Measuring Semantic Relatedness Across Languages

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Abstract

Measures of Semantic Relatedness determine the degree of relatedness between two words. Most of these measures work only between pairs of words in a single language. We propose a novel method of measuring semantic relatedness between pairs of words in two different languages. This method does not use a parallel corpus but is rather seeded with a set of known translations. For evaluation we construct a cross-language dataset of French-English word pairs with similarity scores. Our new cross-language measure correlates more closely with averaged human scores than our unilingual baselines.

1. Distributional Semantics

"You shall know a word by the company it keeps" – Firth (1957)

- Construct a word-context matrix
  - Corpora: French and English Wikipedias
  - Used POS-tagged words as contexts
  - Re-weight matrix – Pointwise Mutual Information (PMI)
- Cosine similarity
- Evaluate correlation on Rubenstein and Goodenough (1965) style dataset

2. Translating a Word-Context Matrix

- Translate French matrix to English
- Build Translation Matrix
  - For each English-French context pair $\langle c_e, c_f \rangle$
    - Find all words $w_e \in c_e$ and $w_f \in c_f$
    - Find translations of w_e and w_f from aligned Wordnet Libre du Francais (WOLF) v0.1.5 (Sagot and Fišer, 2008) and Princeton WordNet v2.0 (Fellbaum, 1998)
    - Calculate PMI between c_e and c_f using translations
- Map contexts from French to English
  - Minimum PMI threshold, $\tau = 1.0, 2.0, ..., 5.0$
- Merge French and English matrices

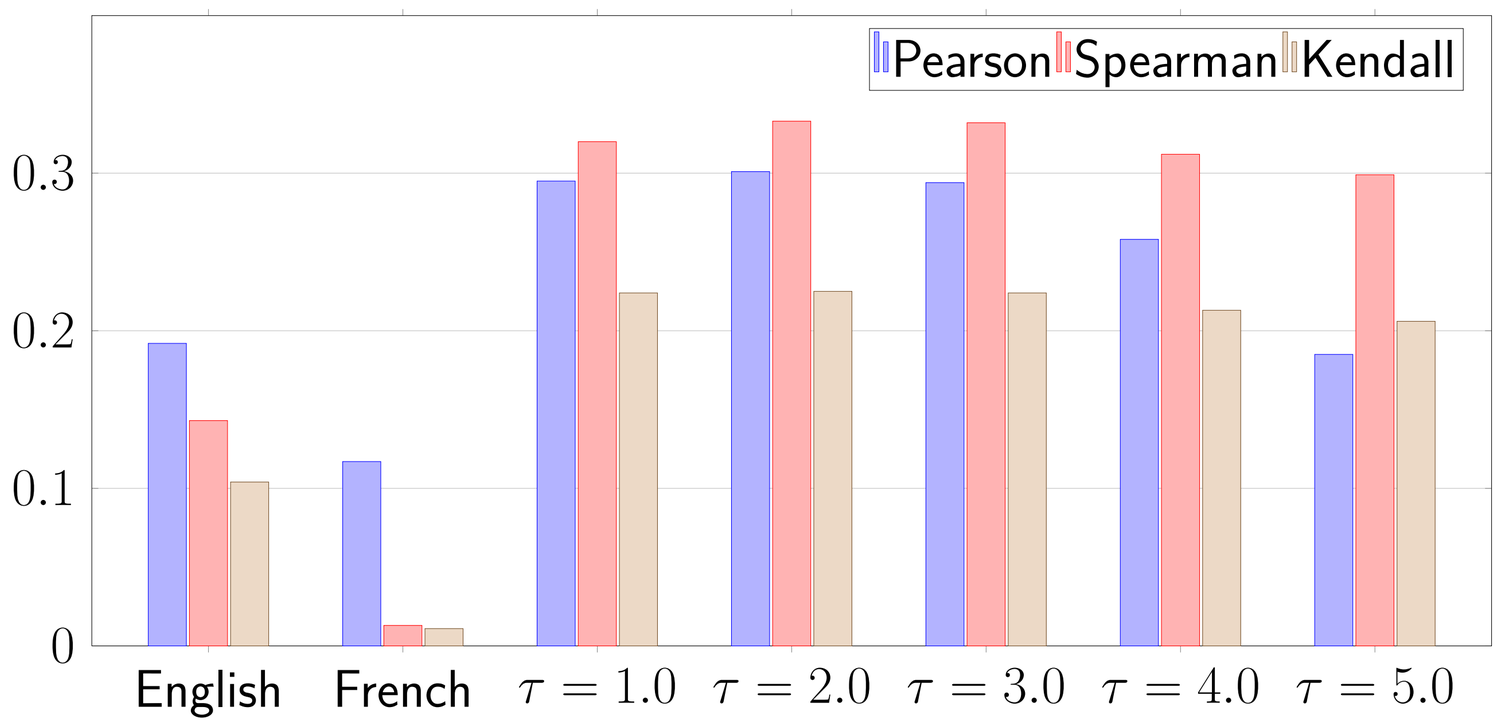
	jaune A	*pain* N	*anglais* N	
yellow A	1.2	0.3	1.1	⋯
bread N	0.3	4.1	0.9	⋯
english N	2.1	1.2	3.2	⋯
	⋮	⋮	⋮	⋱

3. Cross-lingual Rubenstein & Goodenough Dataset

- Merge the English dataset (Rubenstein and Goodenough, 1965) with the French version (Joubarne and Inkpen, 2011) when scores are within ± 1.

English			French			Bilingual		
word1	*word2*	*score*	*word1*	*word2*	*score*	*English*	*French*	*average*
gem	jewel	3.94	joyau	bijou	3.22	gem jewel	bijou joyau	3.58 3.58
car	journey	1.55	auto	voyage	0.33	-	-	-
noon	string	0.04	midi	ficelle	0.00	noon string	ficelle midi	0.02 0.02

4. Results – Three Measures of Correlation



Conclusions and Future Work

- Cross-language measures outperformed the unilingual baselines
- Best PMI threshold was $\tau = 2.0$
- Future Work: Other languages, LSA, new applications, etc.

References

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