Preference Learning and Aggregation from Natural Language

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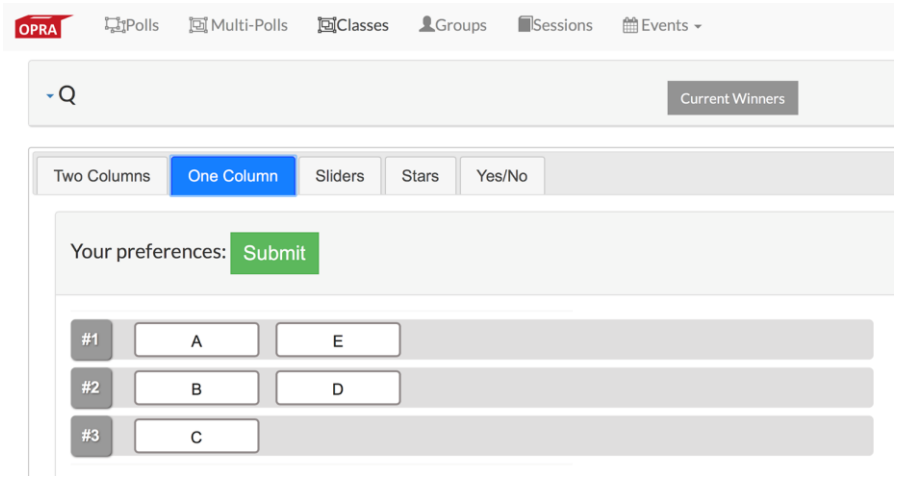
Motivation

- Eliciting preferences



- ***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

Opinion Mining

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

Preference Learning

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

Preference Aggregation

- 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. AAAI-18, Zhibing et al. UAI-18]

  ☺ easy to compute

Theorem. For all anonymous rules and any profile of distributions

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

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	$O(m^2\, n)$