Yamraj: Binary-class and Multi-class based Textual Entailment System for Japanese (JA) and Chinese Simplified (CS)

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Abstract

The experiment has carried out as part of the participation in Recognizing Inference in TExt and Validation (RITE-VAL) at NTCIR-11 for Japanese and Chinese.

One run for Binary-class (BC) subtask and one for Multi-class (MC) subtask has been submitted for Japanese (JA) System Validation, one run for MC subtask has been submitted for Chinese Simplified (CS) System Validation.

The Textual Entailment (TE) system used the web based Google translator system for Machine Translation purpose. The system is based on Support Vector Machine that uses features from lexical similarity, lexical distance, and syntactic similarity.

Evaluation Track Overview

Organizer arranged the evaluation track *Recognizing Inference in TExt and Validation* (RITE-VAL) task (*Matsuyoshi et al., 2014*) in NTCIR-11 for third time.

The RITE-VAL has two subtasks: Fact Validation and System Validation subtask for Chinese-Simplified (CS), Chinese-Traditional (CT), English (EN), and Japanese (JA) and semantic relation between two texts such as entailment, contradiction, and independence.

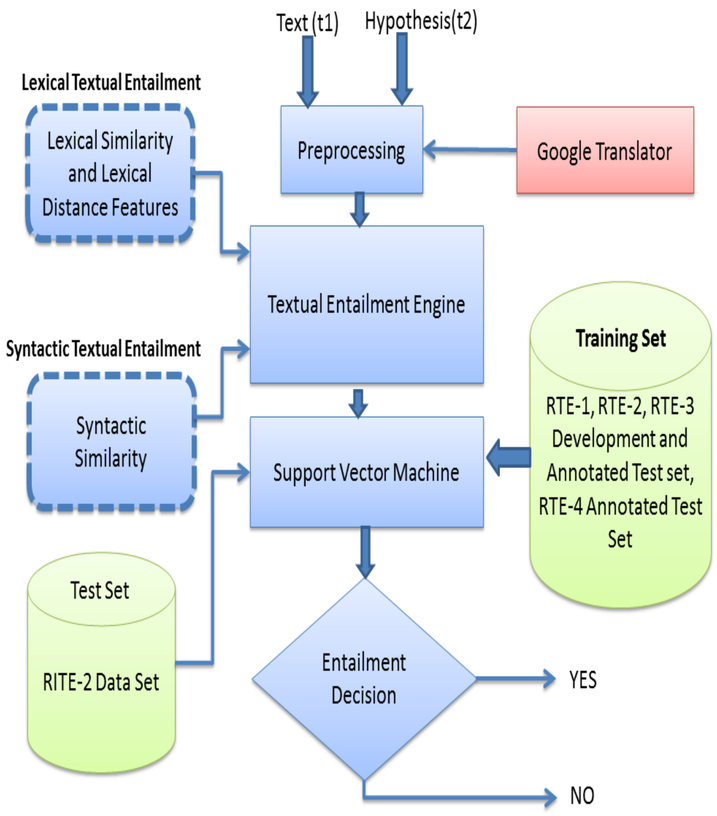


Figure 1. System Architecture

System Architecture

Various components of the textual entailment recognition system (*Pakray et al., 2009; Pakray et al., 2011; Pakray et al., 2013*) are

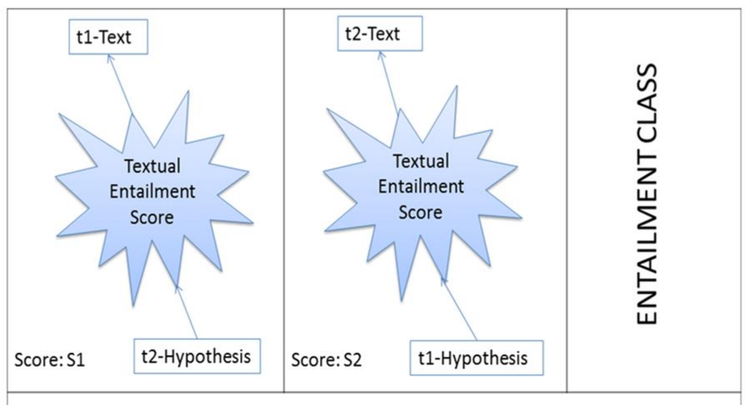
i. Pre-processing module
ii. Textual Entailment module
    a. Lexical Entailment
    b. Syntactic Entailment
iii. Support Vector Machine
iv. Entailment Decision module.

The system architecture is shown on Figure 1. The system is a combination of different rules working on various lexical knowledge sources, lexical distance, and syntactic similarity. The system computes the entailment decision using the outcome from the each of these rules.

i. **Pre-processing**: The pair (t1, t2) of JA and CS converted to English (t1, t2) using the Google Translator.
ii. **Textual Entailment**: It is based on Lexical and Syntactic. Features.
    a. **Lexical Entailment** :
        1. WordNet based Unigram Match
        2. Bigram Match
        3. Longest Common Subsequence (LCS)
        4. Skip-grams
        5. Stemming
        6. Named Entity Match
        7. Lexical Distance

    b. **Syntactic Entailment**: The dependency relations are identified by the Stanford Parser for each text and the hypothesis pair. The hypothesis relations are then compared with the text relations, such as Subject-Verb Comparison, WordNet Based Subject-Verb Comparison, Subject-Subject Comparison, Object-Verb Comparison, etc

iii. **Support Vector Machine (SVM)**: The LibSVM has been used to find the textual entailment relation. The system has used LIBSVM for building the model file. The TE system has used the following data sets: RTE-1 development and test set, RTE-2 development and annotated test set, RTE-3 development and annotated test set, RTE-4 annotated test set to deal with the two-way classification task for training purpose to build the model file. The LIBSVM tool is used by the SVM classifier to learn from this data set. For training purpose, 3967 text-hypothesis pairs have been used. After training the system, it has been tested on the RITE-VAL. Finally, system gives the entailment score with entailment decisions (i.e., "Y" / "N").



Score (S1)	Score (S2)	
71.341211	62.142114	FORWARD
72.433232	72.142334	BIDIRECTIONAL
53.424452	12.5666	INDEPENDENCE
64.245211	69.523423	CONTRADICTION

Figure 2. Output of Entailment class

Multiclass Identification

The system compares two score S1 (t1 as Text and t2 as Hypothesis) and S2 (t1 as Hypothesis and t2 as Text) values as obtained from the BC Class Identification to take the four-class entailment decision. The output of entailment class is shown on Figure 2.

Forward: If the score S1, i.e., the mapping score with t1 as text and t2 as hypothesis is greater than the score S2, i.e., mapping score with t2 as text and t1 as hypothesis, then the entailment class is "forward".

Bidirectional: Similarly if both the scores S1 and S2 are equal the entailment class is "bidirectional" (entails in both directions).

Independence: If the individual scores S1 and S2 fall below a certain threshold, again set based on the observation in the training file, the system concludes the entailment class as "independence".

Contradiction: If S1 is less than S2 then the entailment class as "contradiction".

Evaluation Result

The RITE-2 BC task result is shown in Table 1. The RITE-2 MC task result is shown in Table 2.

Table 1. Results for BC Task

Language	MacroF1	Accuracy
JA	47.43	44.92
CS	49.25	49.24

Table 2. Result for MC Task

Language	MacroF1	Accuracy
CS	25.08	23.71

Conclusion & Acknowledgement

This system used web based machine translation i.e. Google Translator. By this translation Textual Entailment system missed some chunk of words and it also effected in final results. In the future I will add some semantics part for improving my result.

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