Supervised Approaches and Dependency Parsing for Chinese Opinion Analysis at NTCIR-8

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Outline

• Introduction
• Linguistic analysis of opinions
• Supervised approaches for subjectivity/polarity classification
• Opinion holder/target identification with dependency parsing
• Official Results
• Conclusion
Introduction

• The NTCIR-8 Multilingual Opinion Analysis Task (MOAT)

• the CityU (HK)’s system
  – the traditional Chinese task
  – four of the five subtasks:
    • opinionated sentence recognition
    • opinion polarity classification
    • opinion holder identification
    • opinion target identification
  – Three runs were submitted
Subjectivity & Polarity Classification
Linguistic analysis of opinions

- Features for opinionated sentence recognition

  - a) The report said the spying work of Putin was not quite successful...

  - b) The financial market was perhaps facing the danger of not being able to provide necessary funds.

- Reporting verbs: verbs indicating speech events

- Polar items: sentiment-bearing items (words or phrases)

- Adverb clues: adverbs frequently co-occurring with opinions.
Linguistic analysis of opinions (cont’d)

• Features for polarity classification
  – a) 報導中引述KGB在德國的上司卡魯金的話說，普
    亭的間諜工作並不特別成功。(The report said
    the spying work of Putin was not quite
    successful...)

  – c) 普亭雖然支持這項法案，但俄國民意對這項法案
    的反對聲浪高漲。((Although) Putin supports this bill,
    but the majority of Russian people is highly against it.)

Negation markers: words used to reverse the polarity of a polar item.

Discourse markers: those may reverse the polarity of previous clause.
Supervised approaches and ensemble techniques

• **Motivation**
  – make full use
    • the manual labeled lexicons
    • annotated corpora
  – the training corpus
    • the sample and test data for NTCIR-6 OAPT (traditional Chinese)
    • the sample data for NTCIR-7 MOAT (traditional Chinese)
System Architecture

1. sample and test data for NTCIR-6 & NTCIR-7 (traditional Chinese)
2. sample data for NTCIR-8 MOAT (traditional Chinese)
Lexical resources

• Lists of Polar item
  – NTU Sentiment Dictionary (NTUSD)
  – *The Lexicon of Chinese Positive Words* (LCPW)
  – *The Lexicon of Chinese Negative Words* (LCNW)
  – CityU’s polar word and phrase list (CPWP)
  – Polar items from sample data of NTCIR-6 OAPT (SIST)
    • marked with the *SENTIMENT_KW* tag

<table>
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<tr>
<th></th>
<th>NTUSD</th>
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<th>LCNW</th>
<th>CPWP</th>
<th>SWST</th>
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the Lexicon-based method

• Identify opinionated sentences
  – check whether a polar item (including adverbs) or a reporting verb occur in it.
  – If yes, then opinionated,
  – Otherwise, not opinionated.
Lexicon adjustment process

Polar item lexicon;
Reporting verb lexicon

Two reasons for this adjustment on a large sentiment lexicon

a) **may contain errors or typos:** especially those polar items extracted from last year’s sample data are not quite clean, such as 隨着 (with), 可以 (be able to), etc.

b) **words could be contextual or not suitable for news domain:** since they are marked with annotators’ own subjectivities;
**Supervised Lexicon Tuning**

- Compute precision for each reporting verb / polar item (on the training data)

- Learn the best threshold combination (threshold for reporting verbs + threshold for polar items)

1. Tune *separately* for two subtasks (i.e. opinionated and polarity)
2. For polarity classification, only filter polar item lexicon, and reporting verbs were not used.
Lexicon adjustment

• Two kinds of items filtered out:
  – 1) noisy terms: actually not reporting verbs or polar items according to our judgment, e.g.
    • 觀光 (sightseeing) in LCPW, 定下 (set) and 前往 (head for) in SKPI;
  – 2) reporting verbs or polar items: may present facts and frequently occur in factual sentences,
    • e.g. 暴雨 (downpour) in NTUSD and 襲擊 (attack) in NTUSD and CPWP.
Combination method

• Combination method for the *opinionated sentence recognition* task:
  – majority voting
  – if two of the three component classifiers label a sentence as opinionated, the sentence would be marked as opinionated;
### Official Results

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### Official Results

#### Combination of SVM, MaxEnt, Supervised Lexicon-based method

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Holder/Target Identification
Opinion Holder & Target

• Opinion holders/targets are more diverse in *news texts* than in product reviews:
  – Holders could be any named entities and noun phrases
  – Targets are more abstract, could be noun phrases, verb phrases or even clauses
Dependency Parsing and Opinion Holders / Targets

a) 俄國外長伊凡諾夫說，北約東向擴張是“邁向錯誤的方向”。

Russian Foreign Minister Ivanov said that NATO's eastward expansion was "towards the wrong direction."
Holder Candidate Generation

- Reporting Verb?
  - Yes
  - Subject?
    - Yes
    - Object/Attri?
      - Yes
      - Holder Candidate Found
    - No
    - Author as Holder
  - No
- No

- Yes
- No

- Headline?
  - Yes
  - Noun before ?
    - Yes
    - Holder in previous sentence
    - No
  - No
- No
Opinion Holder Identification

• Holder Candidate Generation
  – Subject of Reporting Verb
  – Heuristic Rules (HR)

• Candidate Expansion (EP)
  – Attributive modifier
    • e.g. 俄國外長 伊凡諾夫 (Russian Foreign Minister Ivanov)
  – Quantifier modifier and 和/及 (and/or)
    • e.g. 蘇哈托 和另外 兩名 軍方將領 (Suharto and two other army generals)
Opinion Target Identification with Opinion Holder and Opinion-bearing Words

• Target Candidate Generation (Heuristic Rules, HR)
  – Subject in the embedded clause if holder is identified by a reporting verb
    • the subject of the object (verb) of the reporting verb or find (after the reporting verb) the subject whose parent is an opinion-bearing word
  – Subject/object of the whole sentence if no holder is found
  – Remove a target candidate if it is in the holder candidates (called holder conflict, HC)

• Target Candidate Expansion (EP)
  – similar to holder candidate expansion
### Official Results

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the method described above

add more heuristic rules obtained on NTCIR-7 data
Official Results

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a big difference: annotators have significantly different opinions on opinion analysis of news sentences.
Conclusion

• The result show that
  – the combination of supervised lexicon-based approach and machine learning techniques (namely, SVM and Maximum Entropy) is effective for opinionated sentence recognition;
    • No. 1 for opinionated sentence recognition,

  – the dependency parsing-based approach on opinion holder and target identification is effective.
    • No. 2 for identification of both opinion holders and targets,
Conclusion on Subjectivity Classification

• Large sentiment lexicons needs some adaptation on the new domain

• the combination lexicon and machine learning can improve the performance on opinionated sentence recognition
Conclusion on Holder/Target Extraction

• Dependency parsing-based approach on opinion holder and target identification is effective.

• The existence of reporting verbs is a very important feature for identifying opinion holders in news texts;

• The identification of opinion targets should not be done alone without considering opinion holders in news
  – opinion holders are much easier to be identified in news texts
  – the identified holders are quite useful for the identification of the associated targets.
Future Work

• Polarity classification
  – contextual information
  – topic-related features
  – shallow parsing techniques

• Identifying opinion holder/target based only on dependency parsing
  – not robust to the dependency errors
  – to further investigate machine learning approaches by treating dependency structures as features
    • should be more robust to dependency errors
Thanks!

Q & A