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NPTEL (<https://swayam.gov.in/explorer?ncCode=NPTEL>) » Introduction to Large Language Models (LLMs)  
(course)



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## Course outline

About NPTEL  
( )

How does an  
NPTEL online  
course work?  
( )

Week 1 ( )

Week 2 ( )

Week 3 ( )

# Week 9 : Assignment 9

The due date for submitting this assignment has passed.

Due on 2025-03-26, 23:59 IST.

## Assignment submitted on 2025-03-25, 19:56 IST

1) Which of the following statement best describes why knowledge graphs (KGs) are considered more powerful than a traditional relational knowledge base (KB)? **1 point**

- ☐ KGs require no schema, whereas KBs must have strict schemas.
- ☐ KGs store data only in the form of hypergraphs, eliminating redundancy.
- ☒ KGs allow flexible, graph-based connections and typed edges, enabling richer relationships and inferences compared to KBs.
- ☐ KGs completely replace the need for textual sources by storing all possible facts.

Yes, the answer is correct.

Score: 1

Accepted Answers:

*KGs allow flexible, graph-based connections and typed edges, enabling richer relationships and inferences compared to KBs.*

2) Entity alignment and relation alignment are crucial between KGs of different languages. **1 point**  
Which of the following factors contribute to effective alignment?

- ☐ Aligning relations solely by their lexical similarity, ignoring semantic context
- ☒ Transliteration or language-based string matching for entity labels
- ☐ Ensuring all language aliases are represented identically in each KG

**Week 4 ()****Week 5 ()****Week 6 ()****Week 7 ()****Week 8 ()****Week 9 ()**

☐ Lec 26 :  
Knowledge and  
Retrieval:  
Knowledge  
Graph (unit?  
unit=83&lesson  
=84)

☐ Lec 27 :  
Knowledge and  
Retrieval:  
Knowledge  
Graph  
Completion and  
Evaluation  
(unit?  
unit=83&lesson  
=85)

☐ Lec 28 :  
Knowledge and  
Retrieval:  
Translation and  
Rotation  
Models (unit?  
unit=83&lesson  
=86)

☒ Lecture  
Material (unit?  
unit=83&lesson  
=89)

☐ Feedback Form  
(unit?  
unit=83&lesson  
=87)

☒ **Quiz: Week 9 :  
Assignment 9**

☒ Matching neighbours, or connected entities, across different KGs

Yes, the answer is correct.

Score: 1

Accepted Answers:

*Transliteration or language-based string matching for entity labels*

*Matching neighbours, or connected entities, across different KGs*

3) In the context of knowledge graph completion (KGC), which statement best describes the role of the scoring function  $f(s,r,o)$ ? **1 point**

- ☐ It determines whether two entities refer to the same real-world concept.
- ☒ It produces a raw confidence score indicating how plausible a triple  $(s,r,o)$  is.
- ☐ It explicitly encodes only the subject's embedding, ignoring the relation and object embeddings.
- ☐ It ensures that every negative triple gets a higher score than any positive triple.

Yes, the answer is correct.

Score: 1

Accepted Answers:

*It produces a raw confidence score indicating how plausible a triple  $(s,r,o)$  is.*

4) One key difference between the differentiable KG approach and the semantic interpretation approach to KGQA is: **1 point**

- ☐ Differentiable KG approaches are fully rule-based, while semantic interpretation is purely neural.
- ☐ Differentiable KG approaches do not require any graph embeddings, relying instead on explicit logical forms.
- ☒ Semantic interpretation is more transparent or interpretable, whereas differentiable KG is end-to-end trainable but less interpretable.
- ☐ Both approaches use logical forms; the primary difference is the type of question they can answer.

Yes, the answer is correct.

Score: 1

Accepted Answers:

*Semantic interpretation is more transparent or interpretable, whereas differentiable KG is end-to-end trainable but less interpretable.*

5) Considering the differentiable KG approach, which elements are typically learned jointly when training an end-to-end KGQA model? **1 point**

- ☒ The textual question representation (e.g., BERT embeddings)
- ☒ The graph structure encoding (e.g., GCN or transformer-based graph embeddings)
- ☐ Predefined logical forms to ensure interpretability
- ☒ The final answer selection mechanism that identifies which node(s) in the graph satisfy the question

(assessment?  
name=88)

Week 10 ()

Week 11 ()

Week 12 ()

Year 2025  
Solutions ()

Yes, the answer is correct.

Score: 1

Accepted Answers:

*The textual question representation (e.g., BERT embeddings)*

*The graph structure encoding (e.g., GCN or transformer-based graph embeddings)*

*The final answer selection mechanism that identifies which node(s) in the graph satisfy the question*

6) Uniform negative sampling can have high variance and may require large number of samples. Why is that the case? **1 point**

- ☐ Because the margin-based loss cannot converge without big mini-batches.
- ☒ Because randomly picking negative entities does not guarantee close or challenging negatives, causing unstable training estimates.
- ☐ Because negative sampling must ensure every possible negative triple is covered.
- ☐ Because the number of relations in the KG is too large for small number of samples.

Yes, the answer is correct.

Score: 1

Accepted Answers:

*Because randomly picking negative entities does not guarantee close or challenging negatives, causing unstable training estimates.*

7) In testing embedding and score quality for KG completion, mean rank and hits@K are typical metrics. What does hits@K specifically measure in this context? **1 point**

- ☒ The percentage of queries for which the correct answer appears in the top-K of the ranked list.
- ☐ The reciprocal of the rank of the correct answer.
- ☐ The probability of the correct answer appearing as the highest scored candidate.
- ☐ The margin of the correct triple score relative to all negative triples.

Yes, the answer is correct.

Score: 1

Accepted Answers:

*The percentage of queries for which the correct answer appears in the top-K of the ranked list.*

8) In the TransE model, the scoring function for a triple (s,r,o) is typically defined as **1 point**

$$f(s,r,o) = \|e_s + e_r - e_o\|$$

where  $e_s$ ,  $e_r$ ,  $e_o$  are embeddings of the subject, relation, and object, respectively. Which statement best explains what a low value of  $f(s,r,o)$  indicates in this context?

- ☐ That (s,r,o) is an invalid triple according to the learned embeddings.
- ☐ That  $e_s$  and  $e_o$  must be orthogonal.
- ☐ That the relation embedding  $e_r$  is zero.
- ☒ That (s,r,o) has a high likelihood of being a true fact in the knowledge graph.

Yes, the answer is correct.

Score: 1

Accepted Answers:

*That  $(s,r,o)$  has a high likelihood of being a true fact in the knowledge graph.*

9) In RotatE, if a relation  $r$  is intended to be symmetric, how would that typically manifest in the complex plane? **1 point**

- ☐ The relation embedding  $e_r$  must always equal zero.
- ☐ The angle of  $e_r$  must be  $\pi/2$ .
- ☒ The relation embedding  $e_r$  is its own inverse (i.e., a  $180^\circ$  rotation when squared).
- ☐ The magnitude of  $e_r$  must be greater than 1.

Yes, the answer is correct.

Score: 1

Accepted Answers:

*The relation embedding  $e_r$  is its own inverse (i.e., a  $180^\circ$  rotation when squared).*

10) Which main advantage do rotation-based models (like RotatE) have over translation-based ones (like TransE) when it comes to complex multi-relational patterns in a KG? **1 point**

- ☐ Rotation-based models cannot model any symmetry or inverse patterns, so they are simpler.
- ☒ Rotation-based models handle a broader set of relation properties (symmetry, anti-symmetry, inverses, composition) more naturally.
- ☐ Rotation-based models have no hyperparameters to tune, unlike TransE.
- ☐ Rotation-based models are guaranteed to yield perfect link prediction.

Yes, the answer is correct.

Score: 1

Accepted Answers:

*Rotation-based models handle a broader set of relation properties (symmetry, anti-symmetry, inverses, composition) more naturally.*