Knowledge Graphs with Large Language Models

MSc in AI and Data Science, 2025-2026

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Assignment 2: Knowledge Graph Schema Design

Introduction

Having specified the requirements of your GraphRAG-based QA system and its underlying knowledge graph, your next step is to design the schema of that knowledge graph.

Tasks

Task 1: Design the knowledge graph schema.

Consider the competency questions and the requirements you specified in assignment 1, or a subset of them, and use them to formally define the schema of your knowledge graph. You are free to do this either in RDF/OWL/SHACL or Neo4j.

The schema should be semantically correct and consistent, but also adequately understandable to a human. That means that you should pay particular attention to the naming and description of its elements.

Task 2: Test the schema by transforming and executing the competency questions into SPARQL or Cypher

To verify that your schema supports the competency questions you have selected, transform each such question into a SPARQL query (if you use RDF) or a Cypher query (if you use Neo4j). Then populate your schema with some dummy data and test the queries against them.

Attention: Some of the questions you have specified in assignment 1 are probably not supposed to be directly answerable from the graph via a query (e.g the analytical or predictive questions). For these questions, you can demonstrate the queries that would retrieve the required information that a human or LLM needs to answer them.

Deliverables

- If you use RDF, a file with the RDF/OWL schema and any dummy data, that can be opened and viewed with Protege.
- If you use Neo4j, a dump file with the schema and any dummy data, that can be loaded and viewed from AuraDB.
- A short report describing the process you followed, the design decisions you made (especially in cases where multiple modeling choices were available), the LLM prompts you might have used for assistance, and the SPARQL or Cypher queries that correspond to your selected competency questions

Important notice

You are allowed to use an LLM to help you with the above tasks. However, if you do that, you need to be critical against the suggestions that the LLM might give you and correct/adapt them as needed. **Remember that you are solely responsible for the end result.**