Voting rules at the Eurovision Song Contest (ESC)

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Basic rules of the ESC

- Each *country* sends in a contestant which performs a song
- Afterwards, each country *votes* for other countries' performances
- Votes are aggregated using a *voting rule*
- Country with the *most points* wins

Research Questions

Voting Rules

- A total of 7 different *voting rules* have been used
- The rules belong to different *families*
- Is there a *unified framework* in which all rules can fit?

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Research Questions

- To what extent can a *rule influence* the result?
- It is possible to *design* a rule which makes country X *win* in year Y?
- Are countries *colluding* with each other?

Extracting rankings and applying rules

▶ The first goal is to extract a ranking from the data

Figure: From point distribution to ranking

Extracting rankings and applying rules (2)

- How can we apply a rule F on the rankings extracted from year Y?
- Some problems arise:
    - Some rules aren't directly applicable on extracted rankings
    - Some other rules aren't applicable at all on extracted rankings
- A *model* was created to make possibilities clear and to simplify work on the other questions

A unified perspective

Country v in C votes by submitting a *ranking* $\succ_v$ in $\mathcal{L}(C)$ and a *scoring vector* $w_v = (w_v^1, \ldots, w_v^n)$ in $\mathcal{W}$. A *voting rule $F_{\mathcal{W}}$* is used to select an *outcome*, a set of winning countries:

$$F_{\mathcal{W}} : (\mathcal{L}(C) \times \mathcal{W})^n \to 2^C \setminus \{\emptyset\}$$

The rule $F_{\mathcal{W}}$ will compute the *score* of each country according to the submitted ballots. Countries with the highest final score win.

$$\forall c \in C, \ score(c) = \sum_{\substack{v \in C \\ v \neq c}} w_v^{rank(c)}$$

Automating the computation of results

- Python code was written to:
  - Extract *rankings* from *data*
  - Apply a given *rule* on a *set of rankings*
  - Implement *tie breaking* systems

Influence of the voting rule on the outcome

- ▶ Out of the 142 times another rule has been applied on an ESC, only 21 contests ended up with a different result.
- ▶ If an outcome of an ESC changes when using one different rule, it most likely also changes when using another different rule.
- ▶ Hypothesis: outcome in these ESCs was very close

Rules	ESC's	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
1962		NL	GB	GB	IL	IL	IE	CH	DE	LU	IE	NO	BE	IE	GB	YU/GB	IT	SE	IE	IE	IE	NO	IE	GB	IL	IS	DK
1963		NL	GB	GB	IL	IL	IE	DE/GB	DE	LU	IE/SE	NO	BE	IE	CH	YU/GB	IT	SE	IE	IE	IE	NO	IE	GB	IL	SE	DK
'64-'66		NL	GB	GB	IL	IL	IE	CH	DE	LU	IE	NO	BE	IE	GB	GB	FR	SE	IE	IE	IE	NO	IE	GB	IL	IS	DK
1975-2012		NL	GB	GB	IL	IL	IE	GB	DE	LU	SE	NO	BE	IE	CH	YU	IT	SE	IE	IE	IE	NO	IE	GB	IL	SE	DK
'12-'15				FR																							
'16-now																											

Figure: Outcomes for different ESC rules

Remaining questions

- It is possible to *design* a rule which makes country X *win* in year Y?
  - This problem can be represented by a set of inequalities
  - First solve theoretically
  - Afterwards, use algorithms to solve for all ESCs
- Are countries *colluding* with each other?
  - Come up with a well defined notion of *collusion*
  - Design an algorithm to *automate collusion detection*