

Knowledge Graph for Sleep-Related Respiratory Disorders

Knowledge Graphs can be defined as knowledge repositories that model data in a graph-structured manner. Moreover, these graphs usually encapsulate a semantic model or ontology that facilitates sharing of common understanding among people and teams. In the medical domain, knowledge graphs have several applications like structuring research knowledge for broader and faster accessibility or integrating domain knowledge with study results to help in reliable diagnostics. In the field of Sleep Related Respiratory Disorders a knowledge graph would be highly beneficial for domain knowledge representation and integration. The creation of a Medical Knowledge Graph entails various tasks:

1. Medical ontologies applicable to the field of Sleep Related Respiratory Disorders already exist, but need to be analysed and validated with domain experts.
2. Medical knowledge can be found in both structured and unstructured formats, preprocessing pipelines to transform the data into a graph structure reflecting the ontological model.
3. Unstructured data in text format may need to be preprocessed with Natural Language Processing techniques called Entity Recognition and Relationship Extraction.
4. The graph needs to be stored in appropriate databases that allow for graph querying like Neo4j, GraphDB, etc.
5. Interacting with and visualising the data most probably need to be handled through microservices and/or off-the-shelf applications like Apache Zeppelin.
6. Design and development and of a frontend layer for interacting and visualising is also an option to make the knowledge more accessible.

This research project is associated with the Respire (Responsible Explainable Machine Learning for Sleep-related Respiratory Disorders: <https://www.mn.uio.no/ifi/english/research/projects/respire/>) project. There is an opportunity for up to three students to take part in developing the knowledge graph through collaboration with other members of the Respire project.

Required/recommended qualifications:

- The candidates should have experience with python.
- The candidates should have some knowledge about graphs and ontologies.
- Ideally a candidate has interest or experience in NLP techniques.
- Ideally a candidate has interest or experience in microservices/backend.
- Ideally a candidate has interest or experience in data visualisation and/or frontend.

Contact persons:

- Marta Quemada Lopez (martag@ifi.uio.no)
- Vera Goebel (goebel@ifi.uio.no)

Resources

Respire Project

- ['Respire - Responsible Explainable Machine Learning for Sleep-related Respiratory Disorders - Institutt for informatikk', n.d.] (n.d.). Retrieved 24 August 2023, from <https://www.mn.uio.no/ifi/forskning/prosjekter/respire/index.html>

Cesar Project (Completed)

- ['CESAR: Using Complex Event Processing for Low-threshold and Non-intrusive Sleep Apnea Monitoring at Home (completed)', n.d.] (n.d.). Retrieved 25 August 2023, from <https://www.mn.uio.no/ifi/english/research/projects/cesar/index.html>

Sleep-Related Respiratory Disorders

- ['Sleep-Related Breathing Disorders | Sleep Foundation', n.d.] (n.d.). Retrieved 23 August 2023, from <https://www.sleepfoundation.org/sleep-related-breathing-disorders>
- [Arnardottir et al., 2022] Arnardottir, E. S., Islind, A. S., Óskarsdóttir, M., Ólafsdóttir, K. A., August, E., Jónasdóttir, L., et al.: 'The Sleep Revolution project: the concept and objectives'; Journal of Sleep Research, 31, 4 (2022). <https://doi.org/10.1111/jsr.13630>
- [[Riha, 2015] Riha, R. L.: 'Diagnostic approaches to respiratory sleep disorders'; Journal of Thoracic Disease, 7, 8 (2015). <https://doi.org/10.3978/j.issn.2072-1439.2015.08.28>
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Knowledge Graphs

- [Hogan et al., 2022] Hogan, A., Blomqvist, E., Cochez, M., d'Amato, C., de Melo, G., Gutierrez, C., et al.: 'Knowledge Graphs'; ACM Computing Surveys, 54, 4 (2022), 1–37. <https://doi.org/10.1145/3447772>
- [Barrasa and Webber, 2023] Barrasa, J., Webber, J.: 'Building Knowledge Graphs: A Practitioners Guide'; O'Reilly (2023). Retrieved from (O'Reilly Learning) <https://learning.oreilly.com/library/view/building-knowledge-graphs/9781098127091/> or (PDF) https://go.neo4j.com/rs/710-RRC-335/images/Building-Knowledge-Graphs-Practitioner%27s-Guide-OReilly-book.pdf?_gl=1*1p2g843*_ga*MTY0NTIwNzYyMi4xNjkwMTgwNDAY*_ga_DL38Q8KGQC*MTY5Mjg4NzU5My42LjEuMTY5Mjg4NzYyNC4yOS4wLjA.&_ga=2.10093879.322553162.1692887595-1645207622.1690180402

Use Case: Diabetes Knowledge Graph

- [DZD and Neo4j, n.d.] DZD, G. C. for D. R., Neo4j: 'Knowledge Graph-Powered Diabetes Research'; (n.d.). Retrieved from <https://neo4j.com/case-studies/german-centre-diabetes-research-dzd/>
- [From Advanced Queries to Algorithms and Graph-Based ML, 2021] (2021). Retrieved from <https://www.youtube.com/watch?v=fTpMjdmQb8Y>
- [bytes4diabetes_2020_DZDconnect, 2020] (2020). Retrieved from <https://vimeo.com/387426023>