**A MINI-PROJECT REPORT**

**ON**

**“ARA”**

***Submitted to***

**Rashtrasant Tukadoji Maharaj Nagpur University, Nagpur**

***in partial fulfillment of the requirement for the degree of***

***BACHELOR OF TECHNOLOGY***

***in***

***Computer Science & Engineering***

**Submitted By**

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**2023-2024**

***Certificate***

***This is to certify that the mini-project entitled***

**“ARA” *Is a bonafide work and it is submitted to the***

***Rashtrasant Tukadoji Maharaj Nagpur University, Nagpur.***

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***For the partial fulfillment of the requirement for the degree of***

***Bachelor of Technology in Computer Science & Engineering, during***

***the academic year 2023-2024.***

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**ABSTRACT**

*The exponential growth of research data and information sources has posed significant challenges for researchers, leading to information overload, disconnected insights, missed opportunities, and inefficiencies in organizing and synthesizing knowledge. To address these issues, we have developed ARA (Artificial Intelligence-powered Research Assistant), an innovative application that leverages advanced AI technologies to revolutionize the research process by enhancing information retrieval, analysis, and synthesis.*

*ARA represents a cutting-edge solution that transcends traditional note-taking approaches. It leverages large language models, semantic web technologies, and knowledge graphs to create a dynamic, interconnected web of research information that can be understood and processed by AI models.*

*ARA has delivered an advanced and efficient tool that enhances researchers' capabilities, streamlines their workflows, and contributes to the overall productivity of research activities. By fostering effective information retrieval and adaptability, ARA has the potential to drive groundbreaking discoveries and accelerate the pace of scientific progress across various disciplines.*

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# INTRODUCTION

The modern research landscape is characterized by an ever-increasing deluge of information, posing significant challenges for researchers attempting to navigate this complex terrain. The exponential growth of research data, publications, and online resources has led to a phenomenon known as "information overload," where researchers struggle to manage and process the vast amounts of information available. Consequently, valuable insights and connections often remain hidden, opportunities for collaboration are overlooked, and the overall efficiency of the research process is hindered.

In response to these challenges, ARA (Artificial Intelligence-powered Research Assistant) has been developed, a revolutionary application that harnesses the power of advanced AI technologies to transform the way researchers approach information gathering, organization, and synthesis. ARA represents a paradigm shift from traditional note-taking applications, leveraging cutting-edge techniques such as large language models, knowledge graphs, and semantic web technologies to create a dynamic, interconnected web of research information that can be understood and processed by AI models.

The core objective of ARA is to empower researchers by providing a comprehensive and intelligent research assistant that streamlines their workflow, unveils hidden insights, expands research horizons, and sharpens critical thinking and communication skills. By automating routine tasks, accelerating data analysis, and providing contextual access to relevant information, ARA aims to significantly boost research productivity and efficiency, ultimately contributing to the acceleration of scientific progress across various disciplines.

# LITERATURE SURVEY

In the era of rapidly expanding scientific literature, automated methods have emerged as an asset in managing and streamlining the process. AI-based tools offer a myriad of features, including natural language processing, citation analysis, and automated summarization, enabling researchers to discover, evaluate, and organize relevant research papers efficiently. Given below are tools and platforms which were analyzed as part of the requirements of ARA.

## Lex[]

Lex learns from the text the user adds and uses it to generate new content. Academic and technical writing can be mentally draining, and Lex can take some of the grunt work. Lex helps the user focus on sharing their research findings rather than stressing about technical and scientific writing.

Lex only summarizes the content for the purposes of sharing and does not aid in the process of researching.

## Notion[]

Notion is a collaboration platform with Markdown[] and inducing kanban boards[], tasks, wikis[] and databases. It is a workspace for notetaking, knowledge and data management and project and task management.

Notion only provides rudimentary AI features which enable text prediction, generation and solving of simple arithmetic expressions. Notion cannot search for new sources.

## Elicit[]

Elicit is an AI assistant that uses language models to answer research questions. It can find relevant papers without needing perfect keyword matches, summarize key takeaways, and extract important information.

However, Elicit cannot search the web for generalized information, is not a good fit for identifying facts and theoretical or non-empirical domains.

## Research Rabbit[]

Research Rabbit is an AI-powered platform that assists researchers in discovering, visualizing, and analyzing relevant literature.

Research Rabbit cannot search for general information and does not transform text. The authors of Research Rabbit put it well, “Research Rabbit is like Spotify[] for Research”

## ChatPDF[]

ChatPDF is an AI-powered tool that functions as an interactive chatbot for PDF documents. It can answer queries, rewrite sections, and provide insights.

ChatPDF cannot utilize information beyond the provided PDF and hallucinates frequently.

## Consensus[]

Consensus is an AI-powered search engine that answers questions based on peer-reviewed literature, providing evidence-based answers and a “consensus meter” reflecting the state of current research.

Consensus does not possess the ability to generate summarizations or complete any custom task given by the user.

## IBM Watson[]

IBM Watson is a platform that offers various AI-powered tools for academic research, including data extraction, sentiment analysis, and language processing features to smoothen the research process and discover insights from unstructured data.

However, IBM Watson being a platform provides APIs and SDKs to integrate into your own software, and as such cannot be used by the general populace.

# ANALYSIS

In the due course of researching for our project, we have found the existence of various tools, platforms and components that have a common goal as ours.

## Existing Systems and Drawbacks.

**Lex** can generate new content by learning from provided text, but it does not aid in the research process itself by finding or summarizing sources.

**Notion** provides collaboration and knowledge management features with basic AI capabilities like text prediction but cannot search for or analyze research literature.

**Elicit** uses language models to find relevant papers and summarize key points but cannot search the general web or handle non-empirical domains.

**Research Rabbit** visualizes and analyzes literature but does not transform text or search beyond research papers.

**ChatPDF** allows querying and rewriting PDF documents through an AI chatbot but cannot utilize information beyond the given PDF.

**Consensus** provides evidence-based answers from peer-reviewed literature but lacks the ability to generate summarizations or handle custom tasks.

**IBM Watson** offers powerful AI capabilities for academic research like data extraction and language processing, it requires technical integration as a platform rather than an out-of-the-box solution.

# DESIGN

Activity Diagram, Class Diagram, Collaboration Diagram, State Diagram and Use-case diagram.

# SYSTEM REQUIREMENTS

Hardware, Software

# IMPLEMENTATION

Snaps and working

# SOFTWARE TESTING

Software Testing

# RESULT DISCUSSION

Result Discussion

# APPLICATION

Application

# CONCLUSION

Conclusion

# REFERENCES

[Citation Number] …

# APPENDIX – A

Content for appendix-a