



Veribot: AI-Powered Academic Answer Validation System

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Abstract

PDF documents is used for storing and sharing information. Extracting the answers for questions from PDF files is a valuable task in various domains, including education, research, and business. Langchain is a natural language processing framework that mainly focuses on deep learning techniques, including transformers, to understand and process the text efficiently. In our approach, PDF documents are first inserted and it is processed by Langchain to extract and generate the content. Then, users can ask questions related to the content of the PDF. The NLP will use its language model to process the content and generates correct and informative answers to the user's questions. It provides a simple and user- friendly interface for individuals and organizations to understand the complex data, to make it easier to find the information that they need form the PDF files. This project has the ability to improve information gathering and knowledge management across a wide range of applications, including academic research, legal document analysis, and data-driven decision-making processes. This system will allow the students to check their answers with sources that are provided, improves exam preparation. VeriBot acts an important tool in academics by providing answers and also boosts the confidence of the students in exam preparation.

Keywords: Chatbot, Queries, Accuracy, Artificial Intelligence, Summarizer, Parsing, Ingestion, Processor.

1. Introduction

AI-driven solutions to improves learning and academic performance as the modern education depends on technology. AI has been mostly used in the fields of education, including mentoring programs, automated test scheduling and grading systems, and can customize and have a personalized learning. VeriBot is an artificial intelligence (AI) tool which is designed to check test answers for students studying for exams at different universities [1]. The projects use a Lang chain approach, an AI technique that guarantees correct and standard input processing. VeriBot allows students to enter their study materials into the system. The system processes input items from PDF or DOC formats. As a virtual teacher, the veribot reads the input and responds appropriately to the questions posed by the students. The primary goal is to provide students with a tool that increases their

accuracy when answering to test questions. Because of its user-friendly design, students from various departments may use with the system very easily [2]. In order to reduce mistakes and improve the results, the project handles the problem of making sure that students' answers match with given academic references. VeriBot promotes self-evaluation and a greater comprehension of the subject matter by giving prompt feedback [3-5].

2. Related Works

The use of AI-made chatbots in educational institutions and support field has made a large progress, by addressing a variety of user needs and improving accessibility to information. Vannala et al. (2022) presented an AI chatbot focused on efficiently answering FAQs across various sectors, leveraging natural language processing (NLP) to improve

response accuracy and relevance. Their work depicts the potential of AI chatbots in effective communication by providing quick, automated answers to common questions [6]. This approach has been particularly effective in customer service and technical support, where reducing response times significantly impacts user satisfaction. By using advanced NLP techniques, the study highlighted the capability of chatbots to simulate a personalized experience, even within the constraints of repetitive FAQ-based systems. Expanding on the application of AI in education, Kesarwani et al. (2023) reviewed a range of student-focused chatbot systems, examining how these tools influence the learning experience and improve access to information. The authors underscored the adaptability of educational chatbots, noting that they provide a unique advantage in personalized learning by offering on-demand support and customized feedback [7]. Through this concept, they illustrated how student chatbots can bridge knowledge gaps, supplement instruction, and engage learners in ways that align with their individual needs and academic contexts. However, they identified that most educational chatbots still lack deeper integration with course-specific materials, which could further enhance their effectiveness. VeriBot builds upon these foundations by addressing the need for document-based, context-aware answer validation within an academic setting. Unlike general-purpose chatbots, VeriBot is uniquely tailored to align responses with student-uploaded materials, ensuring relevance and accuracy [8]. By integrating LangChain's NLP capabilities with Pinecone's vector-based retrieval, VeriBot processes content in a way that allows it to respond to specific queries grounded in a student's own resources. This targeted approach not only enhances the accuracy of responses but also fosters a more interactive and self-guided learning experience. Furthermore, VeriBot's drag-and-drop functionality and conversational interface make it easily accessible, empowering students to engage in self-assessment and reinforcing knowledge retention in preparation for exams. In this way, VeriBot represents a significant step forward in adaptive educational technology, filling a notable gap identified in previous research [9].

3. Existing Methodologies

The existing methodologies mainly explain about providing general mentoring, answering for the student questions [10-13]. These systems focus on improving the learning experience but often lack the correctness required for verifying examination answers based on standard academic materials. Many educational chatbots use Natural Language Processing (NLP) techniques to read and answer to student queries. The systems, such as ELIZA, generate answers using machine learning techniques and algorithms [14]. Due to their lack of integration of reference materials and document as the input, these chatbots are not specially designed for verifying exam answers, despite their improved capability in general tutoring. Certain current systems rely on rule-based strategies, in which certain keywords in student queries are used to generate prepared answers. Due to their relative rigidity, these systems struggle to adjust to sophisticated queries or document-based analysis [15]. Intelligent tutoring systems (ITS) and other knowledge-based systems leverage expert knowledge and organized databases to provide answers to queries (Figure 1). However, they frequently have trouble responding dynamically or confirming responses based on semi-structured or unstructured materials (such as DOC or PDF files).

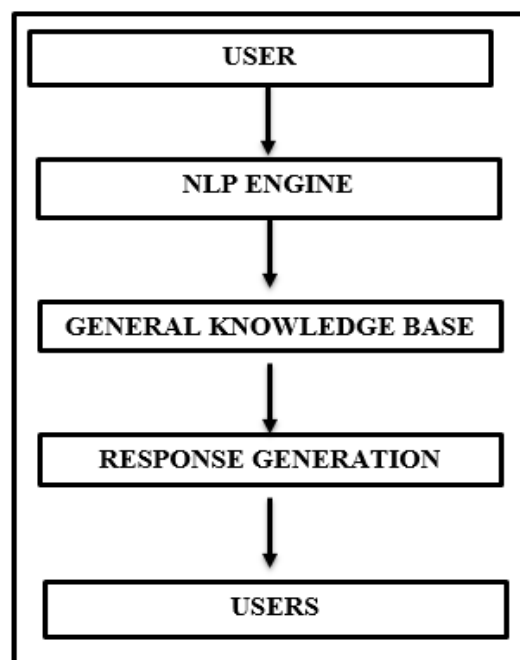


Figure 1 Existing System

The current approaches are not linked to document-based verification procedures; instead, they usually use an NLP engine or rule-based system to analyze user questions and produce answers [16].

4. Proposed System

The proposed methodology of VeriBot mainly focuses on enhancing the accuracy of response generated by integrating a Lang chain approach that links document processing with intelligent answer verification. Unlike existing methods that rely on generalized knowledge retrieval, VeriBot processes inputted materials in PDF or DOC formats, cross-referencing student answers with these documents to ensure they align with academic standards. This approach bridges the gap between general tutoring chatbots and specialized exam preparation tools. The system use NLP which uses pre-processing techniques such as tokenization, stemming, lemmatization, and stop word removal to prepare the data for various applications. Tokenization breaks a sentence into individual units of words or phrases. Stemming and lemmatization simplify words into their root form. Stop word removal ensures that words that do not add significant meaning to a sentence are removed [17]. The system has been made through the languages like Next.js in Visual Studio code. To store the files, the database used is MongoDB. MongoDB enables to go further and faster when developing software applications that handle data of all sorts in a scalable way. The core innovation in the proposed methodology is the application of a Langchain-based AI engine that processes input documents (PDF, DOC formats). LangChain enables chat applications that are advanced enough to handle complex questions and even transactions from users. These applications are able to understand and maintain a user's context throughout a conversation in the same way ChatGPT can. The system can link user questions to certain document sections. This method guarantees a high degree of accuracy by directly comparing the student's responses to the content they have uploaded. The student's input document is initially ingested and parsed by VeriBot [18-20]. The system employs text extraction methods for DOC files for scanned PDFs. The system indexes the data after content extraction

to facilitate effective querying and retrieval. The student receives immediate response from the system after the verification is finished. The alignment with the input document is confirmed if the response is accurate. If it answers is wrong, the system makes recommendations for fixes based on the official source that was supplied. Comparing with the existing system, the propose system has the ability to provide responses based on user-provided documents greatly improves correctness of the answers generated. VeriBot is better trained to manage complex query processing and document reference duties by employing Lang chain for multi-step reasoning. VeriBot promotes self-evaluation and iterative learning by providing immediate, helpful feedback. This approach introduces document-based learning, which changes the conventional chatbots model and makes it a useful aid for students studying for tests (Figure 2).

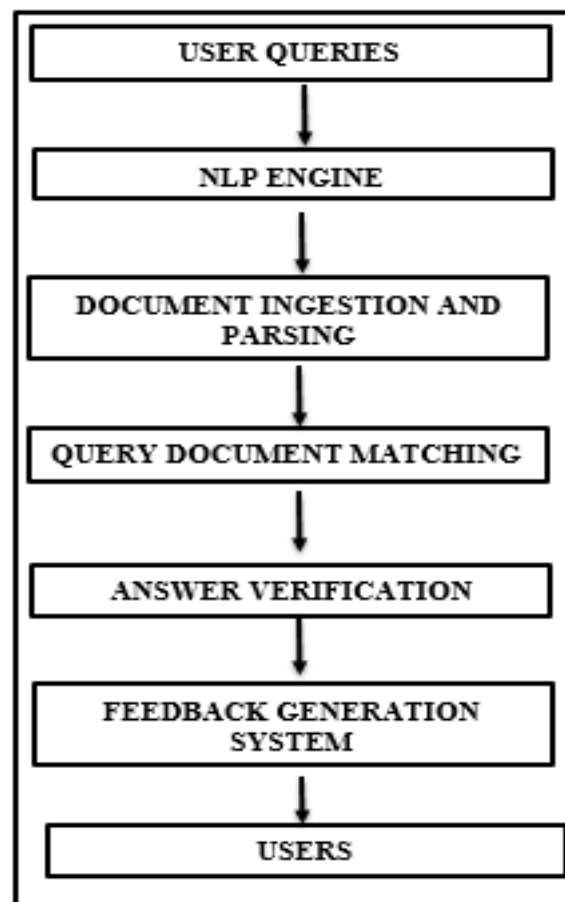


Figure 2 Proposed System

To check the quality and accuracy of VeriBot, documents of various subjects were uploaded. It checked whether it worked on various subjects and different languages. The primary criteria for evaluating VeriBot was its ability to correctly identify and verify whether a student's answer matched with the academic content provided in the document. One of the features of VeriBot was the Langchain approach used for document-based learning. VeriBot has ability to process and verify answers based on inputted documents resulted in more accurate and relevant answers. An important benefit of VeriBot is its ability to understand similar answers, rather than checking for the exact answers which produces the accurate answers. For example, A student has answered a question with correct answer but using different words from the document it is still considered correct (Figure 3). This flexibility encourages great learning, as students are not forced to memorize exact words but are instead they understand the concepts and write answers in their own words.

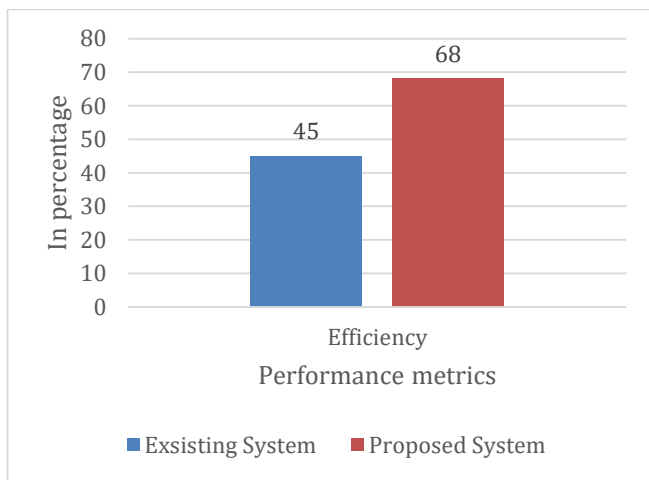


Figure 3 Performance Chart

Veribot in the educational field will have great impact on students. Firstly, it encourages the students in self-assessing themselves and able to check the places where they make mistakes and lag. Secondly, they will get know what would be concepts to be written for a particular question and able mover deeper into that topic. When compared to the other chatbots, this Veribot is able generate answers from a particular

document and we will be able to set limits for the answer so that the answers don't go beyond the syllabus. Proposed Systems are shown in Figures 4 to 6.

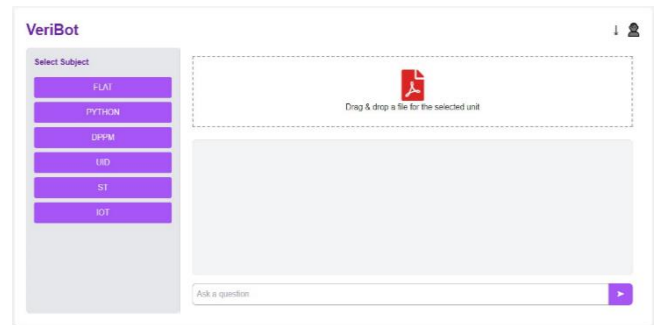


Figure 4 Proposed System

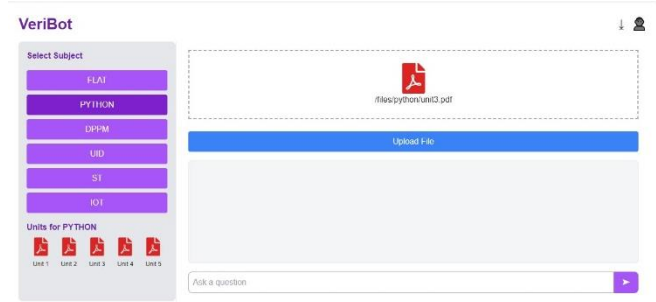


Figure 5 Proposed System

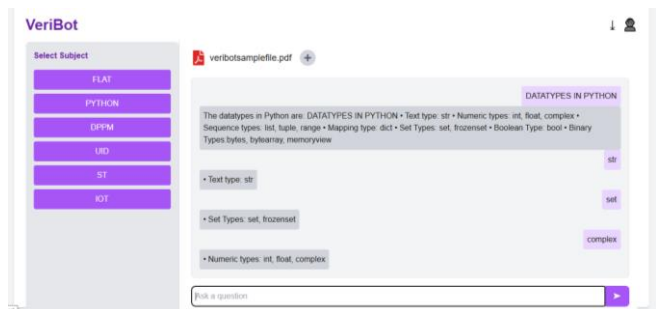


Figure 6 Proposed System

Conclusion

Veribot offers a unique and simple solution for the student's answers being consistent in exams and learning concepts correctly and deeply within the boundaries. It also allows us to prepare the answers from the pre-defined official academic references. The use of Langchain ensures a high accurate answer and providing flexibility in using the chatbot. Veribot has made possible that students able to prepare and verify their answers from a particular document. The



Veribot allows us to upload documents as input and generate answers from it. The integration of the AI-Chatbot in education will improve the student-centred learning and gives confidence to students in learning and writing the tests.

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