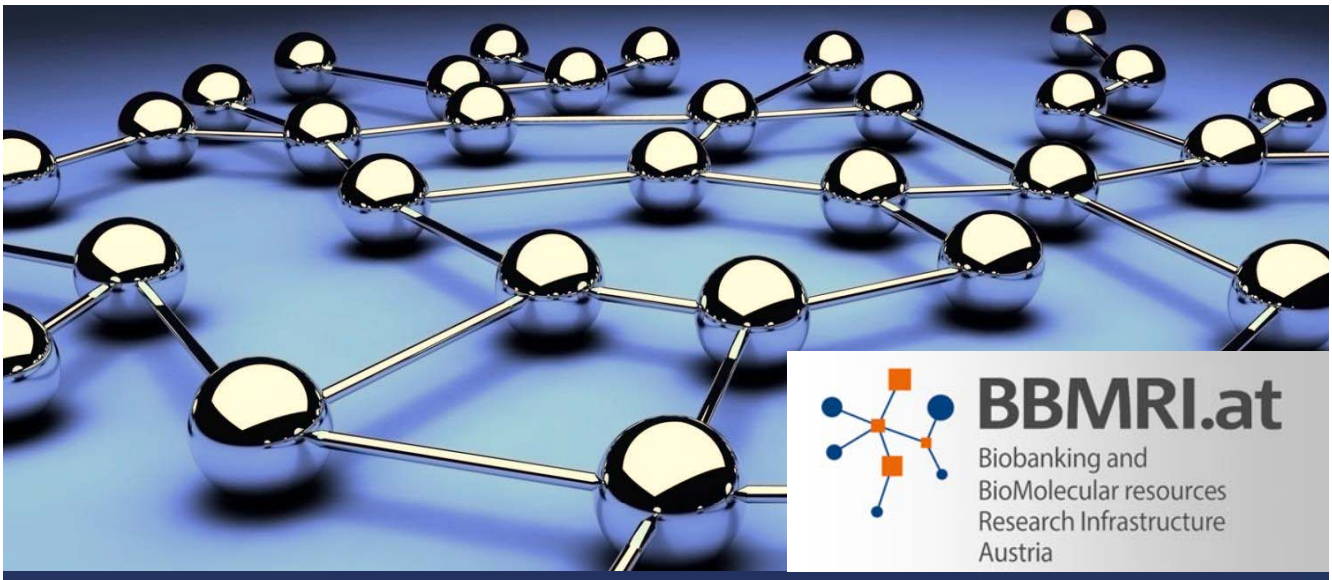

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# Optimizing Biobank Data Retrieval by Using IT-Based Lexical and Semantic Methods

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bmwfw
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## Table of Contents

# Query Heterogeneity Problem

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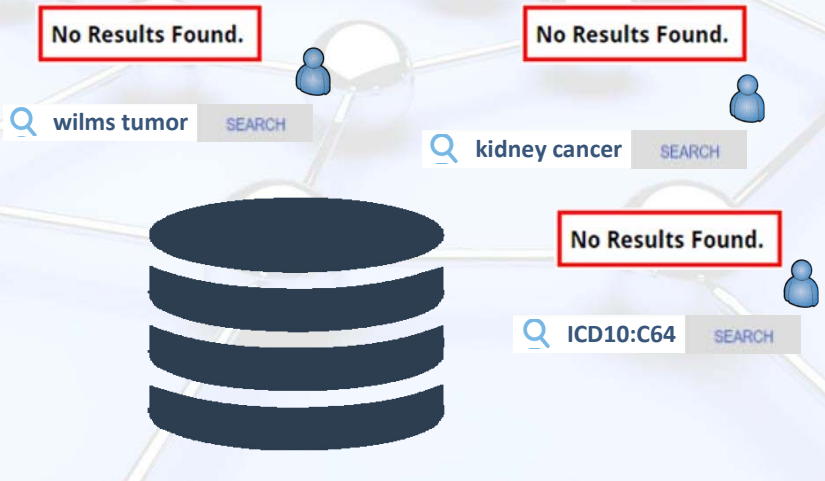


**(i) Sample set**
Material type: FFPE, Frozen Tissue
Number of samples: 2
Diagnosis: **nephroblastoma**
...

*Biobank Information Management System





# Facilitate Data Accessibility

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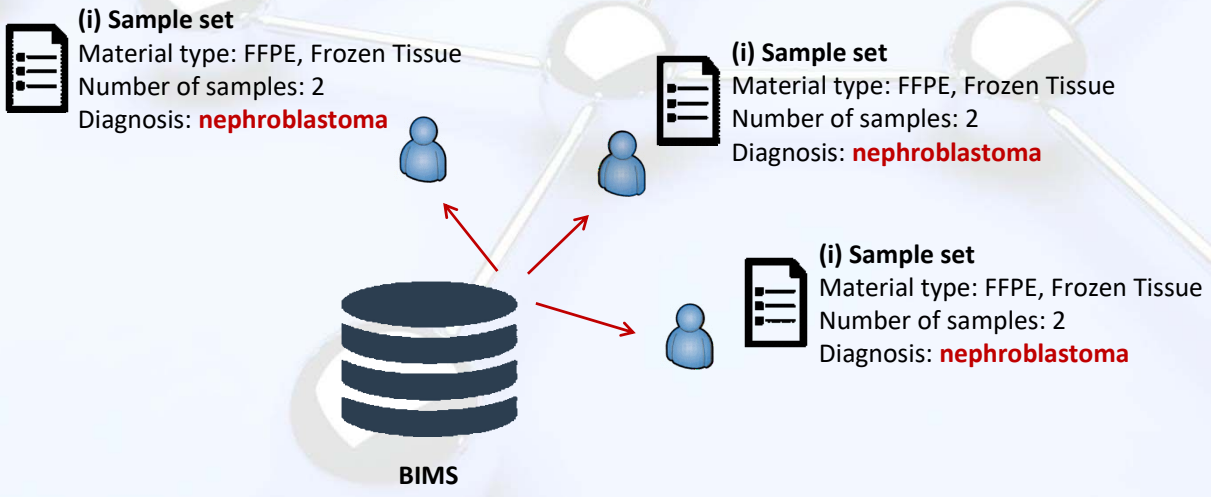
→ Optimize retrieval of desired information



# Main Steps

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I. Identify & classify different query challenges[1,2]

↓

II. Find appropriate methods for all query scenarios

↓

III. Prototype implementation

↓

IV. Proof-of-concept

[1] Fidel, R. (1985). Moves in online searching. Online Review. https://doi.org/10.1108/eb024176
[2] Liu, C., Gwizdka, J., Liu, J., Xu, T., & Belkin, N. J. (2010). Analysis and evaluation of query reformulations in different task types. In Proceedings of the ASIST Annual Meeting. https://doi.org/10.1002/meet.14504701214





# I. Query Challenges

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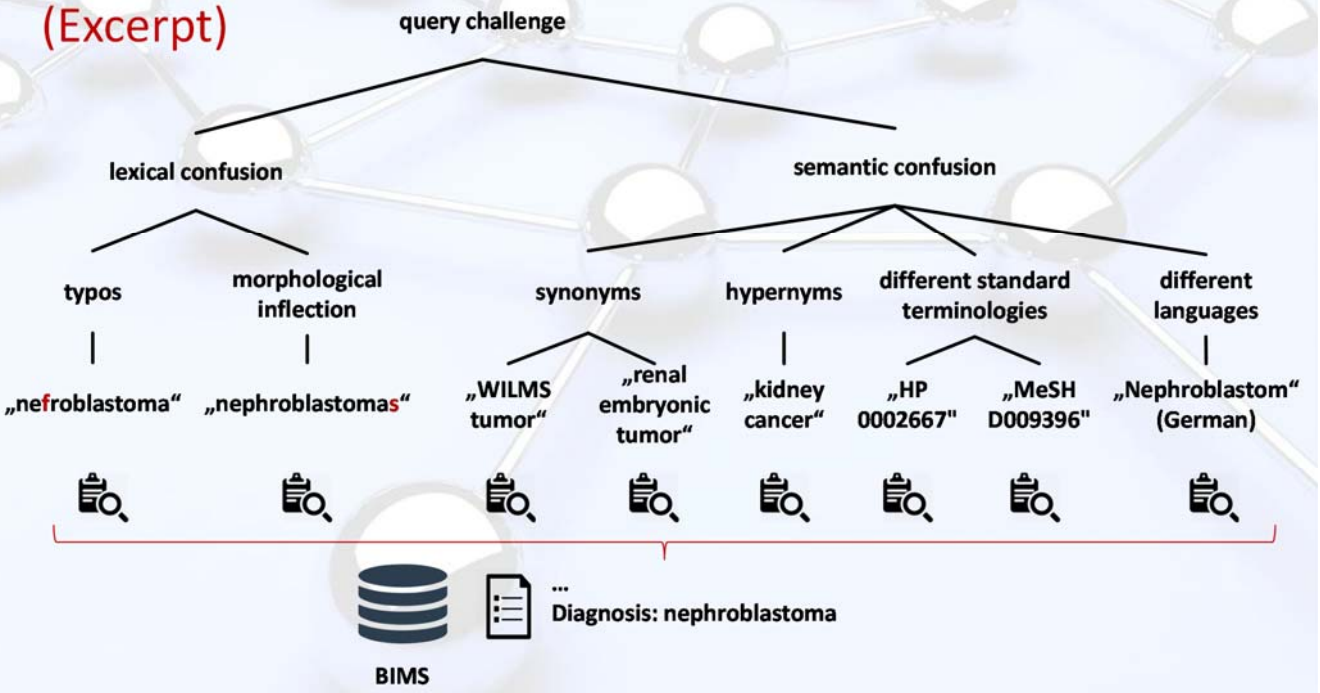
(Excerpt)



# II. Lexical & Semantic Methods

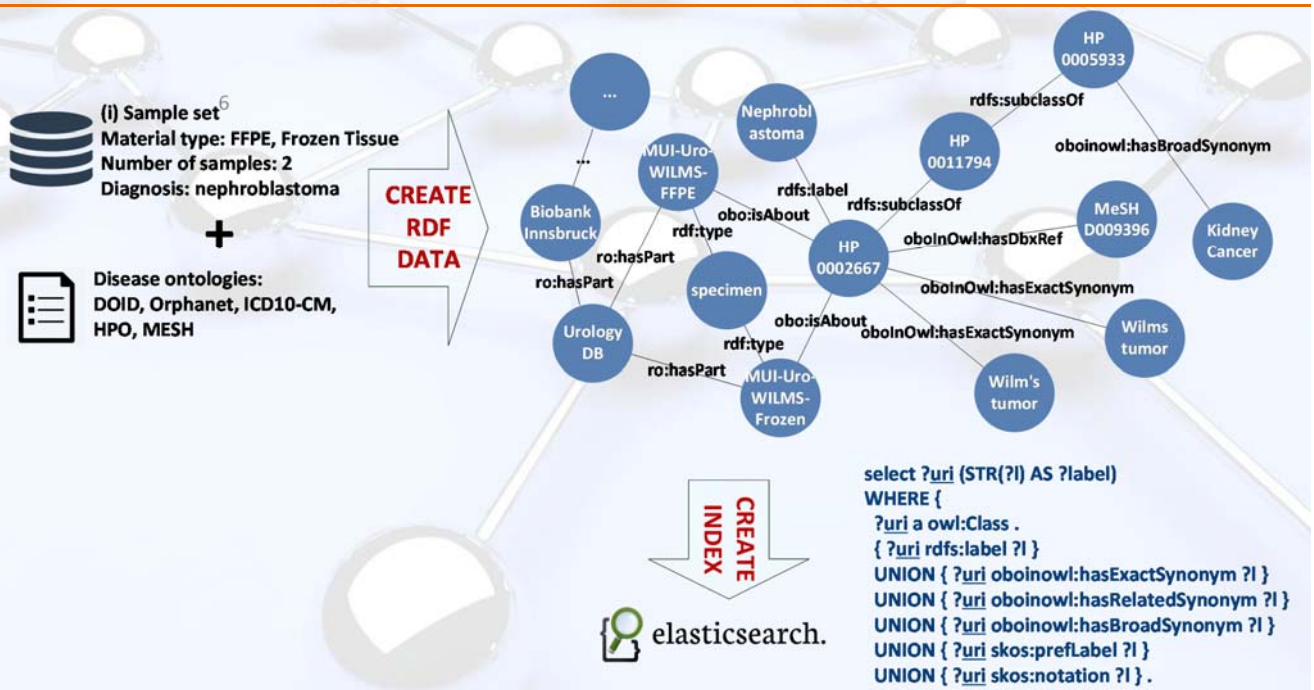
- Lexical confusion[3]
  - Vector Space Model
  - Phonetic Analysis/ Ngram/ Stemming (english)
  - Approximate String Matching (Levenstein distance)
- Semantic confusion
  - RDF Data Representation/ Graph Database[4]
  - (Bio-)Medical Standard Terminologies[5]

[3] M.S. Divya, S.K. Goyal, ElasticSearch: An advanced and quick search technique to handle voluminous data, International Journal of Advanced Computer Technology, 6 (2013), 171-175.
[4] https://www.blazegraph.com, last accessed on April 2018.
[5] Tirmizi SH, Aitken S, Moreira DA, Mungall C, Sequeda J, Shah NH, et al. Mapping between the OBO and OWL ontology languages. J Biomed Semantics. BioMed Central Ltd; 2011;2 (Suppl 1):S3.





# III. Prototype Implementation




[6] Hofer P, Fiegl H, Angerer J, Mueller- E. A Concept of a MIABIS based Register of Biosample Collections at the Medical University of Innsbruck. 2014;

# IV. Proof-Of-Concept

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| Query class | Input String | Annotation used | Record found† | Applied method |
|---|---|---|---|---|
| misspelling | nefroblastom | HPO[a] 0002667 | Yes | Approximate string matching |
| Hypernym | Cancer of the kidneys | HPO 0002667 | Yes | hierarchical relationship |
| Synonym | Wilms tumor | HPO 0002667 | Yes | synonym relationship |
| coding standard | MeSH[b] D009396 | HPO 0002667 | Yes | cross reference HPO → MeSH |

†Expected record:

**(i) Sample set**
Material type: FFPE, Frozen Tissue
Number of samples: 2
Diagnosis: **nephroblastoma**

[a]Human Phenotype Ontology
[b]Medical Subject Headings





# Discussion & Outlook

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- Both stemming and phonetic algorithms are more robust against typos and morphological variations
- Cross-references allow searching across different terminologies
- (Bio-)Medical standard terminologies must be valid regarding knowledge representation
- Combining different techniques would likely be the most rewarding
- A long-term evaluation about frequency of different query scenarios in productive environments will be necessary

# Literature


[1] Fidel, R. (1985). Moves in online searching. Online Review. https://doi.org/10.1108/eb024176

[2] Liu, C., Gwizdka, J., Liu, J., Xu, T., & Belkin, N. J. (2010). Analysis and evaluation of query reformulations in different task types. In Proceedings of the ASIST Annual Meeting. https://doi.org/10.1002/meet.14504701214

[3] M.S. Divya, S.K. Goyal, ElasticSearch: An advanced and quick search technique to handle voluminous data, International Journal of Advanced Computer Technology, 6 (2013), 171-175.

[4] https://www.blazegraph.com, last accessed on April 2018.

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# Thank you for your attention !


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