Automatic Collocation Identification Using Word Embeddings

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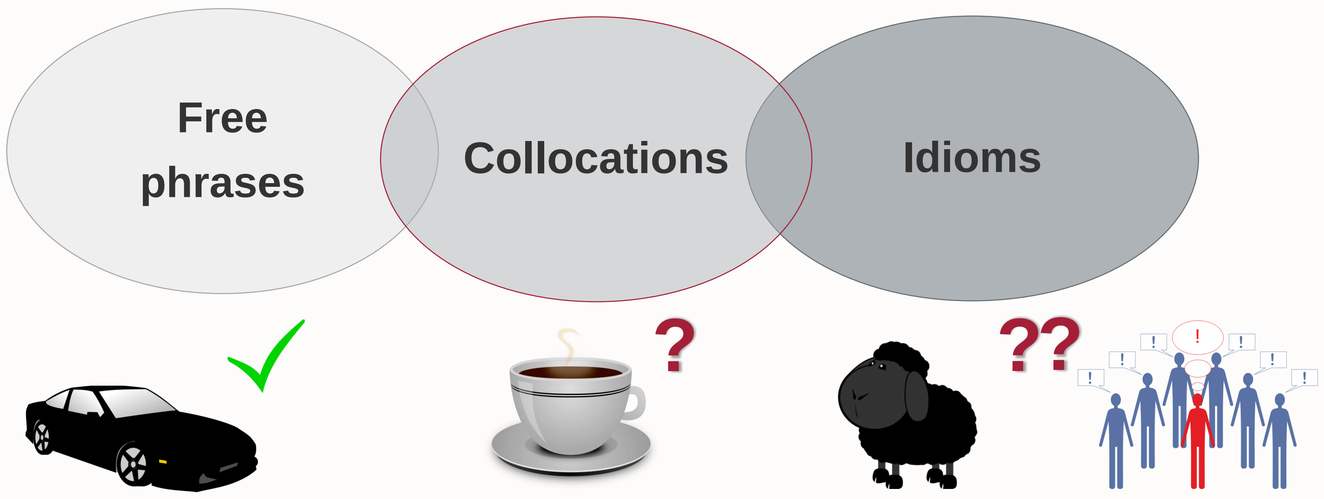

Collocations

- syntactic relation
- partial semantic opacity
- one of the elements carries a special meaning found only in this combination
- constrained lexical selection
- high degree of statistical association

Association Measures (AMs)

✓ extract frequency counts for the words from a corpus
✓ create ranked n-best lists according to the association measure scores

	f_1 adjective	f_2 noun	f adj+noun	Association (dice)
red army	880	160	22	**0.04**
red carpet	880	44	15	0.03
red rose	880	46	8	0.01
red dress	880	84	2	0.004

Word Embeddings

n-dimensional, real-valued vectors
co-occurrence frequencies of words (context):

context ->	bitter	black	fast	**vector**
coffee	2	7	0	[2,7,0]
tea	1	5	0	[1,5,0]
boat	0	1	6	[0,1,6]

He loved his *black* **coffee**, crackers, and an orange.

Dataset (Evert 2008):

- German adj+noun lemma combinations
- annotated by lexicographers
- unique adjectives: 489
  unique nouns: 815

520 true collocations (categories 1&2): *groß+Liebe* 'great love', *grün+Politik* 'green politics'

732 non-collocations: *groß+Park* 'big park', *grün+Baum* 'green tree'

Collocation extraction: previous experiments

best AMs (Evert 2004, 2008):

1. dice
2. log-likelihood
3. chi-squared

best AMs and combining multiple AMs (Pecina 2008):

Method	Average Precision
Piatersky–Shapiro coefficient	**0.63**
LDA (multiple AMs)	0.61
GLM (multiple AMs)	0.60

Binary classification of collocation candidates

Input: **word embeddings** (Dima 2015) **association scores**

brennendes 'burning' + *Problem* 'problem' = **brennendes Problem** + dice, log-likelihood, chi-squared, MI

Logistic Regression binary classifier

- 80% training-20% test
- 10-fold cross-validation

Output: classified candidates
1 – a true collocation
0 – not a collocation

Evaluation

Features	Average Precision	f1-score
baseline (random)	0.42	0.46
300 dimensions	0.71	0.68
50 dimensions + AMs	0.69	0.70
100 dimensions + AMs	0.71	0.69
200 dimensions + AMs	0.71	0.69
300 dimensions + AMs	**0.72**	**0.70**

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