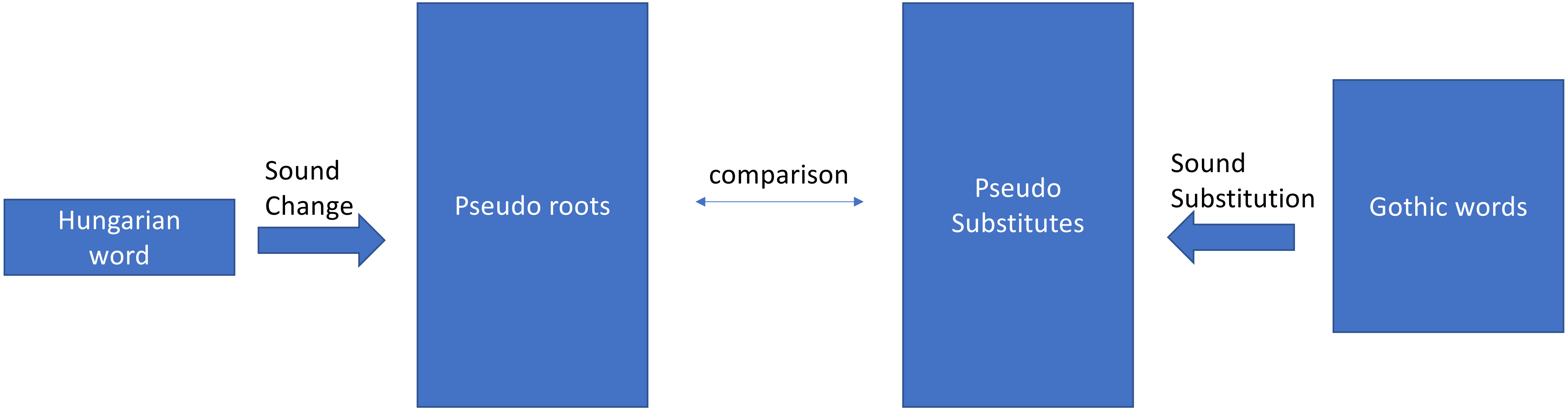
Gothic loans in Hungarian?

Towards a framework for computer-aided borrowing detection

Dissertation project at Uni Wien

- Broader sense: Historical question: When and where could Goths and Hungarians meet? (~Middle Ages, Eurasian steppe?)
- More narrow sense: Is there a possibility of Gothic loans in Hungarian?
- Arbitrary hypothesis, case study, theoretical experiment
- Focus on methodology: How to detect potential loanwords?
- Introducing a new computer-aided framework for Python 3.8.

In: Hungarian word


Hungarian word

Sound Change

Pseudo roots

comparison

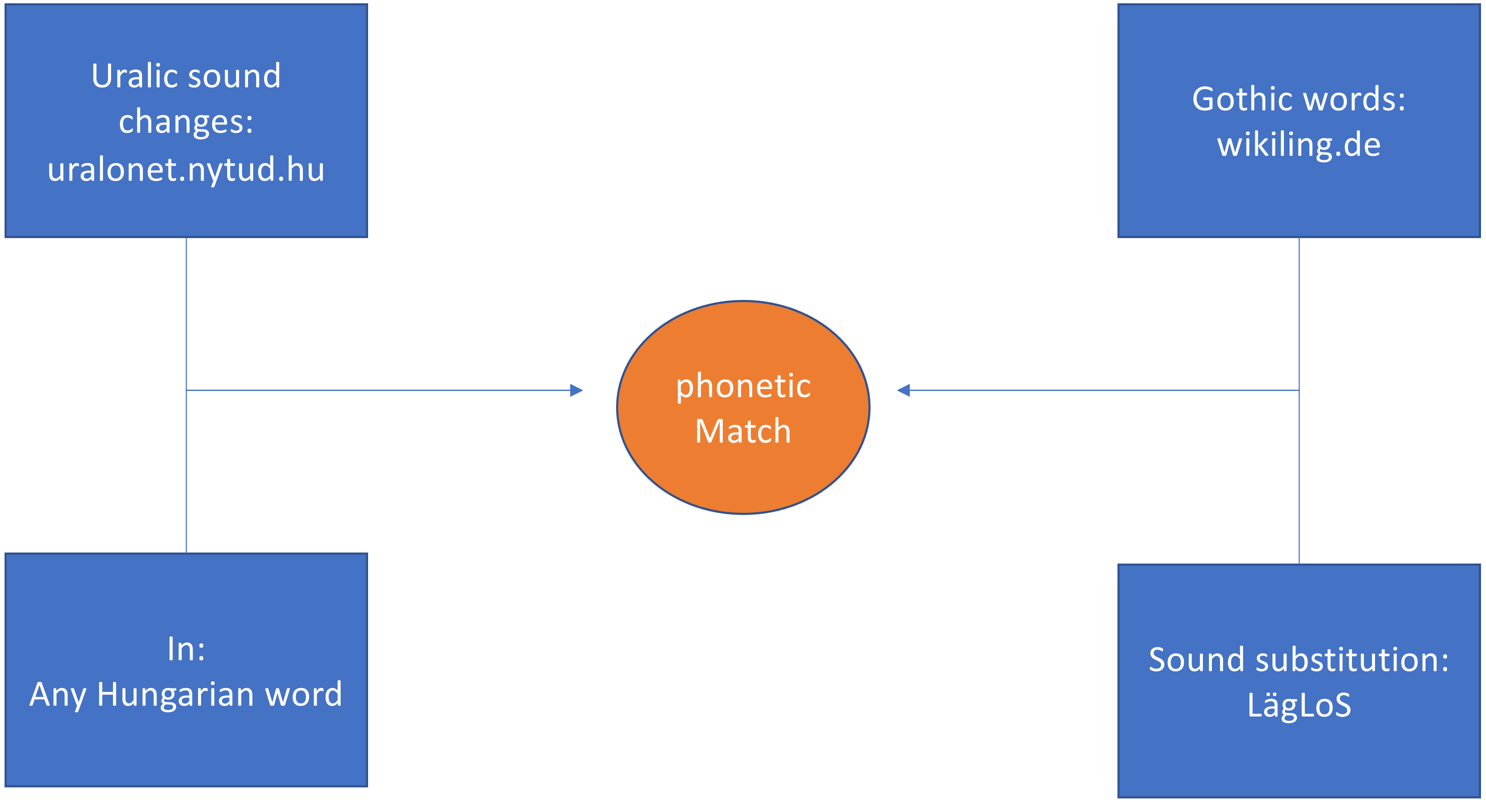
Pseudo Substitutes

Sound Substitution

Gothic words

Out: potential loans

Sources



Uralic sound changes: uralonet.nytud.hu

In: Any Hungarian word

phonetic Match

Gothic words: wikiling.de

Sound substitution: LägLoS

Extracting sound Changes from Etymological dictionary

- Webscrape uralonet (http://www.uralonet.nytud.hu/)
  - Etymological Dictionary published by the Hungarian Academy of Sciences
  - Convert dictionary into a dataframe of three columns:
    - Reflexes, Roots, Name of Proto-Language
- Split words into consonant and vowel clusters
- Match reflex and root sound clusters
- Add <^{1}>: word initial sound cluster, <^{2}>: word final, <^{3}>: medial.
- Create csv that shows all sound changes, including all examples
- qfysc()

How The Proto Form Generator Works

- Input: Word, Sound Changes. Output: Pseudo-Protoforms.
- Use of combinatorics to generate new proto forms:
- For example:

f^{1}	ü^{3}	l^{2}
p	ü	kl
f		j

  - In: *fül* -> Out: *pükl, püj, fükl, füj*
- Throw out words that „violate“ phonotactic rules

Measuring the likeliness of etymologies

- Hypothesis: The more examples per sound change, the more credible the etymology
- Introducing a new measurement method:

NSE (Normalised sum of examples)

  - In how many other words does the same sound change appear in total? (->Sum of Examples)
  - Divided by the number of sound changes with in a word. (->Normalised)

Measuring semantic similarity

- Two approaches: nltk, and gensim
- nltk is a dictionary that maps concepts as hypo- and hypernyms
- It calculates the similarity of two words by counting how many steps connect one concept with another within the dictionary
- gensim works differently: Words of a text are converted into vectors via machine learning. Word similarity is the cosinedistance of two vectors
- It seems gensim (based on google news corpus) works better than nltk.
- Most efficient: Get synonyms of both words with nltk, calculate the semantic similarity of all pairs with gensim, display only the most similar pair.

Outlook

- This dissertation:
    - Remove rows from Gothic dataframe that „violate“ phonotactic rules
    - Tackle speed issues: Optimise code, make it faster or move to C++ or R?
    - Add more complex nuances to substituions:
        - trV>tVr (LägLoS)
        - word final <r,l,m,n, rs, ls, ms, ns> after consonant is syllabic, thus substituted by vowel?
    - Add more paradigms to Gothic dictionary entries (morphological generator)?
    - Add Borrowability according to Haspelmath 2009
    - Add Finno-Ugric, Ugric, and in-between time-layers
    - Make code publicly available #replicability
    - Test also with words that already have well-established etymologies
    - Analyse and interpret results
- Possible future projects:
    - Add more time layers, e.g. Turkic, Western German Dialects, Indo-Iranian etc.
    - Reconstruct Gothic etc. words from Protogermanic?
    - Add other Uralic and Germanic languages
    - Make algorithm more dynamic, so it can handle any given language pair?
    - Base line tests: How much is coincidence?
        - Test language pairs that historically weren‘t in contact
        - E.g. Proto-Austronesian & Proto-Uralic: How many false positives?