PD3: Better Cross-Lingual Transfer By Combining Direct Transfer and Annotation Projection
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Argumentation Mining

- Fast-growing research field in NLP

- Different sub-tasks:
  1) segmenting arguments from non-arguments in text;
  2) classifying them (claim, premise, ...);
  3) finding relations between arguments (support, attack)
  4) Ranking arguments
Challenges for argumentation mining

- Going cross-lingual
  - I.e. train system in a source language L1 (typically: English), then apply system to specific target language L2 of interest
  - Avoids having to redo (high) annotation costs

- Recently, several works have addressed variants of this setup:
  - Aker and Zhang, 2017; Sliwa et al. 2018; Eger et al., 2018; Rocha et al. 2018
Task considered in our work

- We consider argumentation mining
  - On the sentence-level
  - Classifying each sentence into 4 classes:
    - Claim, MajorClaim, Premise, None
- Dataset is derived from the Persuasive Essay (PE) dataset of Stab and Gurevych (2017); Eger et al. (2018) (bi-lingual variant)
  - But token-level annotations are mapped to the sentence-level
(Mono-lingual) Examples

- Not cooking fresh food will lead to lack of nutrition  **Claim**

- To sum up, [...] the merits of animal experiments still outweigh the **demerits**  **Major claim**

- For example, tourism makes up one third of Czech’s economy  **Premise**

- I will mention some basic reasoning as follows  **O**
Our contribution

- We explore cross-lingual argumentation mining in the low-resource setting, i.e., having very little parallel data, ....
  - Which is likewise a hot topic concurrently (Zhang et al., 2016; Artetxe et al., 2017; Artetxe et al., 2018; Lample et al., 2018; Schulz et al. 2018)
- ... by combining two standard cross-lingual approaches --- direct transfer and annotation projection
Excursion - Cross-lingual transfer 1: Direct Transfer

L1

I/PRON love/V children/N Cats/N like/V me/PRON

.....

L2

Die Stube brennt Kinder sind doof

.....

Bilingual word embeddings
Direct Transfer

I/PRON love/V children/N Cats/N like/V me/PRON

Die Stube brennt
Kinder sind doof

Bilingual word embeddings
Excursion - Cross-lingual transfer 2: Annotation Projection

L1

I/PRON love/V cats/N Cats/N like/V me/PRON

.....

L2

Die Stube brennt
Das Wasser läuft

.....

L1-L2

Horses eat carrots
Soccer is football

Pferde essen Möhren
Fußball ist Fußball

.....
Projection

L1

I/PRON love/V cats/N
Cats/N like/V me/PRON

…..

Train

L1-L2

Horses eat carrots
Soccer is football

…..

L2

Die Stube brennt
Das Wasser läuft

…..

Pferde essen Möhren
Fußball ist Fußball

…..
Projection

L1

I/PRON love/V cats/N
Cats/N like/V me/PRON

L2

Die Stube brennt
Das Wasser läuft

Annotate

L1-L2

Horses/N eat/V carrots/N
Soccer/N is/V football/N

Pferde essen Möhren
Fußball ist Fußball
Projection

L1

I/PRON love/V cats/N
Cats/N like/V me/PRON

.....

L1-L2

Horses/N eat/V carrots/N
Soccer/N is/V football/N

.....

L2

Die Stube brennt
Das Wasser läuft

.....
Projection

L1

I/PRON love/V cats/N
Cats/N like/V me/PRON

L1-L2

Horses/N eat/V carrots/N
Soccer/N is/V football/N

L2

Die Stube brennt
Das Wasser läuft

Project

Pferde/N essen/V Möhren/N
Fußball/N ist/V Fußball/N
Projection

L1
I/PRON love/V cats/N Cats/N like/V me/PRON

L2
Die Stube brennt Das Wasser läuft

L1-L2
Horses/N eat/V carrots/N Soccer/N is/V football/N
Pferde/N essen/V Möhren/N Fußball/N ist/V Fußball/N

Project
Projection

L1

I/PRON love/V cats/N
Cats/N like/V me/PRON

L2

Die Stube brennt
Das Wasser läuft

L1-L2

Train/An notate

Horses/N eat/V carrots/N
Soccer/N is/V football/N

Pferde/N essen/V Möhren/N
Fußball/N ist/V Fußball/N
I/PRON love/V cats/N
Cats/N like/V me/PRON

Die Stube brennt
Das Wasser läuft

Horses/N eat/V carrots/N
Soccer/N is/V football/N

Pferde/N essen/V Möhren/N
Fußball/N ist/V Fußball/N

Train on bilingual repres./Annotate

Train/Annotate
I/PRON love/V cats/N
Cats/N like/V me/PRON

Die Stube brennt
Das Wasser läuft

Horses/N eat/V carrots/N
Soccer/N is/V football/N

Pferde/N essen/V Möhren/N
Fußball/N ist/V Fußball/N

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Pferde/N essen/V Möhren/N
Fußball/N ist/V Fußball/N

Train on bilingual repres./Annotate

Train/An notate
PD3: Combining Direct Transfer and Projection

One last issue:
- Can either **merge** all 3 datasets
- Or use **multi-task learning**, taking e.g., both L1 datasets as Task1 and the L2 dataset as Task2

Figure 1: Sequence tagging STL vs. MTL with two tasks. For readability, character-level representations and CRF connections in the output layers are omitted. Bidirectional connections in the hidden layers are also missing. Here, $w$ are the input words and $s$ and $t$ denote different tasks; $h$ are the hidden layers.
Experiments

• Bilingual data:
  • en: *To sum up [...]*, *the merits of animal experiments still outweigh the demerits*  MajorClaim
  • de: *Zusammenfassend kann ich bestätigen [...]*, *dass die Vorzüge von Tierversuchen die Nachteile [...] überwiegen*  MajorClaim
  • About 7k parallel sentences, available here:  
    https://github.com/UKPLab/coling2018-xling_argument_mining

• Setup:
  ○ 2k for train (en), 0.5k for dev (en), 1.5k for test (de)
  ○ 3k as parallel data (and further subsets thereof)
    ■ We also consider non-argumentative parallel data from TED
  ○ Evaluation Metric is Macro-F1
Results - high quality bilingual embeddings
Results - low quality bilingual embeddings
Results - low quality bilingual embeddings
Results - non-argumentative parallel data
Conclusion

- Considered low-resource language transfer for ArgMin
  - By combining direct transfer and annotation projection

- There are benefits, but they’re small

- Also, they diminish quickly

- True low-resource language transfer still a big challenge
  - And an important avenue for the future

- Doing annotation projection using machine translation **without any parallel data** (Artexete et al. 2018, Lample et al. 2018) may be worthwhile to investigate prospectively
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