Acadio : A career guidance chatbot

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Abstract— In developing this Career Guidance Chatbot, we examined and comprehended the challenges, limitations, and issues encountered in career counseling and enrollment support. Methods/Statistical analysis: Implementing a chatbot presents an ideal solution. A chatbot can be operational 24/7 throughout the year. It can automatically and swiftly handle requests from students and parents, providing consistent responses, especially in repetitive scenarios. Findings: Consequently, we conducted research to better understand these challenges. We then created a dataset to support vocational guidance and educational enrollment activities. Additionally, we designed and integrated the chatbot into the school system to enhance the admissions counseling process. Improvements/Applications: Moreover, this project has successfully developed a structured dataset for enrollment orientation and applied natural language processing and machine learning to build identification models. This work will help to address and enhance the effectiveness of university admissions consulting.

Keywords— Admissions, chatbot, AI, data, machine learning, information systems,

I. INTRODUCTION

The advancement of artificial intelligence is surpassing expectations, with chatbots increasingly proving their significant role in various life domains. These intelligent systems are being researched and developed at an accelerated rate, showcasing their potential in revolutionizing numerous sectors. According to Weiyu Wang et al. (2018) [1], chatbots have been utilized to innovate and progress various fields, including finance, healthcare, education, transportation, and more. Each of these sectors benefits from the automation and efficiency that chatbots bring, highlighting the transformative impact of AI in our daily lives. Chatbots not only streamline operations but also enhance user experiences by providing instant and accurate responses.

Currently, the use of chatbots in career guidance and admissions consulting is gaining substantial interest from universities and colleges. The development and refinement of chatbot tools based on information technology, enrollment data, and career counseling data contribute effectively to the support of enrollment counseling at higher education institutions nationwide. By automating repetitive tasks and providing consistent information, chatbots can address complex issues in online enrollment counseling, thus streamlining the process for both students and administrators. This automation reduces the workload on human counselors, allowing them to focus on more complex and personalized guidance.

For instance, answering simple and repetitive questions requires considerable time and manpower, leading to processing delays and errors due to typing, spelling, expression, or environmental distractions. Chatbots can significantly reduce these inefficiencies by handling common inquiries quickly and accurately. Meanwhile, many universities and colleges offer advanced programs in digital technology and artificial intelligence, fields that align with the demands and trends of the 4th industrial revolution. These programs prepare students for a future where AI and digital skills are paramount. Chatbots, by facilitating efficient communication, play a crucial role in promoting these advanced programs and helping students navigate their options.

Artificial intelligence is expected to become a prominent field in the future. However, scholars and parents often lack a deep understanding of this industry, leading to numerous questions and challenges that require career support and advice. Career counseling teams need comprehensive knowledge of the industry and must be trained in effective communication methods to address the specific needs of students and parents. Training an entire team of consultants demands significant time and effort, and the lack of experience can pose considerable risks. Ensuring that counselors are well-versed in AI and digital technologies is essential for providing accurate and relevant guidance. Additionally, ongoing training and professional development are necessary to keep counselors up-to-date with the latest industry trends and technological advancements.

Implementing a chatbot is an ideal solution. A chatbot can operate 24/7 throughout the year, handling requests from students and parents automatically, quickly, and consistently, especially in repetitive scenarios. This reduces manpower requirements, enhances the quality of advice, minimizes errors, and improves the overall experience of interacting with the university. The efficiency of chatbots helps to streamline operations, thereby boosting the institution's reputation, quality, and image among candidates and parents. The availability of round-the-clock support is particularly advantageous in meeting the diverse needs of a global student body. Moreover, chatbots can provide multilingual support, breaking down language barriers and ensuring that non-native speakers receive the same level of assistance.

The creation of an enrollment counseling dataset, along with the design, programming, and integration of a chatbot into the school information system, aims to support the admissions counseling process and address common challenges faced by universities and colleges. By leveraging comprehensive datasets and advanced algorithms, chatbots can provide personalized advice tailored to individual student needs. This approach offers optimal solutions for admissions departments, enabling candidates and parents to access and understand enrollment information more effectively. Additionally, integrating chatbots with existing school systems ensures a seamless user experience, fostering trust and engagement with prospective students and their families. As

data privacy and security are paramount, it is essential to implement robust measures to protect user information and ensure compliance with relevant regulations.

Looking to the future, the potential applications of chatbots in education extend beyond admissions counseling. They can be integrated into academic advising, student support services, and even classroom instruction. By analyzing student interactions and feedback, chatbots can help identify at-risk students and provide timely interventions, contributing to improved academic outcomes. Furthermore, the data collected by chatbots can be used to enhance institutional research and decision-making processes, offering insights into student preferences, behaviors, and challenges.

In summary, the integration of chatbots into educational institutions holds great promise for enhancing the efficiency and effectiveness of various processes. As technology continues to advance, the capabilities of chatbots will only expand, offering even more sophisticated and personalized support to students and parents. By embracing these innovations, universities and colleges can stay ahead of the curve and ensure they are meeting the evolving needs of their students in a rapidly changing educational landscape.

II. METHODOLOGY

Analyzing and Mining Data from HTML Pages

In this research, we employed methods to analyze and mine content from websites and social networks. Using programming languages, we processed HTML strings and pages to extract data. By identifying the layout and tag structure, we applied basic string splitting techniques to extract content from web pages.
During the dataset construction for the Acadio ChatBot, we retrieved data through HTML page analysis. The data extracted from HTML websites was used to complete and build the Acadio ChatBot database.

Applying Text Mining and Natural Language Processing to Build the Dataset

Text mining involves fundamental steps such as preprocessing, model learning, prediction, analysis, and presentation of results. In this research, we utilized preprocessing tools and algorithms during text extraction. Processing, creating a dataset capable of understanding and processing languages from users to the Acadio ChatBot and vice versa.

Word Vectorization

Word vectorization, a key technique in natural language processing, maps words or phrases from the vocabulary to a corresponding vector of real numbers . In this project, we vectorized each sentence individually rather than entire paragraphs to avoid high dimensionality, which can lead to inaccuracies and handling difficulties. The vectorization method included two approaches:
- Using one-hot encoding
- Displaying dispersion

Using the SVM Model

We applied the SVM model to classify topics and support the addition of new datasets. The SVM model was used to calculate the distance from inputs to boundaries, measuring the correlation between sentences in each topic to determine the topic of the input.

Building the Chatbot in two phases

First phase of Acadio consists of a classifier for the user. The user should answer all the questions that are being asked and these questions are career and academic based which work like a personality test. This phase basically sets up the user for queries and makes it easier for the user to chat with the chatbot and get the guidance.

Second phase of Acadio is chatting with the chatbot, here user can ask any questions based on the college admissions as the dataset we have used is majorly based on college admissions.

III. RESULTS AND DISCUSSIONS

Model Fitting

Throughout the training process, our model demonstrated a strong ability to adapt to the questions provided in the database. It effectively adjusted to the various grammatical structures and the inherent randomness of the questions it encountered. This adaptability was crucial for improving the model's performance during training.

Data Limitations

Despite the model's ability to fit well to the training data, we faced significant limitations due to the size of the database. The small dataset restricted the model's capacity to generalize effectively, which is essential for handling a broader range of user queries beyond the specific examples seen during training.

Initial Accuracy

At the onset of training, the model's test accuracy was notably low, starting at 10.5%. This initial low accuracy was expected, as the model was just beginning to learn and adapt to the patterns in the training data. Early stages of training typically involve significant fluctuations in accuracy as the model starts to build its understanding.

Accuracy Improvement

As training progressed, the model showed a substantial improvement in accuracy. By the end of the training period, the test accuracy had increased to 60.4%. This marked improvement indicated that the model was learning effectively and becoming better at answering questions correctly.

Specific Query Handling

Although the overall accuracy remained relatively low, the model exhibited a higher degree of accuracy when dealing with specific user queries. When users asked precise and well-defined questions, the model was more likely to provide accurate and relevant responses. This suggests that, within the confines of its training data, the model performs well under certain conditions.

Challenges

The primary challenge highlighted by this training process is the need for a larger and more diverse dataset. To enhance the chatbot's generalization capabilities and overall accuracy, future work will focus on expanding the database and incorporating more varied examples. This will help the model to better understand and respond to a wider array of user queries, ultimately improving its utility and reliability.

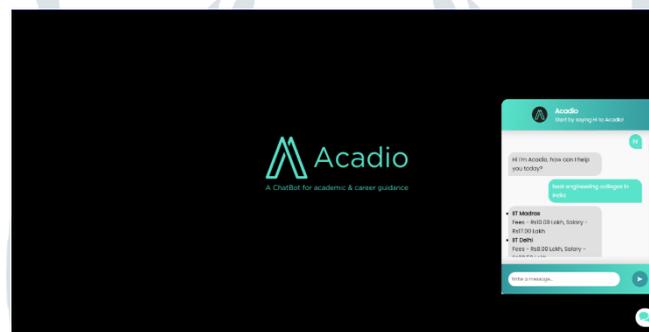Figure 1: Acadio Phase-1 : Counsel test

Figure 2: Acadio Phase-2 : Chatting with Chatbot

IV. FUTURE SCOPE

Increasing Accuracy

One of the primary future goals for Acadio is to enhance its accuracy in responding to user queries. This can be achieved by implementing more advanced machine learning techniques and algorithms. For instance, leveraging deep learning models such as BERT (Bidirectional Encoder Representations from Transformers) can significantly improve the understanding of context and nuances in user queries. Additionally, incorporating techniques like transfer learning can enable Acadio to benefit from pre-trained models on large datasets, thereby improving its language comprehension and response accuracy.

Expanding the Database

To address the limitations posed by a small dataset, it is crucial to expand Acadio's database. This can be accomplished by gathering a diverse range of questions and answers related to career guidance from various sources, including educational institutions, professional career counseling services, and user-generated content on forums and social media platforms. Collaborating with universities and industry professionals to obtain real-world data will also enhance the chatbot's knowledge base. Furthermore, implementing continuous data collection mechanisms, such as user feedback and interactions, will allow the database to grow organically over time, ensuring it remains up-to-date and comprehensive.

Scaling Up the Model

As the database grows, it is essential to scale up Acadio's underlying model to handle the increased complexity and volume of data. This involves transitioning to more robust computational infrastructures, such as cloud-based platforms that offer scalable resources. Employing distributed computing techniques can further enhance the model's training efficiency and performance. Additionally, adopting parallel processing and utilizing GPUs (Graphics Processing Units) can expedite the training process, enabling the model to process larger datasets more effectively.

Enhancing User Interaction

Improving user interaction is another key area for future development. Integrating natural language processing (NLP) advancements will enable Acadio to better understand and interpret user intent, even when queries are vague or complex. Implementing context-aware algorithms can allow the chatbot to maintain coherent and contextually relevant conversations over multiple interactions. Additionally, developing a multi-modal interface, where users can interact with Acadio through text, voice, and even visual inputs, will enhance user engagement and accessibility.

Personalized Career Guidance

To provide more personalized career guidance, Acadio can be enhanced with recommendation systems that leverage user profiles and preferences. By collecting data on users' interests, educational background, and career aspirations, the chatbot can offer tailored advice and resources. Machine learning algorithms can analyze this data to identify patterns and provide personalized career paths, job recommendations, and relevant skill development opportunities. This personalization will make Acadio a more valuable tool for users seeking specific career guidance.

Integration with External Systems

Integrating Acadio with external systems and platforms will further extend its capabilities. For example, linking the chatbot with educational portals, job search engines, and professional networking sites can provide users with seamless access to a wealth of resources. APIs (Application Programming Interfaces) can facilitate these integrations, enabling real-time data exchange and expanding the chatbot's functionality. This interconnectedness will allow Acadio to serve as a central hub for career-related information and services.

Continuous Improvement and Learning

Implementing a feedback loop where users can rate the accuracy and helpfulness of Acadio's responses will be crucial for continuous improvement. Analyzing this feedback can highlight areas where the chatbot needs further training or where the database lacks sufficient information. Additionally, employing reinforcement learning techniques can allow the model to learn from its interactions, gradually improving its performance based on real-world usage.

Future Innovations and Research

Looking ahead, there is significant potential for future innovations and research. Exploring the use of advanced AI techniques such as reinforcement learning, unsupervised learning, and conversational AI can push the boundaries of what Acadio can achieve. Collaborating with academic institutions and participating in AI research initiatives will enable the development of cutting-edge features and functionalities. Moreover, staying abreast of emerging trends in AI and career counseling will ensure that Acadio remains at the forefront of technology and continues to provide relevant and effective guidance.

In summary, the future scope for Acadio encompasses a wide range of enhancements aimed at increasing accuracy, expanding the database, scaling up the model, and improving user interaction. By focusing on these areas, Acadio can evolve into a more sophisticated and reliable career guidance tool, ultimately helping users make informed decisions about their professional futures.

V. REFERENCES

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