DutchSemCor
Building a semantically annotated corpus for Dutch

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DutchSemCor

Overview

- Project goals and planning
- Current progress
- Word-sense-disambiguation results
- Active learning phase

Goals and planning

- Funded by NWO, 2009-2012
- Create a large semantically tagged corpus for Dutch:
  - Sense-tags from the Cornetto database (includes Dutch wordnet)
  - Domain labels from Wordnet Domains
  - Named entities mapped to Wikipedia

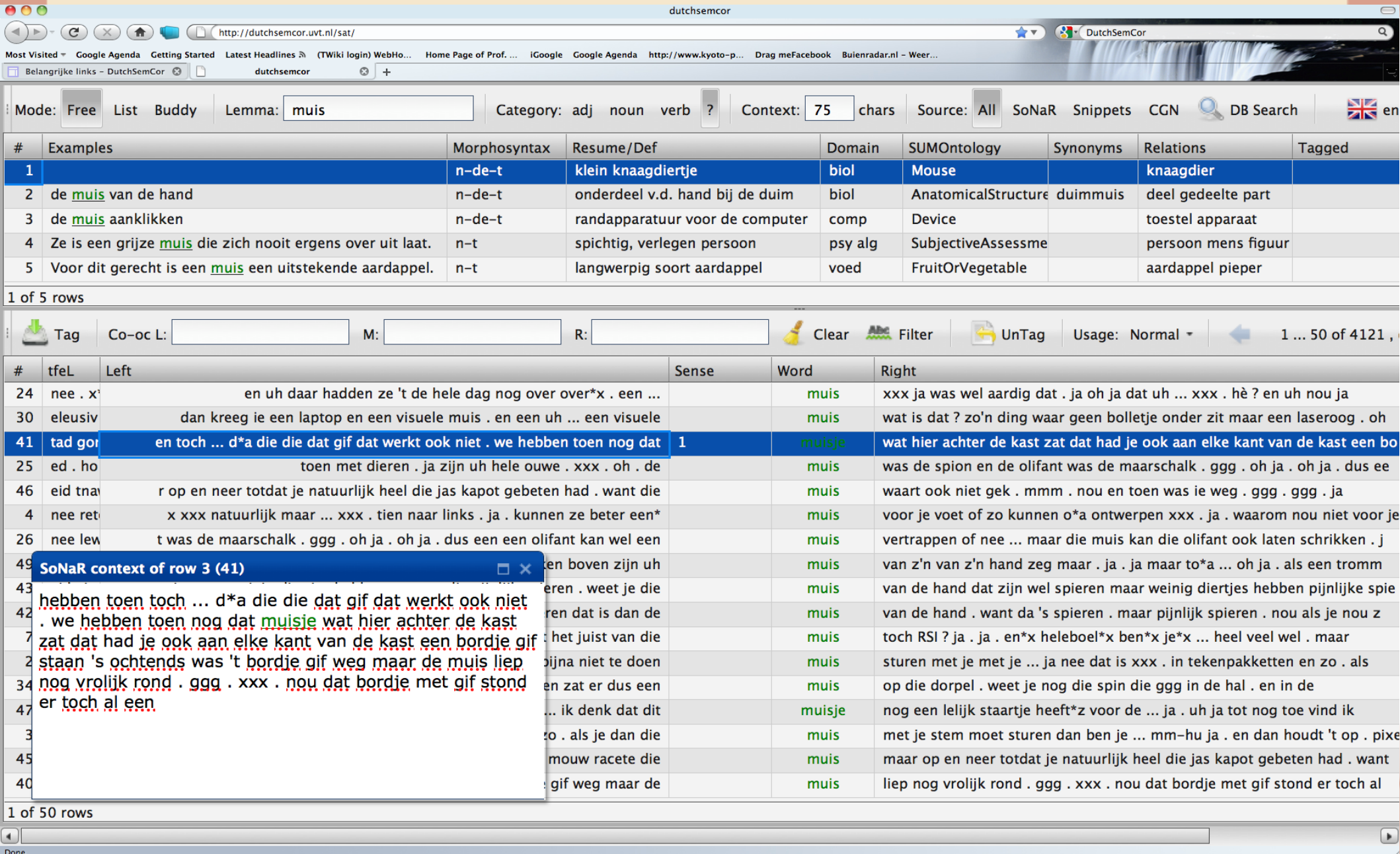
Global procedure

- **Phase-1:**
  - 25 examples per meaning for 3,000 most polysemous and frequent nouns, verbs and adjectives (average nr. of meanings = 3)
  - Annotated by two student assistents
  - Minimal IAA 80%
- **Phase-2:**
  - Word-sense-disambiguation (WSD) systems trained with the data of phase-1
  - Active learning: add examples for low performing words and meanings untill we reach accuracy of 80% or no progress
- **Phase-3:**
  - Apply WSD to rest of the full corpus

Corpora

- SoNaR: 500M tokens written Dutch
- CGN: 1M tokens spoken Dutch
- Web snippets mediated through WebCorp.co.uk (http://www.webcorp.org.uk/)
  - In case no or insufficient examples are found for particular senses in SoNaR and CGN
  - Students select snippets (target word and context) which are added to the corpus in the SoNaR annotation format

Annotation tool



Current results Phase-1

- PoS: nouns, verbs and adjectives
- number of annotated lemmas: 2,589
- number of word senses: 10,172
- number of overlapping annotations: 255,625 (67% SoNaR, 5% CGN, 28% Snippets)
- Inter Annotator Agreement: 93%
- Coverage of senses with 25 examples: 77%
- Coverage of annotations for words: 86%

WSD systems

- Knowledge-based WSD that employs the relations from Cornetto and English WordNet.
- Supervised machine learning-based WSD that creates word experts from annotated examples
- Named Entity recognition and Wikification
- Domain classification of paragraphs

Knowledge-based WSD

- UKB (Agirre and Soroa 2009): http://ixa2.si.ehu.es/ukb/
- Wordnet considered as a graph
- Personalized PageRank algorithm: meanings of the context words activate the weights in the graphs which are propagated to the target meanings

Semantic relations

- Dutch wordnet relations
- Dutch wordnet to English wordnet
- English wordnet relations
- Wordnet domain relations
  - *tennis player, tennis ball* => tennis => sport
  - *footbal player, football* => soccer => sport
- Annotation co-occurrence relations
  - koning (king), koningin (queen), paard (horse), loper (bishop), toren (tower), stuk (chess piece) and slaan (take a chess piece)

Nr. relations for UKB-graph

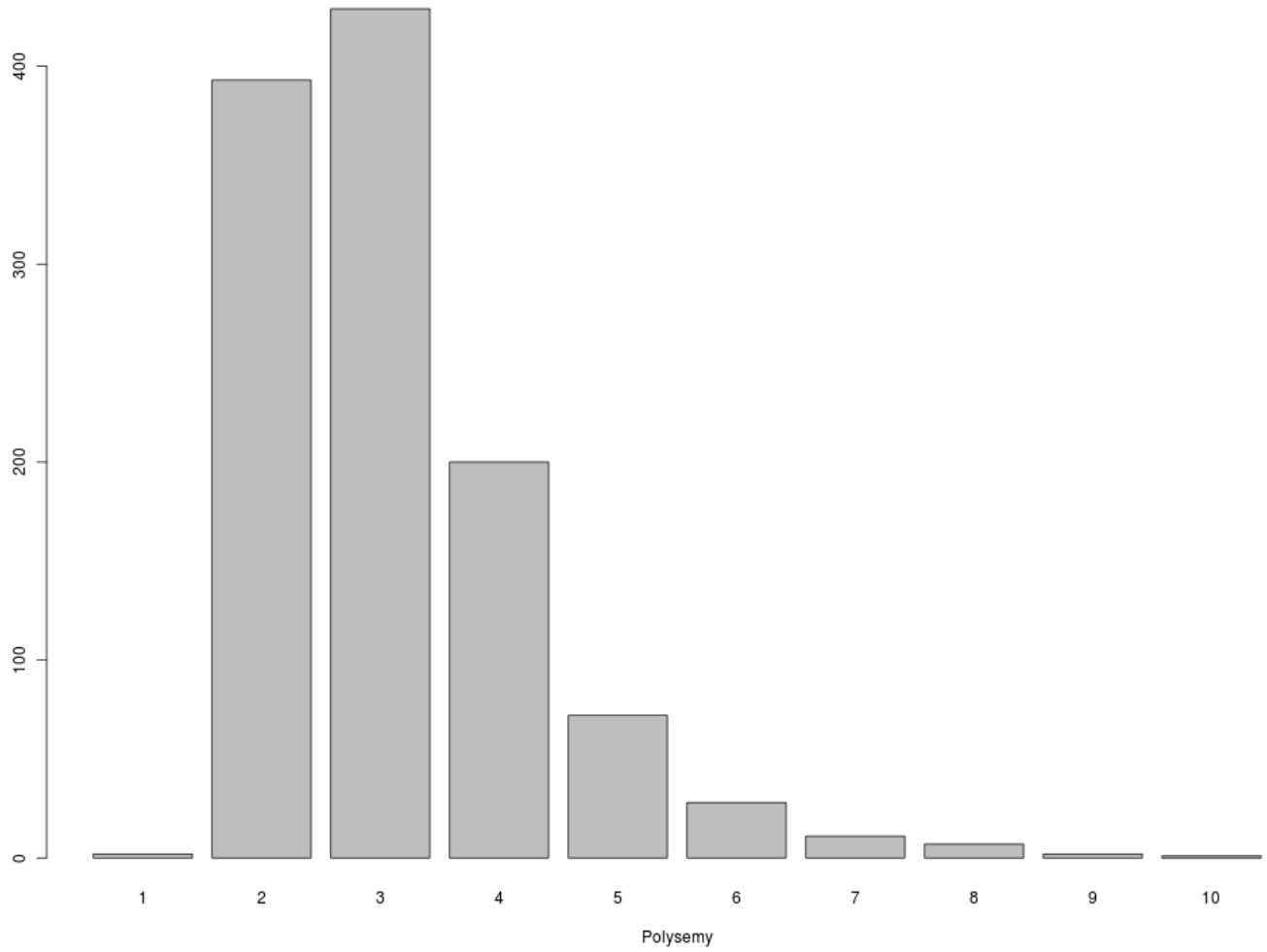
Type of relation	Relations
Dutch_synset/Dutch_synset	140,219
Domain/Domain	125
Dutch_synset/Domain	86,798
Dutch_synset/English_synset	73,935
English_synset/English_synset	252,392
English_synset/English_gloss_synset	419,387
Annotation co-occurrences polysemous	17,152
Annotation co-occurrences monosemous	151,598
Total	1,266,481

Different UKB graphs

- UKB1: D. Synset:D. Synset & Dom.:Dom. & D. Synset:Dom.
- UKB2: UKB1 & D. synset:E. synset
- UKB3: UKB2 & E. synset:E. Synset & E. synset:E. gloss
- UKB4: UKB1 & annotation co-occurrences
- UKB5: UKB3 & annotation co-occurrences

Test set

35,269 tokens (nouns and verbs)



Evaluation

	Precision	Recall	F-measure
UKB1	0.4557	0.4491	0.4523
UKB2	0.4557	0.4491	0.4524
UKB3	0.4560	0.4493	0.4526
UKB4	0.6360	0.6272	0.6316
UKB5	**0.6411**	**0.6322**	**0.6366**

For comparison SemEval2010 Task on WSD in specific domain, all-words-task:

- UKB3 52.6 precision
- English UKB 48.1 precision

- UKB5 & UKB4 gained 9 points on UKB3 due to co-occurrence relations

Memory-based word-experts

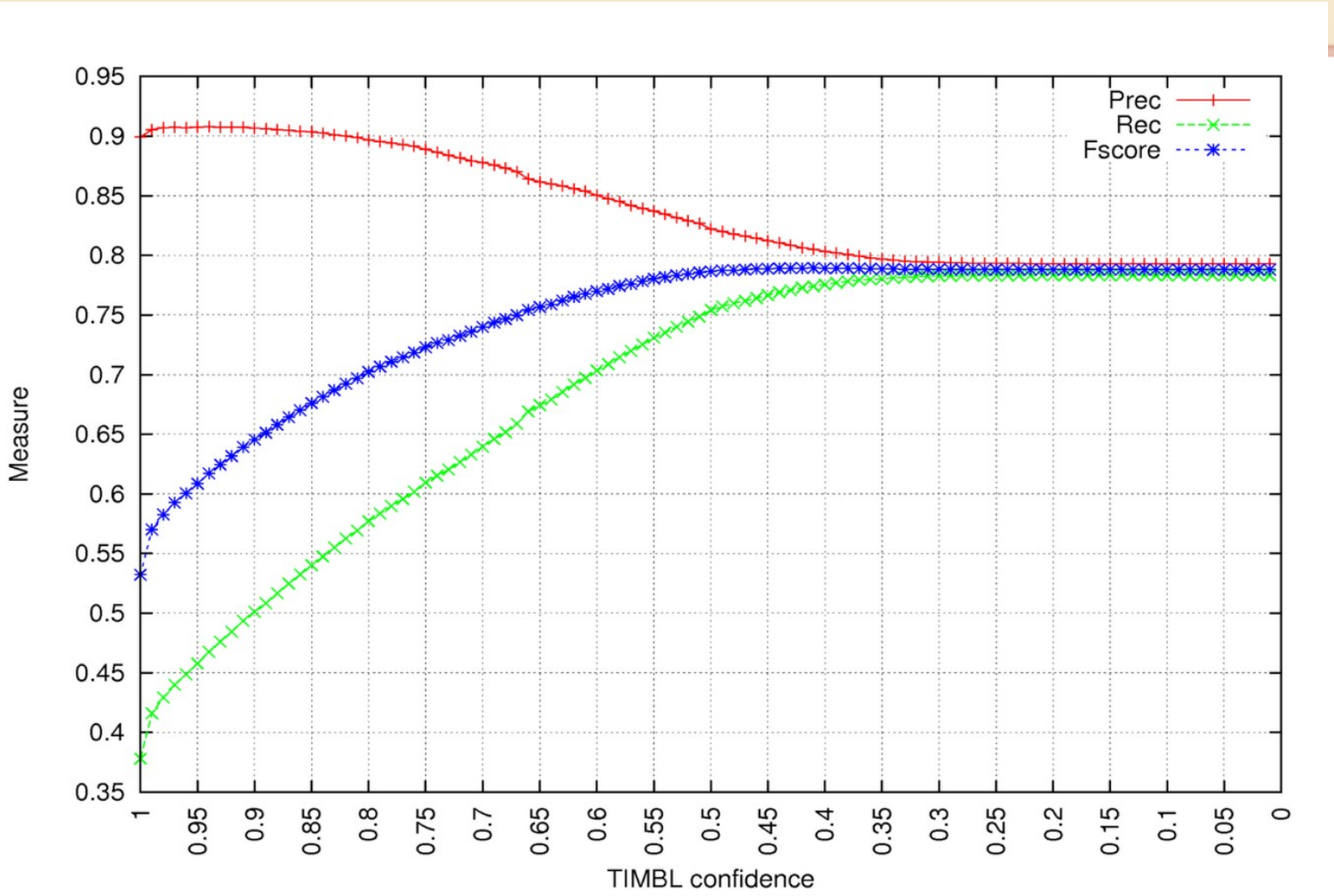
- TiMBL (Daelemans et at 2007)
- Word expert for each word (3,000), employing k-Nearest Neighbour classification
- Feature-vector:
  - Local context (word + words left and right)
  - Global context (binary bag-of-predictor-words in same sentence
  - Domain label
  - Parameter optimisation
- 10 test examples & 15 train examples (random)

TiMBL results

Feature set	Token accuracy
$Words_1$	0.6462
$Words_1$ + Bag-of-words	0.7259
$Words_1$ + PoS_1 + Bag-of-words	0.7226
$Words_1$ + Bag-of-words + PS	*0.7931*

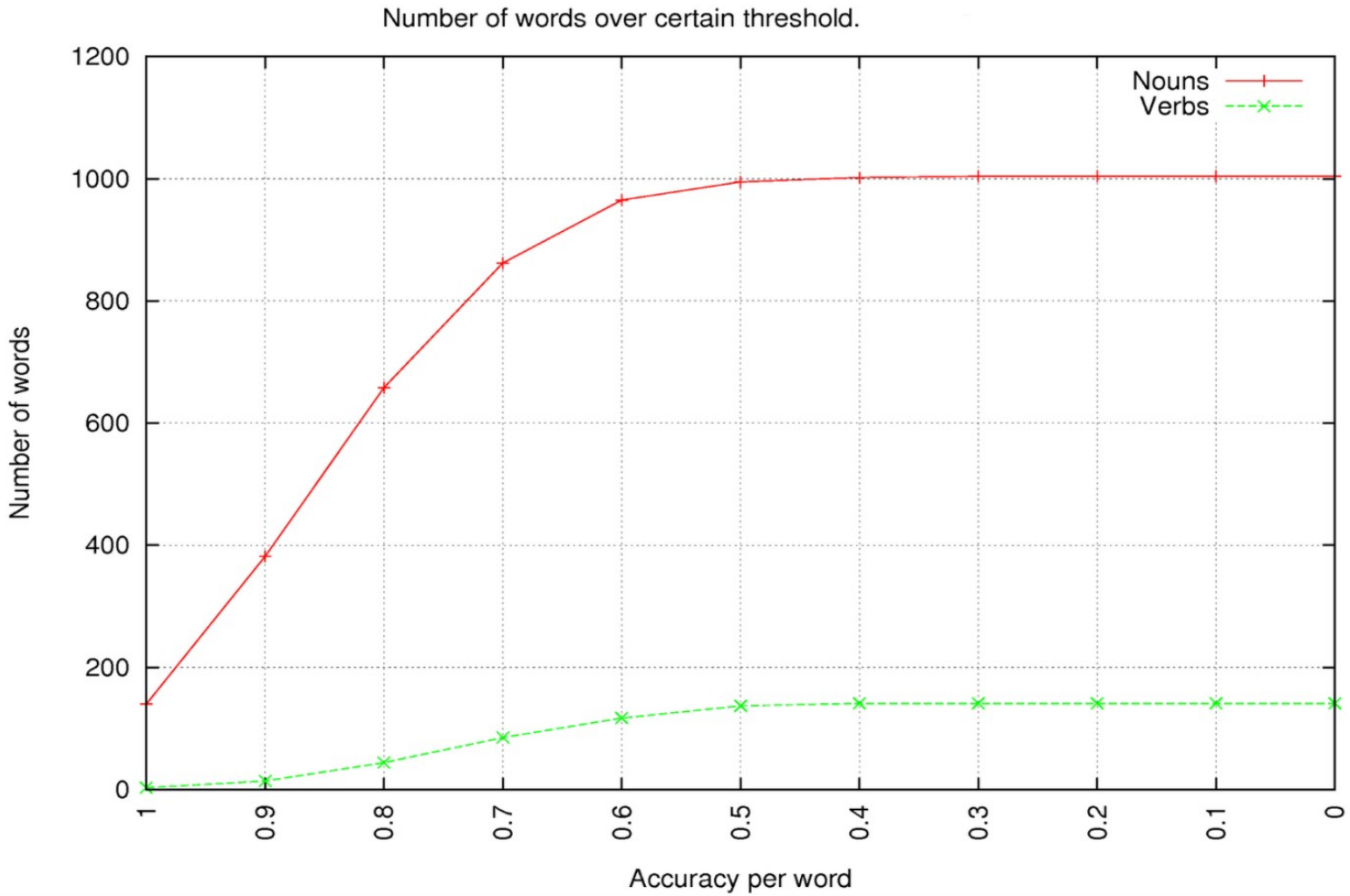
- Bag-of-predictor-words improvement of 8%
- Parameter optimisation (PS) improvement of another 7%

TiMBL results



confidence 0.55 & precision 0.84 (+0.44 compared to no filtering) and Fscore 0.78 (only -0.03 less than no filtering)

Accuracy per word



Phase-2: active learning

1) Train WSD with current data (minus the test set) & determine word accuracies and word meaning F-measures.
2) Select words with accuracy below 80%. Words that already perform well are ignored.
3) Apply WSD to all tokens of selected words not annotated.
4) Select tokens where WSD assigned meaning with F-measure below 80%. Tokens with good performing meanings are ignored.
5) Active-learning score: tokens of which WSD is sure it is the weak sense but that have different features from training set):
    1) (TiMBLE confidence + feature-distance)/ 2
6) Annotate 50 examples per weak meaning in two weeks and return to step 1)

Future work

- Fine tune the active learning;
- Optimise the WSD systems
- Combine named-entity recognition with WSD
- Combine different WSD systems
- Test on independent texts in all-words task
- Apply optimal system to full corpora (over 500K tokens)

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