Unsupervised Regularization of Historical Texts for POS Tagging

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Corpus-based Research in the Humanities
December 10, 2015; Warsaw, Poland

Reference Corpus Middle Low German/Low Rhenish

- Funded by the German Research Foundation (DFG)

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  - Group of dialects
  - Time: 1200-1650
  - Region: Northern Germany

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Name	Year	Domain	Tokens	Types
Johannes	~1480	religious texts	19645	2305
Griseldis	1502	literature	9062	2251
OldenbSSP	1336	law	21800	2731
SaechsWeltchr	1st half 14th c.	arts	18215	3255
		Sum	68722	10542

Overview

- Spelling Variation
- Modernization
- Regularization
- Unsupervised, Language-independent Regularization
  - The Approach
  - Evaluation
- Conclusion

Spelling Variation

Appears in non-standard texts: historical texts, user-generated content, ...

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vorwar vorwar segge ik iu
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uorwar uorwar segge ik ju
vorwar uorwar segge ik iw
UOrwarvorwar segge ik iw
in truth in truth tell I you

'I tell you in truth'
(Johannes)

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- Makes (automatic) annotation harder

> *"Non-standard words are present in many text genres, including advertisements, professional forums, and SMS messages. They can be the cause of reading and understanding problems for humans, and degrade the accuracy of text processing tools [...]."*

[Baldwin et al., 2015]

Solutions in Computational Linguistics

- Automatically preprocess the texts
  - Historical texts
    - Normalization [Bollmann et al., 2012]
    - Canonicalization [Jurish, 2013]
    - Modernization [Scherrer and Erjavec, 2016]
  - User-generated content
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Mapping historical words to the equivalent modern form.

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↓	↓	↓	↓	↓	
fürwahr	fürwahr	sage	ich	euch	Modern German
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Benefits and Requirements of Modernization

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[Sanders, 1982]

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Aim: Regularization without existing annotations

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2. appear in similar contexts

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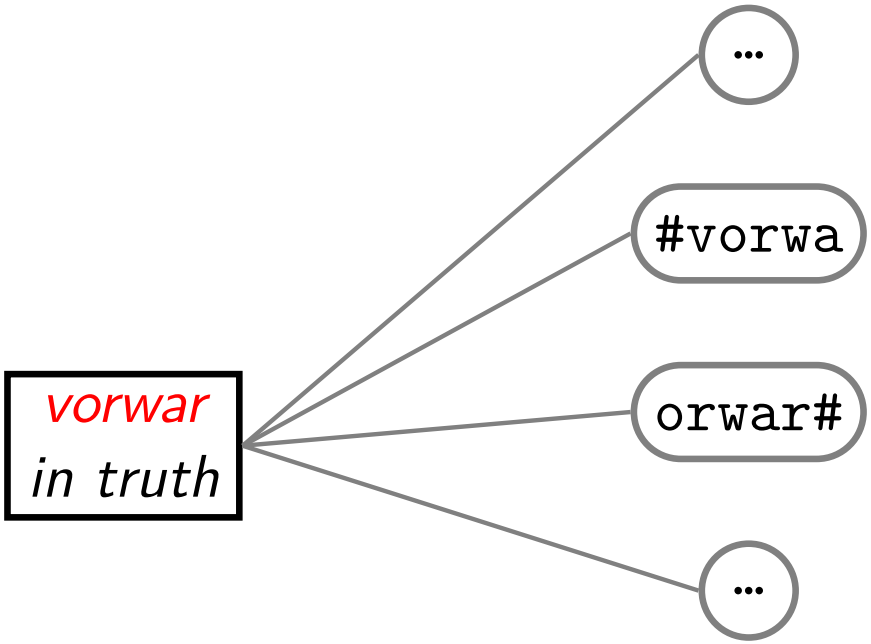
Most spelling variants ...

1. are formally similar → Proxinette [Hathout, 2014]
2. appear in similar contexts

Proxinette



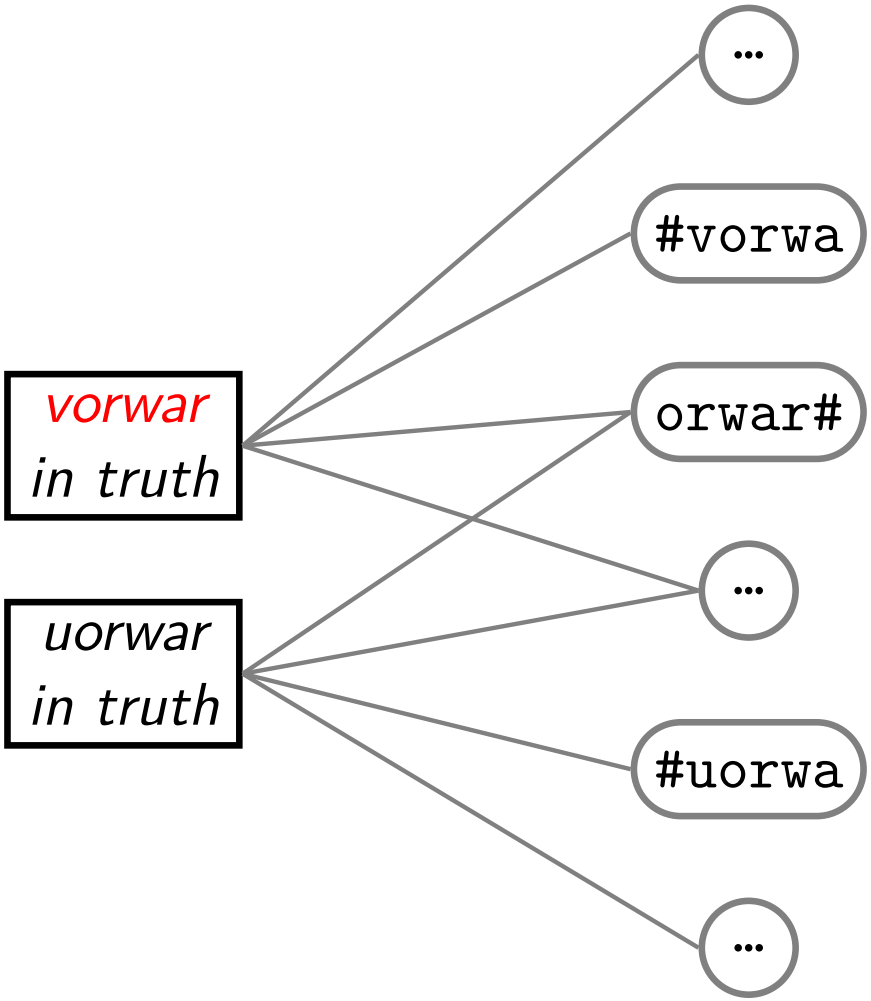
Legend:

Type

`Character-Ngram`

- Word boundary

Proxinette



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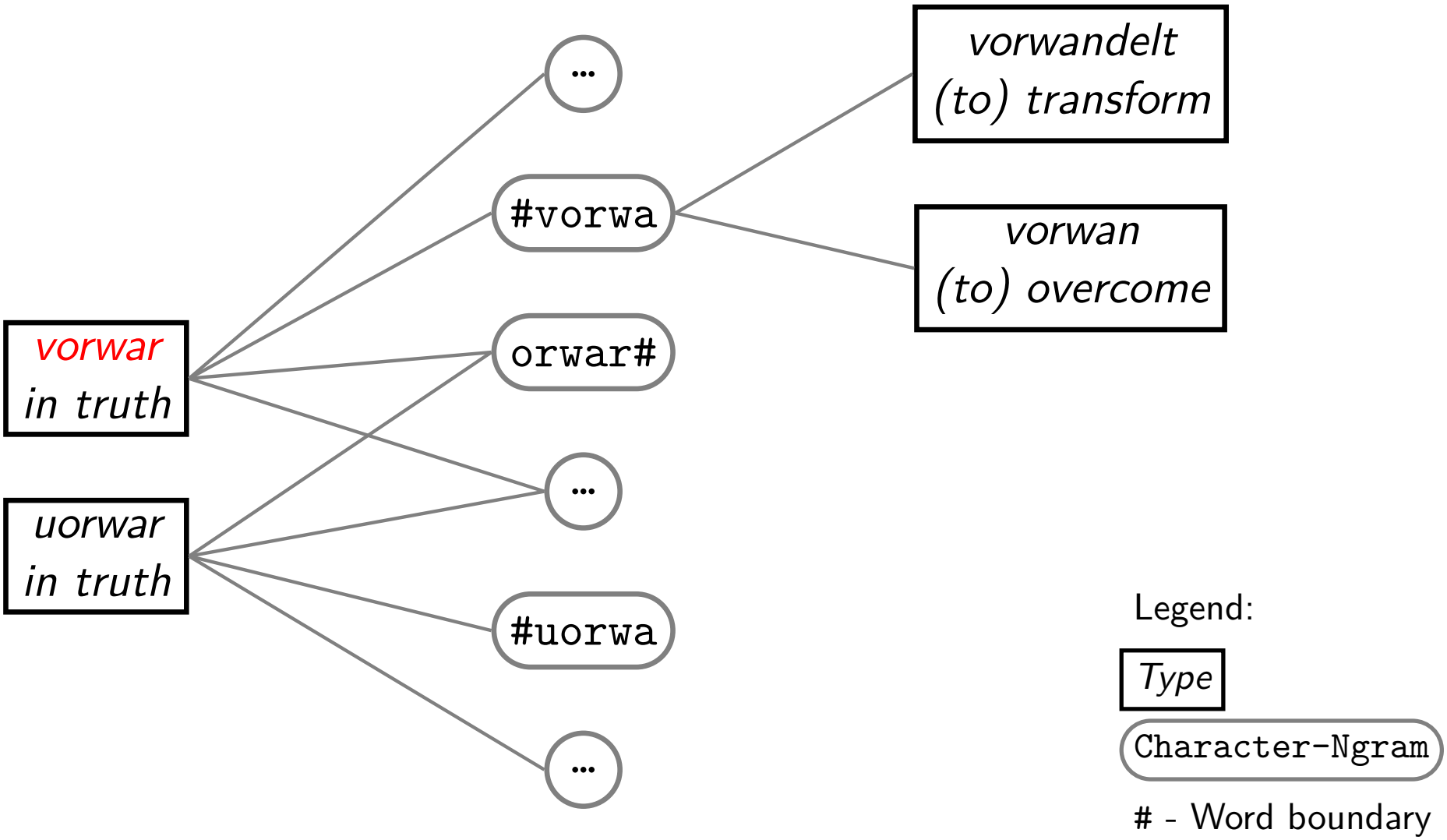
vorwandelt
(to) transform
...
#vorwa
vorwan
(to) overcome
vorwar
in truth
orwar#
...
uorwar
in truth
#uorwa
...
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2. appear in similar contexts → Brown clusters [Brown et al., 1992]

Brown Clusters

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<BOS> vorwar vorwar segge ik iu

left context of x	x
<BOS>	vorwar

Brown Clusters

<BOS> vorwar vorwar segge ik iu

left context of x	x
<BOS>	vorwar
vorwar	vorwar

Brown Clusters

<BOS> uorwar vorwar segge ik iu

left context of x	x
<BOS>	vorwar
vorwar	vorwar
uorwar	vorwar

Brown Clusters

left context of x	x
<BOS>	vorwar uorwar
vorwar	vorwar uorwar
uorwar	vorwar uorwar

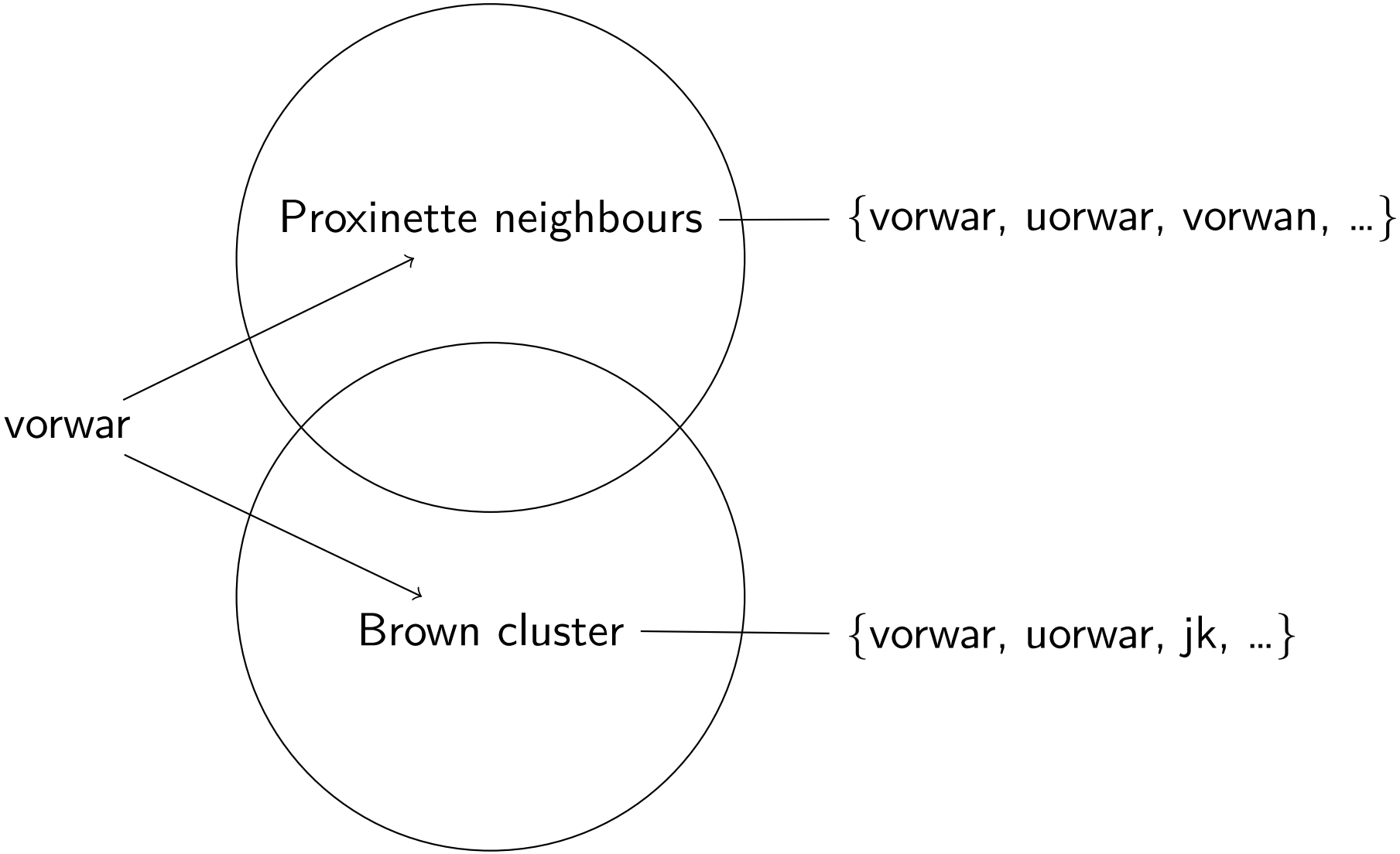
Brown Clusters

left context of x	x
<BOS>	vorwar uorwar jk ik ick ...
vorwar	vorwar uorwar segge ...
uorwar	vorwar uorwar segge ...

Regularization with Proxinette and Brown clusters

vorwar

Regularization with Proxinette and Brown clusters



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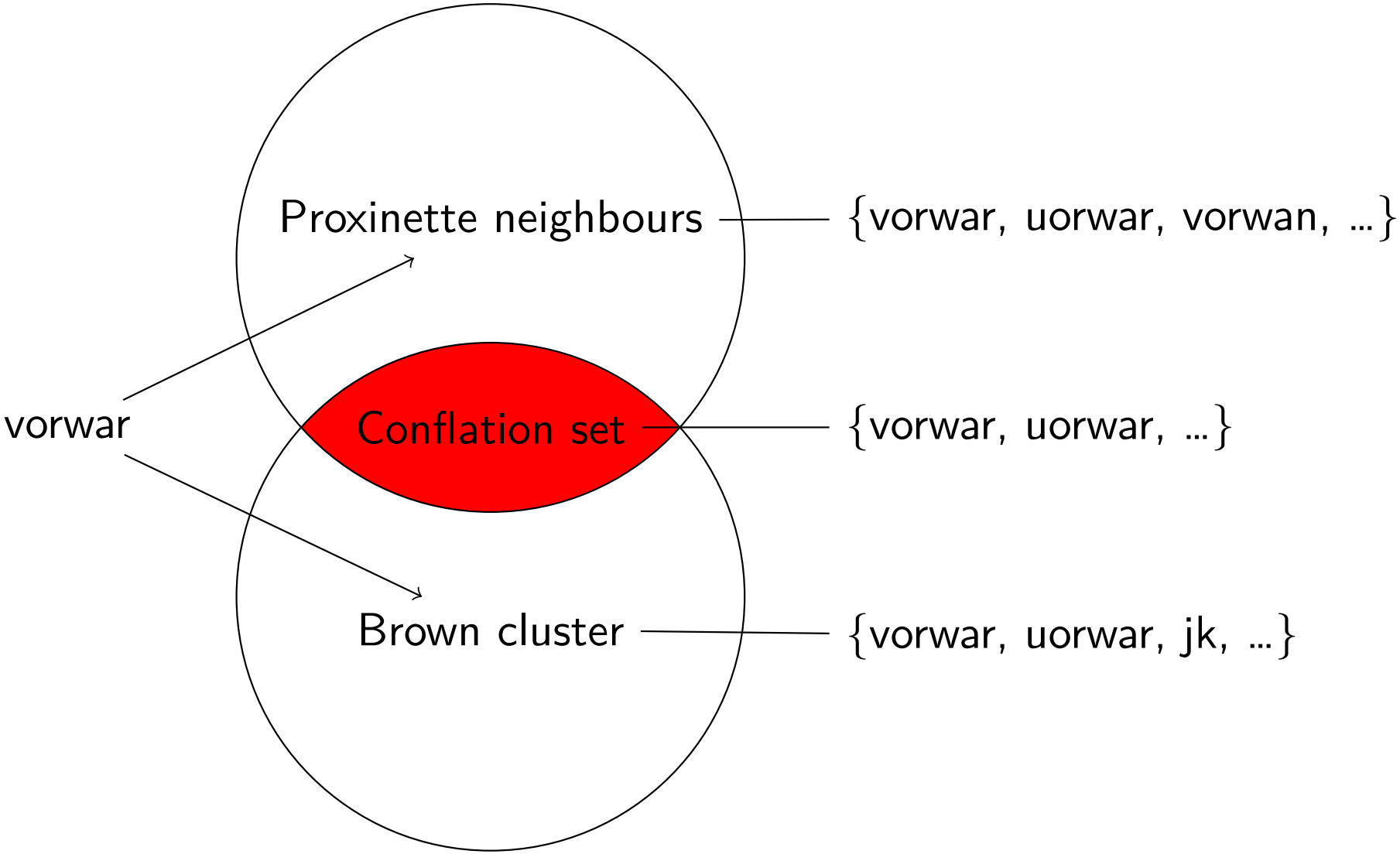

Evaluation with POS Tagging

- Train a POS tagger on one text, tag another one.

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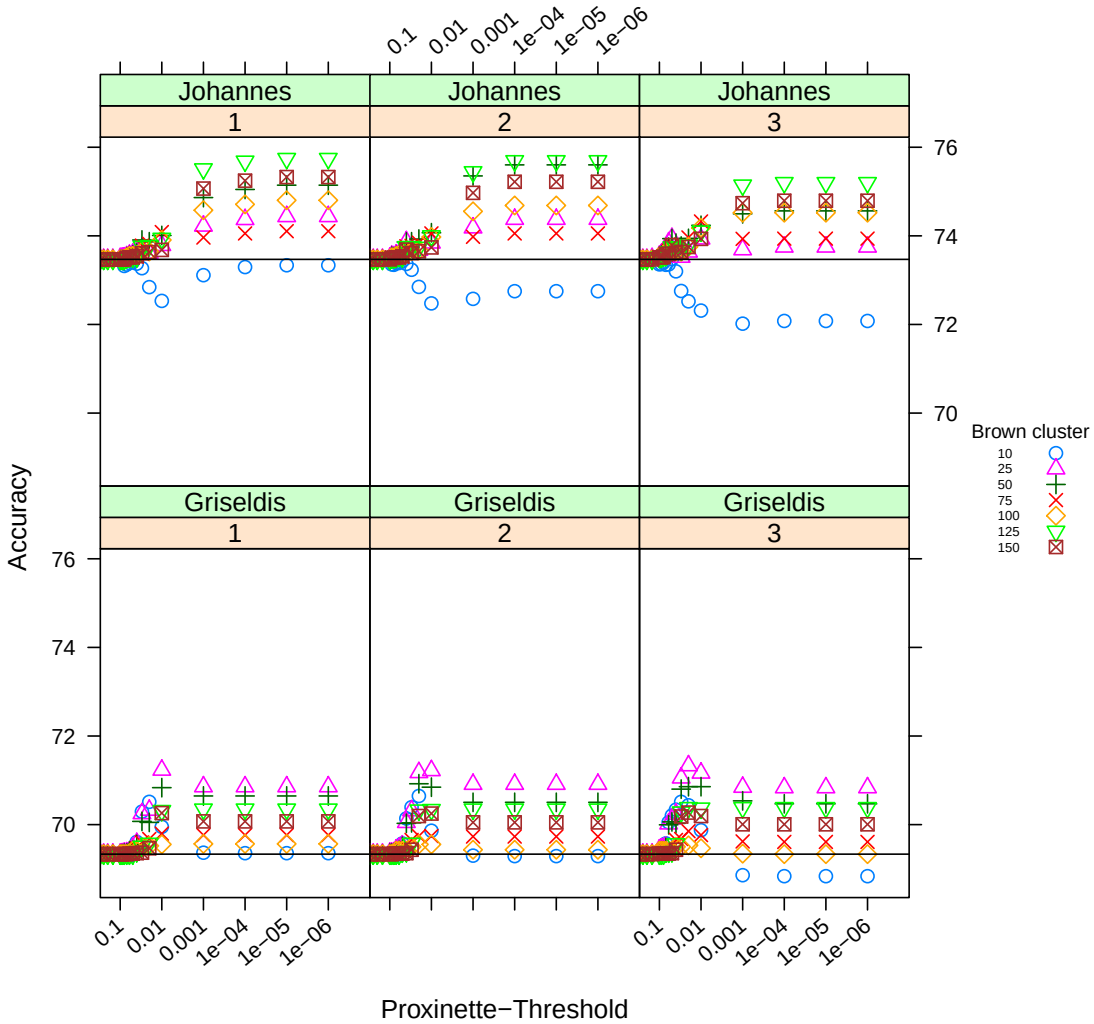
Evaluation with POS Tagging

- Train a POS tagger on one text, tag another one.
- Unknown words might be spelling variants of known words:
  Substitute unknown types with a randomly chosen known type from the conflation set before applying the tagger.
- Expectation:
  Accuracy will increase, if the conflation sets are sets of spelling variants.

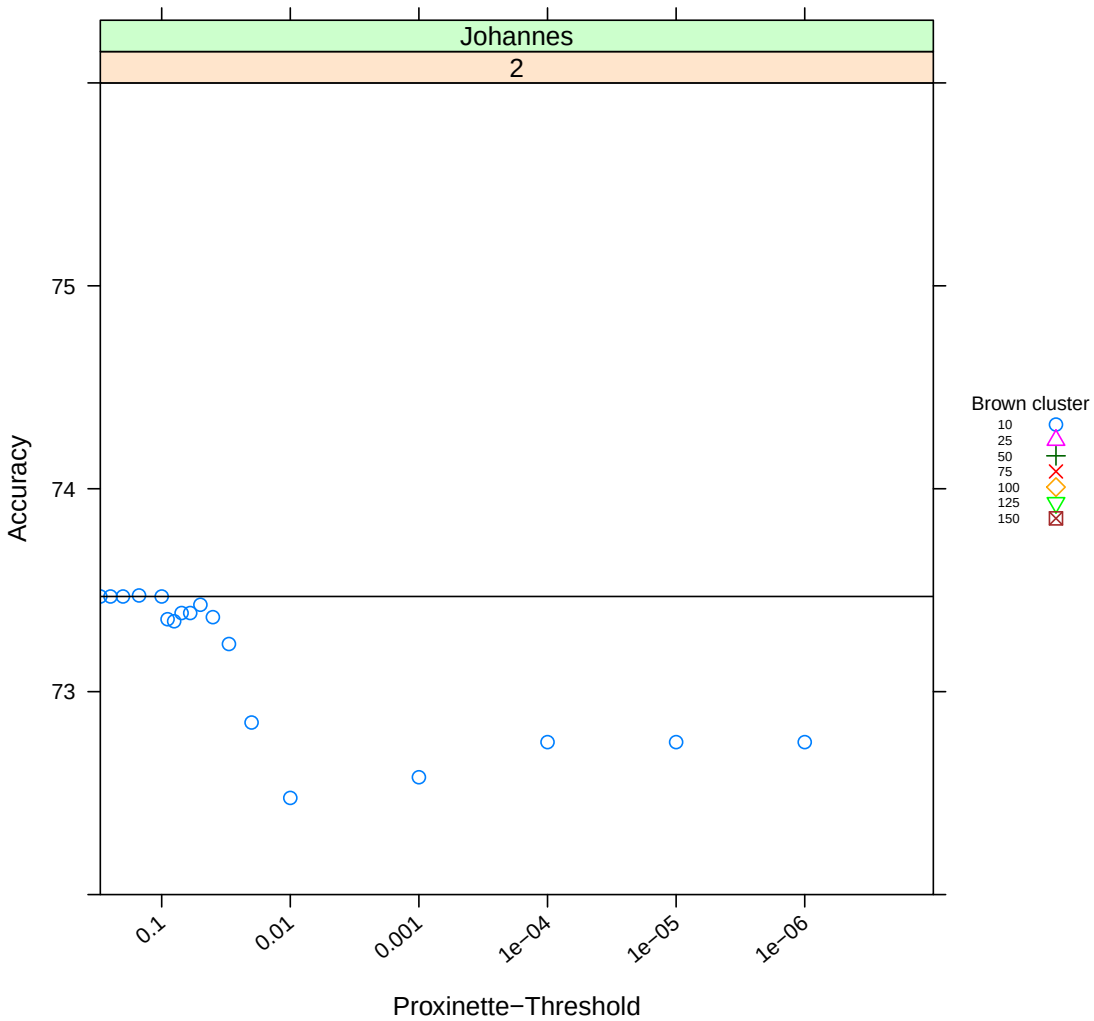
Experiment

- Tagger: RFTagger [Schmid and Laws, 2008]
- Parameters
  - Proxinette: Minimal similarity, Minimal size of character-ngram
  - Brown clusters: Number
  - Both: Texts used to compute the network/clusters

Results


Johannes
1
Johannes
2
Johannes
3
Griseldis
1
Griseldis
2
Griseldis
3
Accuracy
76
74
72
70
0.1
0.01
0.001
1e−04
1e−05
1e−06
Proxinette−Threshold
Brown cluster
10
25
50
75
100
125
150

Results


Johannes
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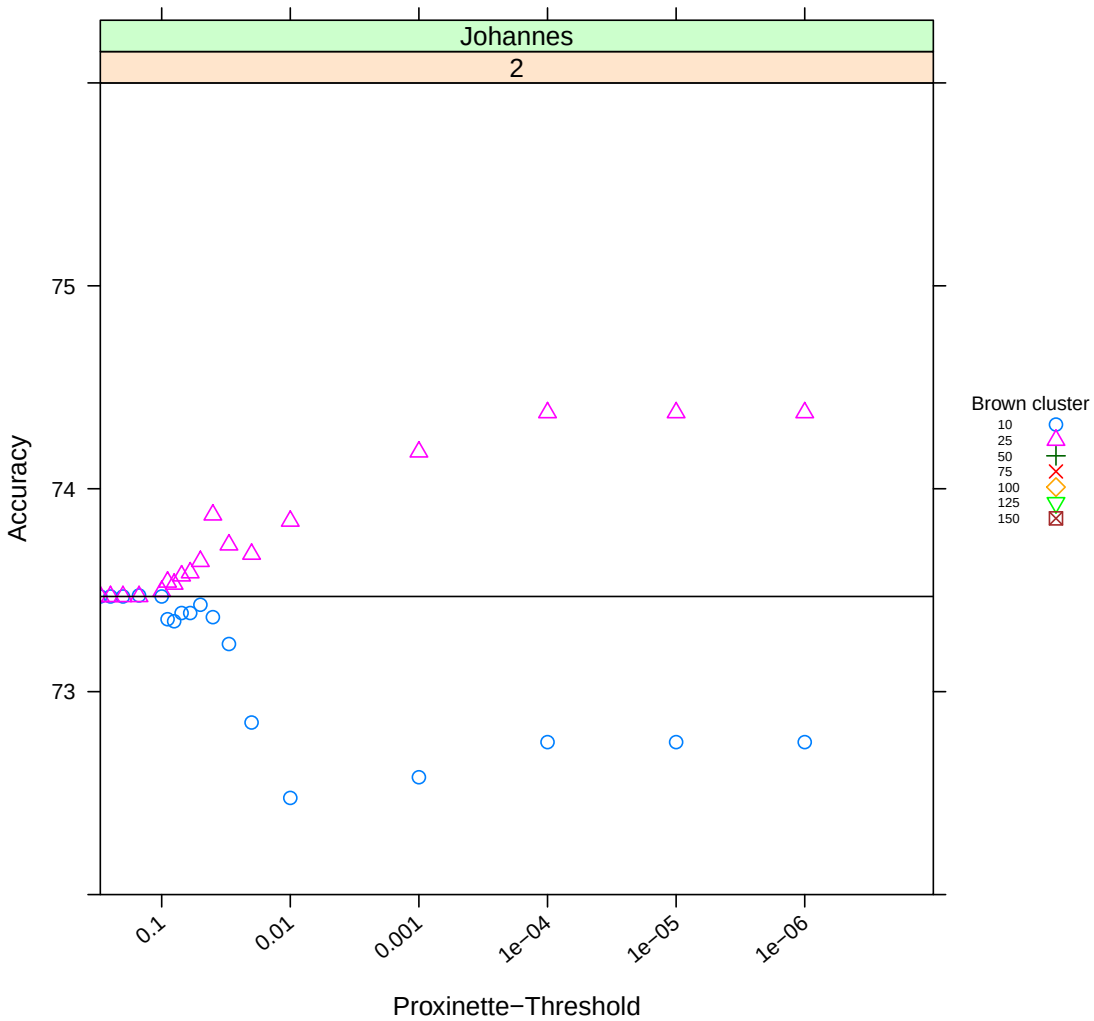
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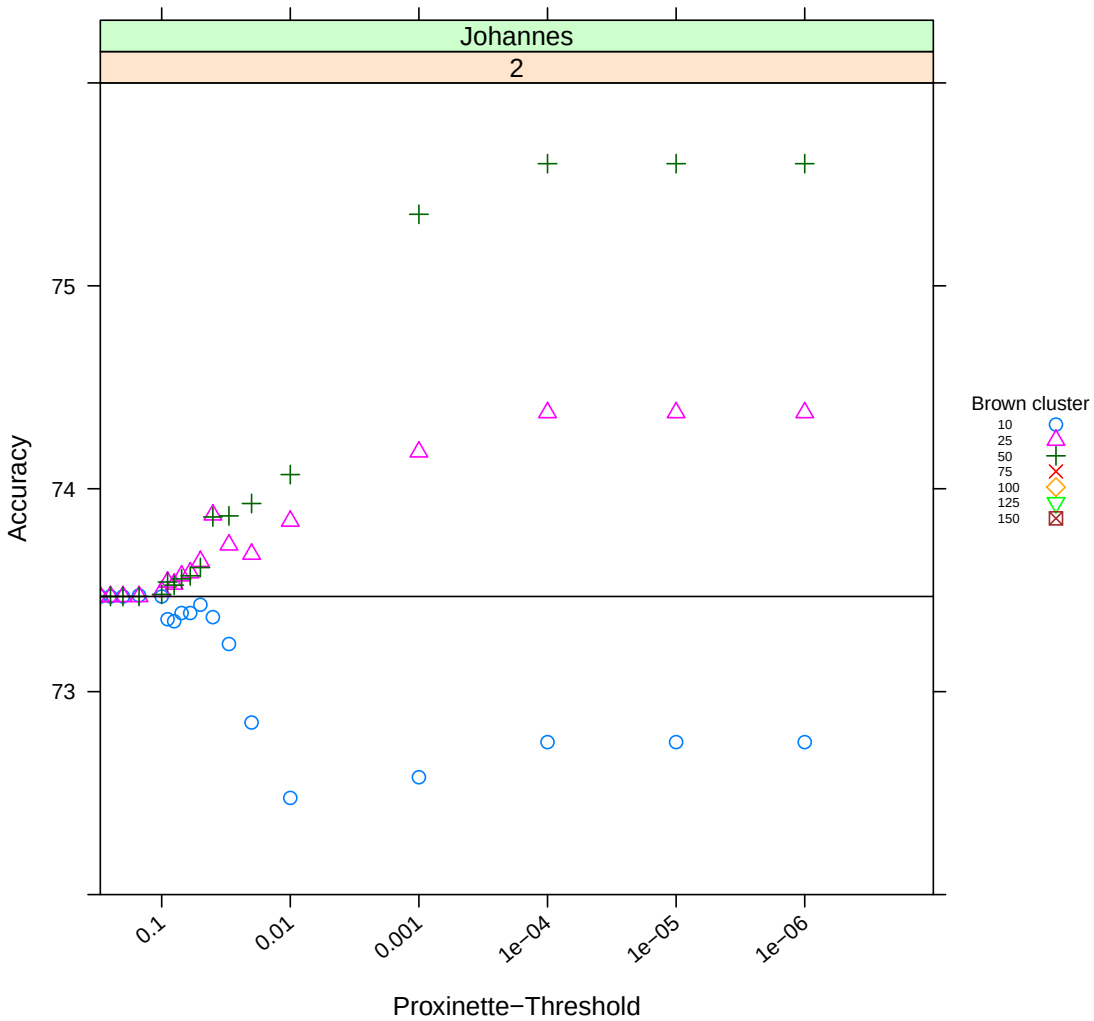
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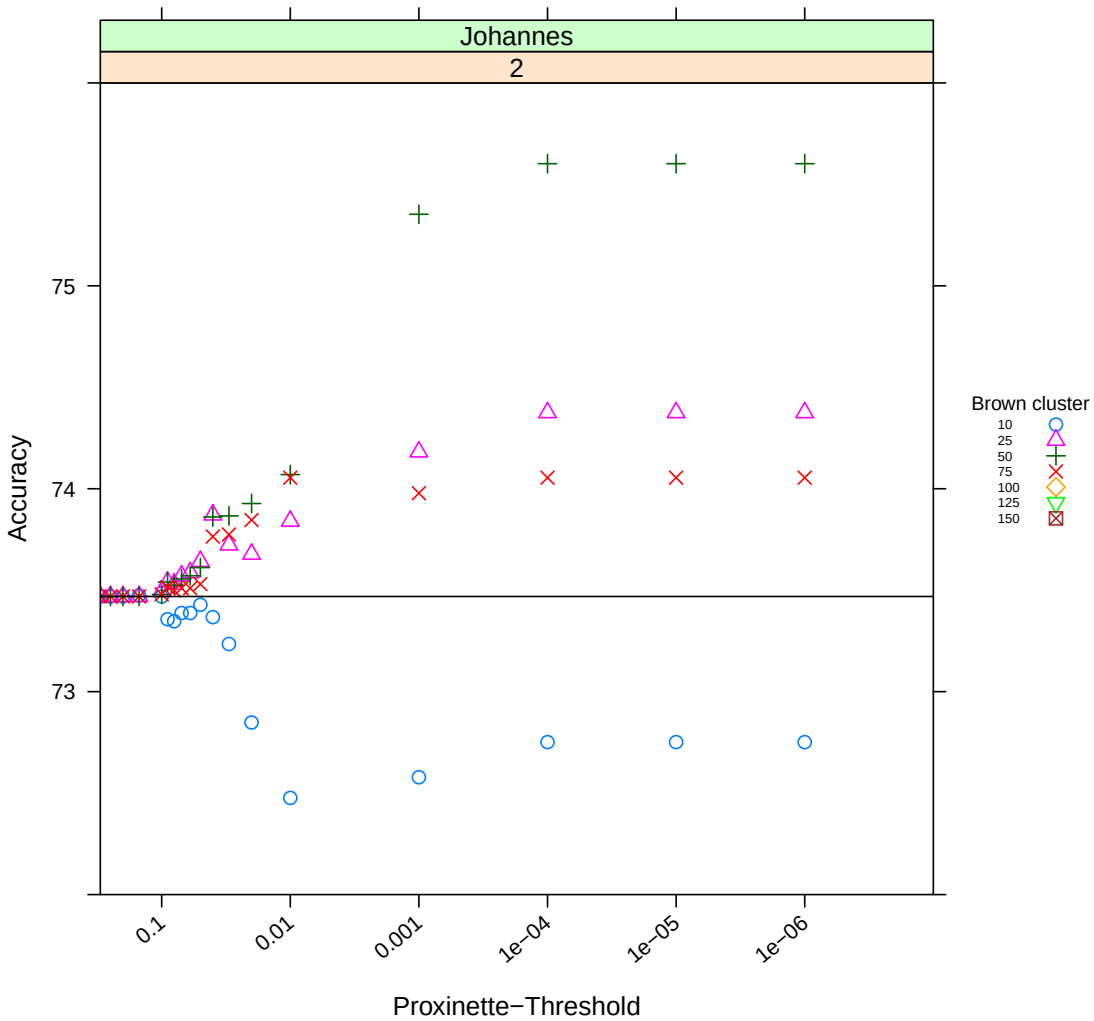
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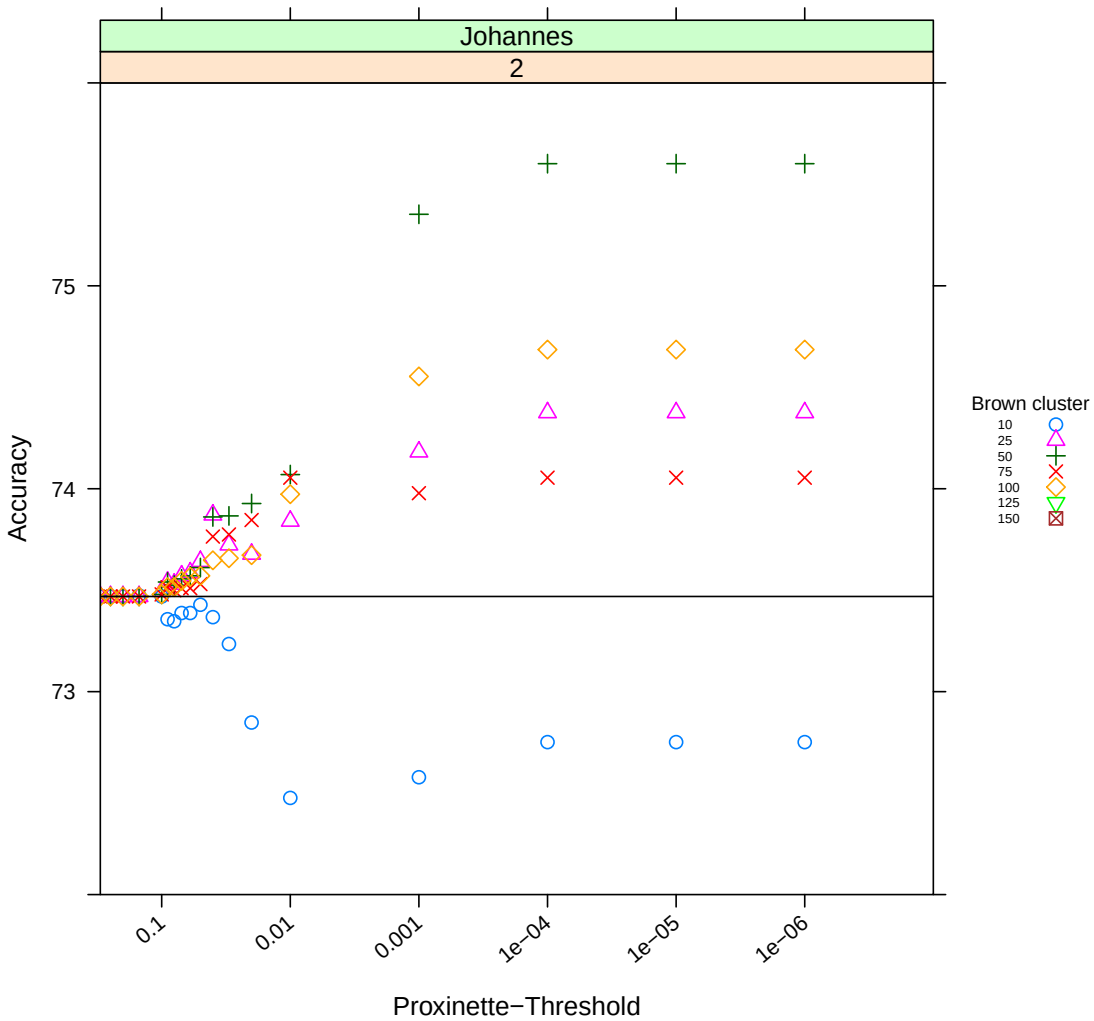
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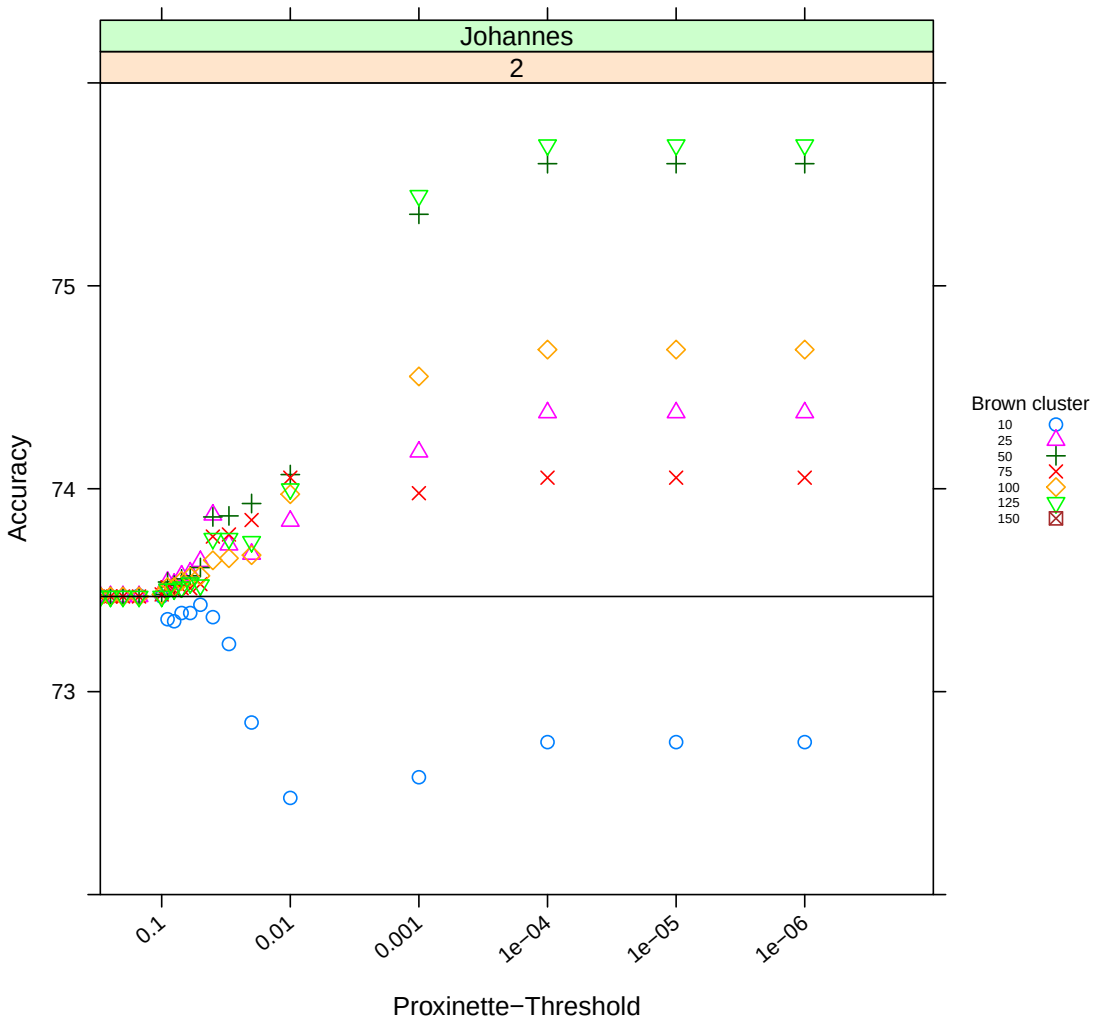
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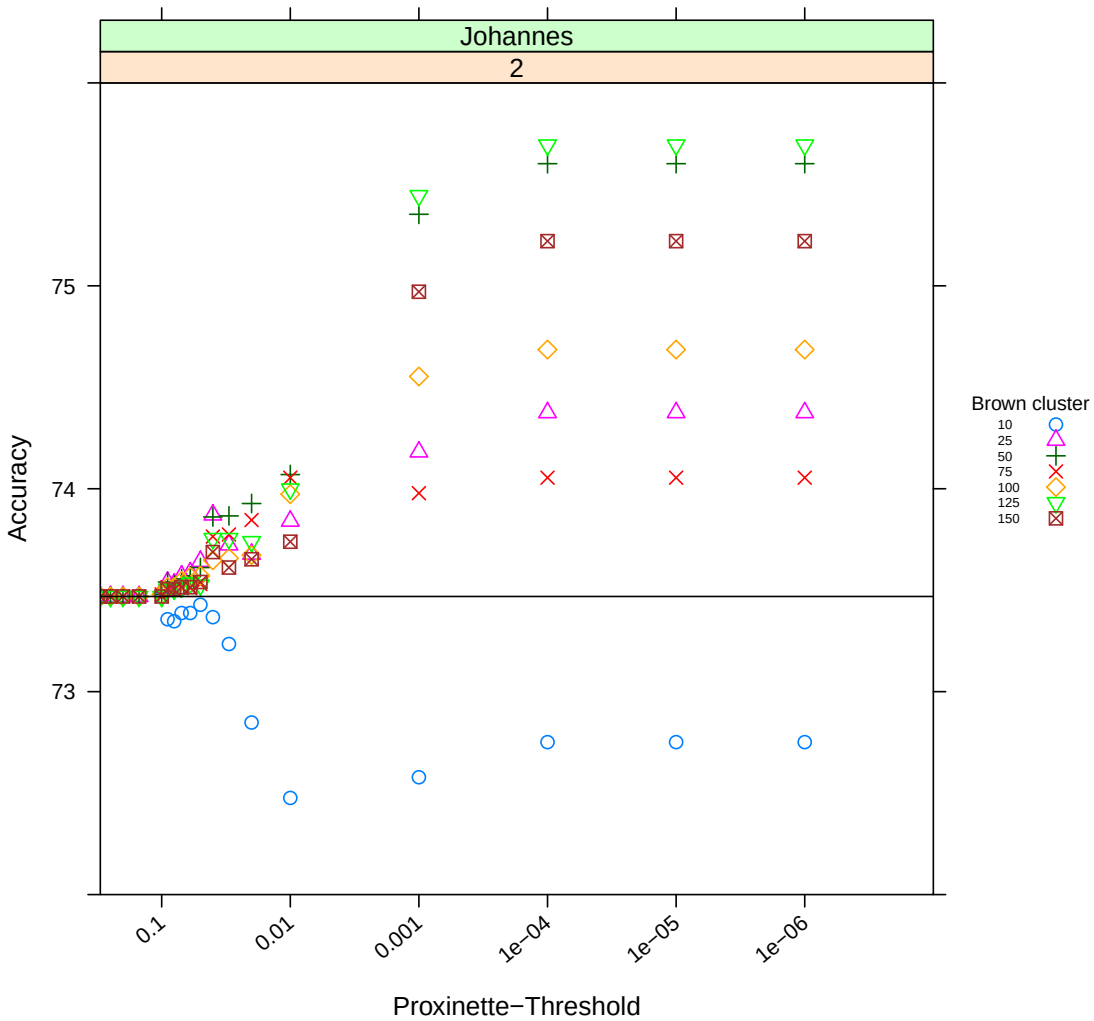
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12	hijr	hir	x	'here'
12	scole	schole	x	'shall'
13	scrift	schrifft	x	'writing'
17	efte	eft	x	'or'
17	sic	sick	x	'herself,himself...'
18	neman	nemande	x	'nobody'
21	uadere	vadere	x	'father'
27	comen	komen	x	'come'
30	lef	leff	x	'beloved'
43	scolen	scholen	x	'shall'
67	uader	vader	x	'father'
14	echter	echtes		'again' (diff. morphology)
15	ghecomen	komen		'come' (diff. inflection)
15	iiij	iii		Roman numerals
15	schare	hare		'cohort'; 'hair'
16	loue	louen		'believe, praise, promise' (diff. inflection)
22	jk	jodoch		'I';'but'
61	ioden	boden		'jews'; 'messengers'

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17	efte	eft	x	'or'
17	sic	sick	x	'herself,himself...'
18	neman	nemande	x	'nobody'
21	uadere	vadere	x	'father'
27	comen	komen	x	'come'
30	lef	leff	x	'beloved'
43	scolen	scholen	x	'shall'
67	uader	vader	x	'father'
14	echter	echtes		'again' (diff. morphology)
15	ghecomen	komen		'come' (diff. inflection)
15	iiij	iii		Roman numerals
15	schare	hare		'cohort'; 'hair'
16	loue	louen		'believe, praise, promise' (diff. inflection)
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Overview

- Spelling Variation
- Modernization
- Regularization
- Unsupervised, Language-independent Regularization
  - The Approach
  - Evaluation
- Conclusion

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  - Evaluate with different annotations/tasks

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  - Exploit systematicity of spelling variation

Thank iu for iwe attention.

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