JAICOB- A DATA SCIENCE CHATBOT

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ABSTRACT

The application of natural language to improve students' interaction with information systems is demonstrated to be beneficial. In particular, advances in cognitive computing enable a new way of interaction that accelerates insight from existing information sources, thereby contributing to the process of learning. This work aims at researching the application of cognitive computing in blended learning environments. We propose a modular cognitive agent architecture for pedagogical question answering, featuring social dialogue (small talk), improved for a specific knowledge domain. This system has been implemented as a personal agent to assist students in learning Data Science and Machine Learning techniques. Its implementation includes the training of machine learning models and natural language understanding algorithms in a human like interface. The effectiveness of the system has been validated through an experiment.

Index : cognitive agent, data science, machine learning, natural language.

1. INTRODUCTION

1.1 INTRODUCTION TO PROJECT

Cognitive computing has grown in the last few years, increasing the research and commercial interest in the topic. Conversational agents have evolved from simple pattern-based programs into rather complex systems, including Natural Language Understanding and Machine Learning Techniques, which have allowed them to be more flexible in maintaining a conversation. Every day more businesses include chatbots as a way to interact with consumers to answer requests and FAQs.. By having the advantage of computational power, a system like this can be even more successful than a human in this kind of task. Though they do not understand the meaning as humans do, the insights these systems provide can be beneficial. As they grow in time, it is expected that they gain

abilities such as sensing and awareness. Some of the benefits of the application of cognitive computing in the development of learning applications are:

(1) They can actively enhance students' performances, especially in computer science classes;

(2) studying cognitive computing behavior can lead to significant results in educational applications,especially in AI-related studies;

(3) using a cognitive computing layer for digital interactions with students can enhance their performances and ease the teachers' job in managing classes and learning materials; and chatbots are excellent analysis tools, as students feel more inclined to send more messages to chatbots than real people . Compared to other traditional e-learning training, chatbots generate a more positive response from the users. More over, there are advantages in this type of learning, such as interaction, active learning, and sociability.Despite these reasons, these technologies have not been widely adopted yet in education, and the ones that have are usually very rule-based and, therefore, less practical and functional. This article presents a modular architecture chatbot named Jaicob, adapted to the learning It is designed in a modular way that allows its adaptation to other areas of knowledge. It includes a flexible conversation workflow and is easy to maintain. This contribution has been evaluated with real users for a specific use case in a Data Science class The rest of the organized as follows

2. EXISTING SYSTEM LIMITATIONS

Limited Domain Knowledge:

Existing chatbots may have limitations in understanding and responding to queries outside their predefined knowledge domain. If JAICOB is designed for Data Science and Machine Learning, it might struggle with questions or topics unrelated to these domains.

Dependency on Training Data:

Chatbots heavily depend on the quality and quantity of training data. Limitations in the diversity or relevance of the training data can impact the system's ability to provide accurate and comprehensive answers, especially in dynamic fields like data science.

Lack of Context Understanding:

Some chatbots may struggle with understanding the context of a conversation, leading to responses that are not contextually relevant. Improving contextual understanding is crucial for enhancing the overall user experience.

Difficulty Handling Ambiguity:

Natural language is inherently ambiguous, and existing systems might face challenges in interpreting ambiguous queries or statements. Resolving ambiguity is a complex task and an area where many natural language processing systems can be further improved.

Inability to Learn in Real-Time:

Some chatbots may lack the ability to learn and adapt in real-time based on user interactions. Continuous learning is essential for keeping the system up-to-date with new information, industry trends, and evolving user needs, particularly in a field as dynamic as data science.

3. PROPOSED SYSTEM & IT'S ADVANTAGES:

The proposed system, "JAICOB: A Data Science Chatbot," aims to address several key aspects to enhance the interaction between students and information systems in the realm of blended learning. This system introduces a modular cognitive agent architecture specifically designed for pedagogical incorporation of social dialogue, or small talk, which fosters a more natural and engaging interaction for users. Unlike existing systems, JAICOB is intended to possess an improved understanding of the contextual nuances within its predefined knowledge domain. This entails not only answering direct Dependency on Training Data: Difficulty Handling Ambiguity: 8 questions but also engaging in more dynamic and context-aware conversations with users The system's design emphasizes modularity, allowing for flexibility and scalability in integrating various components such as natural language understanding algorithms, machine learning models, and a user-friendly interface. JAICOB's implementation involves the meticulous training of machine learning models to comprehend and respond to user queries effectively. The interface is crafted to simulate a human-like interaction, enhancing the overall user experience. As a unique feature, JAICOB focuses on assisting students in learning complex concepts in Data Science and Machine Learning by tailoring its responses and guidance to the specific needs of learners. To validate the effectiveness of JAICOB, an experimental approach has been adopted. This involves rigorous testing and evaluation to measure the system's accuracy, responsiveness, and overall educational impact. The results of these experiments will provide valuable insights into the system's performance, enabling iterative refinement and continuous improvement. Through these innovations, the proposed system envisions a more dynamic, context-aware, and user-centric approach to educational technology, contributing to an enriched learning experience in the field of Data Science and Machine Learning.

3.1 ADVANTAGES

Enhanced Learning Experience:

The proposed system, JAICOB, offers an enriched learning experience by providing personalized

Context-Aware Responses:

assistance to students in the domains of Data Science and Machine Learning. Its modular cognitive agent architecture,coupled with social dialogue capabilities, fosters a more engaging and dynamic interaction, making learning process more enjoyable and effective. JAICOB's design prioritizes contextual understanding within its predefined knowledge domain. This enables the chatbot to deliver responses that are not only accurate but also contextually relevant, enhancing the of information provided to students. The system's ability to grasp the context of user queries contributes to a more natural and effective learning environment

Flexible and Scalable Architecture:

The modular design of JAICOB's cognitive agent architecture ensures flexibility and scalability. This allows for easy integration of new components, updates, and improvements, making the system adaptable to evolving educational requirements and technological advancements. The flexibility of the architecture also facilitates customization for different educational settings or knowledge domains.

Human-Like Interface for User Engagement:

JAICOB distinguishes itself by incorporating a human-like interface, making interactions more intuitive and user-friendly. This interface not only contributes to a positive user experience but Human-Like Interface for User Engagement: 10 also helps in breaking down barriers for learners, particularly those who may be new to the fields of Data Science and Machine Learning. The conversational approach creates a more approachable learning environment.

4. IMPLEMENTATION

Natural Language Understanding (NLU):

The NLU module is responsible for processing and comprehending user input in natural language. It involves techniques such as tokenization, part-of-speech tagging, and named entity recognition.

JAICOB's NLU module aims to understand the intent and context of user queries within the specific knowledge domain of Data Science and Machine Learning.

Dialogue Management:

The Dialogue Management module orchestrates the flow of conversation and determines appropriate responses based on user input and the system's knowledge. It considers the context of the conversation, user history, and the goals of the interaction. This module in JAICOB ensures coherent and context- aware conversations, making the chatbot more effective in pedagogical question answering and small talk

Machine Learning Models for Question Answering:

This module involves the implementation and training of machine learning models tailored for question answering within the domains of Data Science and Machine Learning. JAICOB utilizes these models to provide accurate and relevant responses to user queries. The models are trained on a diverse and representative dataset to enhance their ability to handle a wide range of questions

User Interface (UI):

The User Interface module focuses on the design and presentation of JAICOB to the end-users, primarily students. It provides an intuitive and user-friendly interface, mimicking human-like interactions. The UI module contributes to the overall user experience by making the interaction with the chatbot more engaging and accessible, especially for learners who may be new to the subject matter

Experimentation and Evaluation:

This module involves the setup and execution of experiments to validate the effectiveness of JAICOB. It includes metrics for assessing the accuracy of responses, user satisfaction, and overall educational impact. The experimentation module plays a crucial role in gathering empirical evidence to refine and optimize the system continually
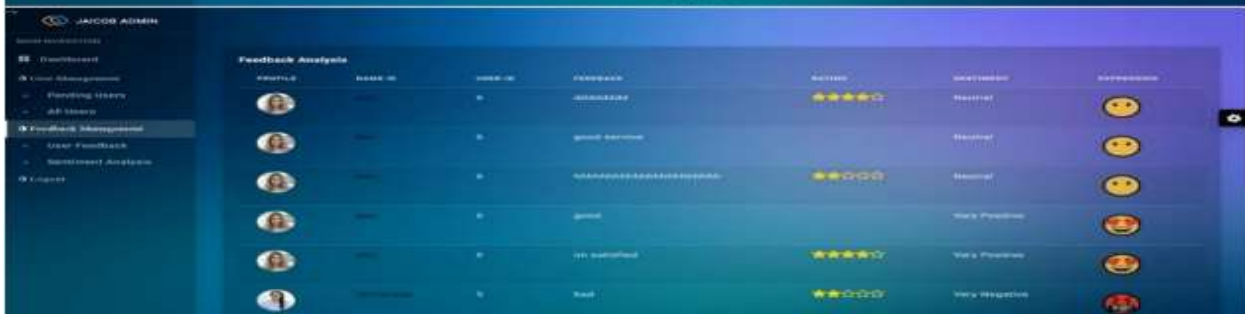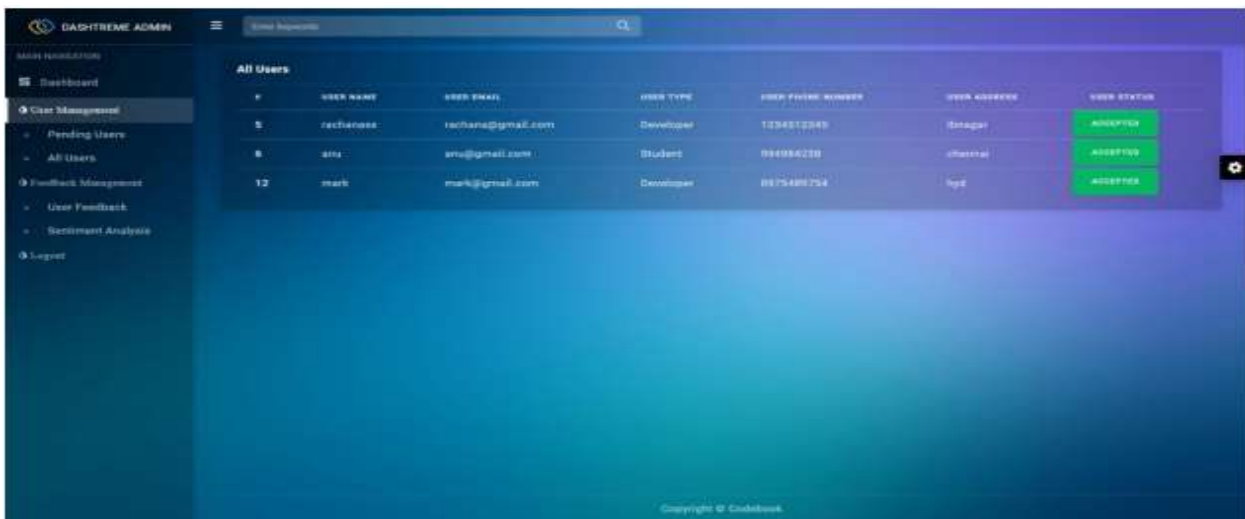
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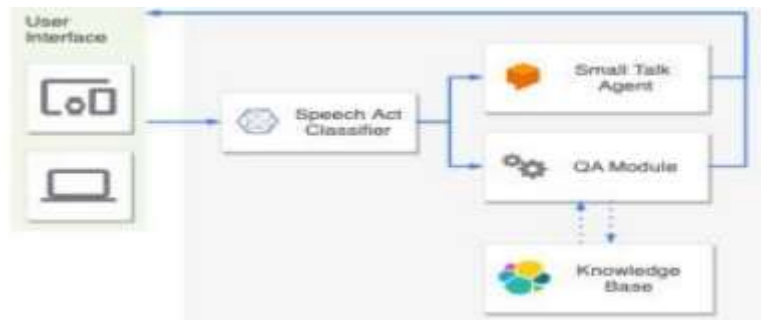
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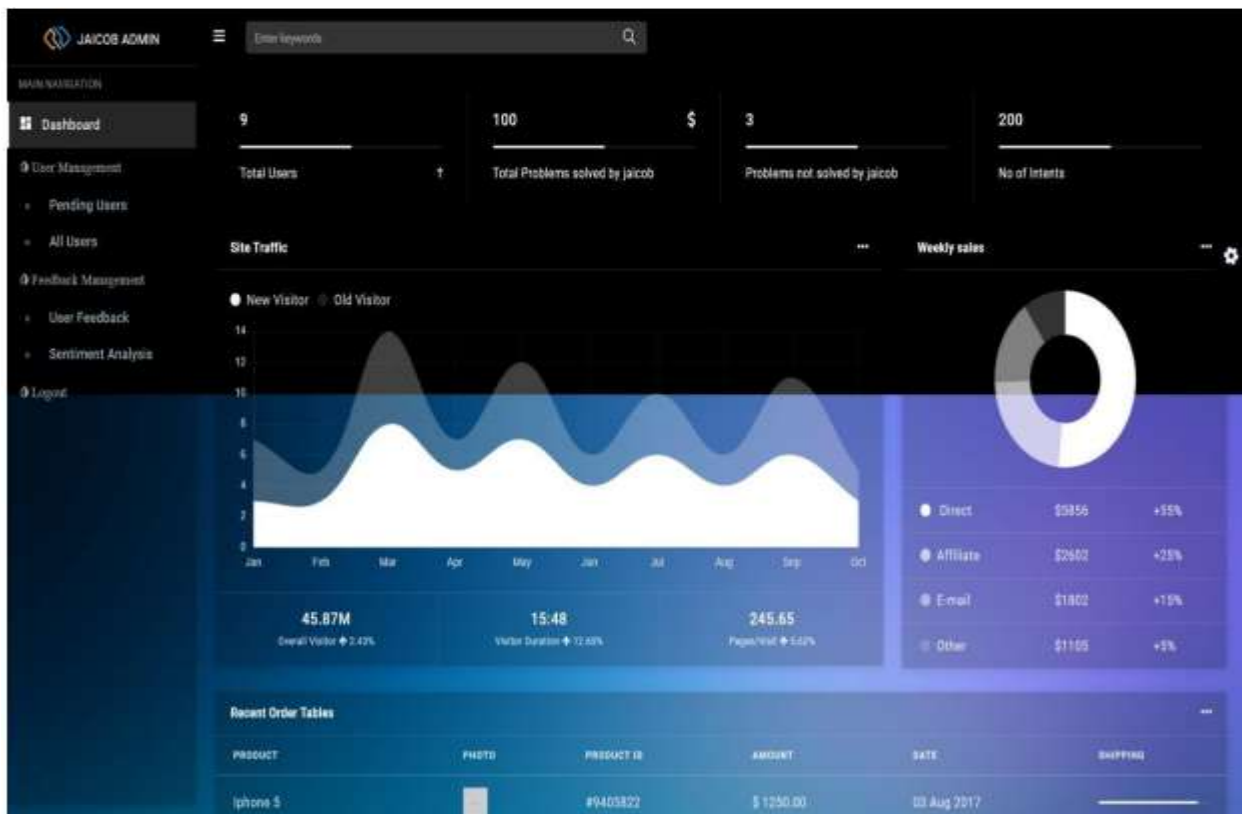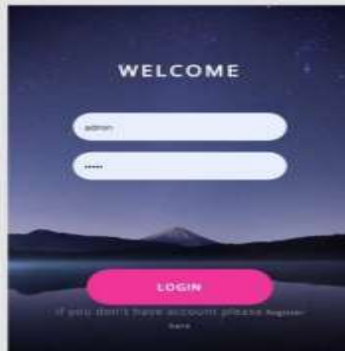
7. CONCLUSIONS

The use of chatbots has become prevalent in the last years in shopping, customer support, general assistance, and, though less developed, education. The use of chatbots as a form of e-learning brings lots of opportunities. This article identified the advantages of cognitive assistants in education and

the corresponding challenges in implementation. A result is a tool for students with a comfortable and usable interface and a human experience. It can provide insights and solve doubts about Data Science. The main contribution is the adaptation of students' real pedagogic needs to the design of the architecture and being flexible in maintaining a conversation.Teachers can also use it as a tool to identify gaps in the knowledge of their students. They can also outsource to Jaicob the answering of all the questions. The pedagogue is also an excellent asset to select the most valuable sources of information from which Jaicob feeds from, thus providing a curated source of information instead of a regular Google Search. The project was evaluated with a sample of students, achieving very favorable results in usability and originality. The experiment confirms that the system can answer effectively, that the answer accuracy affects the satisfaction, utilitarian value, and behavioral intentions of the user, and that proper social handling is significant in satisfaction and utilitarian value but not in behavioral intentions. As these technologies evolve, more and more people will study these subjects. Therefore, the future impact of the project is promising, and the affected groups will increase. In future work, to achieve a broader reach in the areas of knowledge, it is straightforward to place additional information in the Knowledge Base and the corresponding Dialog flow intents.

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