

Preference Learning and Aggregation from Natural Language



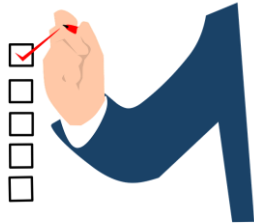
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Rensselaer

Motivation

- Eliciting preferences

A screenshot of a web interface for a poll. At the top, there is a navigation bar with 'OPRA' and links for 'Polls', 'Multi-Polls', 'Classes', 'Groups', 'Sessions', and 'Events'. Below this is a search bar with a magnifying glass icon and a 'Current Winners' button. The main content area has tabs for 'Two Columns', 'One Column' (which is selected), 'Sliders', 'Stars', and 'Yes/No'. Below the tabs, there is a section titled 'Your preferences:' with a green 'Submit' button. Underneath, there are three rows of preference selection: '#1' with options 'A' and 'E', '#2' with options 'B' and 'D', and '#3' with option 'C'.

- ***How can we learn agent preferences from natural language to make a group decision?***


- E.g. Forums, message boards, chat rooms

Harvard is the absolutely best choice for higher education.

Yale University will be a better choice for her than Harvard.

Proposed Framework



- New dataset
 - College Confidential
- Entity-wise Sentiments 
 - not good enough alone
- Stance Detection
 - [\[Mohammad et al. TOIT-2017\]](#)

- Plackett-Luce model with features
 - Opinion+agent+alternative features
- Other ML
 - sentiment+SVM, LogReg, NB
 - ngram+SVM
 - pre-trained word vectors+NN
- Similar accuracy

- 66.67% accuracy for Plurality voting (College confidential dataset)
 - 2 or 3 alternatives
 - 10-40 agents

Preference Aggregation

Voting with m alternatives, n agents, each represented by a distribution

- Probabilistic votes [Hazon et al. AIJ-12]

😊 natural

- Fractional votes [Prasad et al. ICML-15, Noothigattu et al. AAI-18, Zhibing et al. UAI-18]

😊 easy to compute

Theorem. For all anonymous rules and any profile of distributions

$$\Pr(\text{Prob winner} = \text{Fractional winner}) \geq 1 - m! \exp(-\Omega(\text{Margin of Victory}))$$

Proposition. For Plackett-Luce preferences

Voting Rule	Runtime
k-Approval	$O(k m^k n)$
Copeland	$O(m^2 n)$
Maximin	$O(m^2 n)$
STV	$O(m^2 n)$