Visual Exploration of Ontologies Supported by Language Models and Interactive Lenses

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Ontology Visualization

- Ontologies can represent complex relationships within systems, either learned or crafted.
- Visualizations can aid in understanding topics and hierarchies within ontologies.
- Language Models (LMs) can aid in creating groupings or systematization of ontologies [1].
- Approach: novel combination of hierarchies within ontologies with semantic capabilities of LMs!

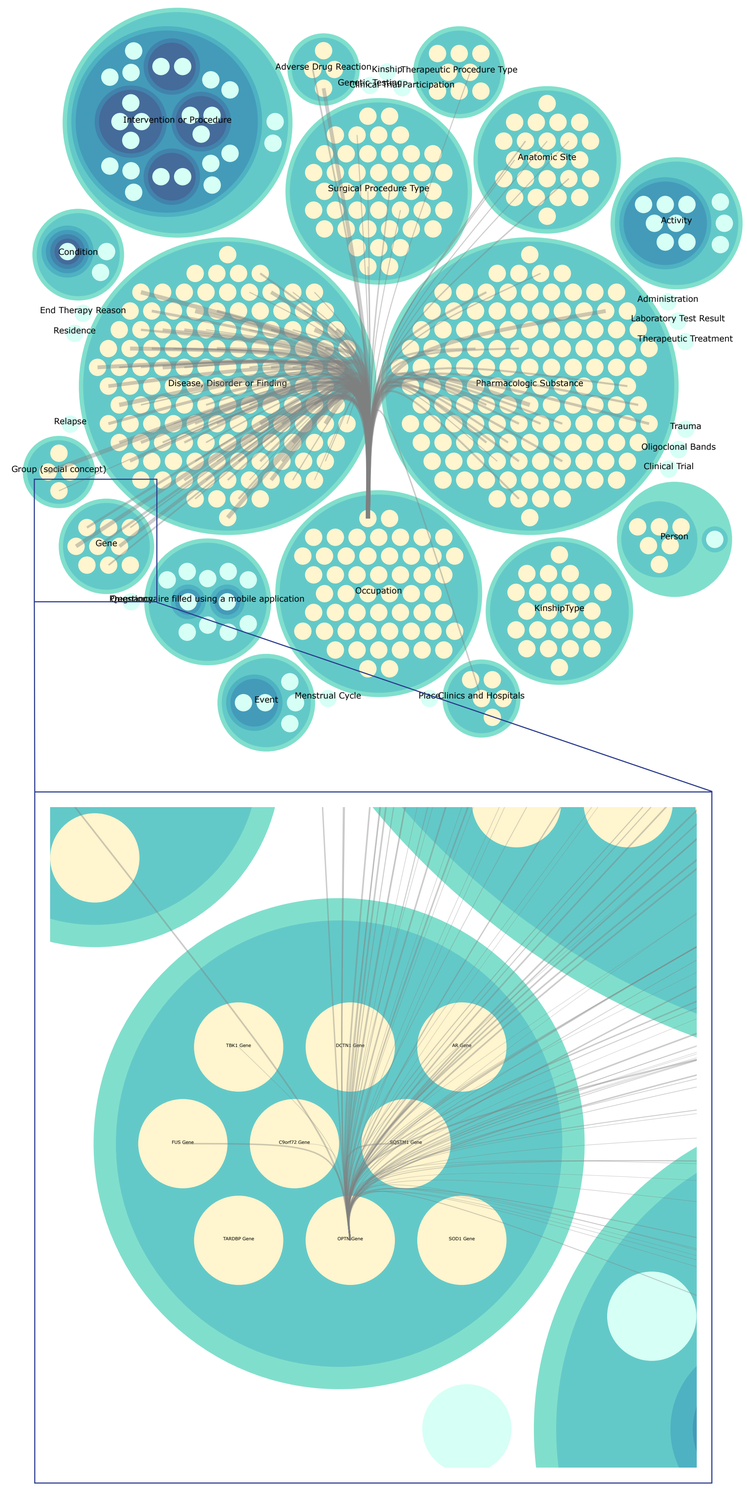
Interactive Lenses

- Semantic, greedy matching to the sparse & high-dimensional dataset based on embeddings.
- Visualize in Circle Packing [2], enabling an on-demand and interactive overview.
- Highlight connections with prevalence in the sparse dataset.

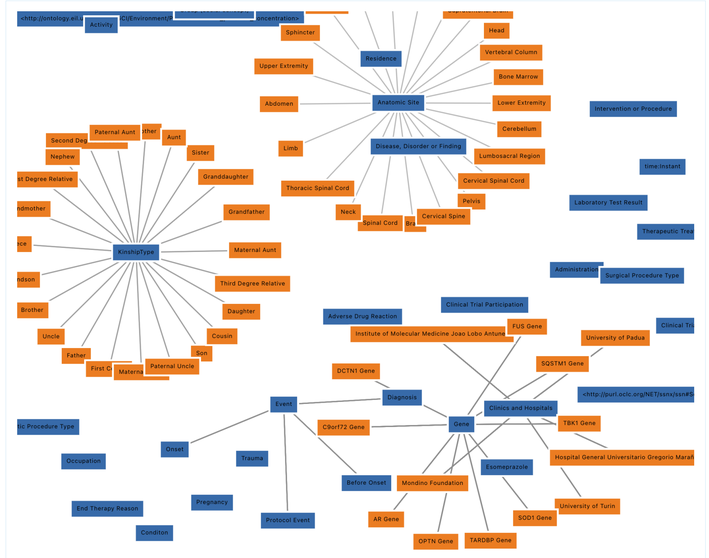
Hierarchical Topics

- Semantic topic modeling [1].
- Combine double hierarchical visualization.
- Circle Packing [2] as ground layer, tree visualization on top - 3D is required due to overlaps!

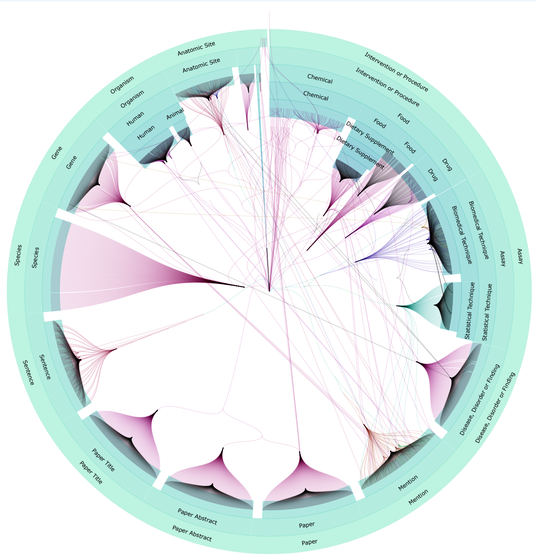
Interactive Lens



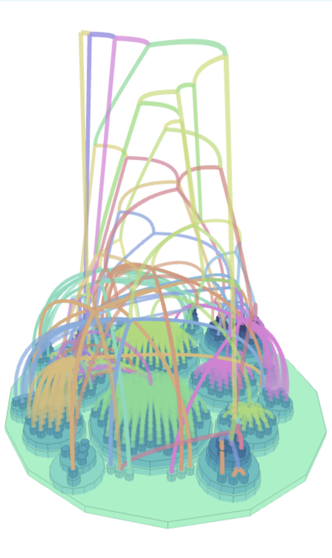
Ontology and Hierarchical Visualization Approaches



Node-Link Diagram

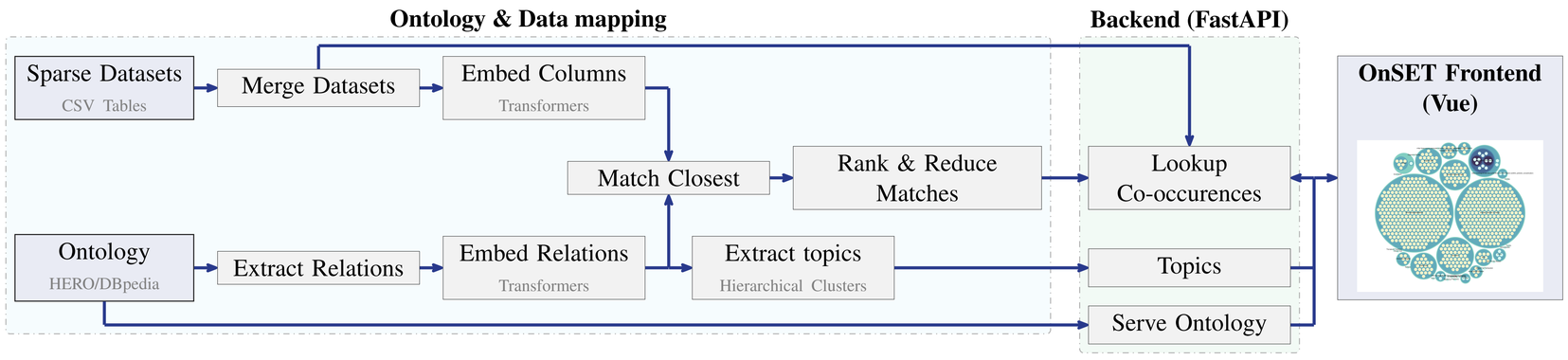


Sunburst Diagram [3]
with inverted topic tree



Circle Packed [2] Ontology +
Topic Tree (proposed)

System Overview



Links

Demo

Code

References

[1] Maarten Grootendorst. 'BERTopic: Neural topic modeling with a class-based TF-IDF procedure'. In: *arXiv preprint arXiv:2203.05794* (2022).

[2] Weixin Wang, Hui Wang, Guozhong Dai and Hongan Wang. 'Visualization of large hierarchical data by circle packing'. In: *Proceedings of the SIGCHI Conference on Human Factors in Computing Systems*. CHI '06. Montréal, Québec, Canada: Association for Computing Machinery, 2006, pp. 517–520. ISBN: 1595933727. DOI: 10.1145/1124772.1124851. URL: https://doi.org/10.1145/1124772.1124851.

[3] John Stasko, Richard Catrambone, Mark Guzdial and Kevin McDonald. 'An evaluation of space-filling information visualizations for depicting hierarchical structures'. In: *International Journal of Human-Computer Studies* 53.5 (Nov. 2000), pp. 663–694. ISSN: 1071-5819. DOI: 10.1006/ijhc.2000.0420. URL: http://dx.doi.org/10.1006/ijhc.2000.0420.

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