

A Multilingual Polarity Classification Method using Multi-label Classification Technique Based on Corpus Analysis

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Abstract

In *NTCIR-7 MOAT*, we participated in four sub-tasks (opinion & holder detection, relevance judgment, and polarity classification) at two language sides: Japanese and English. In this paper, we focused on the feature selection and polarity classification methodology in both languages. To detect opinion and classify the polarity, the features were selected based on a statistical χ -square tests over *NTCIR-6* and *MPQA* corpora. We also compared several multi-label classification methods to classify positive, negative, and neutral polarity. The evaluation results suggested that the coverage of the features in Japanese was acceptable for the opinion analysis in newspaper articles, but there was still a room for improvement in the coverage of the features in English. We also found the result of *SVM voting approach* was slightly better than the results of *Multi-label classification* approach.

1 Introduction

We held a multilingual opinion analysis task twice in *NTCIR-6* and *NTCIR-7* [12, 13]. In *NTCIR-7 MOAT*, we have several different challenging points from the first one as follows:

1. The participants could use *NTCIR-6 OAT corpus*: large size test collection with detailed annotation appropriate for training use.
2. The number of participants who participated at multilingual sides with language portable approaches increased (two participants \Rightarrow eight participants).
3. The task focused on not only sentence-level annotation but also subsentence-level annotation.

For the first & second points, we describe our participation experience in *NTCIR-7 MOAT* at

Japanese and English sides, with the approach based on the feature selection with the statistical analysis in both languages. We investigate the effective features of opinion detection and polarity classification based on χ -square tests over *NTCIR-6 OAT* and *MPQA* corpora. For opinion and holder detection, we took an *author* and *authority* classification approach [11], which was the same approach used in *NTCIR-6*, but based on the newly selected features. For polarity classification, we also compared two multi-label classification techniques: *SVM voting* and *Mulan* [16].

This paper is constructed as follows. In Section 2, we describe our methodology in *NTCIR-7*. Section 3 gives the evaluation results and discussion. Finally, we conclude our research in Section 4.

2 TUT Opinion Detection System in NTCIR-7

2.1 Overview

The opinion detection system overview in *NTCIR-7 MOAT* is described in Figure 1. This architecture was implemented both in Japanese and English. Our opinion detection system was based on the features selected from the significance of frequency in *NTCIR-6 OAT* and *MPQA corpora* and classified sentences into opinionated sentences expressed from author viewpoints or from authority viewpoints, as proposed in [11]. These differentiations were passed into opinion holder identification system. In relevance judgment and polarity classification system, author & authority opinions were not differentiated. In the polarity classification system, the features were also selected based on the significance of frequency in *NTCIR-6 OAT* and *MPQA corpora*.

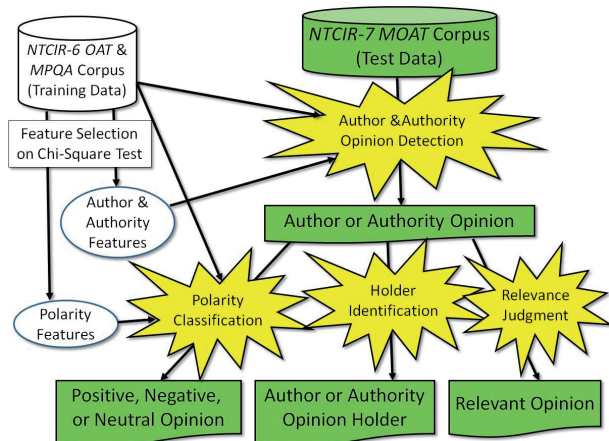


Figure 1: TUT System in NTCIR-7 MOAT

2.2 Feature selection

We selected the features for author and authority opinion detection and polarity classification based on χ -square tests on NTCIR-6 OAT corpus and MPQA corpus [17]. The feature examples shown in Table 3 and Table 4 were used for opinion detection and polarity classification in Japanese. The features shown in Table 5 and Table 6 were used for opinion detection and polarity classification in English. Note that the features in Japanese were suggested partially as examples due to the limit of paper space, although all the features in English were shown.

Feature selection methodology in Japanese

For author & authority opinion detection and polarity classification in Japanese, we checked the following four features:

1. The semantic primitive of the grammatical subject that was the term positioned in previous on the subject case marker “ga” (kaku-joshi) and “ha” (kakari-joshi) was abstracted using *taigen-imiso* (noun type semantic primitive) in Japanese thesaurus Bunrui-Goi-Hyou [9].
2. The semantic primitive of the action element such as verb, sahen-noun (action noun), adjective, adverb, or auxiliary verb was abstracted using *yougen-imiso* (verb type semantic primitive) in Japanese thesaurus Bunrui-Goi-Hyou.
3. All syntactically dependent clauses (*bunsetsu*) were extracted as a syntactic pair. The dependency relationship was checked using Cabocha [6] and the maximum distance of dependency was set as 2. We also extracted the

pairs of the following two elements in a clause as syntactic pairs.

- (a) Normal noun (except action noun or suffix noun) or unknown word.
- (b) Verb, adjective, or action (*sahen* or *keiyoudousi*) noun, that follows the first element.

The source element and the sink element of a syntactic dependent pair were abstracted as follows:

- (a) The source element was replaced as the following elements.
 - i. The named entity tagged with Cabocha was used as a primitive in the first priority.
 - ii. If the named entity information was not tagged in the source element, *Taigen-imiso* (Noun type semantic primitive) was looked up by using the entries in *Bunrui-Goi-Hyo*.
 - iii. Otherwise, a base form of the term was used. Note that the consecutive nouns were concatenated into one element.

If a case marker was found in the element, it was also attached with the result using “=” symbol.

- (b) The sink element was replaced using *Yougen-imiso* (Verb type semantic primitive) using the entries in *Bunrui-Goi-Hyo*. The entry was also looked up by attaching “する (suru)” to action noun, which was suffix used for conversion from noun to verb in Japanese. If no entry was found, a base form of the term was used.

4. All terms with base form were extracted using morpheme tagger *Chasen*¹.

We investigated all features of these four types in the NTCIR-6 OAT corpus as follows.

1. In author & authority opinion detection case, if a feature appeared significantly more in the author (authority) opinion sentences than in all the other sentences, it was regarded as a useful feature for opinion detection.
2. In polarity classification case, if a feature appeared more frequently in the sentences in one polarity type (for example, positive) than sentences with other polarity types (for example, negative or neutral), it was regarded as a useful feature for polarity classification.

¹<http://chasen.naist.jp/hiki/ChaSen/>

Note that the statistical significance was checked based on χ -square test and the significance probability of two-sided test was 5%. To avoid the error from low frequency data, we only investigated the features which appeared more than five times in the *NTCIR-6 OAT corpus*. The examples of the selected features are shown in Table 3 and Table 4.

Feature selection methodology in English

In English, the features of author and authority opinion detection and polarity classification were selected in a similar way as in Japanese. They are selected based on the analysis with χ -square test using both *MPQA* and *NTCIR-6 English corpora*. We investigated the features as follows.

1. We utilized two type syntactic pairs: (a) grammatical subjects and verbs (governors), (b) auxiliary verbs and verbs. Syntactic dependency was checked using Minipar [7].
 - (a) The subject element was abstracted by the following elements.
 - i. If any element was not found in the *subj* position, *ZeroProN* element was assigned. Otherwise, if the antecedent was found, the subject element was replaced by it.
 - ii. It was replaced by the named entities tagged using OAK [14].
 - iii. It was replaced by the part of speech information tagged using OAK unless it was pronoun (*PRP*).
 - (b) The verb element was abstracted by the following elements.
 - i. It was replaced by the communicative verb type and attitude type in appraisal lexicon [1].
 - ii. It was replaced by the four part of speech types as *SbjVerb*, *SbjAdj*, *SbjNoun*, or *SbjAdv* in the subjective lexicon [18].
 - iii. Otherwise, it was replaced by the part of speech tagged with OAK.
2. Subjective term features were categorized by nouns, adjectives and adverbs, any part of speech (anypos) from the entries in the subjective lexicons [18]. The POS was filtered by OAK.
3. Subjective verb type features were abstracted as the same way in the syntactic pair feature case, but they were not replaced by the part of speech.
4. We used three count features: *cntopnoun*, *cntopadj*, and *cntopadv* that represented the numbers of the respective subjective nouns, adjectives, and adverbs in the sentence matched with the entries in the subjective lexicon [18].
5. We also used polarity term type features.
 - (a) The features of adjective, adverb, or verb terms were abstracted using adjective entries [2] which contained 1,914 word entries with five polarity types as *POLP*, *POLM*, *GRAP*, *GRAM*, and *DA*.
 - (b) The features of nouns were abstracted using named entity information in OAK.
 - (c) If the term was not abstracted with above two methods, the term was abstracted using the General Inquirer [15] which contained 1,168 word entries with four polarity types as *IPS*, *INS*, *IPW*, and *INW*.
 - (d) If term was not found in all the above lexicons, a hyperonym term using WordNet [8] was used as a feature.
6. Several other keywords was also selected as features for author and authority opinion detection.

Note that the statistical significance was checked based on χ -square test over both *MPQA* and *NTCIR-6 OAT corpora*. In author and authority opinion detection case, the selected features were significantly frequent in both corpora. In polarity classification case, the annotation strategy seemed slightly inconsistent in both corpora, so the selected features were significantly frequent at least in one corpus. However, if the average frequency of the features were less in the polarity sentences in one corpus even with the significantly frequent case in other corpus, they was discarded. The significance probability of two-sided test was 5%. To avoid the error from low frequency data, we only investigated the features which appeared more than five times in the *NTCIR-6 OAT corpus*. The selected features are shown in Table 5 and Table 6.

2.3 Polarity classification with multi-label classification

For polarity classification, we need to classify three labels: positive, negative, and neutral. Therefore, we need to implement multi-label classification technique. We implement the following two approaches:

1. We implemented a voting approach with three SVM classifiers: positive classifier, negative classifier, and neutral classifier. The features selected based on Section 2.2 discussion were used for each classifier. This was implemented using *SVM^{light}* [3] and the cost (j) parameter was tuned using sample data provided in *NTCIR-7 MOAT*.
2. We also implemented another multi-label classifier by using *Mulan* system [16], which was developed in *Aristotle University of Thessaloniki* and built on top of *Weka*². Note that we could not differentiate the feature sets according to three polarity types (positive, negative, and neutral) in this classifier, so we combined them into one feature set. In *Mulan*, we can choose classification methods such as Multi-label *k*NN classifier. After the small preliminary experiments, we decided to use *label power set classifier* in this time.

In both classifiers and in both English and Japanese languages, we used *NTCIR-6 OAT corpus* as training data.

2.4 Opinion & holder detection

The opinion detection approach was based on the combined results from author and authority opinion detection system. The author and authority opinion detection system was also implemented using *SVM^{light}*. The features were also selected based on the discussion in Section 2.2. The parameter tuning strategy and the training data is the same approach in the polarity classifier case.

For opinion holder identification, our architecture was based on author & authority opinion detection, as shown in Figure 2.

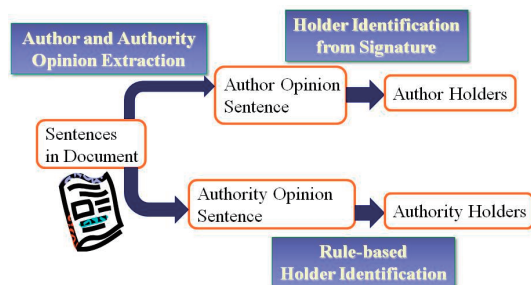


Figure 2: Opinion holder identification

Author opinion holder was extracted from author opinion sentences. For authority opinion sentences in English, based on the results of *NTCIR-6*, we followed and extended the authority opinion

²<http://www.cs.waikato.ac.nz/ml/weka/>

holder extraction approach used by the *ICU-KR* team [5] for the English side. We implemented the following opinion holder extraction rules:

1. We extracted the noun phrases that were followed by “according to”.
2. We extracted the phrases that were governed by “say” or “said”. If “I” was governed, the holder should be the “author”.
3. We extracted the noun phrases that were followed by the word “By”.
4. We extracted the phrases that were governed by the word “by”.
5. We extracted the subjects governed by opinion verbs using lexicons [18] and several communicative verbs, such as “claim”, “express”, “announce”, “talk”, “tell”, “note”, and “deliver”.
6. We extracted the interviewer or interviewee markers using heuristic rules.
7. We extracted the “person” elements from the sentence using a named entity tagger OAK³.

2.5 Relevance judgment

For relevance judgment, our approach is the same as in *NTCIR-6 OAT* [10]. Our relevant sentence judgment was based on the cosine similarity approach using TF.IDF term weights. The target parts of speech are: self-sufficient noun, verb, adjective, and adverbs. The IDF value was based on the local document frequency, and the number of documents was computed from the documents in the test collection.

3 Evaluation

3.1 Evaluation results in *NTCIR-7 MOAT*

The *NTCIR-7 MOAT* evaluation results of opinion detection, relevance judgment, polarity classification, and holder identification at both Japanese and English sides were shown in Table 1. Note that opinion holder evaluation results were not provided in Japanese because there was no other participants in *NTCIR-7 MOAT* and evaluation was not conducted due to time constraints.

³<http://nlp.cs.nyu.edu/oak/>

Table 1: Evaluation results in *NTCIR-7 MOAT* at Japanese and English sides

Lang	Run ID	L /S	Opinionated			Relevance			Polarity			Opinion Holder		
			P	R	F	P	R	F	P	R	F	P	R	F
J	1	L	0.6742	0.562	0.613	0.5527	0.2925	0.3825	0.4596	0.214	0.292			
J	2	L	— (same in TUT-1)			— (same in TUT-1)			0.4283	0.1994	0.2721			
J	1	S	0.5416	0.6199	0.5781	0.3062	0.3357	0.3203	0.4806	0.2417	0.3216			
J	2	S	— (same in TUT-1)			— (same in TUT-1)			0.4535	0.2281	0.3035			
E	1	L	0.3185	0.4092	0.3582	0.2092	0.1755	0.1909	0.1943	0.1830	0.1885	0.3923	0.2833	0.3290
E	2	L	0.3282	0.2562	0.2878	0.1647	0.1136	0.1344	0.1896	0.1142	0.1425	(0.3656)	(0.1689)	(0.2311)
E	3	L	— (same in TUT-1)			— (same in TUT-1)			0.1621	0.1527	0.1573			
E	1	S	0.0961	0.4149	0.1561	0.0740	0.1853	0.1057	0.0569	0.2180	0.0903	0.1250	0.2829	0.1735
E	2	S	0.1039	0.2724	0.1504	0.0615	0.1220	0.0817	0.0484	0.1185	0.0687	(0.1257)	(0.1821)	(0.1487)
E	3	S	— (same in TUT-1)			— (same in TUT-1)			0.0359	0.1374	0.0569			

3.2 Discussion

Opinion detection

For opinion detection, we were satisfied with the results at Japanese side, but were not at English side. We doubt our feature selection methodology for author and authority opinion detection might be too strict because we supposed that the selected feature should be significantly appear both in *NTCIR-6 OAT* and MPQA corpora. This caused the less number of features in English than that in Japanese, as shown in Table 3 and 5.

Polarity classification

For polarity classification, the results using *SVM voting approach* were shown as RunID 1 and the result using *Mulan classifier* was shown as RunID 2 in Japanese and as RunID 3 in English. Basically, the results of *SVM voting approach* were better than the results of *Mulan*. Note that *SVM approach* need to tune cost parameters according to each classifier and we tuned them by using sample data provided in *NTCIR-7 MOAT*, but we did not tune any parameters in *Mulan*. We concluded that these results came from that we could not discriminate the different type of features according to each polarity types in *Mulan*.

Table 2: Confusion matrix with *SVM voting* and *Mulan* approaches

	Lang	Method		Assessment (Lenient)			
				Pos	Neg	Neu	
S y s t e m	J	SVM voting	Pos	15	3	51	
			Neg	9	66	349	
			Neu	18	52	329	
			(No)	63	173	788	
			<i>Mulan</i>	Pos	15	12	105
				Neg	16	89	346
	Neu	11		20	278		
	(No)	63		173	788		
	E	SVM voring		Pos	18	30	4
				Neg	64	136	18
			Neu	25	37	3	
			(No)	165	318	40	
<i>Mulan</i>			Pos	18	17	2	
			Neg	49	102	12	
	Neu	40	84	11			
	(No)	165	318	40			

We also investigated a confusion matrix from *SVM voting* and *Mulan* as in Table 2. You could confirm that the results using *Mulan* classifier were sometimes better than the results using *SVM* classifier, for example, negative classifier in Japanese. In future, we plan to implement Multi-label classification technique to discriminate three polarity types as inputs.

Relevance judgment

Our relevance judgment approach is not trivial and simple approach. This approach proved still effective to some extent at Japanese side, but from other participant’s investigation, we feel the results will improve with considering surrounding context. We assume that the low quality in English came from the different tendency of the annotation results because the human assessors annotated seemed to judge *relevant* in almost all sentences (in lenient case, more than 99%).

Opinion holder identification

For opinion holder identification, we only evaluated the results at English side. In RunID-1, we conducted the holder identification by the proposed method. In RunID-2, we also implemented the result not to differentiate author and authority opinion sentences and extract holders simply by opinion holder extraction rule, explained in Section 2.4. I also added the evaluation results of RunID-2, which is shown within brackets in Table 1, by using semi-automatic evaluation script provided from *NTCIR-7 MOAT* organizer. As a result, we found the precision of the results was not so different, but the recall decreased if we did not differentiate the author and authority sentences.

4 Conclusion

In this paper, we discussed the feature selection method based on χ -square test over *NTCIR-6*

OAT and MPQA corpora. We found that the features in Japanese were effective for opinion detection and polarity classification. In English, we also selected the slightly less features and they were also effective to some extent, but the coverage seems slightly to be limited.

We also compared *SVM voting method* and *multi-label classification technique* and found that *SVM voting approach* is slightly better with tuning cost parameter. However, the input features of multi-label classification were not differentiated according to each polarity: positive, negative, or neutral. In the next step, we plan to implement another polarity classification method by extending *multi-label classification* to utilize multiple feature sets according to polarity types as inputs.

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Table 3: Examples of Syntactic Pairs, Elements, and Keywords Clues in Author and Authority Opinion Extraction in Japanese

Feature Type	Author Clues	Num	Authority Clues	Num
"Subject" (shared)	問答 (Q & A), 交渉 (negotiation), ...	23	人物 (human), 国民・住民 (nation), ...	32
"Action"	生物 (creature), 事柄 (affair), その他・他 (demonstrative), 感覚 (sense), 順位記号 (symbol), ...	7		7
(shared)	計画・案 (plan), 見る (see), 仮定 (assume), 意思 (intend), 判断・推測・評価 (judge, infer), 真偽・是非 (true, false, right, wrong), ...	26	表情・態度 (express, attitude), 信念・努力・忍耐 (believe, effort), 話・談話 (speak), 予期 (expect), 授受 (give & take), 希望 (hope), ...	50
Syntactic Pairs	PERSON - 会議・論議 (discuss), 義務 (duty)=を - 約束 (promise), (wo) 損得 (gain and loss)=を (wo) 授受 (receive), 会議・論議 (confer- ence) - 判断・推測・評価 (evaluate), ...	177	PERSON=は (ha) 話・談話 (speak), PERSON=は - 賛否 (pros & cons), ORGANIZATION - 表現 (express), PERSON=は (ha) 批評・弁解 (criticize), ...	189
(shared)	取引 (trading) - 終了・中止・停止 (stop), 未来 (future) - 詳細・正確・不思議 (detail), ...	15		15
Keyword	安全 (safe), 明らか (clear), たゞ (if), もちろん (of course), 厳しい (strict), にもかかわらず (although), られる (be-ed), 要求 (request), 判断 (judgment), ...	386	高い (high), 安定 (stable), 重要 (important), いい (good), すごい (great), ほしい (want), 自由 (free), 素晴らしい (wonderful), ...	464
(shared)	おかしい (strange), 大きい (big), 必要 (necessity), ない (not), 可能 (possible), 危険 (danger), ...	77		77

Table 4: Examples of Syntactic Pairs, Elements, and Keywords Clues in Polarity Judgment in Japanese

Feature Type	Positive Clues	Num	Negative Clues	Num	Neutral Clues	Num
"Subject"	機関 (organization), 名 (name), ...	5	問答 (Q&A), 家族 (family), ...	11	経済・収支 (economy), ...	8
"Action"	思考・意見・疑い (think, opinion), 才能 (ability), 賛否 (pros & cons), 因果 (cause), 快・喜び (pleasure), 表情・態度 (expression, attitude), ...	11	脅迫・中傷・愚弄 (threat, defame), 過不足 (excess and deficiency), 威厳・行儀・品行 (dignity, manner), 恐れ・怒り・悔しさ (fear, angry), ...	21	意味・問題・趣旨 (mean, issue), 呼び掛け・指図 (address, direct), 価格・費用・給与 (price, cost), 経済・収支 (economy, balance), ...	21
Syntactic Pairs	PERSON=を (wo) 応接・送迎 (reception), 言論 (argument) - 賛否 (pros & cons), 会議・論議 (confer- ence) - 行為・活動 (act), 詳細・正確・不思議 (detail) - 思考・意見・疑い (think), ...	49	自他 (self & others)=を (wo) ORGANIZATION - 救護・救援 (rescue), LOCATION= は (ha) 批評・弁解 (criticize), 生理・病気 (dis- ease) - 批評・弁解 (criticize), ...	35	景 (scene)=は (ha) 詳細・正確・不思議 (detail), 経済・収支 (econ- omy, balance) - 思考・意見・疑い (think), 人事 (human af- fairs) - 会議・論議 (discuss), 景 (scene)=は (ha) 詳細・正確・不思議 (detail), ...	55
Keyword	称賛 (admire), 喜ぶ (enjoy), 満足 (satisfy), 前進 (advance), 素晴らしい (wonderful), 安定 (stable), 感動 (emotion), すごい (amazing), ...	199	ない (absent), 厳しい (strict), 難しい (difficult), 危険 (danger), 不安 (anxiety), 疑問 (interrogation), 重大 (critical), 困難 (difficulty), ...	186	必要 (necessity), 可能 (possible), ほしい (want), 不明 (unclear), 確実 (assurance), 慎重 (careful), 大切 (precious), 大事 (important), ...	170

Table 5: Syntactic Pairs, Polarity Term Lists, and Keywords Clues in Author and Authority Opinion Extraction in English

Feature Type	Author Clues	Num	Authority Clues	Num
"auxiliary verb" - "verb"	will - have, cannot - SbjVerb, can - say, may - be	4	do - declare, to - be, could - SbjVerb, to - SbjVerb	4
"subject" - "verb"	WDT - SbjVerb, NN - say, I - VB, NN - VBZ, ZeroProN - conjecture, VBZ, It - JJ, it - declare, ZeroProN - VBD, NNS - VBP, they - say, NNP - VB, WDT - VB, He - say, NNP - VBD, it - VBZ, ZeroProN - JJ, ZeroProN - VB, DT - VBZ, ZeroProN - SbjVerb, It - VB, it - SbjVerb	21	POS - NN, they - attitude, NNS - SbjVerb, IN - judgment, I - declare, GPE - VB, GPE - VBG, ZeroProN - SbjAdj, We - VBP, NN - SbjVerb, he - SbjVerb, I - SbjVerb, NNS - attitude, NNS - judgment, NNP - SbjVerb, PERCENT - VBD, GPE - SbjVerb, he - declare, we - SbjAdj, he - SbjAdj, we - VB, NNS - say, they - SbjVerb, he - judgment, IN - SbjVerb, DT - SbjVerb, I - VBP	28
(shared)	meet, include, demonstrate, SbjVerb, make, prevent, appear, be, seem, SbjNoun, become, were	12	judgment, express, denied, declare, tell, characterize, admire, advise, have, apologize, voice, expand	12
subjective verb type (shared)	add, say	2		2
subjective adjective/adverb	cntopadj, cntopadv, tragic, vicious, open, worse	6	unfair, angry, firmly	3
subjective noun	cntopnoun, virtue, propaganda, failure, diplomacy, power, influence, enemy, doubt, right, humanity, resistance, excuse, stability	14	harassment, fear, opposition	3
subjective anypos	must, certainly, should, merely, unfortunately, real, perhaps, rather, seem, however	10	condemn	1
polarity term type	humaneness, education, defense, thing	4	report	1
other keywords	“, content, display, perpetrate, agency, discuss	6	relationship, century, spokesman, „, ministry	5

Table 6: Syntactic Pairs, Polarity Term Lists, and Keywords Clues in Polarity Judgment in English

Feature Type - "auxiliary verb" - "verb"	Positive Clues	Num	Negative Clues	Num	Neutral Clues	Num
"auxiliary verb" - "verb"	to to to will we I NNP PERSON he wood GPE admire judgment GPE I I NN NN NN NNP NNP NNP NNP NNS NNS PERSON he he she	4	do do to to GPE EX GPE GPE IN IN JJ NN NN NN NNP NNS NNS One PERSON POS S She WDT WP ZeroProN she	4	could to	2
"subject" - "verb"	promote attract set up contribute VB VBD VBN VEZ VBD say admire judgment SbjAdj I NN NN NN NNP NNP NNP NNP NNS NNS PERSON he he she	25	do do to to GPE EX GPE GPE IN IN JJ NN NN NN NNP NNS NNS One PERSON POS S She WDT WP ZeroProN she	25	CD GPE GPE IN JJ NNP We it it we we EX EX NN NN NN NN NN NN NNS ZeroProN ZeroProN ZeroProN ZeroProN ZeroProN he it they	26
subjective verb type	have, call, continue, play, bring, promote, strengthen, act, contribute, demonstrate, own, generate, broaden, be, admire, judgment, tell, express, contain, reduce, attract, voice, alter	22	were, advise, cover, pose, deliver, whitewash, SbjVerb, have, say, characterize, judgment, order, release, charge, draw, complain, plunge, gather, deem, term, notice, label, rely	23	go, put, prepare, let, stay, cope, preside, determine, catch, lift, undertake, escape, supervise, resort, be, make, declare, attitude	18
subjective adjective/adverb	colorful, confident, cooperative, credible, exemplary, glad, peaceful, pleased, popular, optimistic	23	cautions, central, disadvantageous, erroneous, evil, exclusive, headline, illegitimate, impartial, intense, left-leaning, massive, odd, opportunistic, even, systematic, murk, undonated, visible	30	alert, essential, fair, immediate, important, indispensable, irrational, original, unconstitutional, vital, even, strictly, untold	13
subjective noun	breakthrough, comment, dream, genius, peace, persistence, player, pleasure, reconciliation, remark, respect, appreciation, approval, champion, cooperation, confidence, contribution, esteem, friendship, goodwill, gratitude, hope, knock, pledge, praise, recognition, reform, resolve, restoration, significance, split, support, supporter, understanding	34	danger, impression, lack of mistake, nature, reaction, sentiment, thought, abuse, accusation, activist, anger, blame, condemnation, constraint, critic, criticism, denunciation, destruction, discontent, dissatisfaction, fear, frustration, gaffe, harm, interference, intimidation, irregularity, motive, objection, opposition, outcry, protest, refusal, reluctance, shock, sorrow, starvation, suspicion, terrorism, threat, treason, violation, wrath, entomozoa	45	discrimination, grant, harassment, need, progress, repatriation, wisdom, peace	8
subjective anypos	achievement, good, really, wonderful, although, champion, grateful, sensible, show, welcome	10	claim, furthermore, seriously, wrong, against, angrily, besides, condemn, critical, disapprove, erroneous, odd, too, unreasonable	14	therefore, must, should, so, would	5
polarity term type	7/5, quality, imbibant, improvement, label, phenomenon, accuracy, pal, order, Asian, transport, corruption, maneuver, section, imagination, northbound, POLP activity, capacity, clergyman, affect, argumentation, gathering, convey, unit, continent, decrease, degree, talk, advocate, support, agreement, approval, conversation, measure, wish, drive, feeling, cooperation, knowing, anticipation, meet, capitalist, keep, acceptance, equivalent, energy, union, furniture, affair, presentation, weekday, arouse, applaud, executive	60	instrumentality, prestidigit, substance, male, politician, affirm, falsity, note, response, motto, crime, island, damage, PALS, EGP, PDA, MDD, PDA, MDD, PDA, MDD, PDA, MDD, government, vote, document, title, associate, composer, action, statement, coercion, judgment, charge, choice, division, care, spokesperson, race, disapproval, objection, decision, react, professional, hominid, reformer, comment, press, crime, attach, aggression, neckwear, put, anthropologist, reject, whole, hit, resident, knock, watch, designate, complain, emotion, accusation, collapse, display, anger, beat, denial, Russian, prejudice, penetrate, poverty, weekday, eucase, larceny, dismiss, disapprove, formulation, disappointment, handwear, reorient, misbehavior, disappointment	83	valuation, content, system, match, abroad, head, control, organism, idity, questioning, restate, academician, flee, /MW, normality, accessible, specify, overabundance, anomaly, complexity, evaluate, property, phenomenon, order, part, category, rede, see	33