

The University of Washington Machine Translation System for IWSL 2009

Mei Yang, Amittai Axelrod, Kevin Duh, Katrin Kirchhoff

Dept. of Electrical Engineering, University of Washington, Seattle, WA, USA

{yangmei, amittai, duh, katrin}@ee.washington.edu



1 Overview

- We participated in two BTEC translation tasks: Chinese-English and Arabic-English
- Our interests include
 - Different preprocessing schemes for Chinese and Arabic
 - Combination of phrase tables based on different alignments
 - Semi-supervised reranking of N-best lists
 - Sentence-type specific part-of-speech (POS) language modeling for rescoring

2 Baseline translation system

- A state-of-the-art two-pass phrase-based SMT system
- Trained within the Moses development and decoding framework
- A 4-gram Language model trained using the SRILM toolkit

3 Preprocessing schemes

- Chinese segmentation and markup
 - The Stanford segmenter for re-segmenting the Chinese data
 - Character-based segmentation for the Chinese data
 - An in-house tool *Decatur* to markup dates and numbers in both the Chinese and English data
 - A simple tool to markup just numbers in both the Chinese and English data
 - Strip off all punctuations in both the Chinese and English data
 - None of the above schemes led to significance improvement over the original segmentation
- Arabic tokenization
 - The Columbia University MADA and TOKEN tools with two schemes:
 - Split off *w+*, *f+*, *l+*, *b+*, and *A/+*
 - TOKAN's D2 scheme, which does not split off *A/+* but instead separates *s+*
 - The first scheme yielded better performance

4 Phrase table combination

- Phrase tables learned from GIZA++ and MTTK alignments respectively
- The two individual tables were combined into a single table
- Additional binary features to indicate which alignment produced each phrase pair entry
- The combined table outperformed the individual tables in the Chinese-English system

5 Semi-supervised reranking

f : ranking function

P_L : labeled data
Pair-wise samples (x^l, y^l) collected from each N-best list of a held out set, such that x^l ranks higher than y^l

P_U : unlabeled data
Pair-wise samples (x^u, y^u) collected from the N-best list of a given test sentence

$$f^* = \underset{f}{\operatorname{argmin}} \sum_{P_L} e^{- (f(x^l) - f(y^l))} + \beta \sum_{P_U} e^{- |f(x^u) - f(y^u)|}$$

- The labeled data were produced using smoothed sentence-level BLEU scores
- The ranking function was learned using a modified RankBoost algorithm
 - Maximize the margins of the labeled and unlabeled data jointly
 - Treats the reranking problem as a problem of binary classification on hypothesis pairs
 - Iteratively train a weak ranker and adjust sample weights according to the classification results
 - The final ranking function is a linear combination of the weak rankers from all iterations
- Applied in the second pass for reranking N-best lists
- For IWSLT 2007 Italian-English and Arabic-English data, it achieved substantial improvements
- For this year data, it improved precision based evaluation metrics, such as PER, TER, WER and Precision, but degraded n-gram based metrics, such as BLEU and NIST

6 Sentence-type specific POS language model

- Captures the syntactic differences between questions and statements
- Determine the sentence type using punctuations in the source sentences
- Applied in the second pass for reranking N-best lists
- Led to a small improvement in the Chinese-English system

7 Official evaluation results

	case+punc	no_case+no_punc
BLEU	0.41	0.40
PER	0.42	0.45
Meteor	0.66	0.62
NIST	7.05	7.30

Table 1: the Chinese-English system

	case+punc	no_case+no_punc
BLEU	0.48	0.48
PER	0.35	0.38
Meteor	0.72	0.69
NIST	6.85	6.93

Table 2: the Arabic-English system