MIT School of Engineering
Department of Information Technology

Project Synopsis

Group ID: 3
Project Title: <u>AI-DRIVEN PREDICTIVE DIAGNOSIS SYSTEM FOR HEALTHCARE</u>

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PROBLEM STATEMENT
- Implementing Retrieval-Augmented Generation (RAG) with lightweight LLMs like LLaMA 2 or Mistral to deliver clear, easy-to-understand guidance on symptoms and medications for common ailments.
- This system combines advanced retrieval techniques with LLMs to simplify medical information, making it more accessible and user-friendly.

ABSTRACT

The AI-Driven Predictive Diagnosis System for Healthcare project is a novel approach to simplifying medical information using Retrieval-Augmented Generation (RAG) in combination with lightweight language models (LLMs) such as LLaMA 2 and Mistral. The goal is to develop a system that delivers clear, user-friendly guidance on symptoms and medications for common ailments. By leveraging advanced retrieval techniques alongside LLM capabilities, the system aims to bridge the gap between complex medical terminology and the general public's need for accessible healthcare information, promoting better understanding and engagement with personal health management.

LITERATURE SURVEY

Recent advancements in Retrieval-Augmented Generation (RAG) systems have shown significant potential in improving the accessibility of complex medical information by combining retrieval techniques with generative models like LLaMA 2 and Mistral. Studies highlight the effectiveness of RAG in providing user-friendly healthcare guidance by simplifying medical jargon and enhancing interpretability for non-expert users.

1. **"Leveraging LLM: Implementing an Advanced AI Chatbot for Healthcare" by Ajinkya Mhatre, Sandeep R. Warhade, Sayali Kokate, Omkar Pawar, Samyak Jain, May 2024.**

The paper evaluates the use of Large Language Models (LLMs) in healthcare chatbots for addressing general illness queries, achieving 61% accuracy. It highlights LLMs' benefits in providing accurate, personalized medical guidance and discusses challenges like accuracy, privacy, and bias. The research aims to enhance patient engagement and healthcare accessibility through intelligent chatbot systems.

2. **"A Medical Chatbot: Your Healthcare Assistance" by Harsh Jain, June 2024.**

The paper presents the development of a Medical ChatBot using the Llama 2 model to enhance healthcare accessibility. The chatbot, built with open-source technologies and AI methods, provides accurate medical information and emotional support through efficient processing and rapid response generation. It showcases promising performance in user query handling and highlights its potential to improve healthcare communication and support.

3. **"Efficiency-Driven Custom Chatbot Development: Unleashing LangChain, RAG, and Performance-Optimized LLM Fusion" by S. Vidivelli, Manikandan Ramachandran, A. Dharunbalaji, August 2024.**

The paper introduces a highly efficient medical chatbot leveraging LangChain, Retrieval-Augmented Generation (RAG), and performance-efficient Large Language Models (LLMs) like LoRA and QLoRA. The chatbot uses LangChain for customization, RAG for web-scraping data, and fine-tuned LLMs for rapid, accurate responses. This approach enhances user interactions, provides comprehensive medical information, and improves efficiency. The chatbot was tested using various metrics, showing strong performance in patient education and support.

4. **"Integrating RAG with LLMs in Nephrology: Advancing Practical Applications" by Jing Miao, Charat Thongprayoon, Supawadee Suppadungsuk, Oscar A. Garcia Valencia, Wisit Cheungpasitporn, March 2024.**

The paper explores integrating Large Language Models (LLMs) with Retrieval-Augmented Generation (RAG) techniques in nephrology. It addresses challenges such as LLMs' inaccuracies and hallucinations by using prompt engineering and RAG to improve response accuracy and relevance. The study highlights the development of a ChatGPT model aligned with KDIGO 2023 guidelines for chronic kidney disease, demonstrating its potential for providing precise medical advice.

YEAR	TITLE	AUTHOR	RESULT	LIMITATION
2024	Leveraging LLM: Implementing an Advanced AI Chatbot for Healthcare"	Ajinkya Mhatre, Sandeep R. Warhade, Sayali Kokate, Omkar Pawar, Samyak Jain	- Result: LLM-based chatbots showed 61% accuracy in general illness queries.	- Issues with accuracy, biases, and ethical concerns remain.
2024	A Medical Chatbot: Your Healthcare Assistance	Harsh Jain	- Llama 2-based ChatBot delivers accurate medical info and improves access.	- Needs more refinement for better functionality.
2024	Efficiency-Driven Custom Chatbot Development: Unleashing LangChain, RAG, and Performance-Optimized LLM Fusion	S. Vidivelli, Manikandan Ramachandran, A. Dharunbalaj	- The chatbot efficiently delivers healthcare information using advanced technologies.	- Requires improvements in accuracy and user interaction.
2024	Integrating RAG with LLMs in Nephrology: Advancing Practical Applications	Jing Miao, Charat Thongprayoon, Supawadee Suppadungsuk,Oscar A. Garcia Valencia, Wisit Cheungpasitporn	- LLMs with RAG improve nephrology care and education.	- Accuracy and reliability of information are still challenging.

GENERAL WORKING:
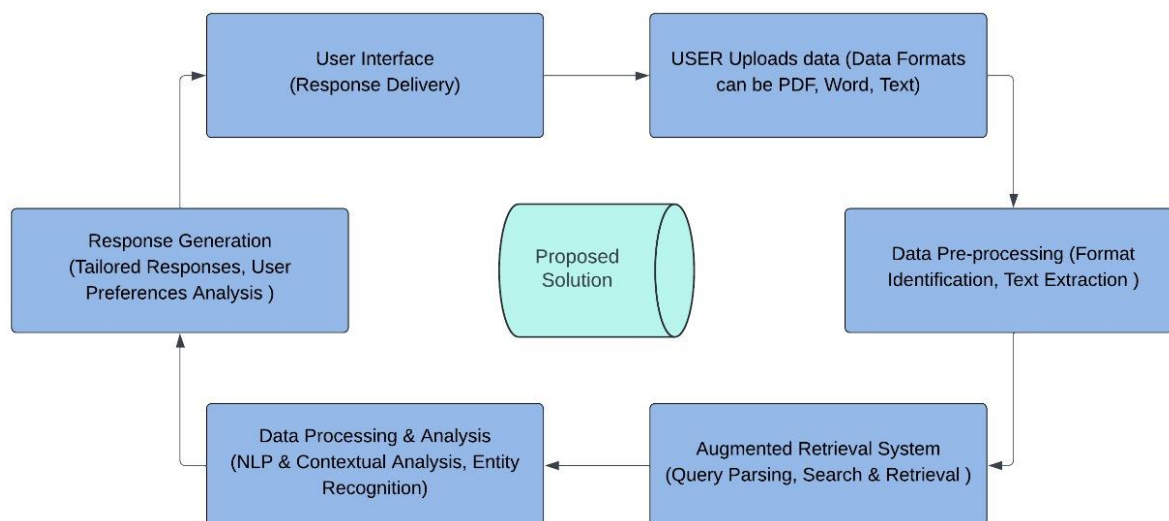
CONCLUSION

We can see from a collection of survey papers that automated website fraud detection programs take over the job from cybersecurity professionals. Not only do these automated programs save time by spotting fraudulent activity without human involvement, but these automated programs can also spot fraud equally well and fairly, no matter the nationality of the cybercriminal. Furthermore, many improve the security of websites by eliminating the need to send sensitive information around the world.

But it's important to remember that although automated fraud detection systems have many advantages, they don't necessarily have to be used solely by computers. For example, many systems still require a human to evaluate the known fraud activities detected in the last stage and refine them to be specifically fit for their organization. Also, we need to add another security layer to ensure that nobody can breach the system and intrude upon the confidential data stored there.

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4. Integrating RAG with LLMs in Nephrology: Advancing Practical Applications by Jing Miao, Charat Thongprayoon, Supawadee Suppadungsuk, Oscar A. Garcia Valencia, Wisit Cheungpasitporn, March 2024.

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