COMSOC researchers. Moreover, in order to effectively elicit citizen participation, we also have to consider the (digital) platforms over which the collective decisions take place.
- **Time** is a dimension that has received increasing attention when studying problems of collective decision-making. Some examples of time-aware formalisms in COMSOC include: iterative voting, i.e., the interplay of strategic voting with time, as agents can modify their votes after observing the current results; perpetual voting, i.e., the analysis of fairness in elections over time; dynamic social choice, i.e., the change in agents' preferences, available resources, or number of participants over time. Indeed, numerous real-world problems include time as a component or have a repeated nature, e.g., the allocation of weekly chores among roommates.

Each of these three topics, as well as the two overarching themes, had a dedicated talk session in the seminar program (with the exception of the theme of *societal impact* which had two sessions), for a total of 18 talks. The talk sessions were structured as three short research talks followed by a panel discussion between the session speakers and the audience.

The seminar program also included 2 invited talks to report on the process and the interaction between policy-makers and academic advisors. The first one was by Sam Hirsh, who was involved in a legal process to reconfigure the electoral voting maps in the United States, and the second one was by Friedrich Pukelsheim, who was a member of the expert committee advising the German Bundestag in the process of the electoral reform of the German Bundeswahlgesetz.

Finally, the program included an experiment session by Théo Delemazure and Jérôme Lang, as well as numerous working group sessions and some time for informal discussions.

We wish to thank all of the participants, the invited speakers, our report collector Emin Berker, as well as the great Dagstuhl staff, for their valuable contribution to the success of the seminar.

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3 Overview of Talks

3.1 Achieving Rawlsian Justice in Food Rescue

Gerdus Benade (Boston University, US)

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URL <https://doi.org/10.2139/ssrn.4992842>

We study a problem faced by a national food rescue platform that matches each donation to the first recipient who claims it. Recipients have very different response rates, leading to a few highly responsive recipients claiming the bulk of the donations. We ask whether priority lists, which control when the donation is announced to each recipient, are a remedy for inequitable outcomes. We give efficient algorithms to find the n -stage and binary priority lists that optimize a class of Rawlsian objective functions focusing on the worst-off recipients. The simple idea is to give higher priority to recipients who have received less in the past and to those who were slower in responding to notifications. This can be codified into an index by which to rank order eligible recipients. Computational experiments calibrated by historical data confirm that even binary priority lists lead to significantly more fair allocations than the existing first-come-first-serve allocation system.

3.2 Approval-Based Committee Voting in Practice: A Case Study of (Over-)Representation in the Polkadot Blockchain

Niclas Boehmer (Hasso-Plattner-Institut, Universität Potsdam, DE)

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We provide the first large-scale data collection of real-world approval-based committee elections. These elections have been conducted on the Polkadot blockchain as part of their Nominated Proof-of-Stake mechanism and contain around one thousand candidates and tens of thousands of (weighted) voters each. We conduct an in-depth study of application-relevant questions, including a quantitative and qualitative analysis of the outcomes returned by different voting rules. Besides considering proportionality measures that are standard in the multiwinner voting literature, we pay particular attention to less-studied measures of overrepresentation, as these are closely related to the security of the Polkadot network.

3.3 When Fairness Does Not Exist: Detecting and Responding to Unfairness in Indivisible Allocations

Robert Bredereck (TU Clausthal, DE)

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Joint work of Matthias Bentert, Niclas Boehmer, Eva Deltl, Klaus Heeger, Pallavi Jain, Andrzej Kaczmarczyk, Leon Kellerhals, Dusan Knop, Junjie Luo, Rolf Niedermeier, Florian Sachse, Bin Sun

In many allocation problems with indivisible goods, fairness notions widely accepted by society, such as envy-freeness (EF), may fail to exist – famously, when two agents compete for a single item. While relaxations like EF1/EFX guarantee existence and have driven much recent progress, they risk masking genuine impossibility by labeling inherently unfair situations as “fair.” In my talk, I advocate a complementary agenda centered on the decision problem: does a fair solution exist at all?

For situations where fair outcomes do not exist in classical allocation settings, researchers have developed several workarounds: shared use, partial allocation, donations of goods, a fine-grained view of possible envy relations via social networks, or minimal subsidies. My talk advocates algorithmically assessing the feasibility of such interventions and identifying inherently unfair situations instead of hiding them.

3.4 An Experiment on the Impact of the Number of Candidates in Approval Voting

Théo Delemazure (University of Amsterdam, NL) and Jérôme Lang (CNRS – Paris, FR)

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Joint work of Théo Delemazure, Jérôme Lang, Roberto Brunetti, Antoinette Baujard

We ran a short pilot experiment on Approval Voting during this Dagstuhl Seminar. To investigate participant preferences, participants had to choose among a set of desserts to be served during cake time. The participants were split into two groups: half of them first had to choose among six candidates (then twelve candidates), while the other half first chose among twelve (then six candidates). Our goal was to check what would be the impact of the number of candidates in the election on the average number of approved candidates per voter. Does the average number of approvals double if we double the number of candidates, remain constant, or follow a linear or sublinear relationship? As we expected, we observed in this experiment that voters tend to lower their “approval threshold” when there are fewer alternatives in the election. We aim to repeat this experiment with more participants and by applying the different changes that were proposed during the discussion with the seminar’s participants.

3.5 Twenty Years of Voting Experiments during French Presidential Elections

Théo Delemazure (University of Amsterdam, NL)

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URL <https://theo.delemazure.fr/datasets/>

Since 2002, 22 voting experiments have been conducted in parallel to French presidential elections, testing alternative voting methods such as Approval voting, Borda, Instant runoff voting, Evaluative voting, or the Majority Judgement. Most of these experiments took place on specific French cities on the day of the election, in official voting stations: after voting in the actual election, voters could take part in the experiment. Since 2012, some voting experiments have also been conducted online, enabling them to reach a high number of participants. These datasets are of significant interest for social choice experiments. Indeed, they cover many different ballot formats, and in some cases, voters provided their preferences with different ballot formats, allowing to compare voting rules based on different formats. Moreover, the political context often facilitates the interpretation of experiment results. Finally, because the context is the same over the years, one can study the evolution of the preferences over time. This motivated us to clean these datasets and make them freely accessible online (including those not previously available), and we aim to compile them into a dedicated library (similar to Pabulib), alongside comparable experiments conducted in other countries.

3.6 Diversity of Structured Domains

Piotr Faliszewski (AGH University of Science & Technology – Krakow, PL)

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Main reference Piotr Faliszewski, Krzysztof Sornat, Stanisław Szufa, Tomasz Wąs: “Diversity of Structured Domains via k-Kemeny Scores”, CoRR, Vol. abs/2509.15812, 2025.
URL <https://doi.org/10.48550/ARXIV.2509.15812>

We consider ordinal elections, where each voter ranks the available candidates from the most to the least appreciated. In principle, each voter can cast an arbitrary preference order, but it is often convenient to consider structured domains of such preferences. For example, in the single-peaked domain there is a societal axis of the candidates (e.g., politicians ranked from the most left-wing to the most right-wing one) and for each preference ranking, each prefix is a contiguous interval of the axis. Such preference domains capture various rationality criteria that we expect the voters to follow.

In this talk, we discuss several ways in which one could measure diversity of structured preference domains. First, we mention the richness-based approach, studied, e.g., by Ammann and Puppe (Preference diversity. Review of Economic Design, 2025) or by Karpov et al. (Local diversity of Condorcet domains, arXiv 2024) that relies on counting various substructures in the votes. Then we introduce our concepts of inner and outer diversity. Under the former, we say that a domain is diverse if it is difficult to cluster, and under the latter we say that a domain is diverse if every possible vote is similar to some vote from the domain. We instantiate inner diversity using the k-Kemeny problem (where given an election we want to partition it – or, cluster – into a given number of subelections whose sum of Kemeny

scores is lowest). To define outer diversity, we measure the expected swap distance between a random vote and the closest vote in the domain. For a number of standard structured domains (including single-peaked, single-crossing, group-separable, and Euclidean ones) we evaluate their diversity using our approaches and find that inner and outer diversity give similar results. Further, we provide a number of algorithmic and complexity-theoretic results related to computing diversity of these domains.

3.7 Formal Explanations for Collective Decisions

Umberto Grandi (University Toulouse Capitole, FR)

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Joint work of Umberto Grandi, Clément Contet, Jérôme Mengin

Main reference Clément Contet, Umberto Grandi, Jérôme Mengin: “Explaining Tournament Solutions with Minimal Supports”, CoRR, Vol. abs/2509.09312, 2025.

URL <https://doi.org/10.48550/ARXIV.2509.09312>

Election results or the outcomes of participatory budgeting campaigns are typically presented to voters as a ranked list of alternatives based on scores. However, from a user or voter perspective, we believe this method fails to adequately explain why a particular candidate is elected or a project is approved. In this presentation, I will discuss our ongoing work on applying techniques used to explain black-box machine learning algorithms to transparent voting rules. Our explanations identify the smallest subsets of collected preference data that either support the winning candidate or, if altered, could change the outcome – these are known as counterfactual explanations. I will introduce algorithms for computing these formal explanations, along with refinements and bounds on their size, particularly for the case of tournament solutions.

3.8 Deploying Fair Sampling Algorithms for Sortition

Paul Gözl (Cornell University – Ithaca, US)

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Joint work of Paul Gözl, Gili Rusak, Bailey Flanigan, Anupam Gupta, Brett Hennig, Ariel D. Procaccia

Citizens’ assemblies are an emerging form of democratic participation, in which a panel of randomly selected constituents weigh in on a policy question. In this talk, I will speak about the past, present, and future of Panelot.org, a not-for-profit website on which practitioners can run sampling algorithms based on fair division. First, I will summarize our collaboration with the Sortition Foundation came to be and how this collaboration impacted the design of the sampling algorithm. Second, I will talk about our algorithm deployment and the extent to which we can (and cannot) evaluate its societal impact. Finally, I will present ongoing work on overhauling Panelot, as well as several new algorithms derived from recent social choice research, which we plan to add as functionalities.

3.9 Navigating the American Redistricting Maze: Mathematical Challenges and Political Realities in US Electoral Map Design

Sam Hirsch

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Unlike Europe’s multi-member district systems, the United States relies on single-member geographic districts, creating a complex optimization problem where boundaries must satisfy numerous competing objectives: equal population, compactness, community preservation, Voting Rights Act compliance, and state-specific criteria ranging from competitiveness to incumbent protection. This patchwork of requirements across 50 states defies uniform mathematical treatment.

Building on recent computational social choice work in redistricting, this conversation identifies where algorithmic advances could impact reform efforts. Key challenges include defining “fairness” when stakeholders fundamentally disagree on objectives, exploring the vast space of valid maps efficiently, and developing interpretable metrics that withstand legal scrutiny.

This conversation will examine why consensus remains elusive – from tensions between mathematical elegance and political feasibility to communicating technical concepts to non-technical audiences. Drawing from practical experience in US election reform, Sam will discuss what tools and measurements would most benefit practitioners and explore whether “optimal” districting is even well-defined in a pluralistic democracy. Attendees will gain insights into translating theoretical advances into real-world impact in one of America’s most contentious political processes.

3.10 Beyond One Person One Vote

Mathijs Kemp (Vennster – Almere, NL)

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Parta is a decision making method and tool that is used for different purposes: In participation councils, area development & energy transition. Parta uses the one person one vote principle to calculate the results. But is this always the most logical approach? In one specific use case, parents voted on classroom composition by age and academic level in an elementary school. Currently, in Parta, there is no information about the voter, nor can you weigh votes differently. We did an external analysis of the votes, based on an external tool. There was a difference between the preference of parents of younger children and the parents of children that were about to leave the school. The decision had more impact on the younger children. The same occurs in area development: Citizens in the area are impacted more than citizens that are casual visitors or live further away. We are considering giving stakeholders with a higher stake more votes. How should we present the outcome based on the different weights and what are the pitfalls of this approach?

3.11 Overton Pluralism as Inference-Time Social Choice

Sonja Kraiczy (University of Oxford, GB)

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Joint work of Sonja Kraiczy, Brandon Amos, Ratip Emin Berker, Avinandan Bose, Edith Elkind, Smitha Milli, Maximilian Nickel, Ariel Procaccia, Jamelle Watson-Daniels

People increasingly turn to LLMs for information, including answering socially contested prompts, so responses should reflect the different viewpoints of sufficiently large groups. We formalize this goal by adapting proportionally representative fairness (PRF) from social choice in metric spaces and introduce inference-time PRF: for any in-scope prompt, large cohesive groups are proportionally represented, and groups that are more cohesive are represented more closely, in the final answer. We present the first system with provable inference-time guarantees over the full response space. We train a personalized reward model that learns prompt-specific user-preference embeddings and a personalized LLM optimized for it. At inference time, a fast social-choice algorithm (a stream-lined version of the Spatial Expanding Approval Rule) selects k representative embeddings; the personalized LLM generates k conditioned responses that are merged into a pluralistic output. Assuming the model optimizes (resp. approximately optimizes) the reward, PRF over the embedding space implies PRF (resp. approximate PRF) over the response space, automatically adapting represented groups to each prompt. This is the first formalization and implementation with guarantees for viewpoint pluralism in LLMs.

3.12 Social Choice Engineering: A Manifesto

Jérôme Lang (CNRS – Paris, FR)

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I would like to argue that one of the goals the computational social choice research community should pursue today is to use our knowledge and methods to solve specific problems coming from the real world. What I call “social choice engineering” is the design of tools for solving real-world collective decision-making problems. We can distinguish two types: (1) Project-based social choice engineering: we start from the specification of an actual need, followed by a theoretical analysis of what can or cannot be done, and the implementation of a software with a suitable interface to be tested and then delivered to the client(s). (2) Product-based social choice engineering: one thinks hard about which product to develop; then a software is designed, implemented, and tested on benchmarks or pilot studies, and the last step consists of finding customers willing to use it, and possibly helping them configure it. Some works of each type exist (especially in matching), and I give several examples; still, these are too few. I try to explain why this is the case, and I argue that, in my opinion, computational social choice is threatened by the (relative) lack of engineering work.

3.13 Participation Incentives in Approval-Based Committee Elections

Patrick Lederer (UNSW – Sydney, AU)

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Joint work of Martin Bullinger, Chris Dong, Patrick Lederer, Clara Mehler

Main reference Martin Bullinger, Chris Dong, Patrick Lederer, Clara Mehler: “Participation Incentives in Approval-Based Committee Elections”, in Proc. of the Thirty-Eighth AAAI Conference on Artificial Intelligence, AAAI 2024, Thirty-Sixth Conference on Innovative Applications of Artificial Intelligence, IAAI 2024, Fourteenth Symposium on Educational Advances in Artificial Intelligence, EAAI 2014, February 20-27, 2024, Vancouver, Canada, pp. 9546–9554, AAAI Press, 2024.

URL <https://doi.org/10.1609/AAAI.V38I9.28810>

In approval-based committee (ABC) voting, the goal is to choose a subset of predefined size of the candidates based on the voters’ approval preferences over the candidates. While this problem has attracted significant attention in recent years, the incentives for voters to participate in an election for a given ABC voting rule have been neglected so far. This paper is thus the first to explicitly study this property, typically called participation, for ABC voting rules. In particular, we show that all ABC scoring rules even satisfy group participation, whereas most sequential rules severely fail participation. We furthermore explore several escape routes to the impossibility for sequential ABC voting rules: we prove for many sequential rules that (i) they satisfy participation on laminar profiles, (ii) voters who approve none of the elected candidates cannot benefit by abstaining, and (iii) it is NP-hard for a voter to decide whether she benefits from abstaining.

3.14 Online Algorithms for Participatory Budgeting

Jan Maly (Wirtschaftsuniversität Wien, AT)

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Joint work of Jan Maly, Matthieu Hervouin

Participatory Budgeting (PB), and in particular, proportionality in PB, has received significant attention from the Computational Social Choice community in recent years. This led to the discovery of voting rules like the Method of Equal Shares, that selects outcomes in a fair and representative fashion. However, these rules assume that the set of possible projects is given in advance. In this talk, I describe a new framework, that we call online PB, in which projects are revealed one by one and a binding funding decision has to be made on the spot. We consider several classical fairness axioms from the offline PB literature in this online setting, namely priceability and the most prominent axioms of justified representation, JR, PJR and EJR. We see that priceability is always satisfiable in the online setting and find tight approximations for the justified representation axioms. Additionally, we discuss experiments showing that, in practice, a simple greedy online PB rule produces outcomes that are nearly as fair as the outcomes produced by the Method of Equal Shares (without completion) in offline PB.

3.15 Repeated Fair Allocation of Indivisible Items

Oliviero Nardi (TU Wien, AT)

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Joint work of Ayumi Igarashi, Martin Lackner, Oliviero Nardi, Arianna Novaro
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The problem of fairly allocating a set of indivisible items is a well-known challenge in the field of (computational) social choice. This classic problem typically assumes a single allocation, but in practice, items often need to be distributed repeatedly. For example, the items may be recurring chores to distribute in a household. Motivated by these observations, we initiate the study of the repeated fair division of indivisible goods and chores. We show that, if the number of repetitions is a multiple of the number of agents, there always exists a sequence of allocations that is proportional and Pareto-optimal. On the other hand, irrespective of the number of repetitions, an envy-free and Pareto-optimal sequence of allocations may not exist. For the case of two agents, we show that if the number of repetitions is even, it is always possible to find a sequence of allocations that is overall envy-free and Pareto-optimal. We then prove even stronger fairness guarantees, showing that every allocation in such a sequence satisfies some relaxation of envy-freeness.

3.16 Reform of the Electoral System for the German Bundestag

Friedrich Pukelsheim (Universität Augsburg, DE)

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URL <https://www.math.uni-augsburg.de/htdocs/emeriti/pukelsheim/2022Berlin/>

The German Federal Election Law was amended in 2024. The talk illustrates how the amended law works using the election to the 21st Deutscher Bundestag in February 2025. The presentation details the procedure how votes are converted into seats, outlines the constitutional objectives as laid down in the German Basic Law, points to the fundamental goal of verifying the principle of One Person, One Vote, and provides an overview of the work of the Bundestag Reform Commission which negotiated in 2022 and 2023 the new amendment and in which the speaker participated as an expert member.

3.17 City Sampling for Citizens' Assemblies

Ulrike Schmidt-Kraepelin (TU Eindhoven, NL)

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Main reference Paul Gözl, Jan Maly, Ulrike Schmidt-Kraepelin, Markus Utke, Philipp C. Verpoort: “City Sampling for Citizens' Assemblies”, CoRR, Vol. abs/2509.07557, 2025.

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In citizens' assemblies, a group of constituents is randomly selected to weigh in on policy issues. We study a two-stage sampling problem faced by practitioners in countries such as Germany, in which constituents' contact information is stored at a municipal level. As a result, practitioners can only select constituents from a bounded number of cities ex post, while ensuring equal selection probability for constituents ex ante.

We develop several algorithms for this problem. Although minimizing the number of contacted cities is NP-hard, we provide a pseudo-polynomial time algorithm and an additive 1-approximation, both based on separation oracles for a linear programming formulation. Recognizing that practical objectives go beyond minimizing city count, we further introduce a simple and more interpretable greedy algorithm, which additionally satisfies an ex-post monotonicity property and achieves an additive 2-approximation. Finally, we explore a notion of ex-post proportionality, for which we propose two practical algorithms: an optimal algorithm based on column generation and integer linear programming and a simple heuristic creating particularly transparent distributions. We evaluate these algorithms on data from Germany, and plan to deploy them in cooperation with a leading nonprofit organization in this space.

3.18 Condorcet Domains

Arkadii Slinko (University of Auckland, NZ)

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Joint work of Clemens Puppe, Arkadii Slinko

Main reference Clemens Puppe, Arkadii Slinko: “Condorcet Domains: The Mathematics of Coherent Collective Decision-Making,” Springer Nature: Studies in Social Choice and Welfare, to appear in 2026

My talk was a presentation of the book titled “Condorcet Domains: The Mathematics of Coherent Collective Decision-Making” written by myself jointly with Prof. Clemens Puppe (KIT). I outlined the structure of the book and gave examples of results from several chapters. As Herve Moulin noted in his foreword “The theory of Condorcet domains straddles the social sciences and discrete mathematics. This interdisciplinary volume is already a canonical reference in both communities.”

3.19 What can we learn from real-world PB data?

Stanisław Szufa (CNRS – Paris, FR)

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Main reference <https://pabulib.org>

We present the results of an analysis of more than 1400 real-world participatory budgeting instances. In particular, we examine how different types of ballots influence citizens' behavior, specifically in terms of the projects they propose and their voting patterns. Moreover, we provide recommendations on which types of ballots to use in practice

3.20 Cost Utilities

Toby Walsh (UNSW – Sydney, AU)

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Cost utilities are those additive utilities in which every agent assigns the same utility for an item (aka its cost) that they approve, and zero utility for an item that they do not approve. They have been called generalised binary utilities and various other names. By restricting to cost utilities, the action space for agents is reduced – agents can only declare their utility for an item is equal to zero or the item cost. In fact, this is enough of a restriction to ensure that several fair division procedures become strategy proof. In this talk, I demonstrate that cost utilities are an interesting and practical domain restriction that ensures a range of good normative properties in addition to strategy proofness.

3.21 Strengthening Proportionality in Temporal Voting

Tomasz Wąs (University of Oxford, GB)

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Joint work of Bradley Phillips, Edith Elkind, Nicholas Teh, Tomasz Wąs

Main reference Bradley Phillips, Edith Elkind, Nicholas Teh, Tomasz Wąs: “Strengthening Proportionality in Temporal Voting”, CoRR, Vol. abs/2505.22513, 2025.

URL <https://doi.org/10.48550/ARXIV.2505.22513>

We study proportional representation in the framework of temporal voting with approval ballots. Prior work adapted basic proportional representation concepts – justified representation (JR), proportional JR (PJR), and extended JR (EJR) – from the multiwinner setting to the temporal setting. Our work introduces and examines ways of going beyond EJR. Specifically, we consider stronger variants of JR, PJR, and EJR, and introduce temporal adaptations of more demanding multiwinner axioms, such as EJR+, full JR (FJR), full proportional JR (FPJR), and the Core. For each of these concepts, we investigate its existence and study its relationship to existing notions, thereby establishing a rich hierarchy of proportionality concepts. Notably, we show that two of our proposed axioms – EJR+ and FJR – strengthen EJR while remaining satisfiable in every temporal election.

4 Working groups

4.1 Computational Social Choice: Research & Development

Niclas Boehmer (Hasso-Plattner-Institut, Universität Potsdam, DE), Dorothea Baumeister (HS Bund f. öffentl. Verwaltung – Brühl, DE), Ratip Emin Berker (Carnegie Mellon University – Pittsburgh, US), Sylvain Bouveret (University of Grenoble, FR), Andreas Darmann (Universität Graz, AT), Piotr Faliszewski (AGH University of Science & Technology – Krakow, PL), Martin Lackner (TU Wien, AT), Jérôme Lang (CNRS – Paris, FR), Nicholas Mattei (Tulane University – New Orleans, US), and Arianna Novaro (Université Paris 1 Panthéon-Sorbonne, FR)

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Computational social choice (COMSOC) studies principled ways to aggregate conflicting individual preferences into collective decisions. Although inspired by concrete applications such as voting and participatory budgeting, much of the published COMSOC research has focused on abstract, foundational questions, with comparatively little emphasis on deploying these ideas in practice.

In this working group, we discussed the need for increased effort towards *Computational Social Choice: Research & Development (COMSOC-R&D)*, a problem-driven research agenda that explicitly aims to design, implement, and test collective decision-making systems in the real world. After the seminar, we collected the ideas raised in the working group in a position paper that captures this call for action. In the paper, we first articulate the defining features of COMSOC-R&D and argue that such work is a necessary next step for the community to achieve meaningful real-world impact. Subsequently, we identify key roadblocks to COMSOC-R&D and discuss potential remedies at the individual and community level. Finally, we propose desiderata and evaluation criteria for future COMSOC-R&D projects.

4.2 Social Choice with Text

Umberto Grandi (University Toulouse Capitole, FR), Robert Bredereck (TU Clausthal, DE), Théo Delemazure (University of Amsterdam, NL), Ulle Endriss (University of Amsterdam, NL), Jan Maly (Wirtschaftsuniversität Wien, AT), Nicholas Mattei (Tulane University – New Orleans, US), Nicolas Maudet (Sorbonne University – Paris, FR), Oliviero Nardi (TU Wien, AT), and Stanisław Szufa (CNRS – Paris, FR)

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Our research typically starts from preferences elicited from voters in the form of rankings, pairwise comparisons, or approval ballots. Given that contemporary AI gives us powerful text-based interfaces, what are principled approaches to do social choice starting from text input? In this group we first tackled the problem of surveying datasets containing both texts and votes on texts (deliberative platforms such as Polis, parliamentary discussions, participatory budgeting, collective statement generation...). Then, participants gave talks and tutorials on their preliminary work on this topic, in particular merging natural language processing techniques or LLMs with classical social choice algorithms. Finally, we sketched

a “blue sky” paper on the topic of the working group, detailing in a systematic way the different aspects of a collective decision that can profit from the use of textual processing techniques such as LLMs.

4.3 Querying in Social Choice

Davide Grossi (University of Groningen, NL), Gerdus Benade (Boston University, US), Ratip Emin Berker (Carnegie Mellon University – Pittsburgh, US), Edith Elkind (Northwestern University – Evanston, US), Paul Gözl (Cornell University – Ithaca, US), Sonja Kraiczy (University of Oxford, GB), Patrick Lederer (UNSW – Sydney, AU), Jannik Peters (National University of Singapore, SG), Ulrike Schmidt-Kraepelin (TU Eindhoven, NL), and Tomasz Wąs (University of Oxford, GB)

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In broad strokes, social choice problems can be typically described as follows: given complete information about individual attitudes (e.g., approval, preferences) over a set of alternatives, find an outcome (e.g., an alternative, or a set of alternatives) that satisfy a given societal objective (e.g., some variant of proportional representation). In the working group we focused on investigating generalizations of the above question where: information over attitudes is incomplete and possibly sparse; the set of alternatives is not fixed and grows over time; outcomes meeting the desired objective should be computed at each time step. Social choice problems of this sort underpin applications in digital democracy and crowd-sourcing and interface directly with topics in learning theory (e.g., exploration/exploitation tradeoffs in online decision-making). The group reviewed relevant literature and proceeded to sketch a first formalization of the problem.

4.4 How can you ensure, that stakeholders with a higher stake, have more say in a matter? Or is that a bad practice?

Mathijs Kemp (Vennster – Almere, NL), Martin Bullinger (University of Oxford, GB), Reshef Meir (Technion – Haifa, IL), Marcus Pivato (Université Paris 1 Panthéon-Sorbonne), and Frederik Van De Putte (Erasmus University – Rotterdam, NL)

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In this working group, one of the practical use cases of Parta was studied. In this use case, a convincing majority (60-70%) was preferred to move ahead with a proposal that would move 3 grades into one classroom. At first, this majority was not achieved. The vote was split 56% in favour and 44% against. After analysing the data, it was concluded that the parents of the younger children voted more heavily in favour of the proposal. The principal concluded that this group has a higher stake and decided to move ahead with the proposal, even though the majority was not as convincing as preferred. In this working group, it was explored to see whether it's possible to take this discrepancy in stakes into account within the voting process itself. An important question was quickly raised: How do we elicit these stakes. It was first concluded that the stakes should be based on objective criteria.

An idea was then proposed to democratically determine these weights. Voters are asked to assign a weight to other voters (anonymously and maybe even hypothetical) based on objective characteristics. Those weights are then averaged, before they're used in the actual process. Another important aspect for acceptance of such a decision is the legitimacy of the final decision. To ensure this, it was concluded that the weighing process should be transparent and that the weighing should be determined in the constitutional phase. With this in mind, democratically deciding the weights will enhance legitimacy. When objective public observable criteria are not available. A number of voting mechanisms were explored to see if they would fit. Quadratic voting, the Pivotal Voting Mechanism and Storable votes were explored. A combination was proposed, where fictional money would be used over multiple decisions, to assure that the weights are elicited fairly and correctly. Using delegation to make stakes count has also been explored. Here, the weights are assigned implicitly, since voters with higher stakes will convince other voters to delegate their vote to them. This will mitigate the tyranny of the majority and therefore give voters with a higher stake more influence in the vote.

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