

Orchestrating Multi-Agent Systems for Multi-Source Information Retrieval and Question Answering with Large Language Models

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Abstract. We present a novel framework for developing robust multi-source question-answer systems by dynamically integrating Large Language Models with diverse data sources. This framework leverages a multi-agent architecture to coordinate the retrieval and synthesis of information from unstructured documents, like PDFs, and structured databases. Specialized agents, including RQL agents, Retrieval-Augmented Generation agents, and router agents, dynamically select and execute the most suitable retrieval strategies for each query. To enhance contextual relevance and accuracy, the framework employs adaptive prompt engineering, fine-tuned to the specific requirements of each interaction. We demonstrate the effectiveness of this approach in the domain of Contract Management, where answering complex queries often demands seamless collaboration between unstructured and structured data. The results highlight the framework's capability to deliver precise, context-aware responses, establishing a scalable solution for multi-domain question-answer applications.

Keywords: Information Retrieval; Question Answer; Large Language Models; Documents; Databases; Prompt Engineering; Retrieval-Augmented Generation; Text-to-SQL.

1 Introduction

The rapid evolution of Large Language Models (LLMs) has transformed the field of information retrieval and question-answering (QA) systems, enabling significant advancements in understanding and generating human-like text. These capabilities have unlocked new possibilities for retrieving precise and contextually relevant information from diverse sources. However, integrating data from heterogeneous sources - such as unstructured text documents, structured databases, and real-time APIs - into a unified system remains a complex challenge. Traditional systems often fall short in managing this complexity, struggling to retrieve and correlate information across varying formats, which can compromise the accuracy and relevance of responses. This challenge highlights the need for sophisticated frameworks that can dynamically orchestrate and retrieve information from multiple sources while leveraging the contextual understanding offered by LLMs.

Professionals across industries often face the daunting task of navigating vast amounts of unstructured text while simultaneously accessing structured data. This process is not only labor-intensive but also error-prone, as locating specific information and correlating it across disparate sources can be difficult. For example, in Contract Management, retrieving details from both lengthy contract documents and structured database records often requires extensive manual effort. Tasks such as identifying penalties, SLAs, or deadlines buried within hundreds of pages and linking them with structured metadata demand significant time and attention to detail.

To address these issues, we propose a dynamic multi-agent framework that leverages advanced techniques in orchestration and retrieval to enhance the capabilities of multi-source

Applications Of Question Answer Systems

Claude Cordell Green



Applications Of Question Answer Systems:

The Application of Theorem Proving to Question-answering Systems Claude Cordell Green,1970 The paper shows how a question answering system can use first order logic as its language and an automatic theorem prover based upon the resolution inference principle as its deductive mechanism The resolution proof procedure is extended to a constructive proof procedure An answer construction algorithm is given whereby the system is able not only to produce yes or no answers but also to find or construct an object satisfying a specified condition A working computer program QA3 based on these ideas is described Methods are presented for solving state transformation problems In addition to question answering the program can do automatic programming control and problem solving for a simple robot pattern recognition and puzzles Author

Intelligent Systems Design and Applications Ajith Abraham,Aswani Kumar Cherukuri,Patricia Melin,Niketa Gandhi,2019-04-13 This book highlights recent research on Intelligent Systems and Nature Inspired Computing It presents 212 selected papers from the 18th International Conference on Intelligent Systems Design and Applications ISDA 2018 and the 10th World Congress on Nature and Biologically Inspired Computing NaBIC which was held at VIT University India ISDA NaBIC 2018 was a premier conference in the field of Computational Intelligence and brought together researchers engineers and practitioners whose work involved intelligent systems and their applications in industry and the real world Including contributions by authors from over 40 countries the book offers a valuable reference guide for all researchers students and practitioners in the fields of Computer Science and Engineering

Computational Science and Its Applications - ICCSA 2023 Workshops Osvaldo Gervasi,Beniamino Murgante,Ana Maria A. C. Rocha,Chiara Garau,Francesco Scorza,Yeliz Karaca,Carmelo M. Torre,2023-06-29 This nine volume set LNCS 14104 14112 constitutes the refereed workshop proceedings of the 23rd International Conference on Computational Science and Its Applications ICCSA 2023 held at Athens Greece during July 3 6 2023 The 350 full papers and 29 short papers and 2 PHD showcase papers included in this volume were carefully reviewed and selected from a total of 876 submissions These nine volumes includes the proceedings of the following workshops Advances in Artificial Intelligence Learning Technologies Blended Learning STEM Computational Thinking and Coding AAILT 2023 Advanced Processes of Mathematics and Computing Models in Complex Computational Systems ACMC 2023 Artificial Intelligence supported Medical data examination AIM 2023 Advanced and Innovative web Apps AIWA 2023 Assessing Urban Sustainability ASUS 2023 Advanced Data Science Techniques with applications in Industry and Environmental Sustainability ATELIERS 2023 Advances in Web Based Learning AWBL 2023 Blockchain and Distributed Ledgers Technologies and Applications BDLTA 2023 Bio and Neuro inspired Computing and Applications BIONCA 2023 Choices and Actions for Human Scale Cities Decision Support Systems CAHSC DSS 2023 and Computational and Applied Mathematics CAM 2023 div div div div div div div div div div

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of the latest advances and trends in information technology science and engineering Specifically it addresses a number of broad themes including multi modal informatics data mining agent based and multi agent systems for health and education informatics which inspire the development of intelligent information technologies The contributions cover a wide range of topics such as AI applications and innovations in health and education informatics data and knowledge management multi modal application management and web social media mining for multi modal informatics Outlining promising future research directions the book is a valuable resource for students researchers and professionals and a useful reference guide for newcomers to the field This book is a compilation of the papers presented in the 2021 International Conference on Multi modal Information Analytics held in Huhehaote China on April 23 24 2021 *Intelligent Systems and Applications* Kohei Arai,Supriya Kapoor,Rahul Bhatia,2018-11-07 Gathering the Proceedings of the 2018 Intelligent Systems Conference IntelliSys 2018 this book offers a remarkable collection of chapters covering a wide range of topics in intelligent systems and computing and their real world applications The Conference attracted a total of 568 submissions from pioneering researchers scientists industrial engineers and students from all around the world These submissions underwent a double blind peer review process after which 194 including 13 poster papers were selected to be included in these proceedings As intelligent systems continue to replace and sometimes outperform human intelligence in decision making processes they have made it possible to tackle many problems more effectively This branching out of computational intelligence in several directions and the use of intelligent systems in everyday applications have created the need for such an international conference which serves as a venue for reporting on cutting edge innovations and developments This book collects both theory and application based chapters on all aspects of artificial intelligence from classical to intelligent scope Readers are sure to find the book both interesting and valuable as it presents state of the art intelligent methods and techniques for solving real world problems along with a vision of future research directions *Advances in Data Mining - Theoretical Aspects and Applications* Petra Perner,2007-08-18 The papers in this volume represent the proceedings of the 7th Industrial Conference on Data Mining They are organized into topical sections on aspects of classification and prediction clustering web mining data mining in medicine applications of data mining time series and frequent pattern mining and association rule mining Readers gain new insights into theories underlying data mining and discover state of the technology applications

International Conference on Computer Applications 2012 :: Volume 04 Kokula Krishna Hari K, Emerging Applications of Natural Language Processing: Concepts and New Research Bandyopadhyay, Sivaji,Naskar, Sudip Kumar,Ekbal, Asif,2012-10-31 This book provides pertinent and vital information that researchers postgraduate doctoral students and practitioners are seeking for learning about the latest discoveries and advances in NLP methodologies and applications of NLP Provided by publisher **Intelligent Computing Methodologies** De-Shuang Huang,M. Michael Gromiha,Kyungsook Han,Abir Hussain,2018-08-08 This book constitutes in conjunction with the two volume set LNCS 10954 and LNCS 10955 the

refereed proceedings of the 14th International Conference on Intelligent Computing ICIC 2018 held in Wuhan China in August 2018 The 275 full papers and 72 short papers of the three proceedings volumes were carefully reviewed and selected from 632 submissions The papers are organized in topical sections such as Evolutionary Computation and Learning Neural Networks Pattern Recognition Image Processing Information Security Virtual Reality and Human Computer Interaction Business Intelligence and Multimedia Technology Biomedical Informatics Theory and Methods Swarm Intelligence and Optimization Natural Computing Quantum Computing Intelligent Computing in Computer Vision Fuzzy Theory and Algorithms Machine Learning Systems Biology Intelligent Systems and Applications for Bioengineering Evolutionary Optimization Foundations and Its Applications to Intelligent Data Analytics Swarm Evolutionary Algorithms for Scheduling and Combinatorial Optimization Swarm Intelligence and Applications in Combinatorial Optimization Advances in Metaheuristic Optimization Algorithm Advances in Image Processing and Pattern Techniques Bioinformatics

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