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A Semi-Supervised Interactive System for Word Sense Clustering

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Introduction

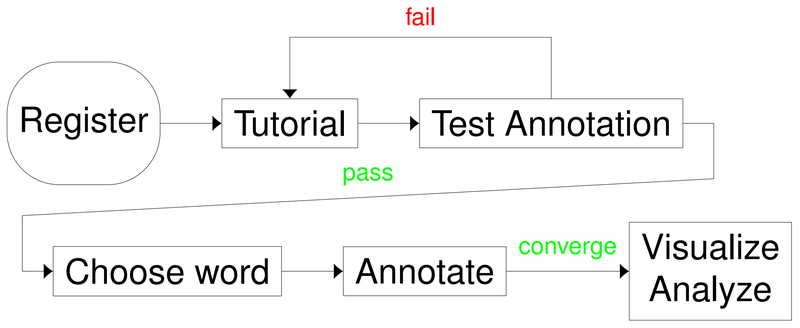
Given: a set of uses of a word

(1) 1786 magna tempestas, so heißt es Sturm, **Donnerwetter**, Wind, u. s.f. und der Deutsche sagt: es kam ein Wetter, ein rechtes Wetter.
(2) 1796 Ein paar **Donnerwetter** nebst etwas Regen trugen noch mehr zur Kühle bey.
(3) 1871 so ließ der alte grämliche Herr manchmal ein gewaltiges **Donnerwetter** los, an welches indessen die Minister schon gewöhnt waren, und aus dem sie sich nichts machten.
(4) 1875 Potz **Donnerwetter**, bin aber ich g'loffen!

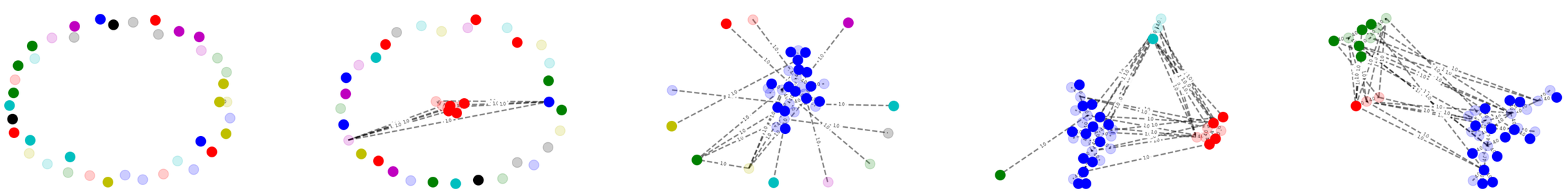
Aim: **retrieve underlying word sense cluster structure** [McCarthy et al. 2016]

Tool: online annotation interface using **relatedness judgments of use pairs from human annotators** to infer cluster structure **consecutively**

System Overview



Annotation Progress



No information → Robust graph clustering

Semantic Relatedness

4: Identical
3: Closely Related
2: Distantly Related
1: Unrelated

0: Cannot decide

Four-point scale of relatedness [Erk et al. 2013, Schlechtweg et al. 2018].

Use Pair Annotation

Screenshot of annotation interface from system's beta version.

Clustering, Edge Sampling & Convergence

Usage Graphs: we obtain a **weighted, sparse, partially observed graph with errors**

Clustering:

- correlation clustering [Bansal et al. 2004, Chen et al. 2014]
- optimization criterion: **reduce number of cluster-edge conflicts**

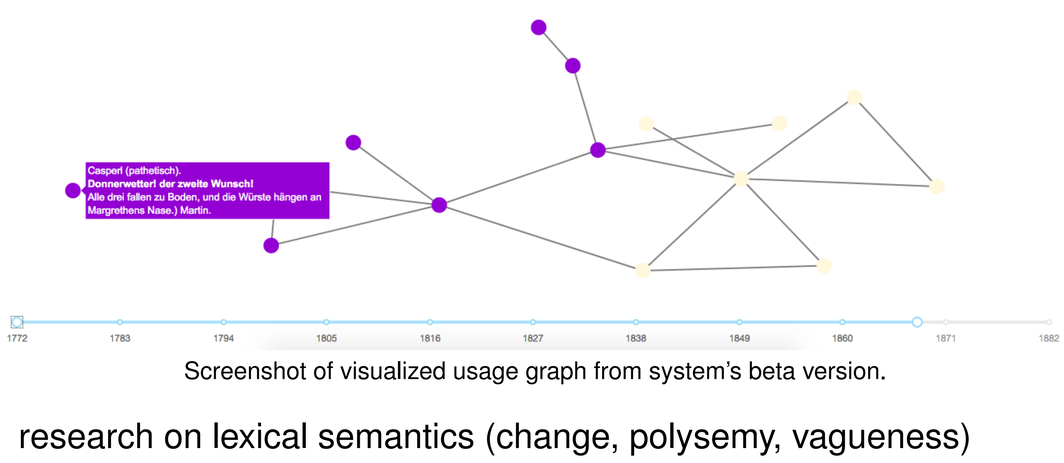
Edge Sampling:

- missing comparisons between clusters and nodes
- **uncertainty** of cluster assignment to nodes
- annotator disagreements
- heuristics

Convergence:

- converge if clustering is **robust** [Gambette & Guénoche 2011]

Applications



Screenshot of visualized usage graph from system's beta version.

- research on lexical semantics (change, polysemy, vagueness)
- evaluation data for comput. models [Schlechtweg et al. to appear]
- tool for lexicographers

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