Predicting the Approval or Disapproval of each Faction in a Local Assembly Using a Rule-based Approach

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A short resume of the presenter

- Ryo Kato graduated from Ibaraki University.
- He is currently a Master's student in Ibaraki University.
- His research interests include text mining and natural language processing.

Introduction

- In recent years, voter turnout in Japan has been on a downward trend, with particularly low turnout among people in their 20s.

- I think this factor may be due to the difficulty in determining what kind of agenda items are on the agenda, what kind of opinions the group has, and what kind of discussions are taking place.

- It is necessary to clearly indicate what kind of opinion each faction has on each proposal.

Contents

- We predict from the given meeting minutes the agree or disagree of the agenda being discussed during that meeting.
  - Create rules for estimating pros and cons.

- We read the factions’ “agree/disagree" opinions on each proposal.

- Our goal is to use the meeting minutes of the Tokyo Metropolitan Assembly and the Ibaraki Prefectural Assembly to create a highly accurate set of rules.

Rule-based in the Tokyo Metropolitan Assembly

- We use the Tokyo Metropolitan Assembly's plenary minutes from 1999-2019.
- Meeting minutes, training data, and test data are from the NTCIR-15 QA Lab-PoliInfo-2 Stance classification task.
- The session, speaker, etc. are described in a json file.

Phase 1:Detection from the final debate

"Speaker": "四十七番（**西崎光子**君）",
“Utterance”: “私は、都議会生活者ネットワーク・みらいを代表し、**第百八十一号議案**に**反対**、その他の知事提出議案に賛成の立場から討論をいたします。…

- Determine the affiliation of the speaker by referring to the dictionary of the party affiliation
- Detecting dissenting opinions from the beginning of the statement of each party's representative
- The speaker's opinion shall be the opinion of his or her party.

Phase 2:When there is a description of the "Opposition to the outside ○○ proposal".

"Speaker": "八十一番（たぞえ民夫君）",
“Utterance”: “日本共産党都議団を代表して、第百六十二号議案外五議案に反対する立場から討論します。…

■ If you are opposed to a large number of proposals together, such as “外 ○○ 議案", the "Speaker" refers to the proposals in the null and gives a label of opposition for the number of ○○+1 from the top of the list.

" Speaker " : " null ",
“ Utterance “:
”…十二月十五日議事日程第四号¥n第一　第百八十一号議案¥n　…　¥n第二　第百八十二号議案¥n　…　¥n第三　第百六十二号議案¥n　…　¥n第四　第二百号議案¥n　…　¥n第五　第二百一号議案¥n　…　¥n第六　第百七十二号議案¥n　…　¥n第七　第百五十四号議案¥n　…　”

第３段階　少数会派の傾向の推定

- Collect the parties that are less likely to answer the questions and estimate whether they are more like the ruling party or the opposition.
  - From Wikipedia and training data
- The party presumed to be more than the opposition will be given the same opinion label as the Communist Party.

If agree or disagree could not be output in the previous steps, give a label of agree.

Tokyo Metropolitan Assembly Experiment Results

	miss	match	accuracy
Phase 1	234	4307	0.9485
+Phase 2	180	4361	0.9604
+Phase 3	164	4377	0.9639

- The addition of the second step increased the accuracy by 1.19%, the addition of the third step increased the accuracy by 0.35%, and the overall accuracy increased by 1.54%.

Rule-based Ibaraki Prefectural Assembly

■We use the minutes of the Ibaraki Prefectural Assembly.

■The first session of 2011 to the fourth session of 2018 will be used as test data, and the first session of 2019 to the second session of 2020 will be used as training data.

Applied to Ibaraki Prefectural Assembly

- We use the minutes of the Ibaraki Prefectural Assembly.
- The first session of 2011 to the fourth session of 2018 will be used as test data, and the first session of 2019 to the second session of 2020 will be used as training data.

Ibaraki	Accuracy	All	match	miss	All opposing proposals	Give the correct opposition	Giving the wrong opposition
All agree	0.8968	10312	9248	1064	1029	12	47
Grant various factions	0.8982	10312	9262	1050	1029	26	47

- The percentage of correct answers was lower than that of the Tokyo Metropolitan Assembly.

Rules added by the Ibaraki Prefectural Assembly

- Use the minutes of the Parliamentary Steering Committee.
- Prediction of approval or disapproval using cos similarity of proposals calculated using BERT.
- Predicting pros and cons using machine learning for BERT with training data.

Use of the minutes of the Council Steering Committee

- Using the minutes of the Assembly Steering Committee of the Ibaraki Prefectural Assembly.
- We use the Parliamentary Steering Committee from 2011-2018.
- Compared to the Tokyo Metropolitan Assembly, it describes the approval or disapproval of specific proposals.

Predicting agree and disagree using cos similarity

- We extract opposing views from training data.
- Enter a list of words in the bill and vectorize them with BERT.
- Calculate the cos similarity of the proposal with the proposals that each faction has opposed in the past.
- If the similarity exceeds 0.98 and 0.99, respectively, the proposal will also be given the opposite label.

Predicting pros and cons using machine learning for BERT

- Create training data.
  - Extraction of bill pairs from past bills of the Communist Party
    - If both are opposite, related labels
    - Disagree and agree, unrelated labels

- Concatenate the two bill word strings and enter them into BERT.

- Training a classification model by inputting vectors from [CLS] into MLP.

- Apply this learning result and disagree if relevant.

Experiment

■ Conduct the experiment in the following 5 ways.

- ①Use the Parliamentary Steering Committee
- ②Use BERT and set the threshold at 0.98
- ③Use BERT and set the threshold at 0.99
- ④Using the training data, machine learned agree and disagree methods in 20 EPOCs of BERT
- ⑤Using the training data, machine learned agree and disagree methods in 100 EPOCs of BERT

Results of Ibaraki Prefecture Assembly Experiment

Ibaraki	Accuracy	All	Total	miss	All opposing proposals	Give the correct opposition	Giving the wrong opposition
①	**0.9935**	7190	7143	47	674	673	46
②	0.9122	10312	9407	905	1029	413	289
③	**0.9143**	10312	9428	884	1029	369	224
④	0.8958	10312	9237	1075	1029	39	85
⑤	0.8964	10312	9244	1068	1029	40	79

- The results showed that the highest accuracy was achieved using the minutes of the Assembly Steering Committee meetings.

Consideration

- In the Tokyo Metropolitan Assembly, the method of estimating the tendency in advance is effective because the minority factions make few statements and their approval or disapproval cannot be read.

- Due to the small size and small number of factions in the Ibaraki Prefectural Assembly, the rule base of the Tokyo Metropolitan Assembly is not effective.

- The method of training data with BERT is not very suitable because it cannot obtain the trend of the opposing proposal of the Communist Party in the Ibaraki Prefectural Assembly.