Sheffield Submissions

For WMT18 Multimodal Translation Task

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Task 1

Single Source Multimodal Machine Translation

EN +  → DE or FR or CS

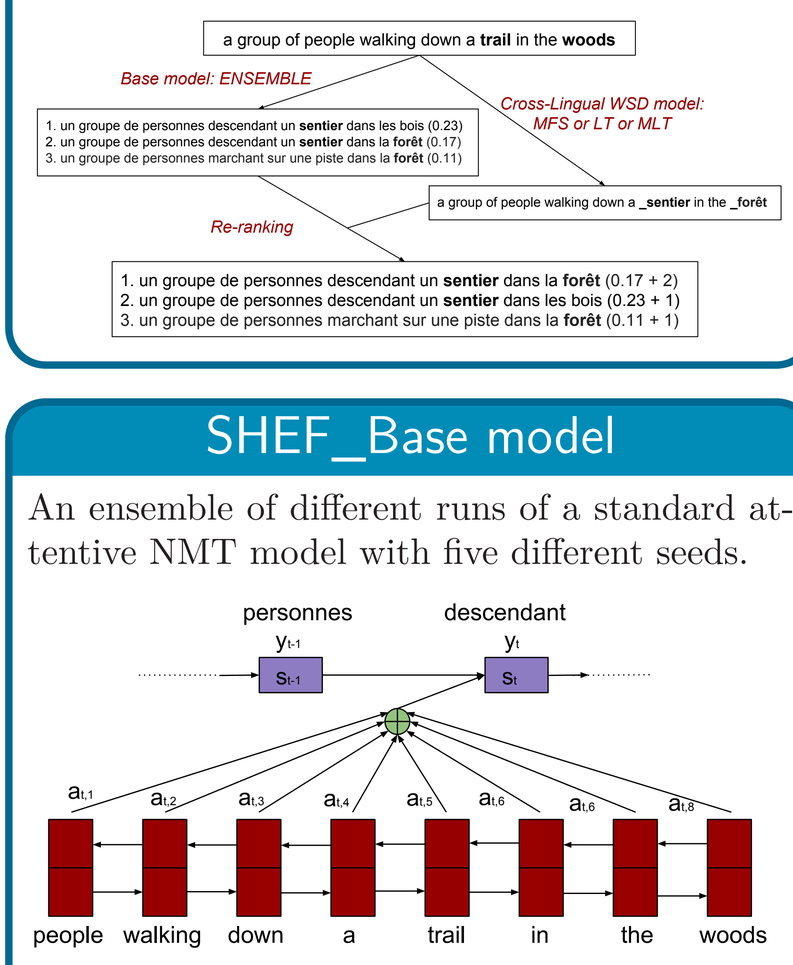
Task 1b

Multi - source Multimodal Machine Translation

EN + DE + FR +  → CS

Re-ranking with WSD

A baseline NMT system (**SHEF_Base**) generates n-best translation hypotheses. These are re-ranked using novel cross-lingual Word Sense Disambiguation (WSD) models.



SHEF_Base model

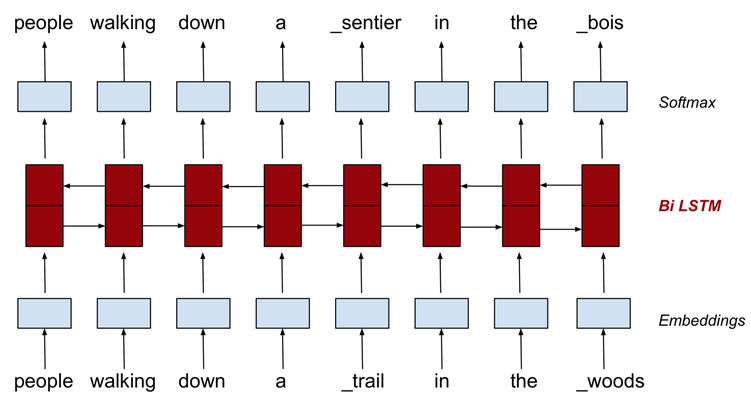
An ensemble of different runs of a standard attentive NMT model with five different seeds.

10-best translation hypotheses with likelihood scores are generated. It's 1-best (no re-ranking) forms the **SHEF_Base**

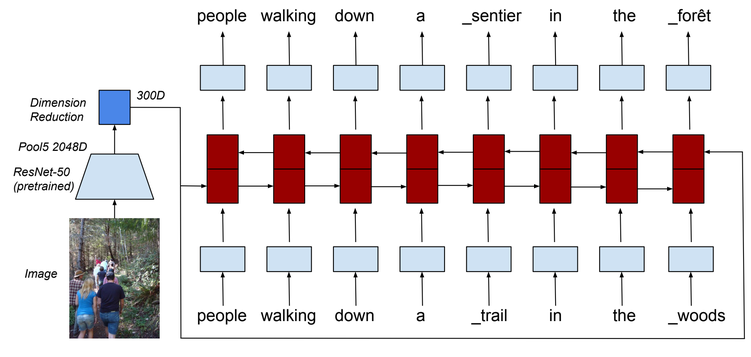
Cross-lingual WSD models

1. Most Frequent Sense (SHEF_MFS)
$Freq_{woods}(bois) = 79$, $Freq_{woods}(forêt) = 16$
Most Frequent Translation of *woods* is *bois*

2. Lexical Translation (SHEF_LT)



3. Multimodal LT (SHEF_MLT)



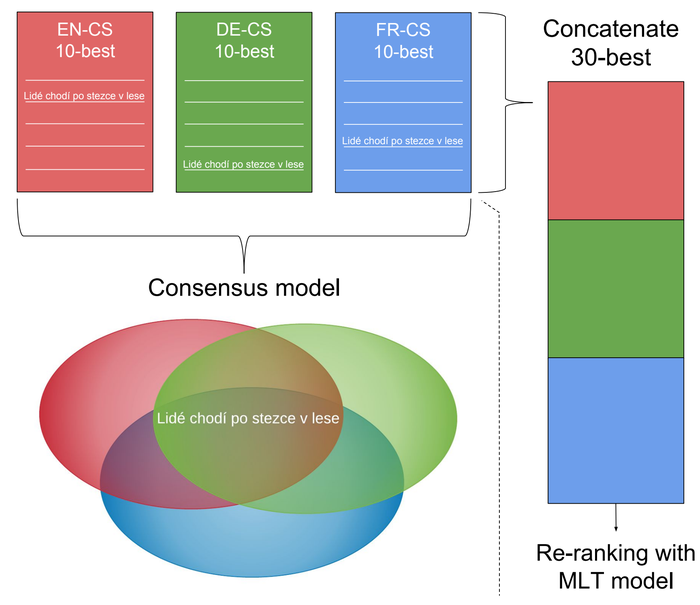
These models are trained on the Multimodal Lexical Translation Dataset (`https://github.com/sheffieldnlp/mlt`) derived from the Multi30K corpus. Caveat: EN-CS is noisy.

Concatenation and Consensus

First, we train standard attentive NMT models for three language directions into Czech and generate 10-best lists in Czech from each model.

SHEF_MLTC: concatenate the 10-best lists and then re-rank using MLT model.

SHEF_Con: consensus of the 10-best lists, i.e. select the translation hypothesis that appears in the intersection of the three lists.

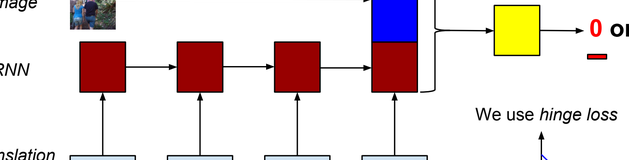


Augmentation and Classifiers

First, we add more training data by translating German, French, Czech training instances into English and then train EN-CS NMT model.

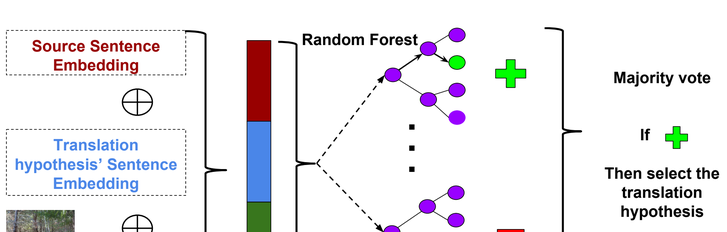
DE FR CS
EN + EN* + EN* + EN* +  → CS

The 10-best translation hypotheses of this EN-CS NMT model on training and val instances are re-ordered by sentence-level METEOR scores and then top 4 are labeled positive.



Then, we train multimodal binary classifiers:

1. Random Forest (SHEF_ARF)



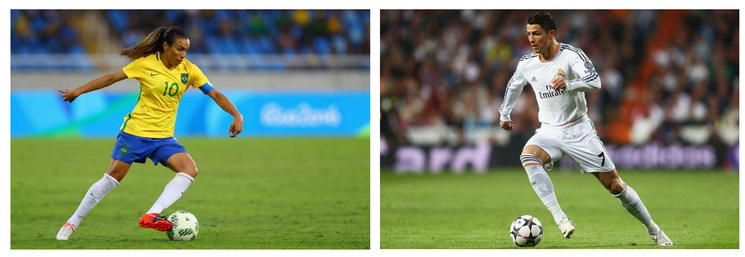
Sentence Embeddings using Arora et al. (2016)

2. RNN Classifier (SHEF_ARNN)

Why cross-lingual WSD?

We believe humans usually look at the image to disambiguate ambiguous words in the source sentence and then select correct translation.

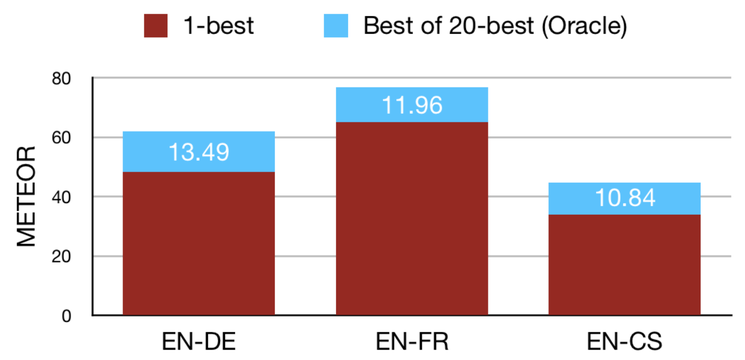
*"A **sportsperson** is playing football"*



*"Une **sportive** joue au football"* *"Une **sportif** joue au football"*

Why Re-ranking?

In a preliminary experiment, we trained a standard NMT and looked at 20-best hypotheses. The best of 20-best hypotheses (Oracle) was compared to the 1-best hypothesis and we found plenty of scope for re-ranking these hypotheses.



Results and Conclusion

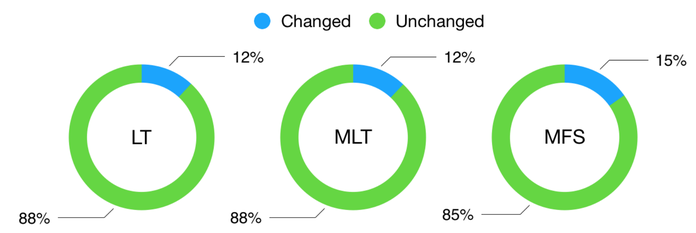
Sheffield Submissions (METEOR scores ↑)

Task 1	EN-DE	EN-FR	EN-CS*
SHEF_LT	50.7	59.8	29.1
SHEF_MLT	50.7	59.8	29.1
SHEF_Base	50.7	59.8	29.4
SHEF_MFS	50.7	59.7	29.2
Baseline	47.4	56.9	27.7

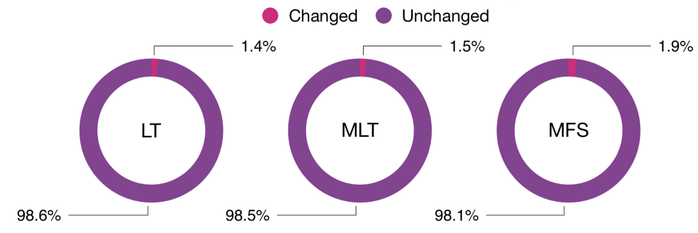
Task 1b	ALL-CS
SHEF_Con	27.6
SHEF_MLTC	27.5
SHEF_ARNN	27.5
SHEF_ARF	27.1
Baseline	26.8

- Our systems are better than baseline
- Hardly any difference between our systems

Why no difference?
For EN-FR, only 12% to 15% of the test instances get re-ranked



And, less than 2% lexical changes



Contribution of re-ranking is small and since SHEF_LT (Text-only) and SHEF_MLT (Image-aware) outputs are nearly identical, the contribution of image is further minute.

Task1b shows a similar trend: the contribution of images is minor. The best model was SHEF_CON – the consensus-based model that does not use image information.