Syntactic Contexts for Finding Semantically Similar Words

CLIN
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Motivation(1)

Overview

Motivation

Distributional similarity

Similarity Measures

Data

Evaluation

Results

Conclusion

- Extending Dutch EuroWordNet for:
  - Question Classification

    `Welke tennisser ...?` > person ques.

  - Answering 'which' questions

    `Welk beroep heeft Renzo Piano?`

    De **Italiaan** Renzo Piano is **architect.**

Motivation(2)

- Disambiguation
  - Coordination:

(Chirac uit Frankrijk) en Blair.

Chirac uit (Frankrijk en Blair).

  - PP-attachment

Hij at (mie) met stokjes.

Hij at (mie met stokjes).

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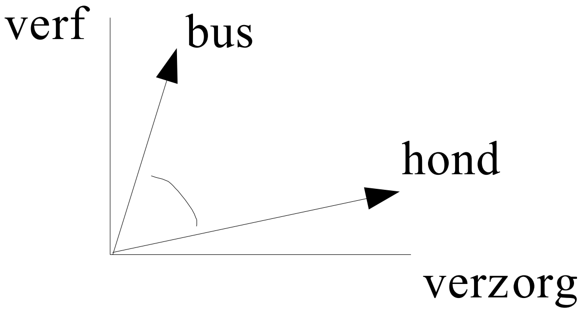
Distributional Similarity

- Similar words share similar contexts
- Context = Syntactic context

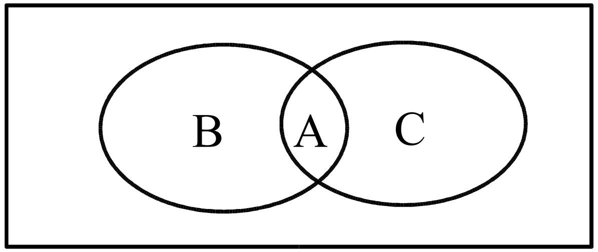
	zie	verf	verzorg	laat_uit
bus	50	5	1	0
hond	56	1	5	8

Similarity Measures

- Cosine



- Dice



$$\frac{2A}{2A+B+C}$$

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Weights

- Mutual Information
- T-Test

	hebben	verdoen	geven	doordrijven
zin	500	0	400	18
tijd	560	10	600	0

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- 78 million words of parsed Dutch newspaper text

Subject-Verb	kat eet
Verb-Object	voer kat
Adjective-Noun	langharige kat
Coordination	Bassie en Adriaan
Apposition	de clown Bassie
PC	begin_met werk

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Extracted from data

Gram rel.	# types	# tuples
Coord	2.465.098	965.296
Subj	2.122.107	5.639.140
Adj	1.040.785	3.262.403
Obj	993.913	2.642.356
Appo	526.337	602.970
PC	389.139	770.631

Tuples,triples etc

	ga_subj	geel_adj	neem_obj	Lassie_app
bus	4	9	8	0
hond	4	1	6	8

Cutoff:
row > 10

Example Output

(for combi obj/adj using MI and Dice)

Trainingspak

bloes

tricot

tshirt

hemd

shirt

tenue

winterjas

bretel

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Example Output

(for subject using TTest and Cosine)

Aanduiding

```
quorum
skiluik
term
dashboardkastje
raambediening
Pep
godfather
gelijkwaardigheid
```

Example Output

(for coord. rel. using MI and Dice)

Wim Kok

Elco Brinkman

Thijs Wöltgens

Hans van Mierlo

Frits Bolkestein

Jacques Wallage

Relus ter Beek

Hedy d'Ancona

Felix Rottenberg

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Evaluation Framework

- Dutch EWN as gold standard
  - Advantages
    - No need for human evaluators, nor application
  - Disadvantages:
    - EWN contains no proper names
    - More than one way to measure distance in WordNet

Evaluation Framework

- 1000 words from EWN (random, freq> 10)

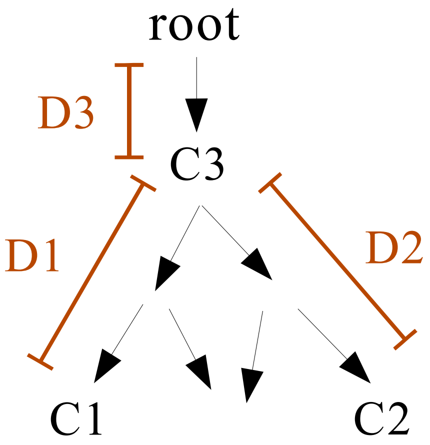
For each word

→ collect 100 most similar words

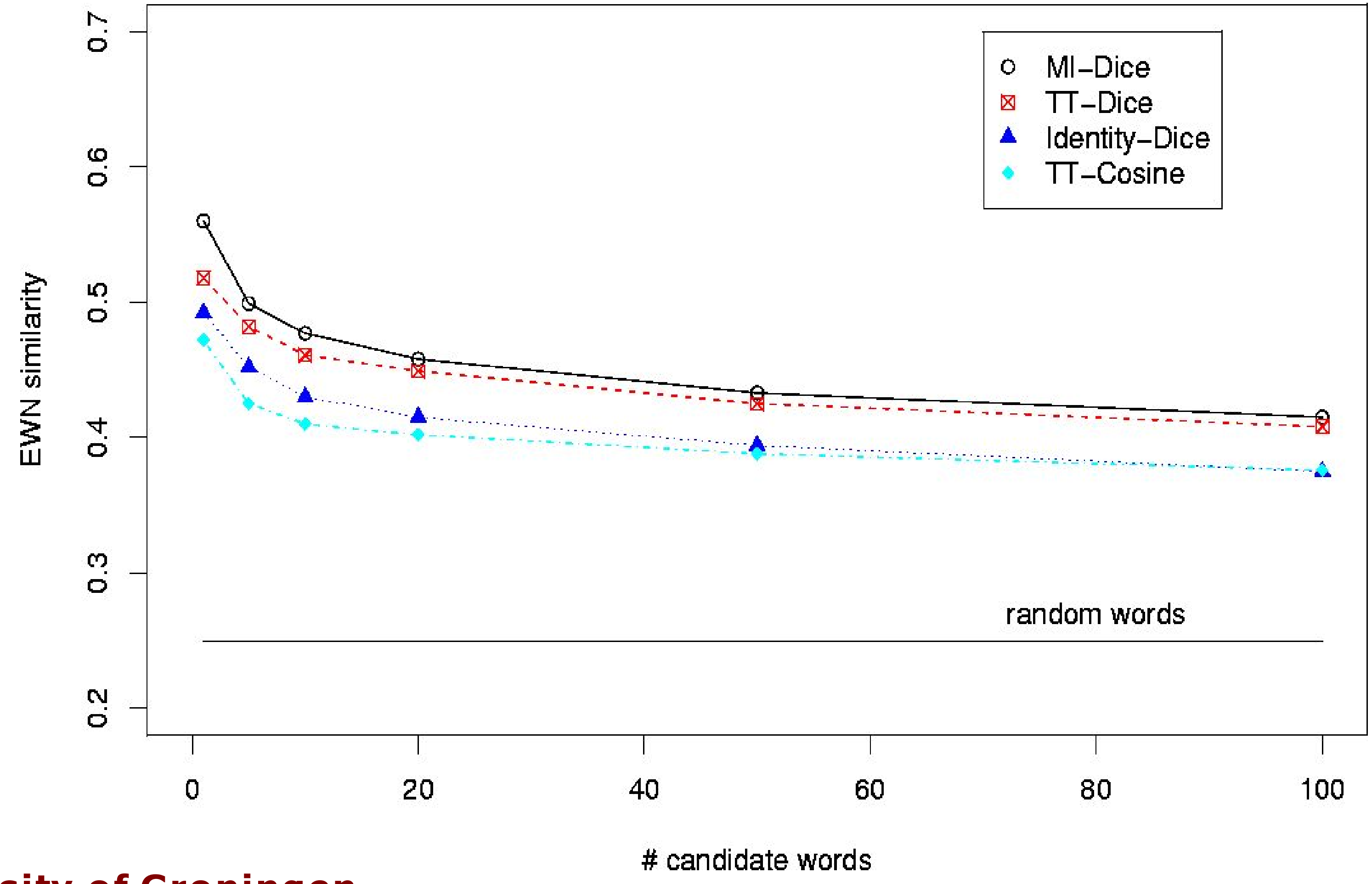
For each pair of words

→ measure similarity in EWN with Wu & Palmer's measure

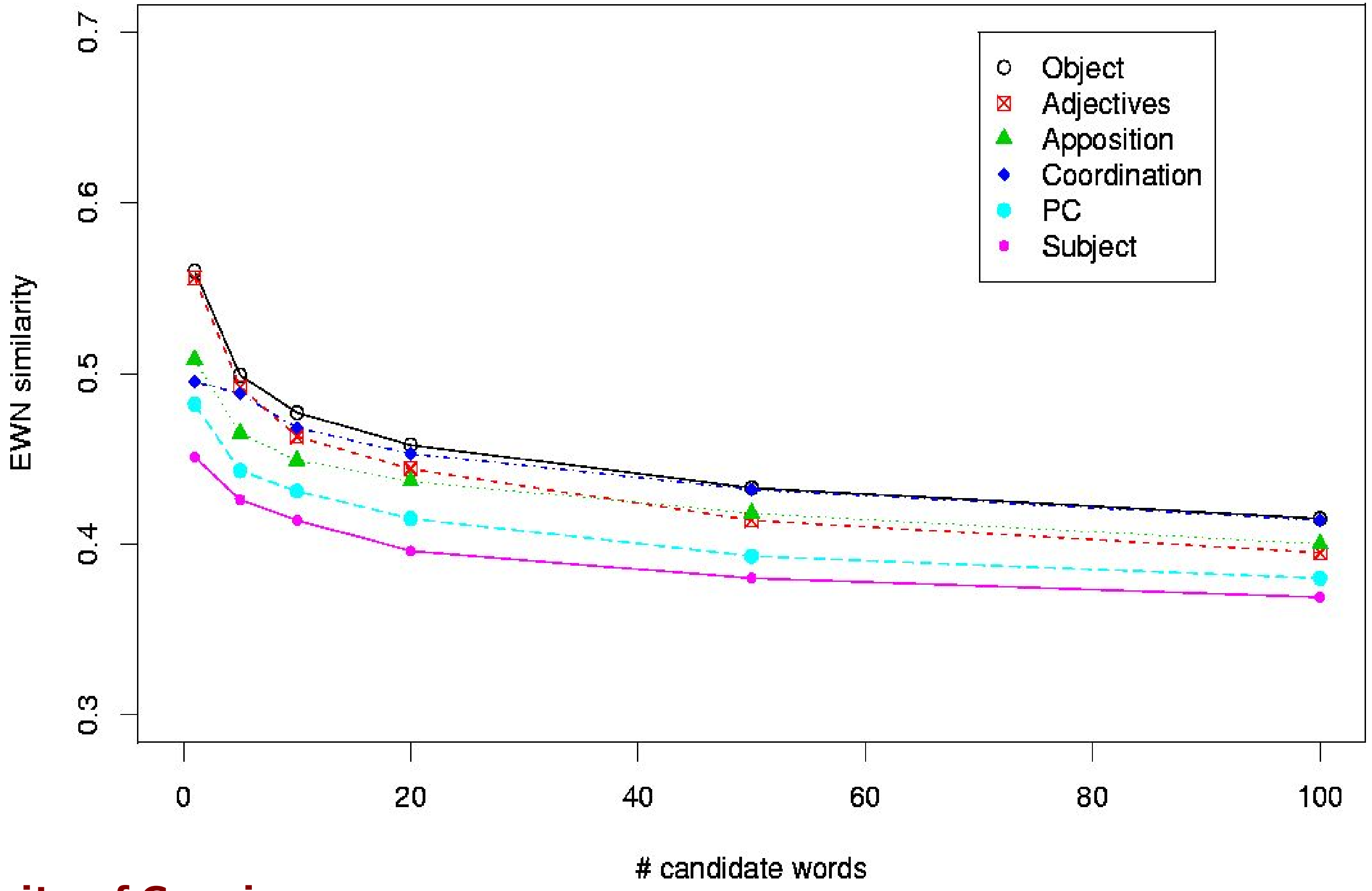
$$\frac{2(D3)}{D1+D2+2(D3)}$$



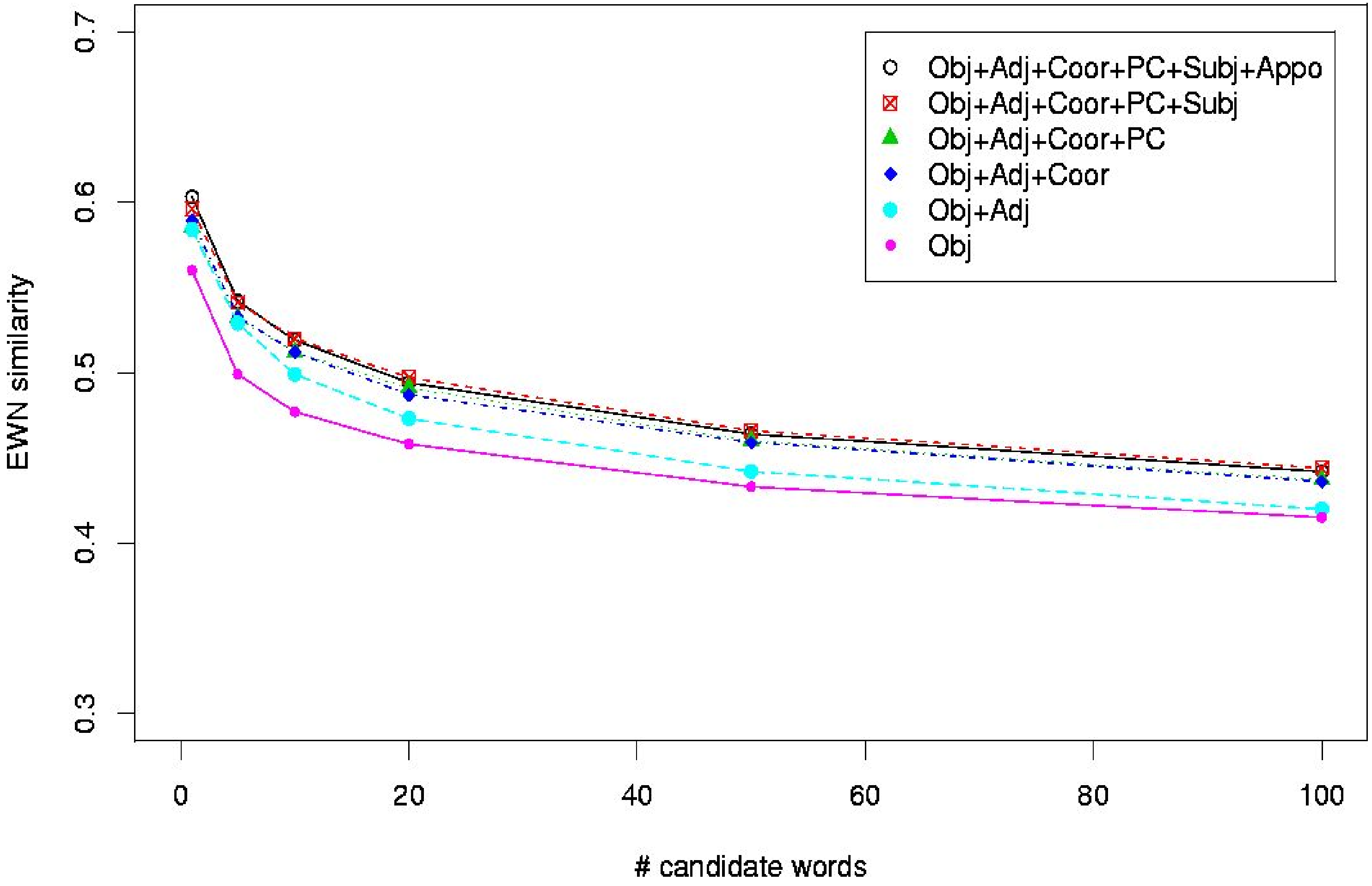
Results (object relation)



Results (diff. gram rels Dice MI)



Results (combining gramrels)



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Recall

Gram rel	Recall (%)
Appo	11,2
PC	29,8
Obj	47,8
Adj	50,3
Coord	56,0
Subj	57,9

Gram rel	Recall (%)
O+A	62,3
O+A+C	72,9
O+A+C+P	74,5
O+A+C+P+S	78,8
All	78,9

- Recall is number of words found in our matrix
- On average 40 % of target's most similar words are not found in EWN

Conclusions

- Combination of Dice and MI gives best results.
- Object seems most suitable grammatical relation for this task, although evaluating on EWN is not fair for Coord + Appo
- Combining grammatical relations improves results.
- With 40 % of words missing in EWN room for improvement

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Future Work

- From horizontal to vertical relations (hypernym structures) using
  - Clustering techniques
  - Patterns from encyclopaedia
  - Better similarity measures
- LSA, LDA to compress feature space, allow for generalization
- Get more insight into behaviour of different grammatical relations