# Disambiguated linear word translation in medium European languages

Márton Makrai
makrai@nytud.hu

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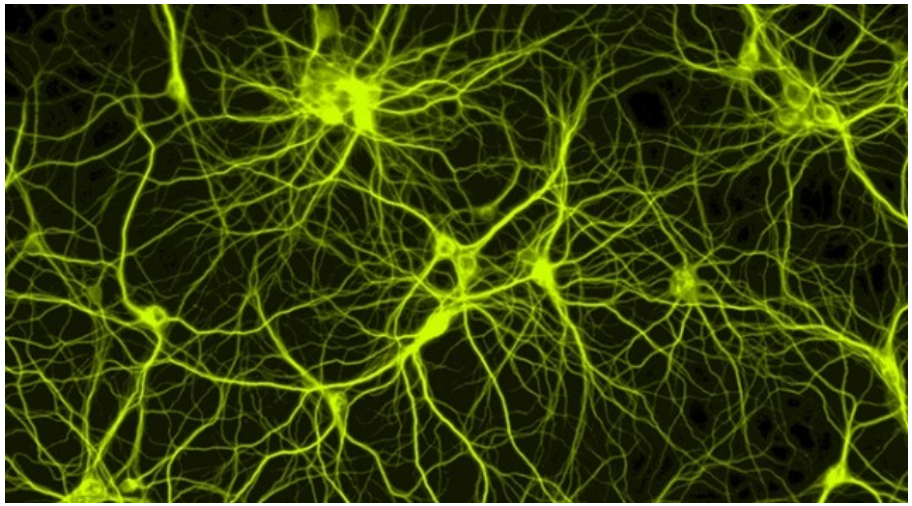
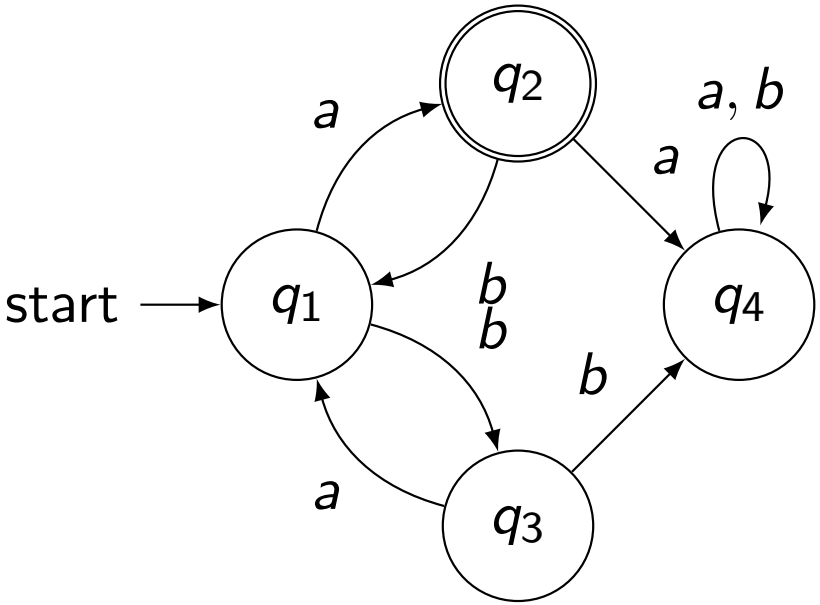
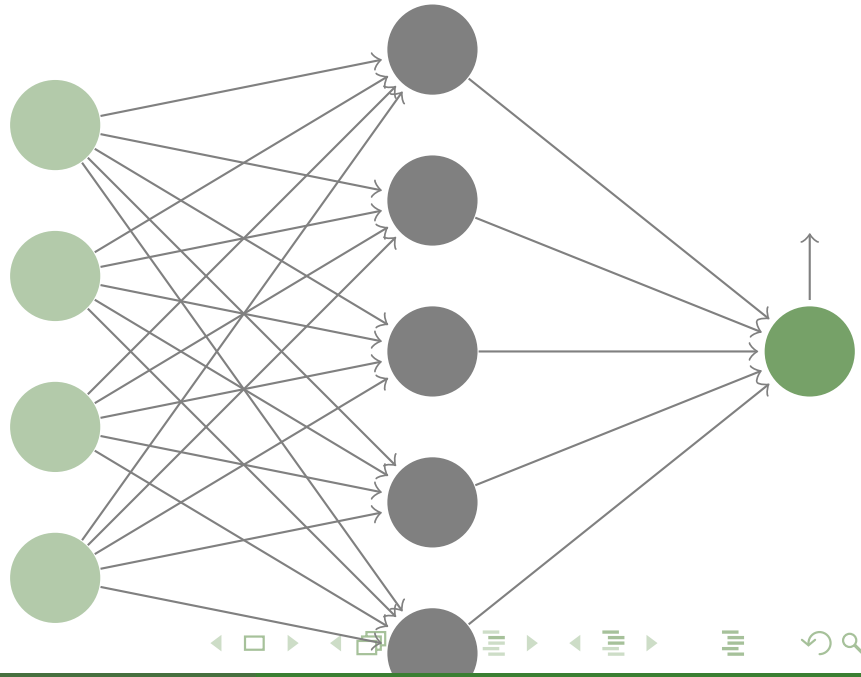
# Overview

# The cognitive inspiration





# Overview

1. Neural language models
   - Distributed representations applied
   - Counts and synapses
2. Translation
   - neural machine translation
   - pivot-based dictionary induction
3. Experiments

# Modalities

- image recognition (Krizhevsky and Sutskever, 2012)
- speech recognition (Hinton et al., 2012)
- natural language processing
  - topic classification
  - sentiment analysis (Socher et al., 2011)
  - question answering and
  - machine translation (Sutskever et al., 2014)

# similarity and relatedness

- similarity

$$\textbf{Lake Baikal} \approx \textbf{Aral Sea}$$

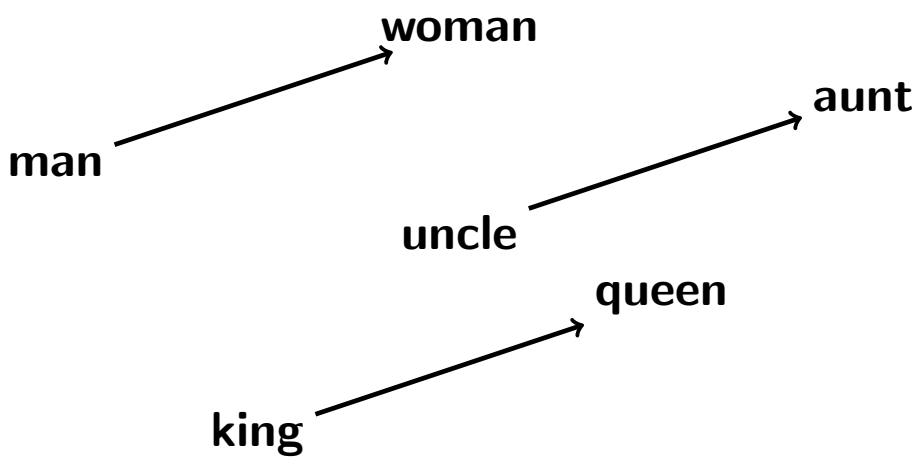
  - synonymy

$$\textbf{graffiti} \approx \textbf{spray paint}$$

  - relatedness

$$\textbf{apple} \approx \textbf{pear}$$

- relational similarity



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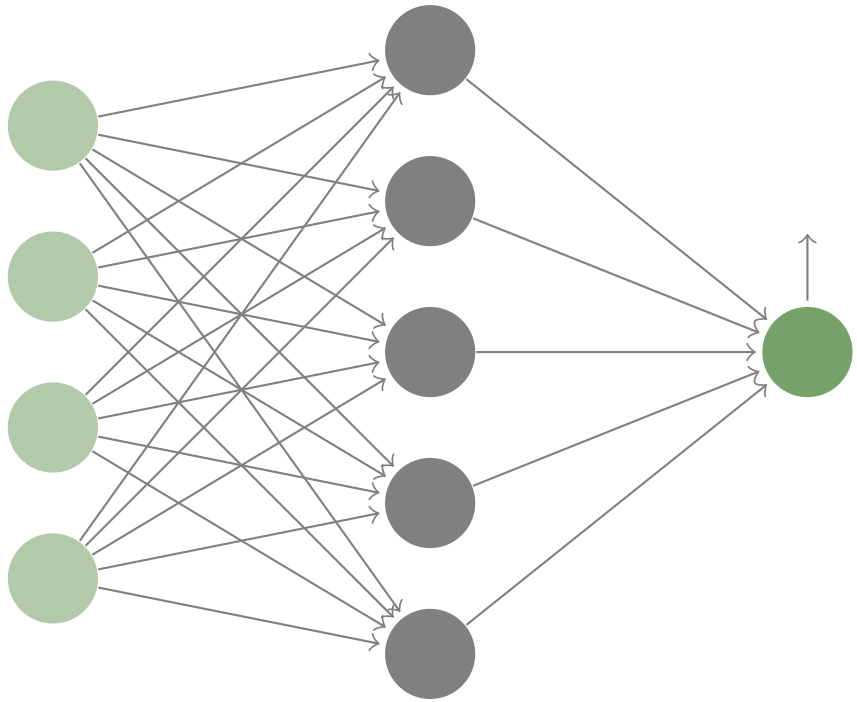
# Vector space language models

| | the | , | ... | table | ... | dog | ... |
|---|---|---|---|---|---|---|---|
| the | 30507 | 126192 | ... | 99067 | ... | 16785 | ... |
| , | 10488729 | 3462 | ... | 5164 | ... | 1645 | ... |
| ⋮ | ⋮ | ⋮ | ⋱ | ⋮ | ⋱ | ⋮ | ⋱ |
| table | 1307 | 39189 | ... | 36 | ... | 62 | ... |
| ⋮ | ⋮ | ⋮ | ⋱ | ⋮ | ⋱ | ⋮ | ⋱ |
| dog | 257 | 10268 | ... | 91 | ... | 46 | ... |
| ⋮ | ⋮ | ⋮ | ⋱ | ⋮ | ⋱ | ⋮ | ⋱ |

- + feature engineering (domain specific)



- unsupervised learning
- representation sharing among
  - words
  - NLP tasks (Collobert et al., 2011)
  - modalities

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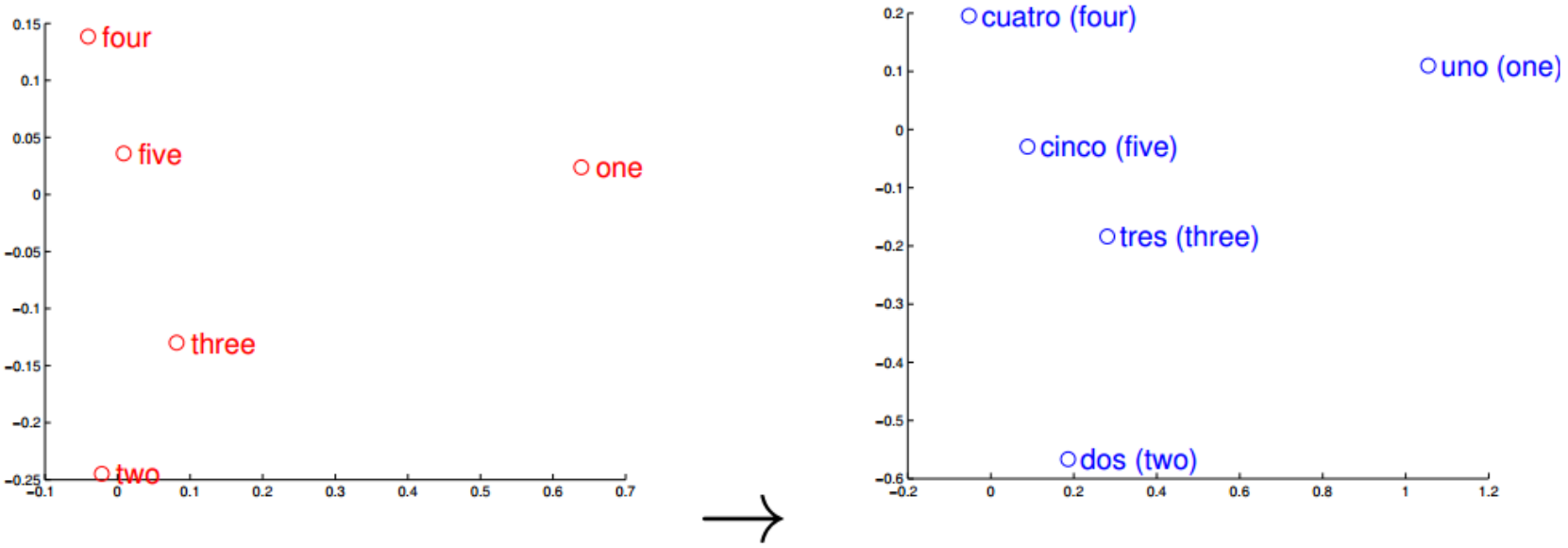
# neural word translation (Mikolov et al., 2013b)




$$W : \mathbb{R}^{d_1} \rightarrow \mathbb{R}^{d_2} \quad z \approx Wx$$

- learning the mapping: supervised by a seed dictionary

$$\min_W \sum_i ||Wx_i - z_i||^2$$

- 5 K train + 1 K test

- generate or score translations
- hub: some targets are erroneous translations of many sources (Dinu et al., 2015)

# multi-prototype VSMs

- meaning depends on context
- prototype $\leftarrow$ psychological concept modeling
- Reisinger and Mooney (2010); Huang et al. (2012)
- problems
  - uniform number of senses
  - word sense induction proceeds VSM learning
  - efficiency
- solution?, free code?? (Neelakantan et al., 2014; Chen et al., 2014; Bartunov et al., 2015)

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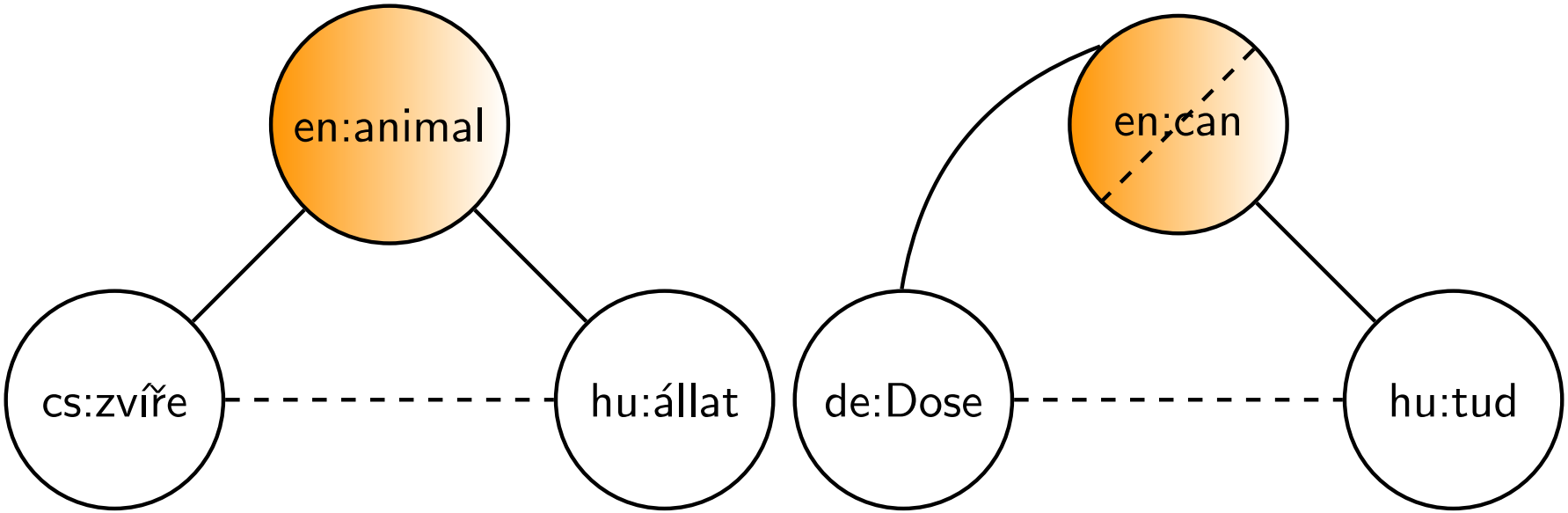


- pruning triangles
  - number of pivots (Tanaka and Umemura, 1994)
  - based on distributional similarity
    - comparable corpora (Saralegi et al., 2011)
    - now: with monolingual corpora

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# Less-resourced languages

- project
  - EFNILEX
  - European Federation of National Institutions for Language
  - machine translation for lexicography in less-resourced Official EU languages
- scoring Wiktionary triangles
  - mapping trained with direct pairs
- linear mapping between Multi-prototype VSMs

# Data and tools

## Corpora

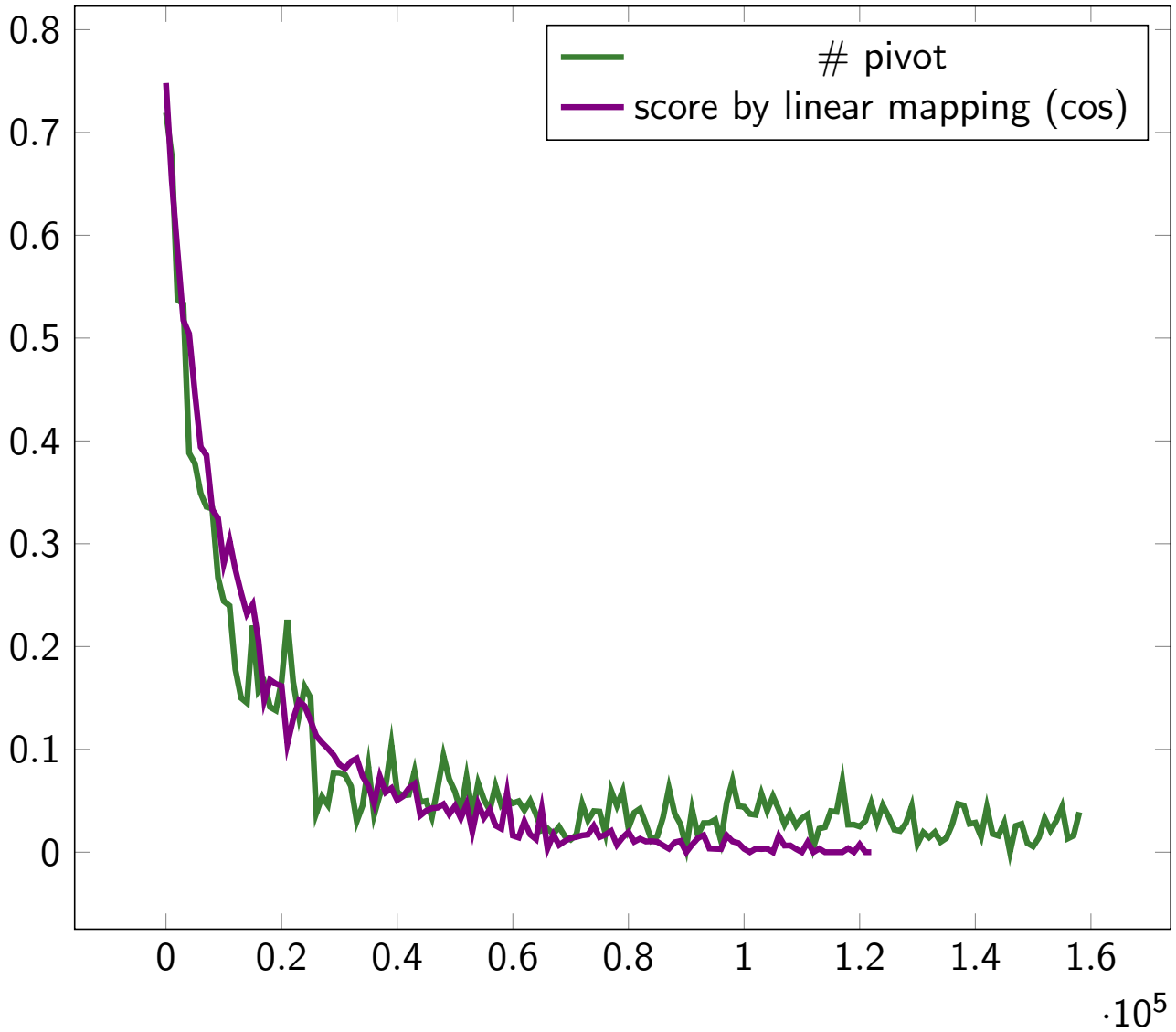
| | | # words |
|---|---|---|
| * Czech | CNK-SYN (Hnátková et al., 2014) | 2.2 B |
| Croatian | hrWaC2.0 Ljubešić and Klubička (2014) | 2.0 B |
| * Slovenian | slWaC (Ljubešić and Erjavec, 2011) | 1.6 B |
| Polish | Araneum Polonicum Maius (Benko, 2014) | 1.1 B |
| Serbian | srWaC (Ljubešić and Klubička, 2014) | 1.0 B |
| * German | SdeWac (Baroni et al., 2009) | 0.8 B |
| * Hungarian | HNC (Oravecz et al., 2014) | 0.8 B |
| * Hungarian | webcorpus (HW) (Halácsy et al., 2004) | 0.7 B |

# Data and tools

## Tools

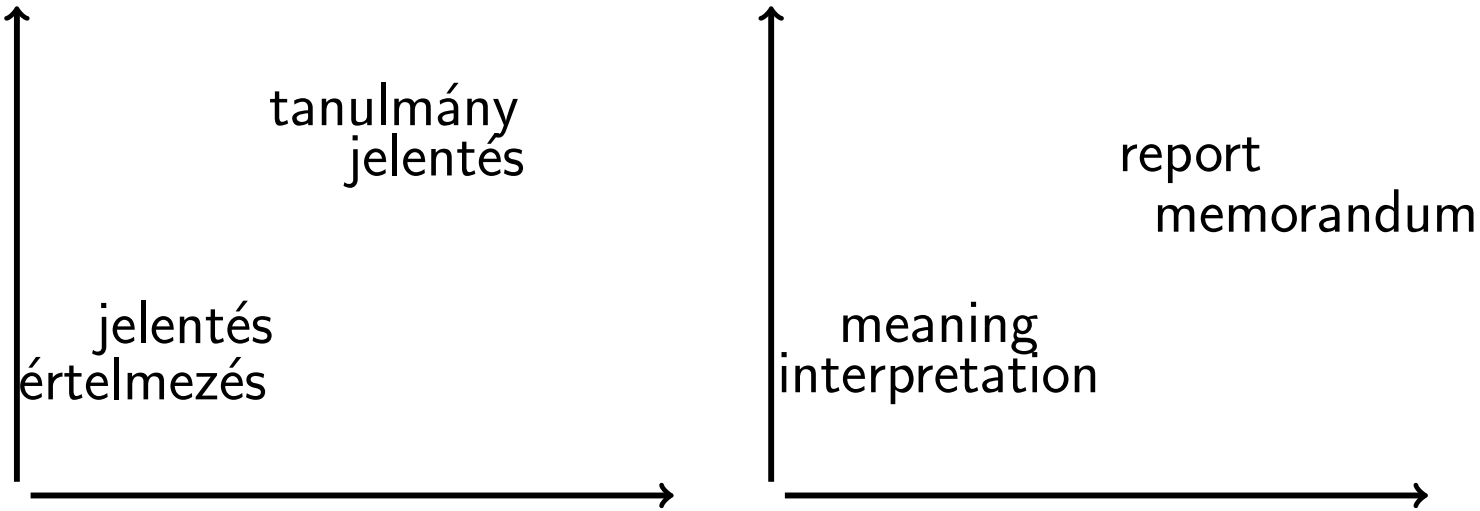
- VSM tools and pre-trained English models:
  - word2vec (Mikolov et al., 2013a), GloVe (Pennington et al., 2014), gensim (Řehůřek and Sojka, 2010)
- triangle scoring
  - seed dictionary extracted from Wiktionary by wikt2dict (Ács et al., 2013)
  - translational mapping: Dinu et al. (2015) forked `https://github.com/makrai/dinu15/`
  - evaluated against dictionaries extracted from parallel corpora (Tiedemann, 2012)
- MPVSM: AdaGram (Bartunov et al., 2015)

# exper 1: triangle scoring



# exper 2: linear mapping between MPVSMs

- idea




- preliminary results are poor $\Leftarrow$ prototypes don't match intuition

# url

http://corpus.nytud.hu/efnilex-vect/

makrai@nytud.hu

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