

Specs for 'Chatbot on Knowledge Graph using Large Language Models'

Product Requirements Document with hints of Implementation



Yogesh Haribhau Kulkarni (PhD)

Published in Technology Hits

3 min read · 1 hour ago



Listen



Share



More



Photo by [Jarritos Mexican Soda](#) on [Unsplash](#)

Overview

This document outlines the specifications for a chatbot that leverages the combined power of knowledge graphs (KGs) and large language models (LLMs). This innovative approach aims to address the growing need for efficient information retrieval and analysis, particularly in domains with vast amounts of unstructured text data.

Problem Statement

Effectively processing and comprehending the ever-increasing volume of information, especially in specialized domains like medicine and law, poses a significant challenge. Manually sifting through millions of articles and documents is impractical and time-consuming. This project aims to develop a chatbot that utilizes KG and LLM technology to overcome these limitations and provide users with a faster, more efficient way to access and understand complex information.

Objective

The primary goal of the {KG + LLM} chatbot project is to develop an end-to-end application for fine-tuning Large Language Models (LLMs) on Knowledge Graphs generated from a given text corpus. This application aims to leverage the capabilities of LangChain as the LLM front-end for Natural Language Understanding (NLU) and Natural Language Generation (NLG), with LLaamaIndex serving as the data ingestion and back-end Knowledge Graph database store.

Proposed Solution

The proposed solution involves a three-pronged approach:

a) Knowledge Graph Construction:

- Extract relevant data from text corpora in various domains (e.g., medical journals, legal documents, research papers).
- Utilize linguistic features like POS and NER tagging, topic modeling, and domain-specific knowledge (ontologies, dictionaries) to populate the KG with nodes and edges.
- Allow for configuration and customization of the KG construction process.

b) Chatbot Interface:

- Implement a chatbot front-end based on the LangChain LLM framework.
- Leverage LangChain's capabilities for natural language understanding (NLU) and natural language generation (NLG) to handle user queries and deliver informative responses.
- Design an intuitive and user-friendly interface accessible through various platforms like voice assistants and messaging apps.

c) Powerful Querying:

- Enable users to query the KG using natural language.
- Support various types of queries, including finding relations, identifying paths between concepts, extracting sub-graphs, calculating similarity, and detecting anomalies.

Key Features

- Domain Agnostic: Applicable across various domains with diverse information needs.
- Highly Portable: Open-source technology stack ensures scalability and widespread adoption.
- Global Impact: Potential to address information access challenges globally.
- Intuitive Interface: User-friendly design for efficient interaction.
- Advanced Querying: Enables comprehensive exploration and analysis of knowledge graphs.

Potential Applications

- Information Retrieval: Assist researchers, legal professionals, and healthcare workers in navigating vast amounts of textual information.
- Question Answering: Provide users with concise and accurate answers to their queries.
- Hypothesis Generation: Facilitate scientific discovery and innovation through data-driven insights.
- Elderly Care: Offer voice-based assistance to seniors for daily tasks, medication reminders, and basic medical guidance.

Technology Stack

- Open Source: LangChain for NLU/NLG, LLaamaIndex for data ingestion/KG storage.
- Google Cloud: VertexAI MLOps for enterprise-grade deployment (optional).
- Knowledge Graph Database: Neo4j (optional).

Future Enhancements

- **Geometric Deep Learning (GDL):** Integrate GDL techniques for predictive analysis and deeper insights from KGs.
- **Multi-lingual Support:** Enable the chatbot to handle queries and responses in multiple languages.
- **Agent-based Architecture:** Develop agents for model construction and query execution on the KG.

Success Metrics

- User satisfaction with the chatbot's ability to answer their queries accurately and efficiently.
- Increase in user engagement and utilization of the chatbot over time.
- Positive feedback from domain experts regarding the chatbot's performance.
- Measurable improvement in information retrieval and analysis tasks in specific domains.

Conclusion

The proposed {KG + LLM} chatbot has the potential to revolutionize the way we access and utilize information. By combining the strengths of KGs and LLMs, this project aims to empower users with a powerful tool for knowledge discovery and understanding, ultimately contributing to advancements in various fields and improving lives globally.

References

- LangChain: <https://python.langchain.com/en/latest/index.html>
- LLaamaIndex: https://github.com/jerryjliu/llama_index
- KGQA: A Framework for Building Knowledge Graph-based Question Answering Systems with Large Language Models by Li et al. (2023). This paper details a framework for building KGQA systems using LLMs, focusing on the importance of knowledge graph construction and reasoning.

These additional references provide further insights and resources for understanding and applying the combination of LLMs and KGs in building powerful and informative chatbots.

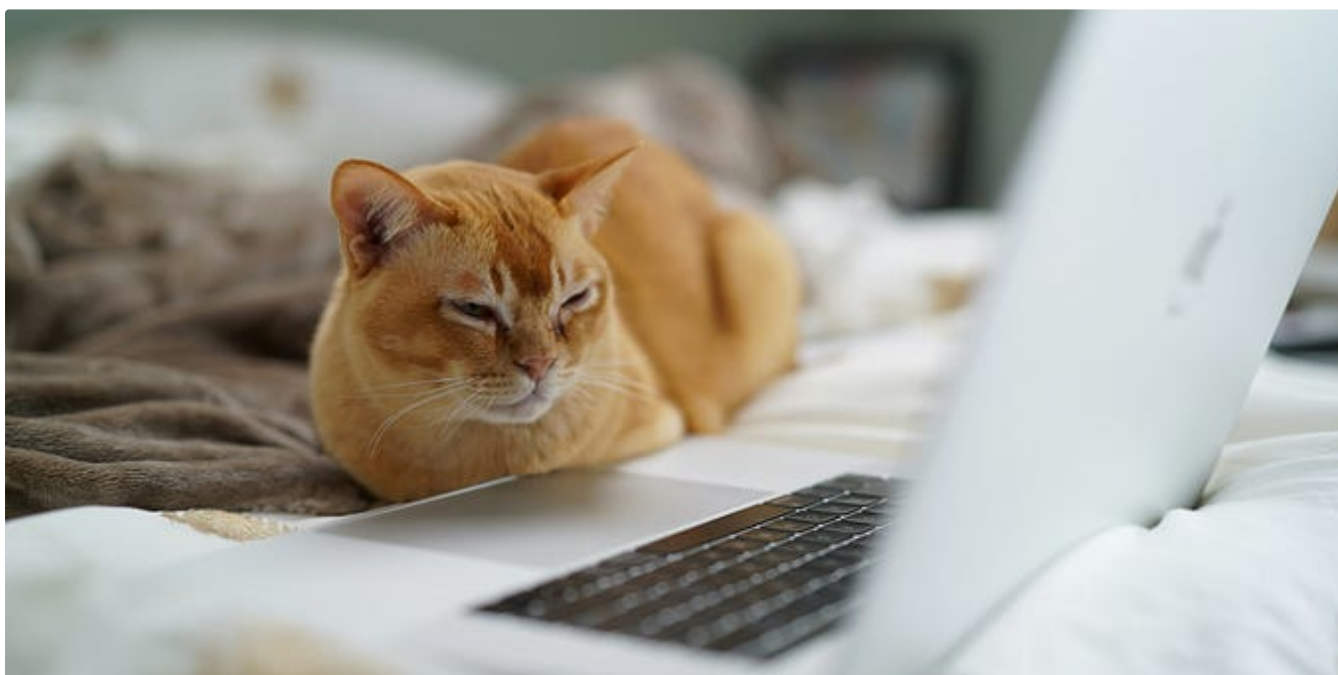
[Artificial Intelligence](#)[Chatbots](#)[Future](#)[Llm](#)[Knowledge Graph](#)

[Open in app](#)

1.1K Followers · Editor for Technology Hits

PhD in Geometric Modeling | Google Developer Expert (Machine Learning) | Top Writer 3x (Medium) | More at <https://www.linkedin.com/in/yogeshkulkarni/>

More from Yogesh Haribhau Kulkarni (PhD) and Technology Hits




Yogesh Haribhau Kulkarni (PhD) in Analytics Vidhya

How to Fine-tune LLMs without Coding?

Low/no-code platform to train Large Language models & more

7 min read · Nov 29

 67

 2









Yogesh Haribhau Kulkarni (PhD) in ILLUMINATION-Curated

Mind(map)Your Exams

Read, Record, Revise, Reproduce

4 min read · Nov 24

 74

 2







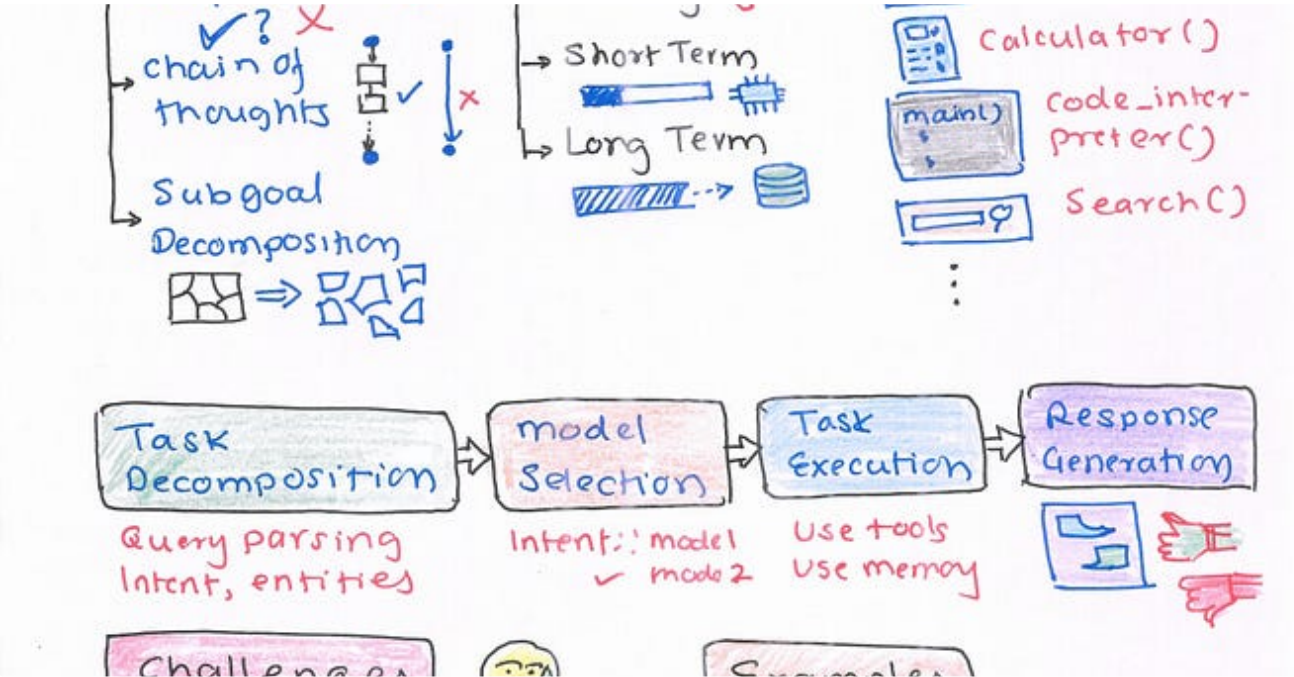
 Yogesh Haribhau Kulkarni (PhD) in Desi Stack

The Basis of Happiness

String of Wisdom-pearls from Chanakya Sutrani

4 min read · Nov 20

 20  1  



 Yogesh Haribhau Kulkarni (PhD) in Technology Hits

Power of Autonomous AI Agents

The Future of Work

3 min read · Sep 29


 105   

See all from Yogesh Haribhau Kulkarni (PhD)

See all from Technology Hits

Recommended from Medium



 Milena Trajanoska

Automated Knowledge Graph Construction using ChatGPT

Extract hidden insights from unstructured data

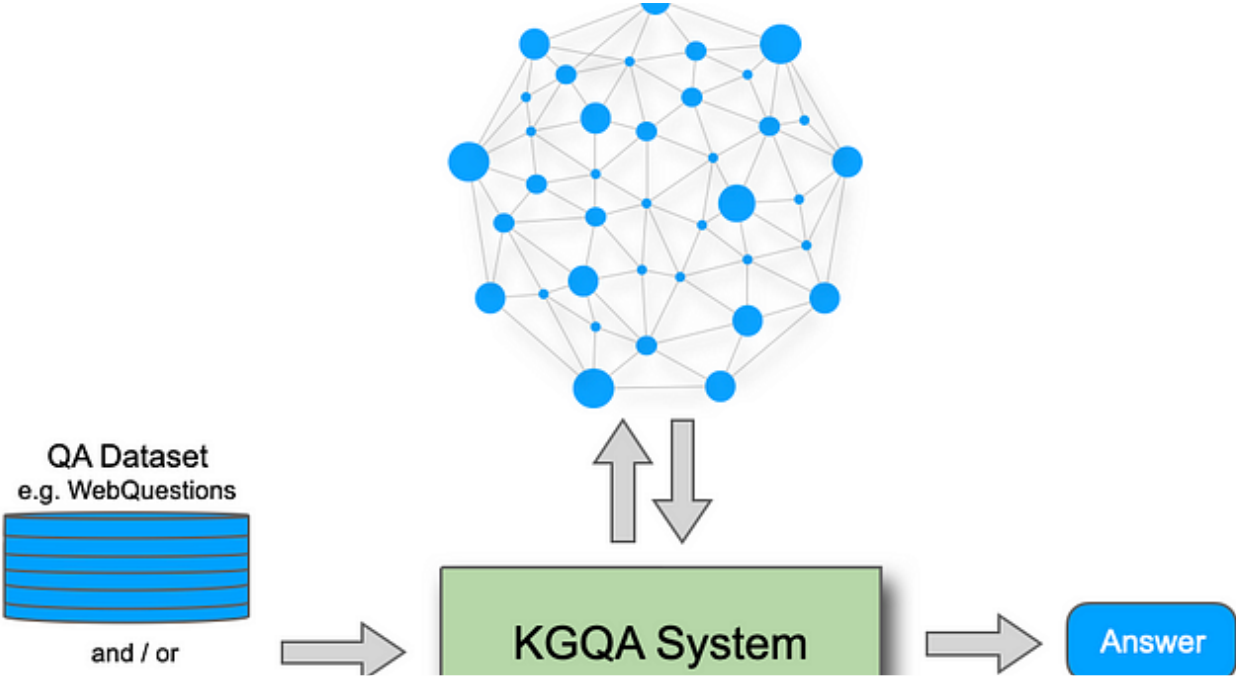
9 min read · Nov 29

 455

 3









Ahmad Alzeitoun

Question Answering over Hyper-relational Knowledge Graphs

This work explores the core chain approaches for Knowledge Graph Question Answering (KGQA) task. We adopt hyper-relational KG (e.g...

12 min read · Nov 22


 57










Lists

- 

AI Regulation
6 stories · 210 saves
- 

Natural Language Processing
943 stories · 450 saves
- 

Generative AI Recommended Reading
52 stories · 475 saves
- 

ChatGPT
23 stories · 299 saves



Anthony Alcaraz in Artificial Intelligence in Plain English

The Silent Information Transformation with LLMs: Building Knowledge Graphs with Maximum Automation

As AI permeates across industries, a silent transformation is underway in how AI systems are built.

🌟 · 14 min read · Nov 26

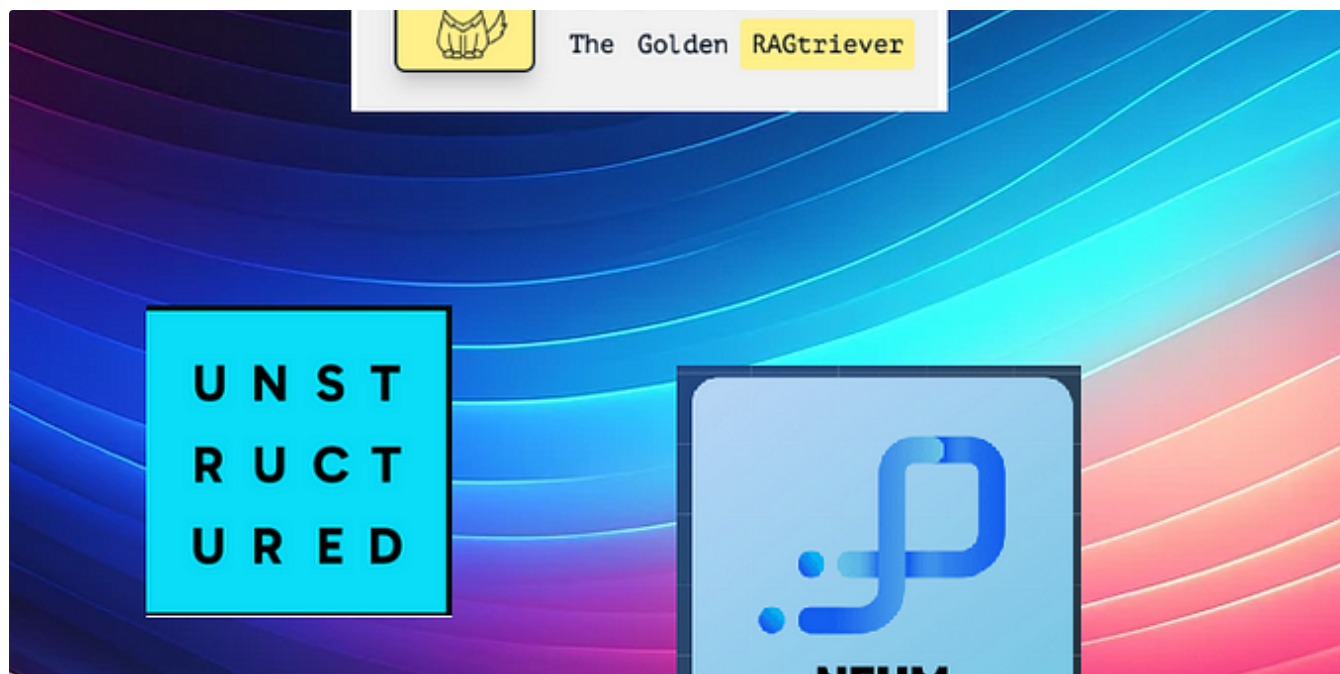


244



1





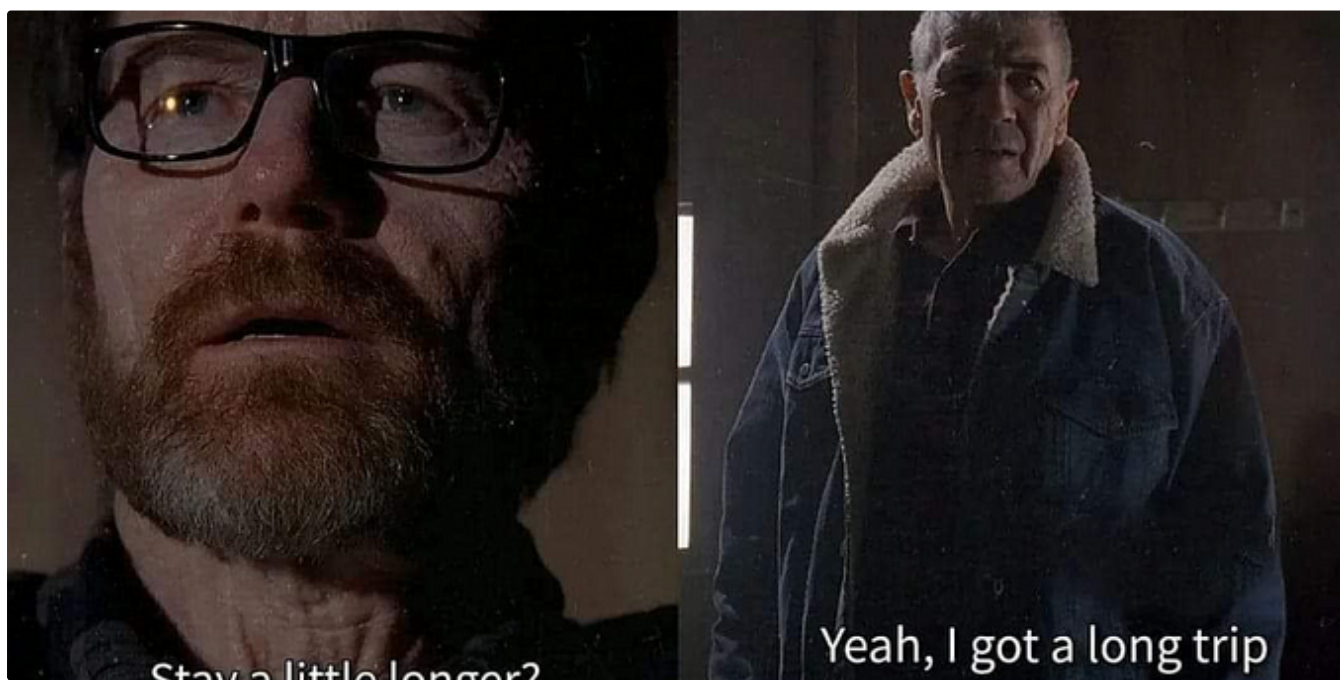
 Adam Hughes in Programmer's Journey


Three Open-Source RAG Tools You Need to Know About

Verba, Unstructured, and Nuem

🌟 · 9 min read · Dec 1

 220




 Lan Chu in Towards AI

GenAI's products: Move fast and fail

Building a cool and fancy demo is easy, building a final product is not.

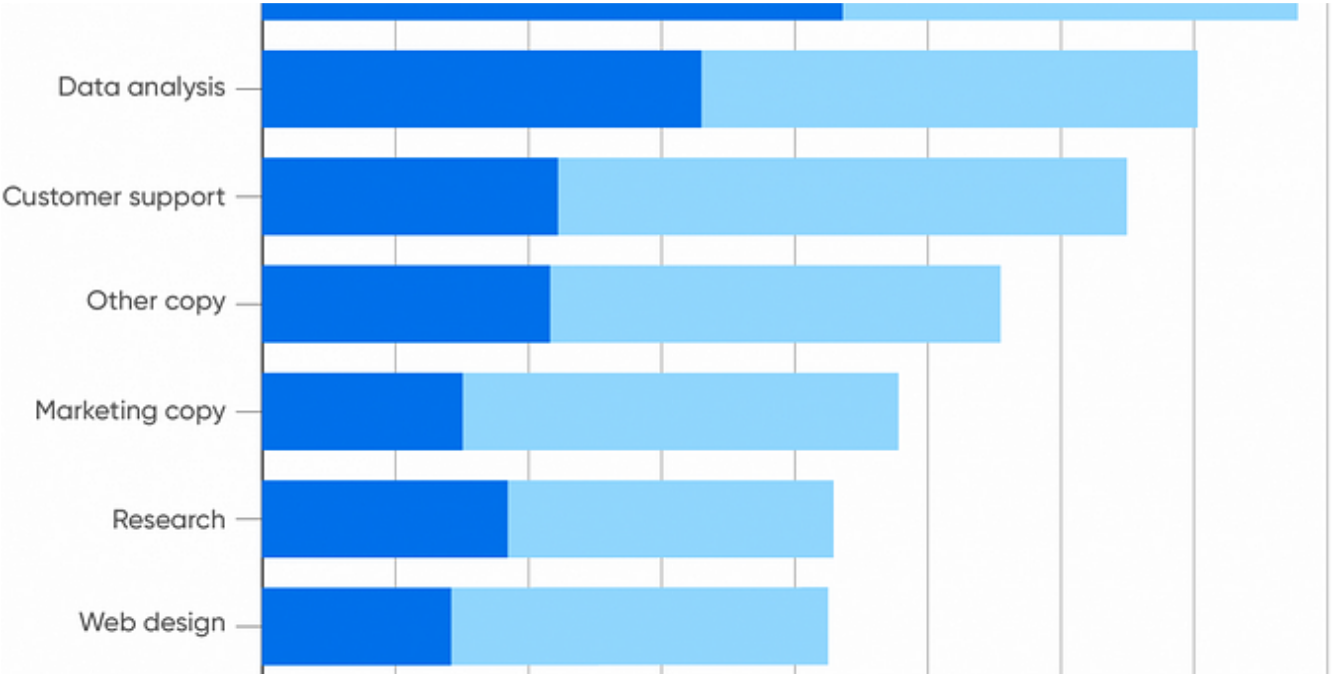
🌟 · 13 min read · 4 days ago

 545

 11







 O'Reilly Media

Generative AI in the Enterprise

By Mike Loukides November 28, 2023

27 min read · 3 days ago

 139

 1





See more recommendations