Comparing Different Approaches to Knowledge Graphs

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Introduction

Knowledge Graphs are a structured way of representing knowledge and is used in various ways in the real world

- Semantic Search
- Natural Language Processing
- Biomedical Research
- Recommendation Systems

More importantly for our project, knowledge graphs are a systematic and semantic way to manage large-scale data of different forms for efficient data mining and prediction.

Background

The Evolving History
- **The idea of representing knowledge in a structured and machine-readable way dates back to the early days of the Semantic Web. RDF, a standard model for representing information, played a crucial role. It allowed for the creation of linked data by expressing relationships between resources.**

Relational Databases vs Regular Graphs
- **Ability to create advanced relationships**
- **Can run advanced algorithms**

Regular Graph vs Knowledge Graph
- **Representation of Knowledge**
- **Data Enrichment**
- **Machine learning benefits**

Method

Phase 1: Schema Design:
- Designing a schema for the database that will allow for the most efficient knowledge graph
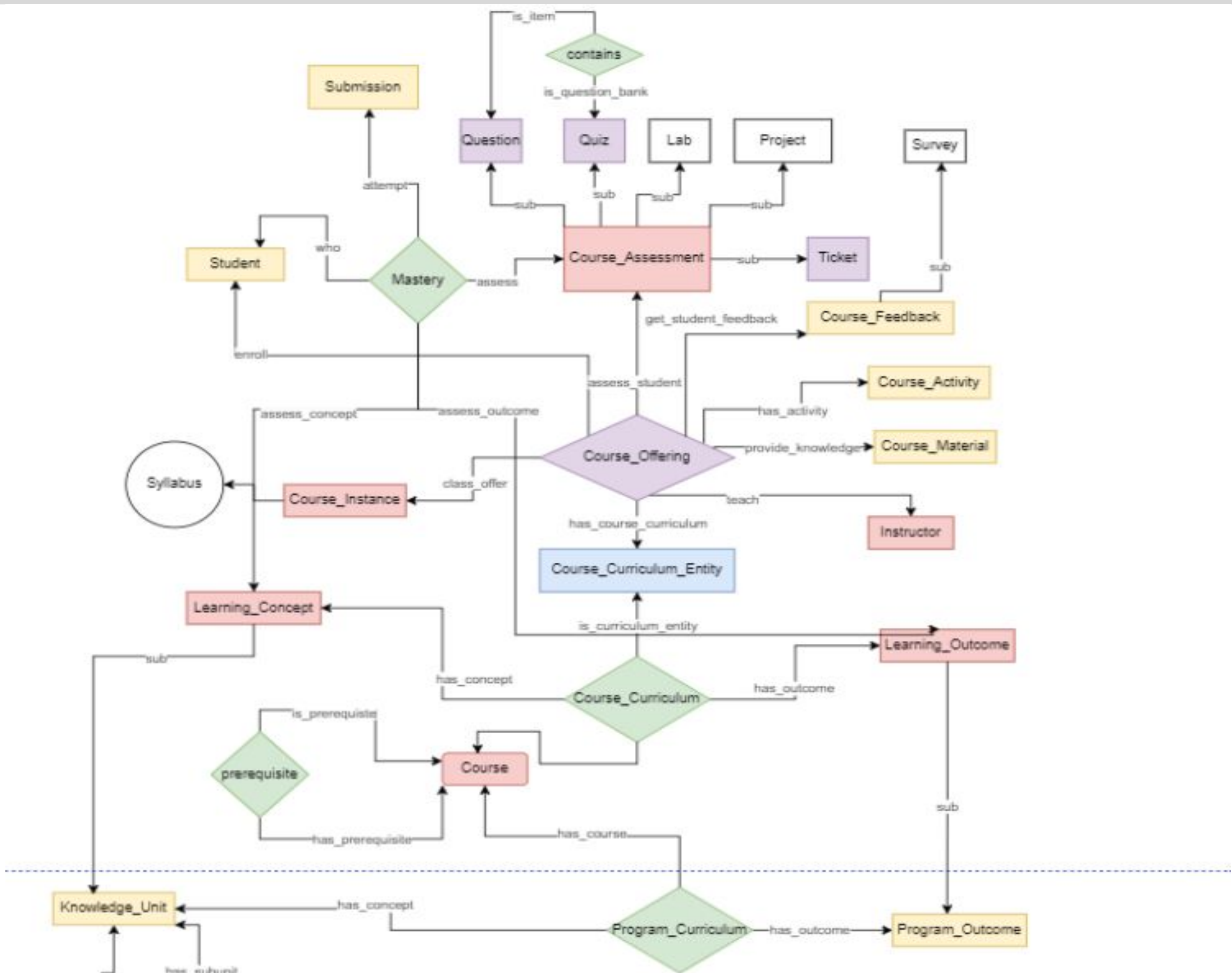
Phase 2: Data Migration:
- Learning how to utilize TypeDB Loader
- Working with CSV files to migrate data into the TypeDB Database
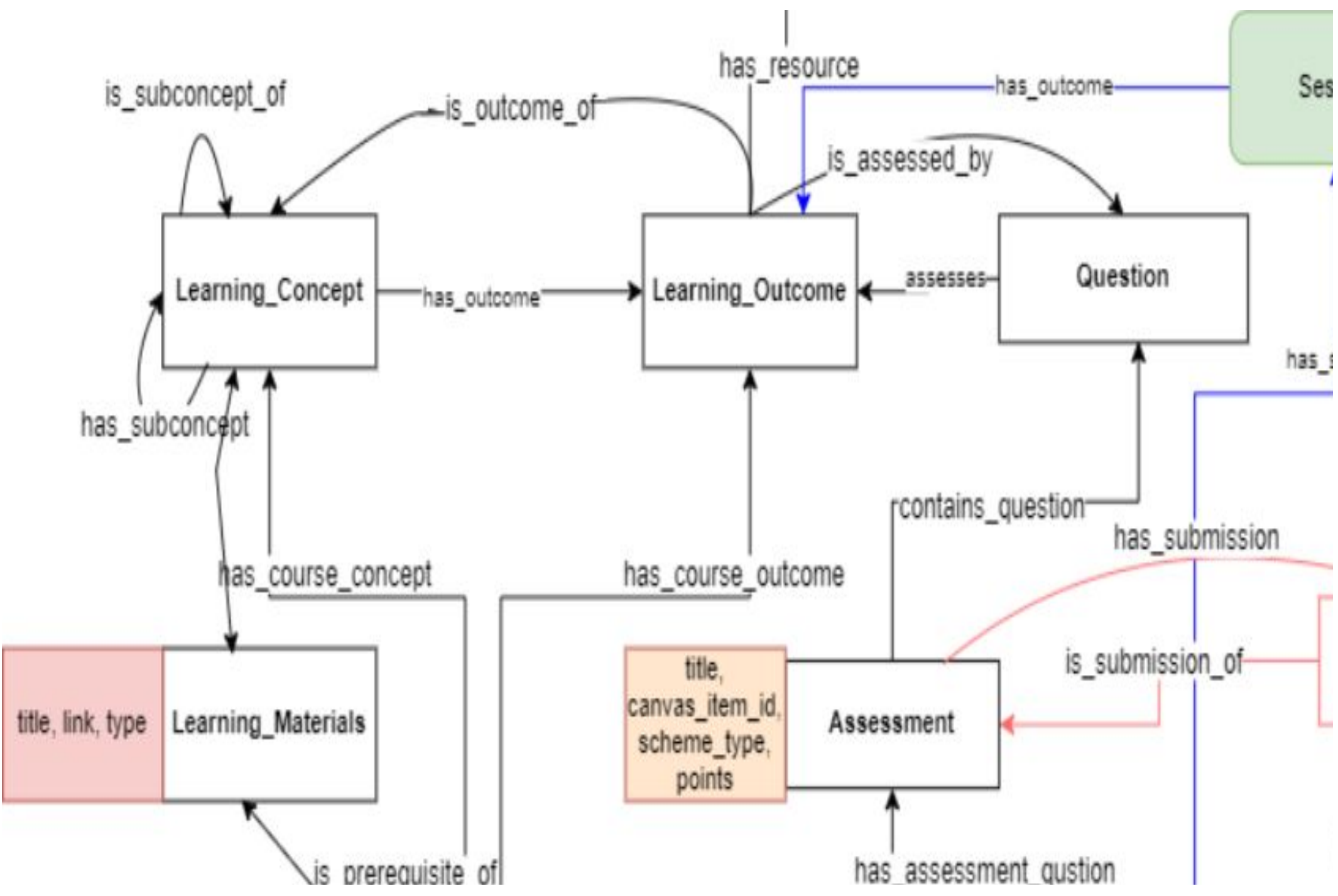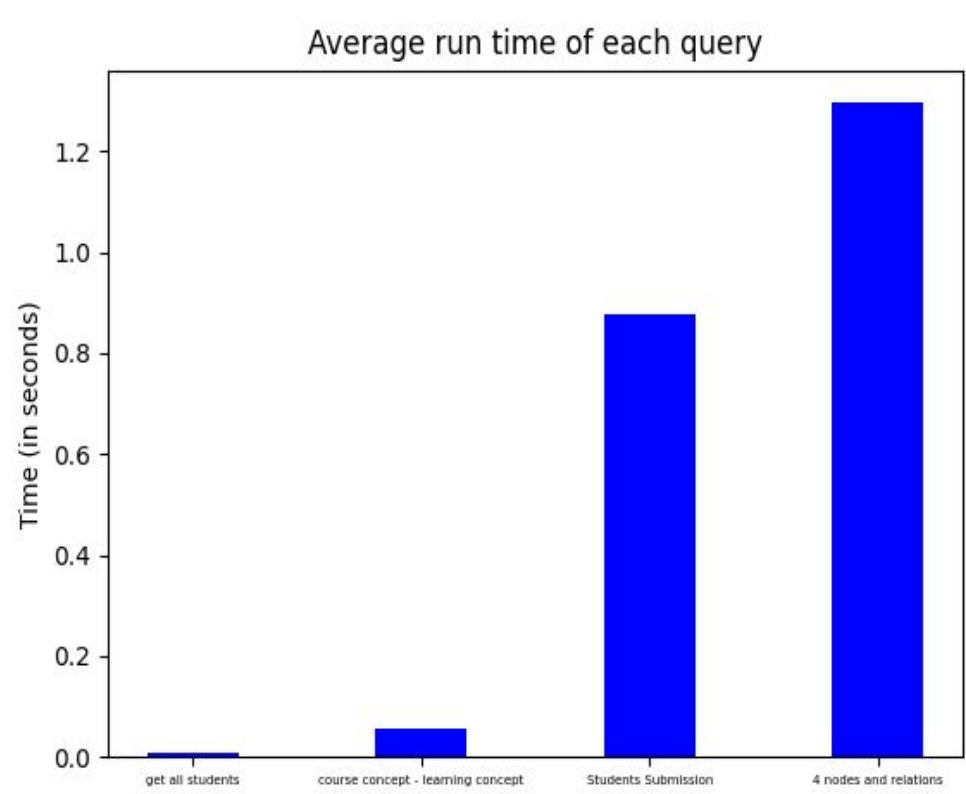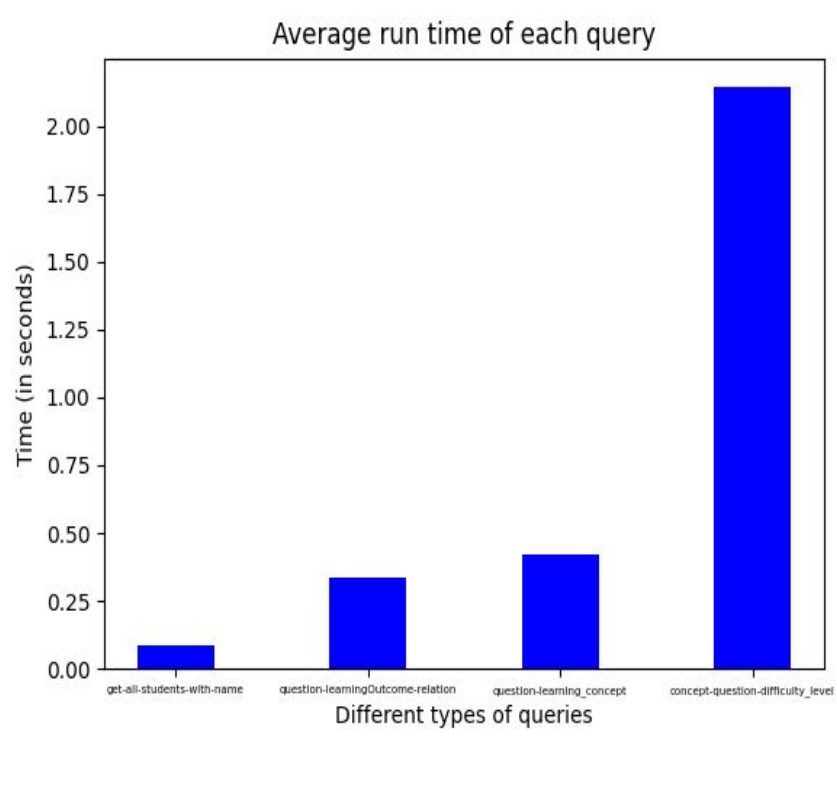- Configuring JSON files to match schema

Phase 3: Evaluate
- Write different queries ranging from simple to complex queries.
- Compare neo4j schema with TypeDB Schema
- Test Database Scalability
  - Test Latency in TypeDB and Neo4j
  - Test Concurrency in Neo4j and TypeDB

Latency

Latency in Neo4j

Latency in TypeDB

Latency

Query 1 - TypeDB
Query 2 - TypeDB
Query 3 - TypeDB
Query 4 - TypeDB
Query 1 - Neo4j
Query 2 - Neo4j
Query 3 - Neo4j
Query 4 - Neo4j

Schema

TypeDB Schema

Portioj of the Neo4j Schema

Future Plans

- **Explore and research more on the applications of knowledge graphs**

- **Learn more about Machine Learning to find anomalies in knowledge graphs**

- **Further pursue this project in the next semester and contribute more to this project**

References

Fletcher, James. "Strongly Typed Data for Machine Learning." Vaticle, 2023, pp. 1–11. Accessed 29 Nov. 2023.

What Is a Knowledge Graph? edited by Junyi Tao, California, Stanford University, May 2021, pp. 1–9, Accessed 29 Nov. 2023.