

Summer School on Computational Social Choice: Welcome & Introduction

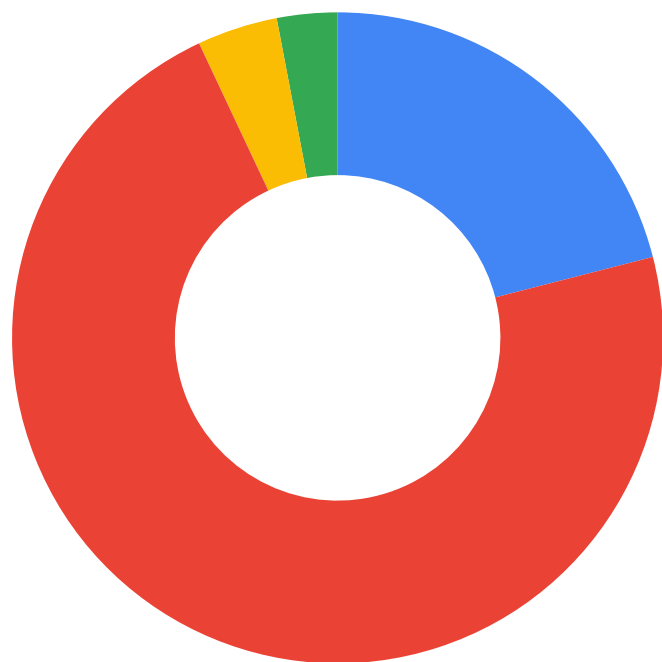
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Welcome!

So who's here? — 67 registered participants



● MSc ● PhD ● Postdoc ● Faculty



● Computer Science ● Economics
● Mathematics ● Philosophy

[+ 16 lecturers / experimenters / locals / organisers]

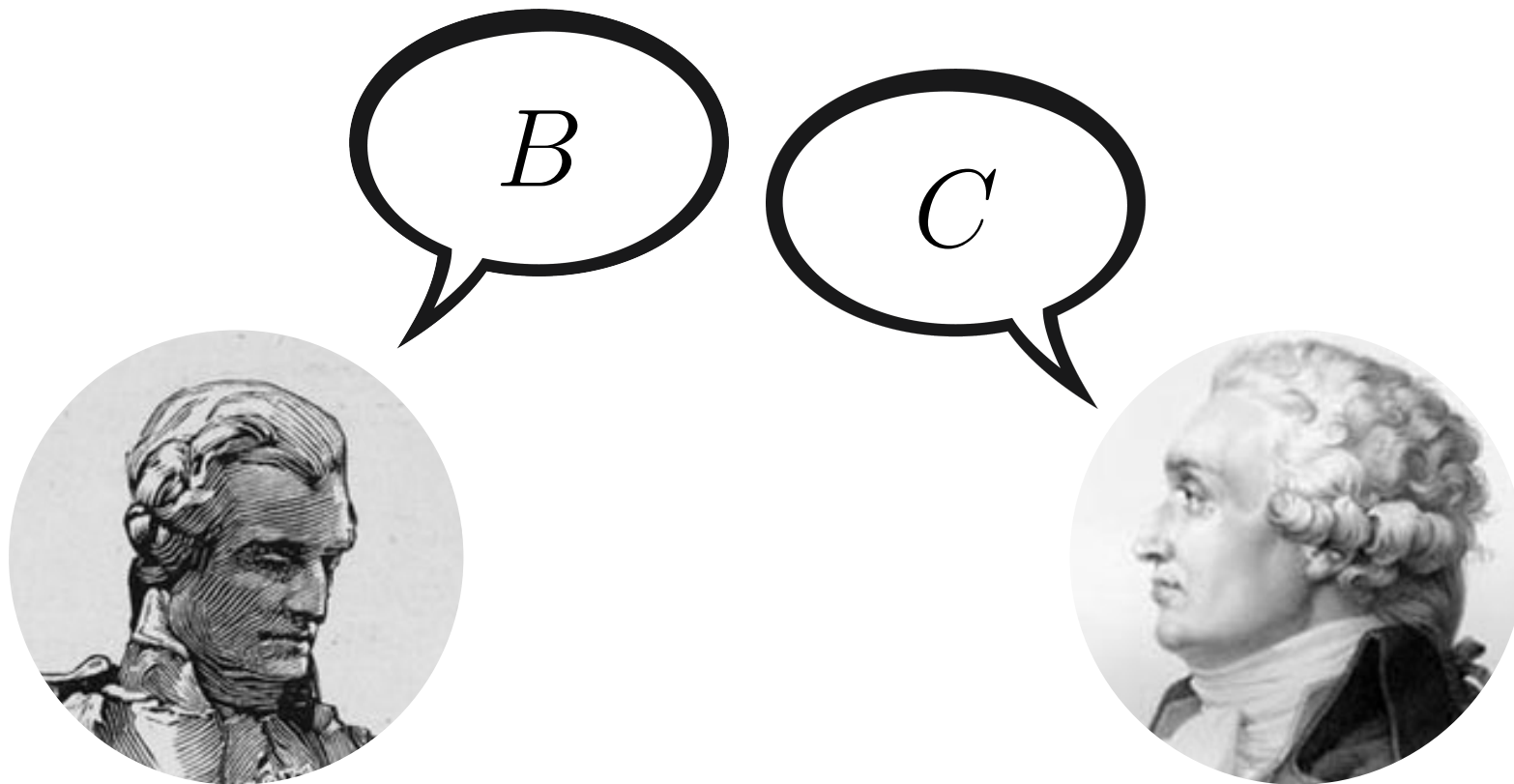
Example

A group of voters are asked to rank alternatives A , B , and C :

2 voters: $B \succ A \succ C$

3 voters: $C \succ B \succ A$

What's the right collective decision to take here?



2 voters: $B \succ A \succ C$

3 voters: $C \succ B \succ A$

Early History

Ancient Rome: *Pliny the Younger* discusses agenda manipulation case with acquit (most popular), banish (won!), condemn (withdrawn)

Middle Ages: *Ramon Llull* discusses voting rules (notably Copeland?), thinking of outcomes as divine revelation (\hookrightarrow epistemic perspective)

Enlightenment: aforementioned debate between *Borda* and *Condorcet*

Late 19th Century: *Charles Dodgson* discusses voting problems and proposes a Condorcet-consistent rule (also writes *Alice in Wonderland*)

Most likely, similar ideas were in circulation also outside of Europe, but this is less well documented (*addressing this is a worthwhile project!*).

I. McLean and A. Urken. *Classics of Social Choice*. Univ. of Michigan Press, 1995.

The Classical Period

Black (1948/58) rediscovers early writers + discusses *single-peakedness*

Arrow (1951) develops the *axiomatic method* for SCT + proves his famous *impossibility theorem* (IIA + Pareto \Rightarrow dictatorship)

Gibbard (1973) and Satterthwaite (1975) show that every reasonable voting rule is subject to *strategic manipulation* (\leftrightarrow game theory)

Limited enthusiasm for SCT after \sim 1980 in mainstream Economics (basically “too much theory” and “too many impossibility theorems”)

K.J. Arrow, A.K. Sen, and K. Suzumura (eds), *Handbook of Social Choice and Welfare*, Volume 1. North-Holland, 2002.

The Computational Turn

Precursors: Gale and Shapley's deferred-acceptance algorithm (1962), cake-cutting algorithms such as that of Dubins and Spanier (1961)

Bartholdi, Tovey, and Trick (1989): explicit use of complexity theory to analyse hardness of outcome determination and manipulation

Explosion: since early 2000s, lots of activity across AI and TCS; initial focus on complexity theory, but getting much broader later

Community: first workshop in 2006 (in Amsterdam!); more and more contacts between Economics and CS; Handbook published in 2016

Nowadays: COMSOC and SCT indistinguishable, covering axiomatic, algorithmic, and behavioural aspects of collective decision making

F. Brandt, V. Conitzer, U. Endriss, J. Lang, and A.D. Procaccia (eds), *Handbook of Computational Social Choice*. Cambridge University Press, 2016.

Beyond the Standard Model of Voting

Condorcet, Arrow, et al. were concerned with voters strictly ranking all alternatives and with collectively choosing a single best alternative.

But there are lots of other scenarios also worthy of our attention:

- Input: approvals, utilities, incompleteness, domain restrictions
- Output: sets of alternatives, constraints, randomisation
- Environment: alternatives with internal structure, repeated voting, electing peers, vote delegation, voting on social networks

Beyond Voting

The largest subfield of COMSOC is *voting* (choice of a public good).

Two further large areas:

- *fair allocation* (of private goods)
- *coalition formation* (including matching)

Smaller areas of activity:

- *judgment aggregation*
- *reputation management*
- *tournament design*
- ...

Methodology

COMSOC researchers make use of a rich range of methodological tools to deepen our understanding of collective decision making. Examples:

- axiomatic method
- game theory
- probability theory
- algorithm design
- complexity theory
- mathematical logic
- automated reasoning
- data-driven analysis
- behavioural economics

Community & Resources

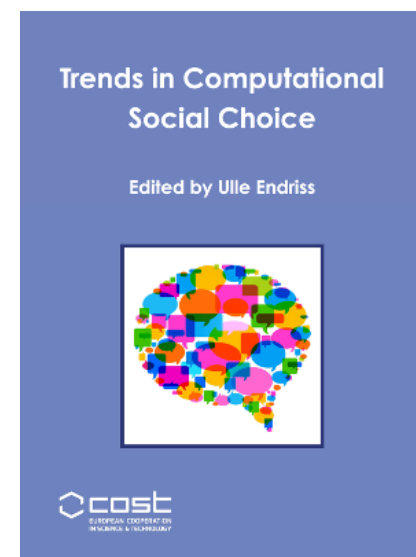
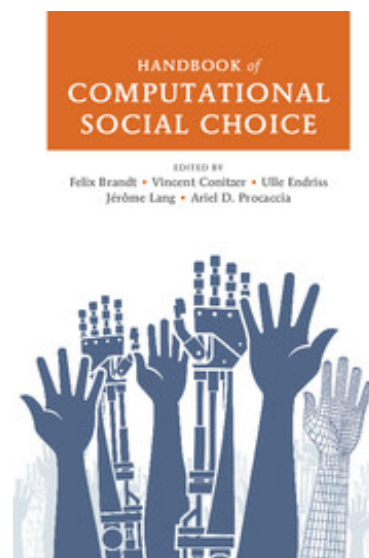
Main meeting point of the community: biannual *COMSOC Workshops*, alternating with *Meetings of the Society for Social Choice and Welfare*.

Online resources:

- Community portal: <https://research.illc.uva.nl/COMSOC>
- Mailing list: <https://lists.duke.edu/sympa/info/comsoc>
- COMSOC Video Seminar: <https://www.comsocseminar.org>

The community portal includes a *PhD thesis collection* for COMSOC.

Books (freely available online):



Core Lectures

- Zoi Terzopoulou: Axiomatic Social Choice
- Dominik Peters: Computing Desirable Collective Decisions
- Reshef Meir: Behavioural Social Choice

Special-Topic Lectures

- Clemens Puppe: Frugal Aggregation
- Anaëlle Wilczynski: Fairness and Optimality in Matching
- Britta Dorn: Computational Complexity for COMSOC
- Piotr Faliszewski: Using the Map of Elections
- Vincent Conitzer: Social Choice for Moral AI

Make sure to ask them plenty of questions!

Special Sessions

- Tuesday: Poster Session (in the main building)
- Thursday: Experiments (in the main building)
- Friday: *Rump Session* (here)

Social Programme

- Monday: Welcome Reception (in this building)
- Tuesday: option to have picnic at Flevopark (bring your own)
- Wednesday: Boat Tour + Social Dinner (*who will come by bike?*)
- Friday: Farewell Drinks (at Café Polder)

Enjoy!

(Please wear your badge so it's easier to get to know one another.)