

NCLT/CNGL
Internal Workshop

24 July 2008

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LEARNING WORD TRANSLATIONS

NON PARALLEL
CORPORA

Does syntactic context fare
better than positional context?

Learning a Translation Lexicon from non Parallel Corpora

- ❖ Motivation
- ❖ Methodology
- ❖ Implementation
- ❖ Experiments
- ❖ Conclusion

Master's Project

AT

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JUNE 2008

{ lexicon }

- Word – to – word mapping between 2 languages
- Invaluable resource in multilingual applications like CLIR, CL resource, CALL, etc.

Wahl	
election	0.85
ballot	0.10
option	0.02
selection	0.02
choice	0.01

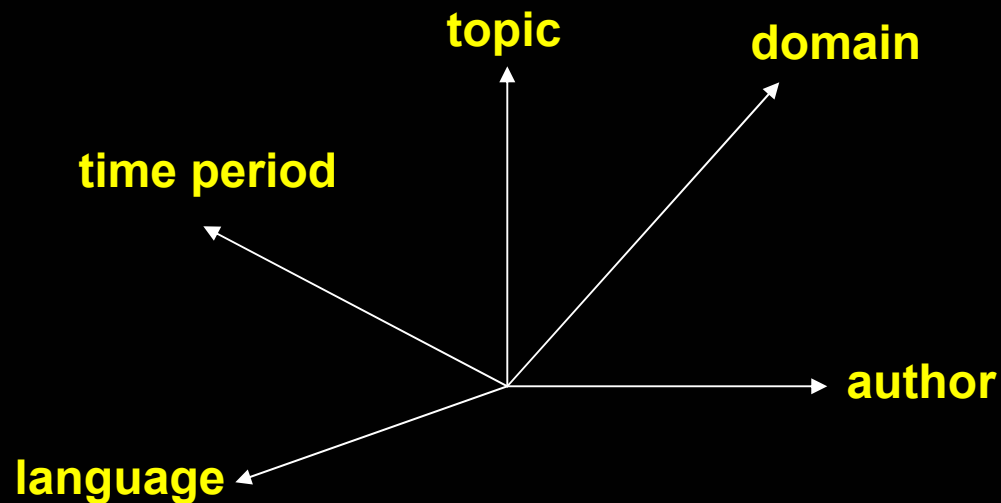
Sheridan & Ballerini 1996
McCarley 1999

Yarowsky & Ngai 2001
Cucerzan & Yarowsky 2002

Nerbonne et al. 1997

{ corpora }

- ◊ Parallel, comparable, non-comparable text
- ◊ More monolingual text than bitext
- ◊ 5 dimensions of nonparallelness
- ◊ Most statistical clues no longer applicable



MOTIVATION

{ task }

Given any two pieces of text
in any two languages...



...Can we extract word translations?

{ insight }

- ❖ If two words are mutual translations, then their more frequent collocates (context window) are likely to be mutual translations as well.
- ❖ Counting co occurrences within a window of size N is less precise than counting co occurrences within local syntactic contexts [**Harris 1985**].
- ❖ 2 types of context windows – Positional (window size 4) and Syntactic (head, dependent)

{ context }

Vinken will join the board as a nonexecutive director Nov 29 .

POSITIONAL:

Vinken will join the board as a **nonexecutive** director Nov 29 .

SYNTACTIC:

Vinken will join the board as a **nonexecutive** director Nov 29 .



{ algorithm }

- ❖ For each unknown word in the SL & TL, define the **context** in which that word occurs.
- ❖ Using an initial **seed** lexicon, translate as many source context words into the target language.
- ❖ Use a **similarity** metric to compute the translation of each unknown source word. It will be the target word with the most similar context.

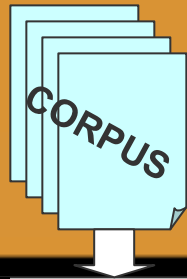
Rapp 1995, 1999

Fung & Yee 1998

Koehn & Knight 2002

Otero & Campos 2005

IMPLEMENTATION



{ system }

1 CORPUS
CLEANING



2 PCFG
PARSING

{ pre-process }

1 Raw Text Corpora:

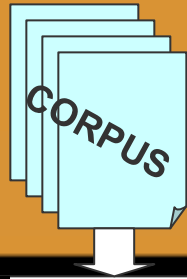
	ENGLISH	GERMAN
DATA	Wall Street Journal (WSJ)	Deutsche Presse Agentur (DPA)
YEARS	1990,1991 and 1992	1995 and 1996
COVERAGE	446 days of news text	530 days of news text

2 Phrase Structures:

Stanford Parser (Lexicalized PCFG) for English and German
<http://nlp.stanford.edu/software/lex-parser.shtml>

[Klein & Manning 2003]

IMPLEMENTATION



{ system }

1 CORPUS
CLEANING

2 PCFG
PARSING

3 PS TO DS
CONVERSION

4 DATA
SETS

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Lexicon Extraction ~ Ankit

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{ pre-process }

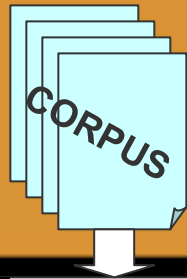
3 Dependency Structures:

Head Percolation Table [**Magerman 1995; Collins 1997**] was used to extract head-dependent relations from each parse tree.

4 Data Sets:

	ENGLISH	GERMAN
TEXT	1,521,998 sentences	808,146 sentences
TOKENS	36,251,168 words	14,311,788 words
TYPES	276,402 words	388,291 words

IMPLEMENTATION



1 CORPUS
CLEANING

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CONVERSION

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{ system }

SEED
LEXICON

PARSED
TEXT

RAW
TEXT

5 CONTEXT GENERATOR

SYN
VECTORS

POS
VECTORS

Lexicon Extraction ~ Ankit

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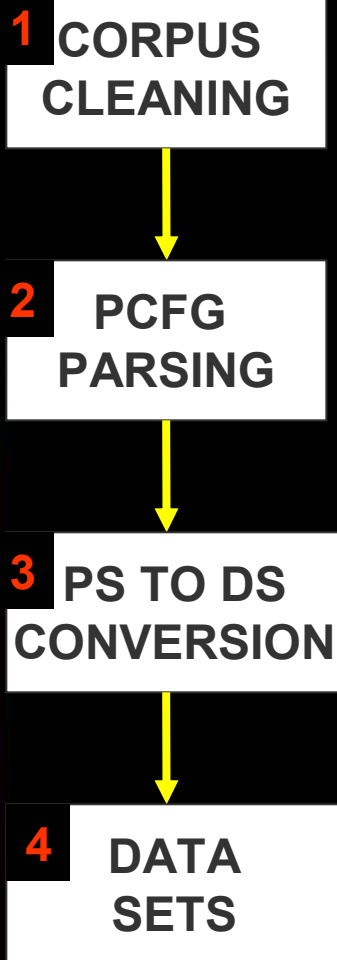
{ vector }

- ❖ Seed lexicon obtained from a dictionary, identically spelled words, spelling transformation rules.
- ❖ Context vectors have dimension values (co occurrence of word with seed) normalized on seed frequency.

5 Context Vectors:

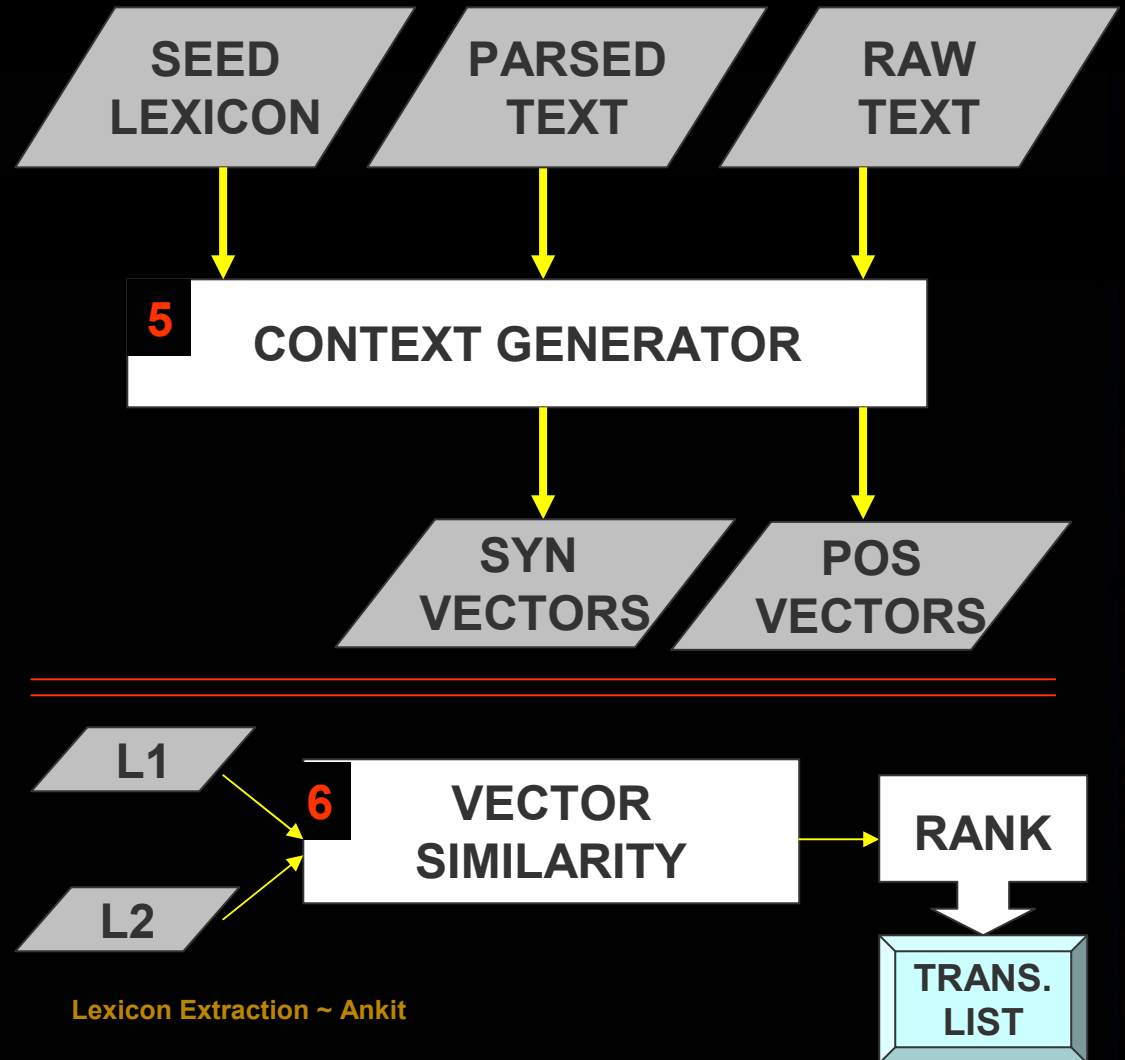
	ENGLISH	GERMAN
DIMENSION	2,376 words	
SEED	2,350 words	2,376 words
UNKNOWN	74,434 words	106,366 words

IMPLEMENTATION



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{ system }



Lexicon Extraction ~ Ankit

{ evaluate }

- ❖ Vector similarity metrics used are city block [Rapp 1999] and cosine. Translations sorted in descending order of scores.
- ❖ Evaluation data extracted from online bilingual dictionaries (364 translations).

6 Ranked Translations Predictor:

	CITY BLOCK	COSINE
POSITIONAL CONTEXT	63 out of 364	148 out of 364
SYNTACTIC CONTEXT	301 out of 364	216 out of 364

{ endnote }

- ❖ Extraction from non parallel corpora useful for compiling lexicon from new domains.
- ❖ Syntactic context helps in focusing the context window, more impact on longer sentences.
- ❖ Non parallel corpora involves more filtering, search heuristics than in parallel.
- ❖ Future directions include using syntactic only on one side, extending coverage through stemming.

{ thanks }

