

## Introduction

### Motivation:

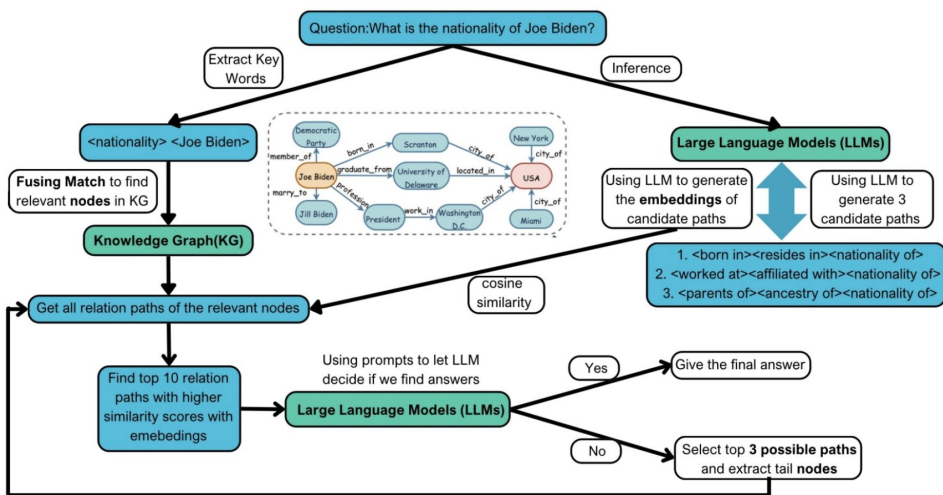
- Large Language Models (LLMs), such as LLaMA2 have shown their ability to solve NLP tasks. However, for the knowledge they do not know, the models generate unreliable answers.
- Inspired by a method called "Reasoning on Graphs" (RoG) that uses Knowledge Graph (KG) to fine-tune LLMs to answer question. We proposed a new way sophisticatedly integrating KG and LLM to generate knowledge-based answers.

## Method

Our method improve LLM responses in KG-driven relational paths and accomplished by following steps:

- Step 1: Using LLM to generate candidate paths and get embeddings for later similarity calculation.
- Step 2: Extracting key words and sing fusing match to find nodes in KG and then get all relation paths.
- Step 3: Calculate the cosine similarity of relation paths and embeddings in step 1 to choose top 10 paths.
- Step 4: Using LLM to decide if we get answer. If not, choose 3 most possible paths' tail nodes and back to step 2.

## Method



## Dataset

For the KGQA task, We use WebQuestionSP (WebQSP), which is commonly used benchmark datasets which are used in many related papers. And we use Freebase as the background knowledge graph for our datasets.

## Evaluation

We use Hits@k as assessment criteria. And this table show accuracy results on LLAMA, ROG method and our method.

Method	hit@1	hit@10
Original LLama	-	-
LLama with our method	28.4%	42.2%

Table 1: Model Performance Metrics

## Extension

- ROG using KG fine-tune LLM to improve performance on KGQA. It may be only useful on specific dataset and fine-tune Language model may be too costly and too demanding on computing resources.
- Our approach eliminates the need for model fine-tuning, saving computing resource and time, and imposes no constraints on the dataset. And it has exceptional scalability and adaptability. Combining the modular construction of KG and the flexible learning proficiencies of LLM, our method manages to solve novel knowledge and intricate queries. Moreover, this method helps to narrow the knowledge gaps problems often encountered by LLMs, thereby it can be applied to the study and exploration of new fields for LLM.

## Reference

Linhao Luo, Yuan-Fang Li, Gholamreza Haffari, and Shirui Pan. Reasoning on graphs: Faithful and interpretable large language model reasoning. arXiv preprint arXiv:2310.01061, 2023.

Kurt Bollacker, Colin Evans, Praveen Paritosh, Tim Sturge, and Jamie Taylor. Freebase: a collaboratively created graph database for structuring human knowledge. In Proceedings of the 2008 ACM SIGMOD international conference on Management of data, pages 1247–1250, 2008.