Evaluating the Stanza NLP toolkit's performance on historical Polish

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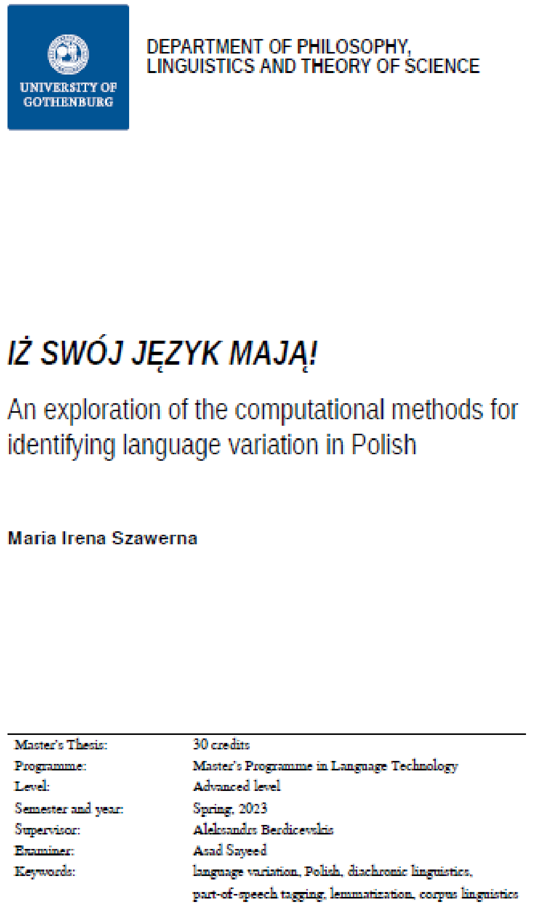
Roadmap

- Research Context
  - Original project
  - Related work
- Data
  - Example
- Research Question
- Experiment
- Results
- Future Work
- Conclusions

Related Research

- MA thesis project at the University of Gothenburg
- Quantitative and corpus research in historical linguistics
  - Part-of-speech tagging of historical data
- Methods for dealing with language variation in NLP



UNIVERSITY OF GOTHENBURG

DEPARTMENT OF PHILOSOPHY, LINGUISTICS AND THEORY OF SCIENCE

IŻ SWÓJ JĘZYK MAJĄ!

An exploration of the computational methods for identifying language variation in Polish

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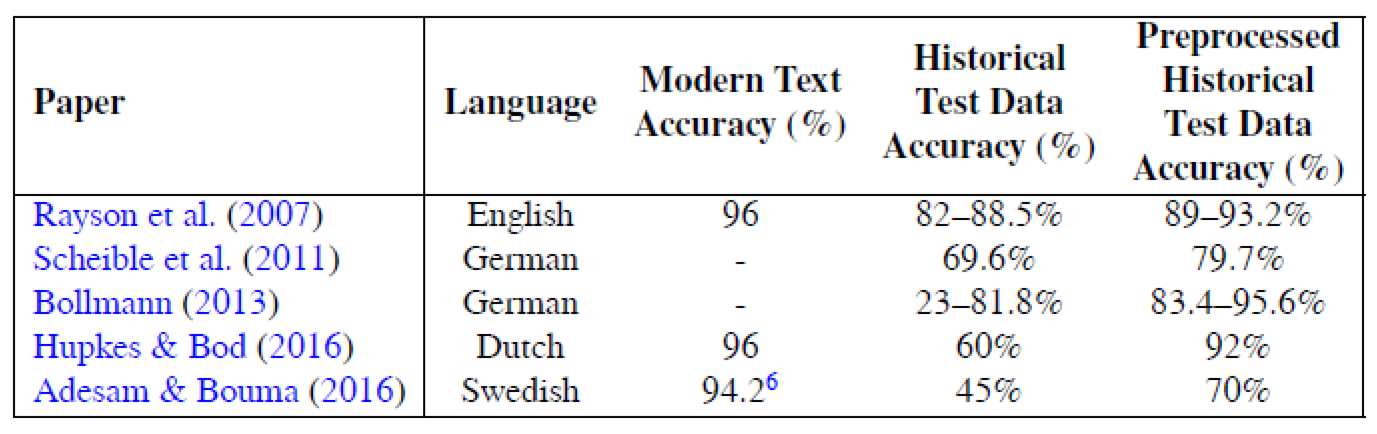
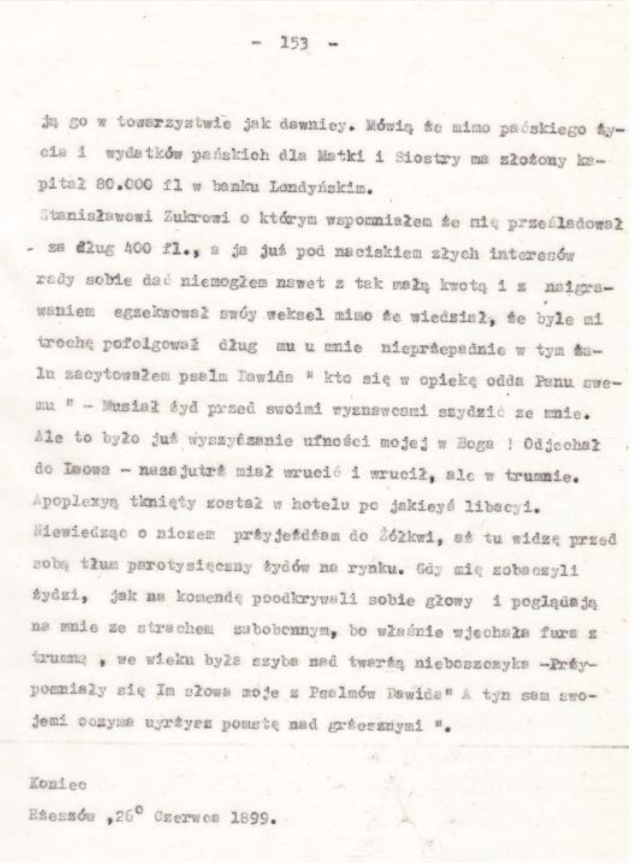
Master's Thesis:	30 credits
Programme:	Master's Programme in Language Technology
Level:	Advanced level
Semester and year:	Spring, 2023
Supervisor:	Aleksandrs Berdicevskis
Examiner:	Asad Sayeed
Keywords:	language variation, Polish, diachronic linguistics, part-of-speech tagging, lemmatization, corpus linguistics

Related Research



Paper	Language	Modern Text Accuracy (%)	Historical Test Data Accuracy (%)	Preprocessed Historical Test Data Accuracy (%)
Rayson et al. (2007)	English	96	82–88.5%	89–93.2%
Scheible et al. (2011)	German	-	69.6%	79.7%
Bollmann (2013)	German	-	23–81.8%	83.4–95.6%
Hupkes & Bod (2016)	Dutch	96	60%	92%
Adesam & Bouma (2016)	Swedish	94.2[6]	45%	70%

Waszczuk et al. (2018): precision and recall both around 88.3% for baroque texts and 90.3% for texts from 1830–1918.



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ją go w towarzystwie jak dawniey. Mówią że mimo pańskiego życia i wydatków pańskich dla Matki i Siostry ma złożony kapitał 80.000 fl w banku Londyńskim.

Stanisławowi Zukrowi o którym wspomniałem że mię prześladował - za dług 400 fl., a ja już pod naciskiem złych interesów rady sobie dać niemogłem nawet z tak małą kwotą i z naigrawaniem egzekwował swóy weksel mimo że wiedział, że byle mi trochę pofolgował dług mu u mnie nieprzepadnie w tym żalu zacytowałem psalm Dawida " kto się w opiekę odda Panu swemu " - Musiał żyd przed swoimi wyznawcami szydzić ze mnie.

Ale to było już wyszydzanie ufności mojej w Boga ! Odjechał do Lwowa - nazajutrz miał wrucić i wrucił, ale w trumnie.

Apoplexyą tknięty został w hotelu po jakieyś libacyi.

Niewiedząc o niczem przyjeżdżam do Żółkwi, aż tu widzę przed sobą tłum parotysięczny żydów na rynku. Gdy mię zobaczyli żydzi, jak na komendę poodkrywali sobie głowy i poglądają na mnie ze strachem zabobonnym, bo właśnie wjechała fura z trumną , we wieku była szyba nad twarzą nieboszczyka -Przypomniały się Im słowa moje z Psalmów Dawida" A tym sam swojemi oczyma uyrzysz pomstę nad grzesznymi ".

Koniec

Rzeszów ,26° Czerwca 1899.

Data

- 1899 memoir from the *Kresy* region.
- Visible variation in e.g. spelling, still intelligible for a native speaker.
- Manual UD-style annotation (with pre-annotation).
  - Total: 37 405 tokens.
  - UPOS-annotated: 10 286 tokens.
  - XPOS-annotated, lemmatized: 3271 tokens.

Data – example

Original:

Odjechał do Lwowa – nazajutrż miał wrucić i wrucił, ale w trumnie.
Apoplexyą tknięty został w hotelu po jakieyś libacyi.

Modernized spelling:

Odjechał do Lwowa – nazajutrz miał wrócić i wrócił, ale w trumnie.
Apopleksją tknięty został w hotelu po jakiejś libacji.

Heavily modernized language:

Pojechał do Lwowa – miał wrócić dzień później, i wrócił, ale w trumnie.
Dostał udaru w hotelu po jakiejś imprezie.

English:

He drove away to Lviv – and he was supposed to return the day after and that he did, but in a coffin.
He had suffered a stroke at a hotel after some party.

Research Question

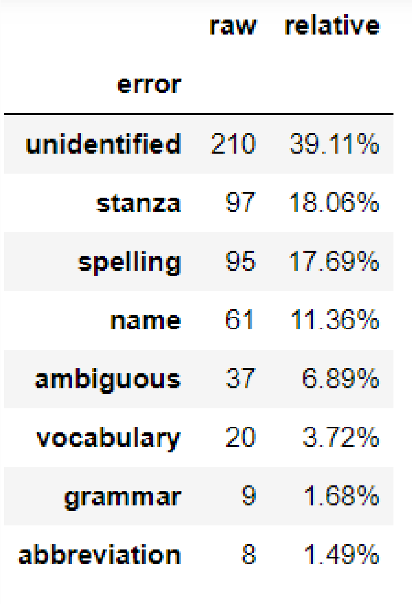
How well does the Stanza NLP toolkit perform on a sample of 19th-century Polish and what errors does it tend to make?

Experiment

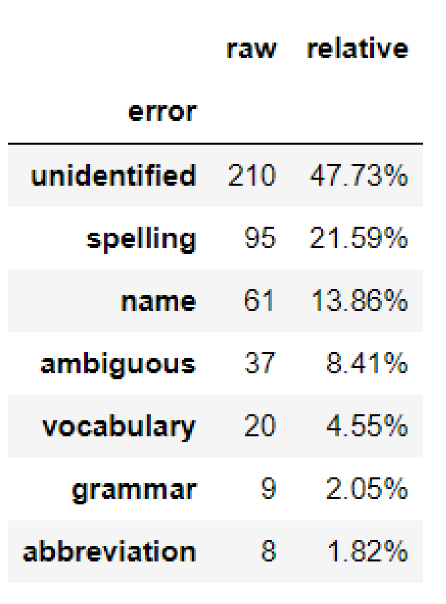
- XPOS- and UPOS-tagging, lemmatization
- Error annotation
- Tools and resources:
  - Stanza NLP toolkit
  - Other appropriate Python libraries and modules
  - Jupyter Notebook
  - PDB-UD

Results: lemmatization

	Accuracy (original)	Accuracy (lowercase)
PDB-UD	90.89%	92.34%
Historical	83.58%	86.55%



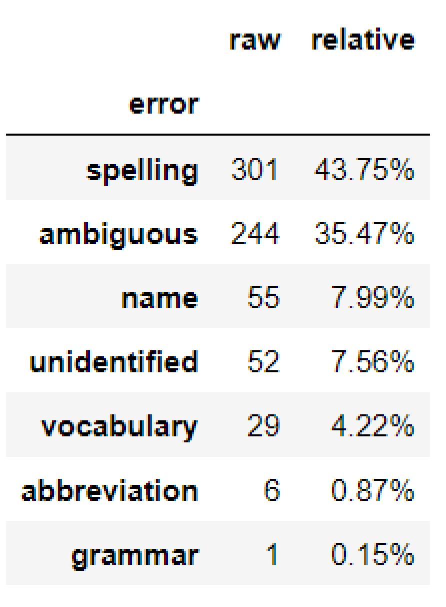
	raw	relative
error		
unidentified	210	39.11%
stanza	97	18.06%
spelling	95	17.69%
name	61	11.36%
ambiguous	37	6.89%
vocabulary	20	3.72%
grammar	9	1.68%
abbreviation	8	1.49%



	raw	relative
error		
unidentified	210	47.73%
spelling	95	21.59%
name	61	13.86%
ambiguous	37	8.41%
vocabulary	20	4.55%
grammar	9	2.05%
abbreviation	8	1.82%

Results: UPOS-tagging

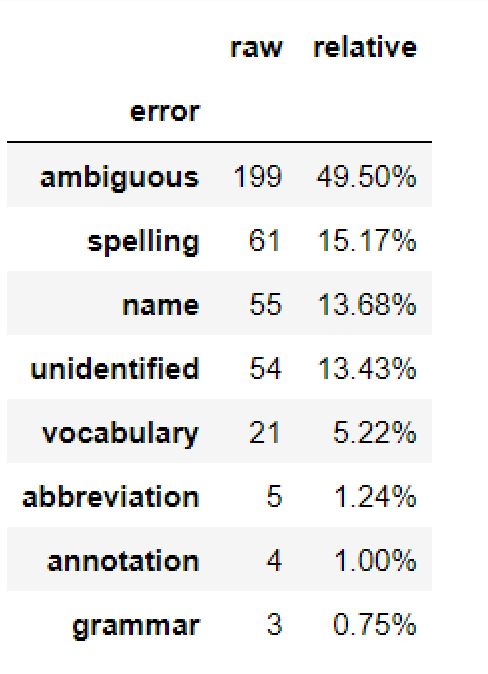
	Accuracy
PDB-UD	98.40%
Historical	93.31%



	raw	relative
error		
spelling	301	43.75%
ambiguous	244	35.47%
name	55	7.99%
unidentified	52	7.56%
vocabulary	29	4.22%
abbreviation	6	0.87%
grammar	1	0.15%

Results: XPOS-tagging

	Accuracy
PDB-UD	94.29%
Historical	87.71%



	raw	relative
error		
ambiguous	199	49.50%
spelling	61	15.17%
name	55	13.68%
unidentified	54	13.43%
vocabulary	21	5.22%
abbreviation	5	1.24%
annotation	4	1.00%
grammar	3	0.75%

Results: trends in errors

- Spelling: *y* (*suchey* instead of *suchej*)
- Spelling: *nie* (*niemają* instead of *nie mają*)
- Spelling/pronunciation: *e* (*małem* instead of *małym*)
- Spelling/pronunciation: *rż* (*warżenia* instead of *warzenia*)
- Spelling: capitalization (*Dziedzica* instead of *dziedzica*)

Results: trends in errors

- Grammar: nonstandard inflection (*człowiecze* instead of *człowieku*)
- Grammar: vocative vs. nominative (*Asińdźka* instead of *Asińdźko*)
- Grammar: impersonal verb forms
- Vocabulary: proper names
- Vocabulary: other OOV items
- Ambiguity: numerals
- Ambiguity: verb-derived nouns and adjectives
- Miscellaneous errors.

Future work

- Comparison to more data
  - More data from the same time and region
  - Older data
  - Contemporary non-standard data
- Research on pre-processing methods
- Completing the annotation of the data, verifying the quality of the annotation

Conclusions: back to Research Question

- How well does the Stanza NLP toolkit perform on a sample of 19th-century Polish and what errors does it tend to make?
  - Significantly worse performance
  - Errors related to dialectical and diachronic variation
  - Miscellaneous errors
- Stanza is not fully reliable as an annotation tool for nonstandard data, but can be used for preannotation

Thesis and conference repository

- Thesis and code available at: https://github.com/Turtilla/swe-ma-thesis, upcoming at: https://gupea.ub.gu.se/
- Presentation and code available at: https://github.com/Turtilla/WSMF-presentation

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Thank you for your attention!

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