IMTKU Textual Entailment System for Recognizing Inference in Text at NTCIR-11 RITE-VAL

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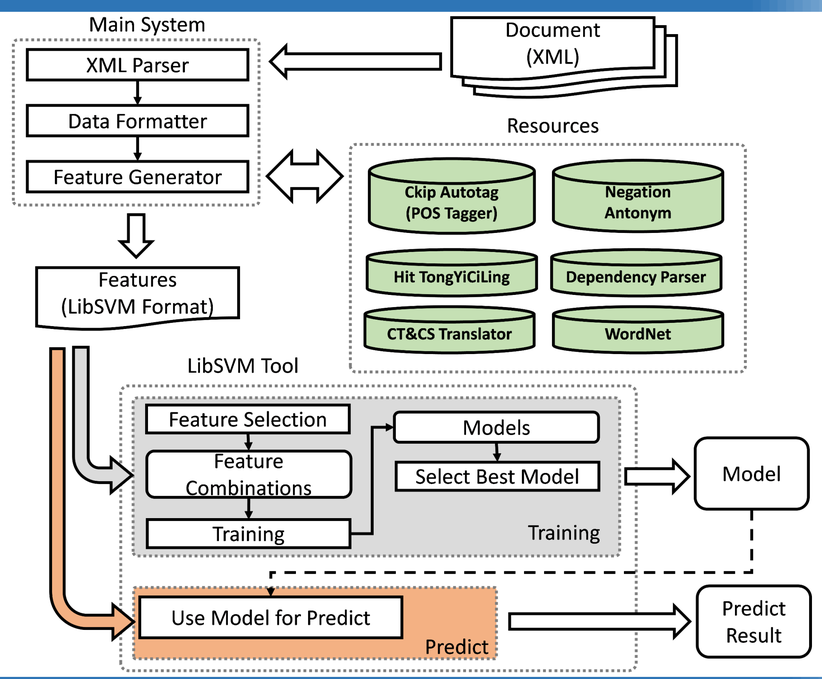
In this paper, we describe the IMTKU (**I**nformation **M**anagement at **T**am**K**ang **U**niversity) textual entailment system for recognizing inference in text at NTCIR-11 RITE-VAL (Recognizing Inference in Text). We proposed a textual entailment system using a Statistics approach that integrate semantic features and machine learning techniques for recognizing inference in text at NTCIR-11 RITE-VAL task. We submitted 3 official runs for BC, MC subtask. In NTCIR-11 RITE-VAL task, IMTKU team achieved 0.2911 in the CT-MC subtask, 0.5275 in the CT-BC subtask; 0.2917 in the CS-MC subtask, 0.5325 in the CS-BC subtask.

System Architecture



Methods for Official Runs

• RITE-VAL-IMTKU-CT-BC Subtask

RITE-VAL-IMTKU-CT-BC-01
Tools: CKIP AutoTag, LibSVM
Resources: Bilingual Wordnet (SINICA BOW)
Method: Statistics approach (LibSVM Tool) for NTCIR-11 RITE-VAL.
Feature Extraction from normalized t1 and t2. Measure similarity match between t1 and t2.
Multiple Features used (Antonym, Negation, String Length and Length Ratio and Length Difference, LCSS, Char-Based Edit Distance, Noun/Verb Number, Wordnet Similarity and Ratio and Minimum) in SVM.

RITE-VAL-IMTKU-CT-BC-02
Tools: CKIP AutoTag, LibSVM
Resources: Bilingual Wordnet (SINICA BOW), HIT TongYiCiLing (HIT-TYCL)
Method: Statistics approach (LibSVM Tool) for NTCIR-11 RITE-VAL.
Feature Extraction from normalized t1 and t2. Measure similarity match between t1 and t2.
Multiple Features used (Antonym, Negation, Word Based Similarity, LCSS , Word Length and Length Ratio and Length Difference, Word-Based Edit Distance, Noun/Verb Number, Wordnet Similarity and Ratio and Minimum) in SVM.

RITE-VAL-IMTKU-CT-BC-03
Tools: CKIP AutoTag, LibSVM
Resources: HIT TongYiCiLing (HIT-TYCL)
Method: Statistics approach (LibSVM Tool) for NTCIR-11 RITE-VAL.
Multiple Features used (Antonym, Negation, String Length and Length Ratio and Length Difference, LCSS, Char-Based Edit Distance, Noun/Verb Number, Word Length and Length Ratio and Length Difference, Word-Based Edit Distance) in SVM.

• RITE-VAL-IMTKU-CT-MC Subtask

RITE-VAL-IMTKU-CT-MC-01
Tools: CKIP AutoTag, LibSVM
Resources: Bilingual Wordnet (SINICA BOW), HIT TongYiCiLing (HIT-TYCL)
Method: Statistics approach (LibSVM Tool) for NTCIR-11 RITE-VAL.
Feature Extraction from normalized t1 and t2. Measure similarity match between t1 and t2
Multiple Features used (Antonym, Negation, Word Based Similarity, LCSS , Word Length and Length Ratio and Length Difference, Word-Based Edit Distance, Noun/Verb Number, Wordnet Similarity and Ratio and Minimum) in SVM.

RITE-VAL-IMTKU-CT-MC-02
Tools: CKIP AutoTag, LibSVM
Resources: HIT TongYiCiLing (HIT-TYCL)
Method: Statistics approach (LibSVM Tool) for NTCIR-11 RITE-VAL.
Feature Extraction from normalized t1 and t2. Measure similarity match between t1 and t2.
Multiple Features Antonym, Negation, String Length and Length Ratio and Length Difference, LCSS, Word Semantic Similarity) in SVM.

RITE-VAL-IMTKU-CT-MC-03
Tools: CKIP AutoTag, LibSVM
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Multiple Features used (Antonym, Negation, String Length and Length Ratio and Length Difference, LCSS, Word Semantic Similarity, Word Length and Length Ratio and Length Difference, Char-Based Edit Distance, Word-Based Edit Distance) in SVM.

• RITE-VAL-IMTKU-CS-BC Subtask

RITE-VAL-IMTKU-CS-BC-01
Tools: CKIP AutoTag, LibSVM
Resources: Bilingual Wordnet (SINICA BOW)
Method: Statistics approach (LibSVM Tool) for NTCIR-11 RITE-VAL.
Feature Extraction from normalized t1 and t2. Measure similarity match between t1 and t2.
Multiple Features used (Antonym, Negation, String Length and Length Ratio and Length Difference, LCSS, Char-Based Edit Distance, Noun/Verb Number, Wordnet Similarity and Ratio and Minimum) in SVM.

RITE-VAL-IMTKU-CS-BC-02
Tools: CKIP AutoTag, LibSVM
Resources: Bilingual Wordnet (SINICA BOW), HIT TongYiCiLing (HIT-TYCL)
Method: Statistics approach (LibSVM Tool) for NTCIR-11 RITE-VAL.
Multiple Features used (Antonym, Negation, Word Based Similarity, LCSS , Word Length and Length Ratio and Length Difference, Word-Based Edit Distance, Noun/Verb Number, Wordnet Similarity and Ratio and Minimum) in SVM.

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• RITE-VAL-IMTKU-CS-MC Subtask

RITE-VAL-IMTKU-CS-MC-01
Tools: CKIP AutoTag, LibSVM
Resources: Bilingual Wordnet (SINICA BOW), HIT TongYiCiLing (HIT-TYCL)
Method: Statistics approach (LibSVM Tool) for NTCIR-11 RITE-VAL.
Feature Extraction from normalized t1 and t2.
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Multiple Features used (Antonym, Negation, Word Based Similarity, LCSS , Word Length and Length Ratio and Length Difference, Word-Based Edit Distance, Noun/Verb Number, Wordnet Similarity and Ratio and Minimum) in SVM.

RITE-VAL-IMTKU-CS-MC-02
Tools: CKIP AutoTag, LibSVM
Resources: HIT TongYiCiLing (HIT-TYCL)
Method: Statistics approach (LibSVM Tool) for NTCIR-11 RITE-VAL.
Feature Extraction from normalized t1 and t2.
Measure similarity match between t1 and t2.
Multiple Features used (Antonym, Negation, String Length and Length Ratio and Length Difference, LCSS, Word Semantic Similarity) in SVM.

RITE-VAL-IMTKU-CS-MC-03
Tools: CKIP AutoTag, LibSVM
Resources: HIT TongYiCiLing (HIT-TYCL)
Method: Statistics approach (LibSVM Tool) for NTCIR-11 RITE-VAL.
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Multiple Features used (Antonym, Negation, String Length and Length Ratio and Length Difference, LCSS, Word Semantic Similarity, Word Length and Length Ratio and Length Difference, Char-Based Edit Distance, Word-Based Edit Distance) in SVM.

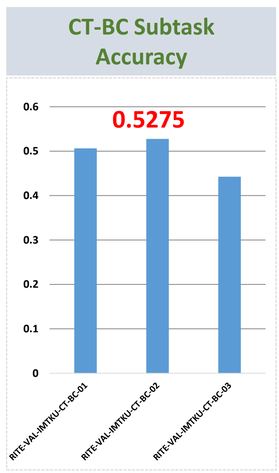
Performance

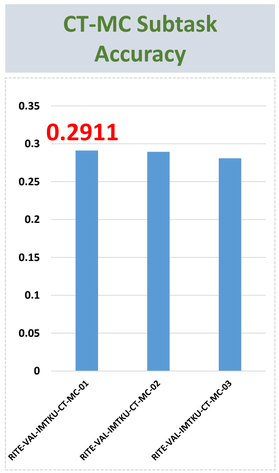
IMTKU CT BC Subtask Official Runs	Macro-F1	Accuracy
RITEVAL-IMTKU-CT-SVBC-01	**0.4403**	0.5063
RITEVAL-IMTKU-CT-SVBC-02	0.4218	**0.5275**
RITEVAL-IMTKU-CT-SVBC-03	0.4271	0.4425

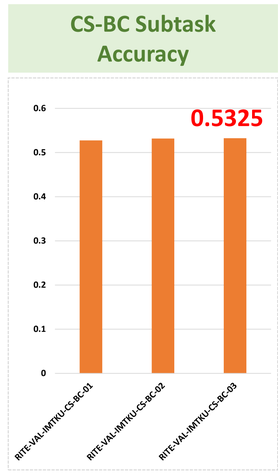
IMTKU CS BC Subtask Official Runs	Macro-F1	Accuracy
RITEVAL-IMTKU-CS-SVBC-01	0.4177	0.5275
RITEVAL-IMTKU-CS-SVBC-02	0.4254	0.5317
RITEVAL-IMTKU-CS-SVBC-03	**0.4280**	**0.5325**

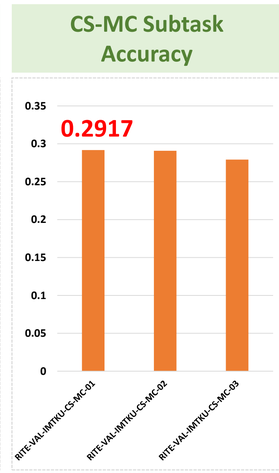
IMTKU CT MC Subtasks Official Runs	Macro-F1	Accuracy
RITEVAL-IMTKU-CT-SVMC-01	0.1901	**0.2911**
RITEVAL-IMTKU-CT-SVMC-02	0.1848	0.2894
RITEVAL-IMTKU-CT-SVMC-03	**0.1963**	0.2808

IMTKU CS MC Subtask Official Runs	Macro-F1	Accuracy
RITEVAL-IMTKU-CS-SVMC-01	0.1902	**0.2917**
RITEVAL-IMTKU-CS-SVMC-02	0.1867	0.2908
RITEVAL-IMTKU-CS-SVMC-03	**0.1954**	0.2792









Discussion

* Imbalanced Data Sets on Development Dataset of RITE-VAL SV-MC subtask

RITE-VAL SV-MC Subtask Labels	B	C	F	I	Total
Development Dataset Label Count	**222**	**152**	**148**	**59**	**581**
Development Dataset %	38%	26%	25%	10%	100%
Official Runs Dataset Label Count	**300**	**300**	**300**	**300**	**1200**
Official Runs Dataset %	25%	25%	25%	25%	100%
Balanced Training Dataset Label Count	**50**	**50**	**50**	**50**	**200**
Balanced Training Dataset %	25%	25%	25%	25%	100%

* Cross Validation of Development and Test datasets of NTCIR-11 RITE-VAL Task

Datasets	10 Fold CV Accuracy
RITE_VAL_CT_dev_bc_g.txt (gold standard) (BC Development Dataset: 581 pairs)	64.02%
RITE_VAL_CT_test_bc_g.txt (BC Test Dataset: 1200 pairs)	56.25%
RITE_VAL_CT_dev_test_bc_g.txt (BC Dev+Test Dataset: 581+1200 =1781 pairs)	55.53%

DEMO: http://rite.im.tku.edu.tw

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