MANCHESTER 1824

The University of Manchester

TempEval-3

Task #1 of SemEval-2013: Temporal Annotation, Atlanta, 14-15 June 2013

ManTIME: Temporal expression identification and normalization in the TempEval-3 challenge

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CDT Centre for Doctoral Training in Computer Science

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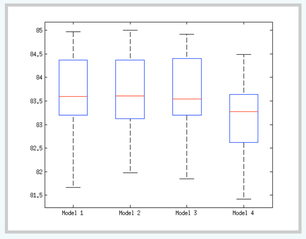
IDENTIFICATION

The **identification** phase consists of a pre-processing step followed by a machine learning classifier (**Conditional Random Fields**). We investigated the use of four different feature sets:

- **Model 1:** morphological features only
- **Model 2:** Model 1 + syntactic features
- **Model 3:** Model 1 + gazetteers
- **Model 4:** Model 3 + WordNet-based features

We found that (i) there is not statistical difference among the first three models, and (ii) the use of WordNet **negatively** affected the performance. Model 1 has been chosen because of its **reduced feature set** (to prevent overfitting).



Data: Silver & Human annotated.

Experimental setting: 5x10-fold cross validation.

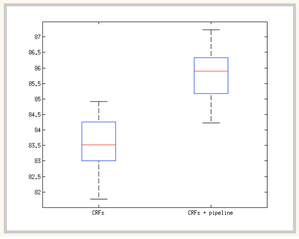
The results are statistically significant ($p = 0.0054$ ANOVA test).

POST-PROCESSING PIPELINE

The post-processing pipeline consists of three components:

- **Probabilistic correction module:** averages the probabilities from the trained CRFs model with the ones extracted from the human-annotated data only
- **BIO fixer:** fixes wrong label sequences (i.e. O-I) and merge adjacent temporal expressions
- **Threshold-based label switcher:** force the label learnt from the human-annotated data when there is a certain confidence level

The sequence of components is: Probabilistic correction module, BIO fixer, Threshold-based label switcher, BIO fixer.



Data: Silver & Human annotated.

Experimental setting: 10-fold cross validation over 4 models.

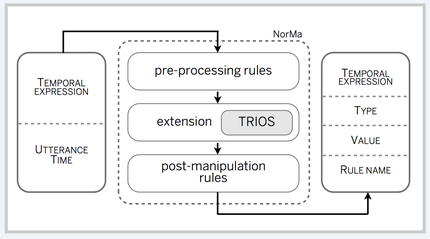
The results are statistically significant ($p = 3.51 \times 10^{-23}$ paired T-test).

NORMALIZATION

The normalisation component used is NorMA[1], a previously developed **open-source** dictionary-driven rule-based system.

It extends TRIOS[2] normalizer with a three-tier architecture:

- **Pre-processing rules:** used to make expressions easier to normalize (12 new rules)
- **Extension rules:** used to extend TRIOS rule set (16 new rules)
- **Post-manipulation rules:** used to catch implicit temporal expression like festivities (4 new rules)

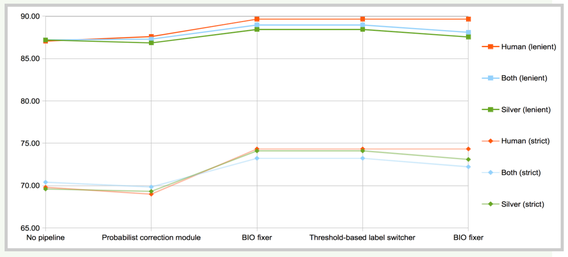


NorMA architecture.

RESULTS & CONCLUSIONS

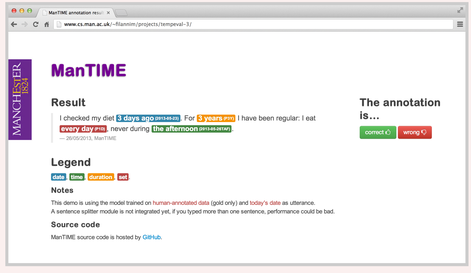
We submitted **6 runs** as combinations of different training sets and the use of the post-processing identification pipeline. **Silver data do not provide improvements in the learning phase.** We also performed a preliminary analysis of the **contribution of each post-processing pipeline component** with respect to the TempEval-3 benchmark test set only. Interestingly, the threshold-based label switcher and the last BIO fixer do not lead to any improvement.

# Run	Training data	Post-processing pipeline	Identification						Normalisation		Overall score
			Strict matching			Lenient matching			Accuracy		
			Pre.	Rec.	F1	Pre.	Rec.	F1	Type	Value	
1	Human & Silver	no	78.57	63.77	70.40	97.32	78.99	87.20	88.99	77.06	67.20
2	Human & Silver	yes	79.82	65.94	72.22	97.37	80.43	88.10	87.38	75.68	66.67
3	Human only	no	76.07	64.49	69.80	94.87	80.43	87.06	87.39	77.48	67.45
4	Human only	yes	78.86	**70.29**	**74.33**	95.12	**84.78**	**89.66**	86.31	76.92	**68.97**
5	Silver only	no	77.68	63.04	69.60	97.32	78.99	87.20	88.99	77.06	67.20
6	Silver only	yes	**81.98**	65.94	73.09	**98.20**	78.99	87.55	**90.83**	**77.98**	68.27



AVAILABILITY & DEMO

It uses the **human-annotated** training data with the **post-processing pipeline** and the current date as utterance time.



ManTIME is an **open-source** project:

- https://github.com/filannim/ManTIME

[1] Filannino, M. Temporal expression normalisation in natural language texts. In CoRR abs/1206.2010

[2] UzZaman N., and Allen J. F. Event and temporal expression extraction from raw text: First step towards a temporally aware system. Int. J. Semantic Computing, 4(4):487–508, 2010

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