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Alexander Panchenko

**INDUCING INTERPRETABLE WORD
SENSES FOR WSD AND ENRICHMENT OF
LEXICAL RESOURCES**

Overview

■ Inducing word sense representations:

- word sense embeddings via retrofitting [Peleвина et al., 2016, Remus and Biemann, 2018];
- sparse sense representations [Panchenko et al., 2017c];
- inducing synsets [Ustalov et al., 2017]
- sense semantic classes [Panchenko et al., 2018]

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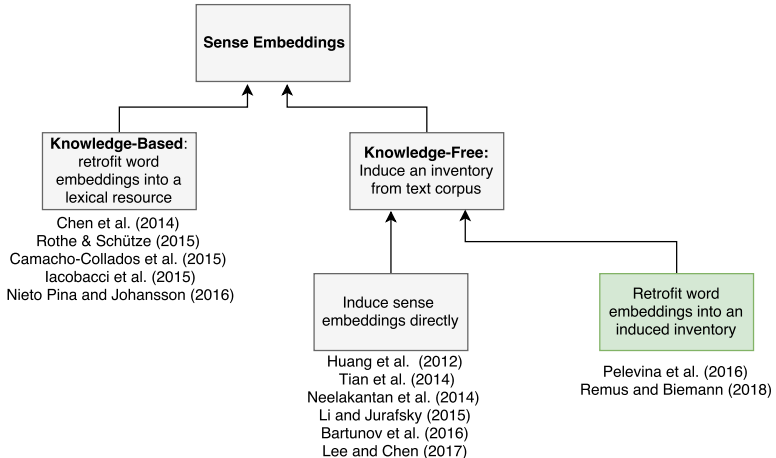
■ **Making the induced senses interpretable**

[Panchenko et al., 2017b, Panchenko et al., 2017c]

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- **Making the induced senses interpretable**
[Panchenko et al., 2017b, Panchenko et al., 2017c]
- **Linking induced word senses to lexical resources** [Faralli et al., 2016, Panchenko et al., 2017a, Biemann et al., 2018]

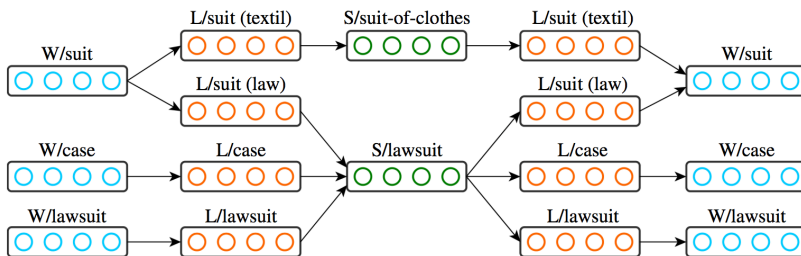
Inducing word sense representations

Related work



Related work: knowledge-based

■ AutoExtend [Rothe and Schütze, 2015]



* image is reproduced from the original paper

Related work: knowledge-free

- **Adagram** [Bartunov et al., 2016]
- Multiple vector representations θ for each word:

$$p(Y, Z, \beta | X, \alpha, \theta) = \prod_{w=1}^V \prod_{k=1}^{\infty} p(\beta_{wk} | \alpha) \prod_{i=1}^N [p(z_i | x_i, \beta) \prod_{j=1}^C p(y_{ij} | z_i, x_i, \theta)],$$

- α – a meta-parameter controlling number of senses;
- z_i – a hidden variable: a sense index in context;
- $p(\beta_{wk} | \alpha)$ – probability of the k -th sense of the word w ;
- $p(z_i | x_i, \beta)$ – probability of observing word x_i in the sense z_i ;
- $\prod_{j=1}^C p(y_{ij} | z_i, x_i, \theta)$ – probability of the context C .

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 - $\prod_{j=1}^C p(y_{ij} | z_i, x_i, \theta)$ – probability of the context C .
- **See also:** [Neelakantan et al., 2014] and [Li and Jurafsky, 2015]

Related work: word sense induction

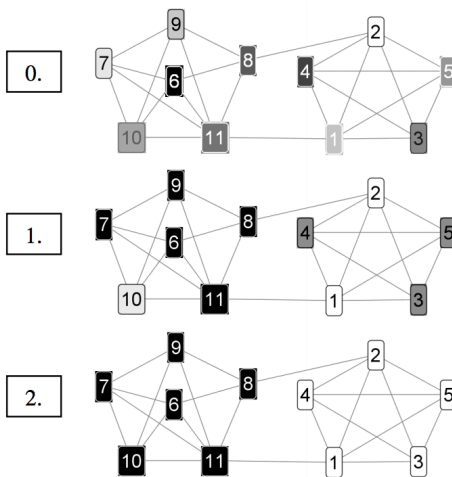
- Word sense induction (WSI) based on **graph clustering**:
 - [Lin, 1998]
 - [Pantel and Lin, 2002]
 - [Widdows and Dorow, 2002]
 - **[Biemann, 2006]**
 - [Hope and Keller, 2013]

Related work: Chinese Whispers#1



* source of the image: http://ic.pics.livejournal.com/blagin_anton/33716210/2701748/2701748_800.jpg

Related work: Chinese Whispers#2





Sense embeddings using retrofitting



Sense embeddings using retrofitting



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Inducing word sense representations

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Sparse sense representations



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Inducing word sense representations

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Watset: synset induction



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Induction of sense semantic classes



Induction of sense semantic classes



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Inducing word sense representations

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Induction of sense semantic classes

Conclusion

Summary

- How to **induce word senses, synsets** and **semantic classes** from text and synonyms.

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Summary

- How to **induce word senses, synsets** and **semantic classes** from text and synonyms.
- **Interpretability can be added** on the top of induced word senses in a model agnostic way.
- Hypernymy labels **improve hypernymy extraction**.
- Linking induced word senses to lexical resources:
 - improves **performance of WSD**;
 - can be used to **enrich lexical resources** with new senses.

A New Shared Task on WSI&D

- Participate in an ACL SIGSLAV sponsored shared task on **word sense induction and disambiguation** for Russian!

A lexical sample task evaluated using the ARI measure

- Target word, e.g. “bank” (in Russian).
- Contexts where the word occurs.
- You need to group the contexts by senses.

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- **More details:** <http://russe.nlpub.org/2018/wsi>
 - You can participate by **31.01.2018**.

Thank you!



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