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# Using ChatBot to Provide Personalized College Counseling to High School Students

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**Abstract:** ***Recently, we noticed that high school students find it hard to obtain reasonable and accessible college counseling services to help guide them through major decisions such as selecting the universities that fit them, what majors to take, whether or not to take double degrees or double majors, financial aid options etc. Conventional college counseling services are very expensive and also very limited in availability, making it for high school students to receive personalized advice. This research paper talks about the potential of AI-ChatBots, which would successfully be able to provide affordable, and scalable solutions for college counseling which is a market rapidly growing in demand. By leveraging Natural Language Processing (NLP) and Machine Learning (ML), chatbots would be able to offer real-time, unique advice for college applications, scholarships, and course selection, while reducing the financial and accessibility barriers for students. The paper delves into use of both supervised and unsupervised learning models, and most types of datasets needed, and the probable challenges that could come up during execution. We also explore how AI can offer better well suited guidance to every applicant than the online resources, offering a solution that is both reasonable on the basis of price and easily accessible for the students who are not able to purchase traditional college counseling services. Our research demonstrates that AI-driven can be an effective tool to democratize access to quality college quality college guidance.***

**Keywords:** Natural Language Processing (NLP), Machine Learning (ML), Natural Language Toolkit (NLTK), GPT (Generative pre-Trained Transformer), Support Vector Machines (SVM), Proximal Policy Optimization (PPO), Long Short-Term Memory (LSTM)

## 1. Introduction

The main focus revolves around the primary challenge that a lot of high school students cannot purchase or make use of college counseling services, that're very expensive and not available everywhere. Hence, as a result, most of the students are left alone to work out the complex college application process on their very own, which could lead to uninformed decisions about choosing the right universities, majors and financial aid options. And, so there is a need for an affordable, scalable solution that would be successful in providing personalized and convenient help to students regardless of their monetary situation or location.

## 2. Literature Review

**Table 1:** AI Chabot's Research Summary:

| Author(s) and Year | Focus Area | Key Findings | Challenges & Limitations | Recommendations |
|---|---|---|---|---|
| Le Hoanh Su et al. (2022) | AI Chatbots for College Applications | AI chatbots assist in evaluating and comparing college applications effectively, like LISA, which provides real-time, adaptive responses. | Integration challenges in university systems and data limitations. | Enhance AI chatbot capabilities for better application assessment and integration. |
| Akhil Siva Sai Jupalli et al. (2024) | AI Chatbots in Various Domains | AI chatbots enhance personalized support across education, healthcare, and customer service. | Privacy, bias, and conversational naturalness. | Further research on ethical AI, NLP improvements, and bias reduction. |
| Labadze et al. (2023) | AI Chatbots in Education | AI chatbots support personalized learning, admin tasks, and pedagogy; students benefit from homework help and skill-building. | Reliability, academic integrity, and data privacy. | Awareness initiatives, ethical guidelines, and educator training. |
| Le Hoanh Su et al. (2020) | AI Chatbots for Admissions and Guidance | Chatbot provides 24/7 admission and career guidance using NLP and machine learning. | Data collection challenges and system integration. | Expand functionalities, integrate speech processing, and support broader student services. |
| Himanshu Gadge et al. (2021) | AI Chatbots in Healthcare | "CureBot" offers rural users medical diagnostics via deep learning—analyzing symptoms and giving advice. | Accessibility, speech-to-text accuracy, and diagnostic reliability. | Improve NLP, integrate with health services, and enhance deep learning models. |
| Labadze, Grigolia, and Machaidze (2023) | Systematic Review on AI in Education | Reviews AI chatbots' role in learning and admin support; notes limitations in understanding complex queries. | Ethical issues, data privacy, and academic integrity. | Focus on advanced NLP, better ML models, and more human-like interactions. |
| Alazzam, Alkhatib, and Shaalan (2023) | Traditional vs. Deep Learning Chatbots | Compares chatbot approaches for education and counseling, highlighting data biases in AI outcomes. | Biased training data causing inaccurate responses. | Combine supervised, unsupervised, and reinforcement learning to reduce bias. |
| Suresh et al. (2021) | AI Chatbots for Career Counseling | Facebook Messenger chatbot democratizes career guidance access. | Privacy risks, data breaches, and compliance issues. | Use strong encryption, federated learning, and ethical AI design. |

**Le Hoahn Su et al. (2022)** So, work done by has been done keeping in mind the same goal to make it easier for college guidance for college application by the use of an ai powered chatbots decided to propose an idea to make it easier for ai chatbot to help the college application team to consider all applications and compare application based on what they need to get into their administrations. Similarly like LISA that was made to give quick responses in real time and supposed to learn via the users queries/ prompts and a lot of things [7].

**Akhil Siva Sai Jupalli et al. (2024)**, This paper explores the impact of chatbots on user interactions across various platforms, driven by advancements in AI and natural language processing. It examines their applications, challenges, and future prospects, providing insights to enhance their design, effectiveness, and ethical implementation. Chatbots are transformative technologies enhancing user experiences with 24/7 personalized support across domains like healthcare, education, and customer service. Advances in AI and NLP drive their growth, while ongoing innovation tackles challenges like privacy, bias, and conversational naturalness to enable more empathetic and sophisticated interactions [6].

**Labadze et al. (2023)**, AI chatbots have the potential to revolutionize education by providing personalized learning support, assisting with administrative tasks, and enhancing pedagogy for educators. While students benefit from homework assistance, skill development, and interactive learning, concerns about reliability, academic integrity, and data privacy persist. Addressing these challenges requires awareness initiatives, ethical guidelines, and educator training. Further research is essential to optimize chatbot integration and explore long-term impacts on educational outcomes.[2]

**Le Hoanh Su et al. (2020)** "Building AI Chatbot to support admissions and career guidance for universities" investigates challenges in counseling and enrollment, proposing a solution through a 24/7 accessible chatbot. It includes creating a structured dataset and employing natural language processing and machine learning for identification models. Despite limitations in data collection and integration into university systems, the research aims to enhance admissions consulting. Recommendations suggest integrating speech processing, expanding chatbot functionalities across university platforms, and extending support to student life and educational processes, emphasizing broader applications beyond admissions. [7]

**Himanshu Gadge et al. (2021)** The project focuses on designing an AI-powered conversational chatbot, "CureBot," for medical diagnostics using deep learning, targeting rural and underprivileged populations. It addresses the challenges of providing affordable and quality healthcare, especially evident during the COVID-19 crisis, by offering symptom analysis, medical advice, and precautionary measures through a web-based interface. The chatbot utilizes Natural Language Toolkit (NLTK) for natural language processing and incorporates speech-to-text features for enhanced accessibility. By leveraging deep neural networks, the system bridges the gap between the growing demand for healthcare and limited services available, particularly in rural areas. CureBot aims to improve early diagnosis and treatment recommendations, reducing delays and enhancing patient care.[8]

**Labadze, Grigolia, and Machaidze (2023)** conducted a systematic literature review on the role of AI chatbots in education, highlighting their growing impact on personalized learning, administrative support, and student engagement. The study emphasizes that AI chatbots can enhance accessibility to educational resources by providing real-time responses and adaptive learning experiences. However, the research also identifies key limitations, such as the lack of contextual understanding, inability to handle complex student inquiries, and ethical concerns surrounding data privacy and academic integrity. The authors stress the need for further advancements in Natural Language Processing (NLP) and machine learning to improve chatbot capabilities in higher education, ensuring a more effective and human-like interaction experience for students.[9]

**Alazzam, Alkhatib, and Shaalan (2023)** provided a comparative analysis of traditional and deep learning-based chatbot models, discussing their applications across various domains, including education and career counseling. The study explores the challenges associated with AI chatbot implementations, particularly data biases that arise due to the limitations of training datasets. The authors argue that if an AI model is trained on skewed or outdated data, it may lead to inaccurate or misleading responses, ultimately affecting the quality of decision-making in educational contexts. To mitigate these issues, the paper suggests leveraging a combination of supervised and unsupervised learning techniques along with reinforcement learning to improve chatbot performance and reduce bias over time.[10]

**Suresh et al. (2021)** investigated the development and deployment of a career counseling chatbot on Facebook Messenger, focusing on the privacy and security risks associated with AI-driven counseling systems. The research highlights that while AI-powered chatbots can democratize access to career guidance by providing instant and cost-effective counseling services, they also introduce significant ethical and security challenges. The authors discuss potential risks, such as data breaches, unauthorized access to sensitive student information, and the need for strict compliance with data protection regulations. The study underscores the importance of implementing robust encryption mechanisms, federated learning, and ethical AI principles to ensure secure and trustworthy chatbot interactions, particularly in educational and career counseling applications.[11]

## 3. How You Propose to Address That (How to use AI)

We would like to propose the development of an AI-powered chatbot that is masterfully designed for high school students that seek college counseling. With use of Natural Language Processing (NLP) for understanding and responding to student queries, and Machine Learning (ML) for giving personalized recommendations, the chatbot would be skilled enough to provide custom advice on college selection, financial aid, scholarships and course choices. Supervised learning models would be used alongside to be able to train

the chatbot on labeled datasets of previous counseling sets data, meanwhile the unsupervised learning will help in finding new patterns in students behavior, making sure that the system is capable of being able to provide increasingly personalized recommendations over time. Additionally, sentiment analysis will allow the chatbot to detect the students emotional states, helping structure the interactions more empathetic and in a more supportive way.

Furthermore, Deep Learning techniques, particularly transformer-based models, will be employed to enhance the chatbot's comprehension of complex queries and context retention. Neural networks will be leveraged to refine recommendation accuracy by analyzing vast amounts of counseling data. Reinforcement Learning will allow the chatbot to optimize responses based on user feedback, ensuring continuous improvement. Additionally, multimodal deep learning can be integrated to process text, voice, and even image-based queries, making interactions more dynamic and accessible [12].

### 3.1 Supervised and Unsupervised Learning

In this supervised learning will be used to train the chatbot with provided labeled data, such as data from previous counseling sessions, transcripts and student application profiles. This would allow the chatbot to give in recommendations based on all the patterns found in previous students' interactions. Meanwhile, unsupervised learning will be used for finding out newer trends in student preferences and behaviors, such as common interests and educational paths that may still not be explicitly labeled, enhancing the system's potential to provide customized recommendations over time.

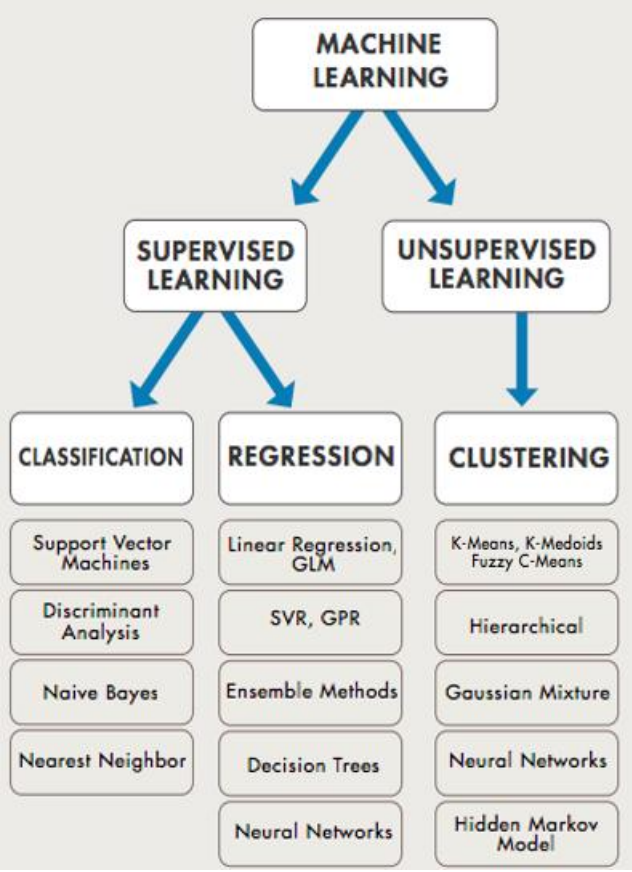


**Figure 1:** *Source:https://uniquesubmission.com/machine-learning-assignment-sample-3/*

### 3.2 Type of Modeling (NLP)

NLP Models are pre trained language models for eg. GPT and even BERT. These could be made use of to allow the chatbot to comprehend and reply to student requests in a spontaneous way. Such models are capable enough to understand student requests and reply with a human-like response by processing large amounts of text data. When it comes to responding to students prompts GPT (Generative pre-Trained Transformer) holds huge prowess

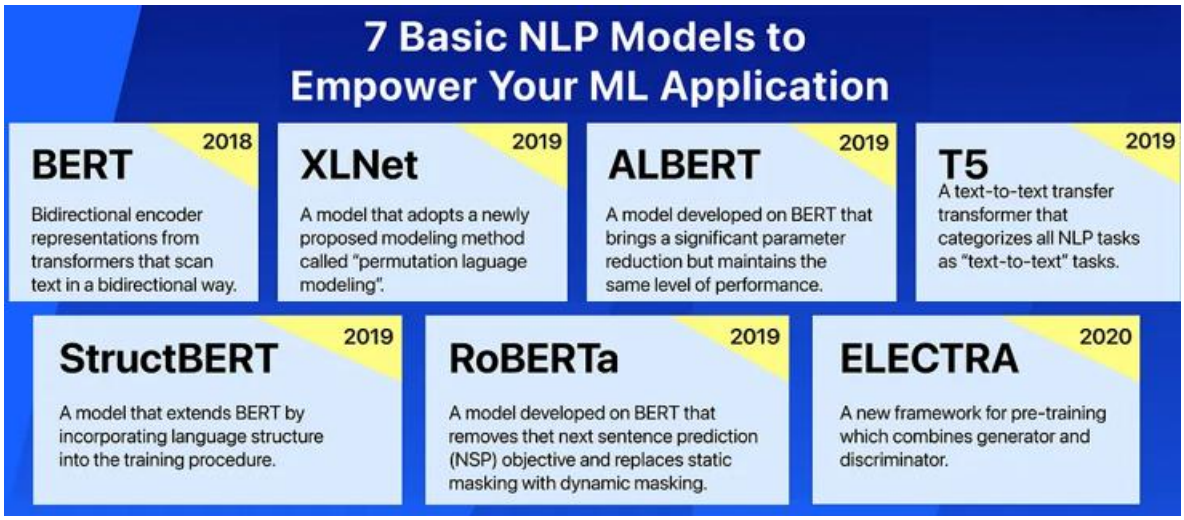


**Figure 2:** Source: https://medium.datadriveninvestor.com/7-basic-nlp-models-to-empower-your-ml-application-5d1a09ac325f

## 4. Methodology

**Algorithm for AI Chatbot-Based College Counseling Methodology**

**Step-1: Problem Identification**
Identify key challenges in traditional college counseling services and analyze the limitations of existing systems. Define the objectives of an AI-driven chatbot that can provide personalized guidance on college selection, scholarships, financial aid, and course recommendations.

**Step-2: Data Collection**
Gather historical counseling session transcripts, student queries, and feedback data. Compile relevant datasets on universities, courses, scholarships, and financial aid programs to ensure a comprehensive knowledge base for the chatbot.

**Step-3: Data Preprocessing & Labeling**
Clean and preprocess raw text data by removing noise, stopwords, and irrelevant information. Label datasets for supervised learning models and apply NLP techniques such as tokenization and vectorization to structure the data for analysis.

**Step-4: Model Development**
Implement supervised learning models to train the chatbot on labeled datasets. Apply unsupervised learning to identify emerging patterns in student preferences and behavior. Utilize deep learning models like transformers and neural networks for accurate query comprehension. Sentiment analysis is integrated to adjust responses based on students' emotional states.

**Step-5: Training & Fine-Tuning**
Train the chatbot using real student queries and optimize model hyperparameters for improved accuracy. Reinforcement learning is employed to refine responses based on continuous user feedback, ensuring the chatbot evolves to provide better recommendations over time.

**Step-6: Testing & Evaluation**
Evaluate the chatbot's performance using key metrics such as precision, recall, and F1-score. Conduct real-time testing with high school students to assess usability and effectiveness. Compare chatbot responses with expert counseling feedback to validate the quality of guidance provided.

**Step-7: Deployment & User Interaction**
Deploy the chatbot on a web and mobile-friendly platform, allowing students to seek real-time counseling support. Monitor chatbot engagement, analyze response patterns, and ensure seamless user interaction to enhance accessibility and ease of use.

**Step-8: Feedback & Continuous Improvement**
Collect user feedback to refine chatbot recommendations and improve response accuracy. Update the AI model periodically based on new educational trends, admission policies, and evolving student needs. Expand the chatbot's knowledge base with the latest college admissions data to ensure relevance and reliability.

## 5. Process Flow Chart

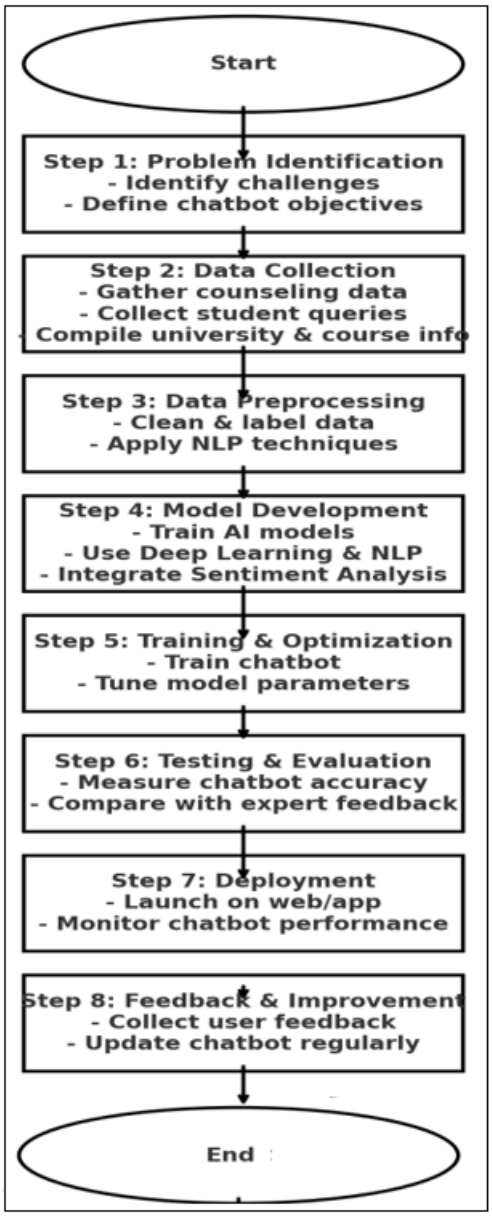


**Figure 3:** Evaluation and Procedural Steps

## 6. Machine Learning Solutions for AI-Powered College Counseling Chatbot

The AI-powered college counseling chatbot leverages a combination of supervised learning, unsupervised learning, and deep learning models to enhance response accuracy, personalization, and adaptability. Supervised learning algorithms, such as Random Forest, Support Vector Machines (SVM), and Gradient Boosting, are trained on labeled datasets containing historical counseling interactions, student queries, and expert recommendations. This enables the chatbot to generate structured and reliable advice on university selection, financial aid, and career pathways. Unsupervised learning techniques, such as K-Means Clustering and Principal Component Analysis (PCA), are employed to detect emerging patterns in student preferences, helping identify new academic interests, career trends, and personalized scholarship opportunities [15].

For natural language understanding, transformer-based deep learning models like BERT, GPT-4, and T5 are implemented to enhance contextual comprehension and response generation. These models enable the chatbot to handle complex multi-turn conversations, ensuring continuity and coherence in responses. Sentiment analysis using Long Short-Term Memory (LSTM) networks and Bidirectional Encoder Representations (BERT-based classifiers) allows the chatbot to assess students' emotional states, ensuring a supportive and empathetic interaction experience.

To continuously refine recommendations, reinforcement learning with Proximal Policy Optimization (PPO) and Q-learning is integrated, allowing the chatbot to optimize its responses based on student feedback and engagement metrics. Additionally, federated learning frameworks, such as TensorFlow Federated (TFF) and PySyft, are implemented to improve data privacy by enabling decentralized model training without exposing sensitive student information. These machine learning techniques collectively ensure that the chatbot delivers highly personalized, scalable, and secure college counseling, effectively addressing challenges related to contextual understanding, response bias, and data privacy [16].

## 7. Benefits of IDEA

**Table 2:** Benefits of AI Chabot for College Counseling:

| Serial No. | Benefit |
|---|---|
| 1 | Affordable and Scalable – Unlike traditional college counseling services, AI chatbots offer a cost-effective alternative, making personalized guidance accessible to students regardless of their financial background. |
| 2 | 24/7 Availability – Chatbots eliminate time constraints by providing instant responses at any hour, ensuring that students receive timely assistance with their college applications. |
| 3 | Personalized Guidance – By leveraging NLP and ML, the chatbot can analyze student preferences, academic strengths, and career interests to provide tailored recommendations on university selection, majors, and financial aid options. |
| 4 | Data-Driven Insights – AI chatbots continuously learn from interactions, improving the accuracy of their advice over time and identifying patterns in student behavior for more precise recommendations. |
| 5 | Reduced Workload for Counselors – Traditional counselors can integrate chatbot assistance to manage routine queries, allowing them to focus on more complex and high-priority student concerns. |
| 6 | Enhanced Student Engagement – Interactive AI-driven responses create an engaging learning environment where students can ask unlimited questions without hesitation or judgment. |
| 7 | Multi-Channel Accessibility – The chatbot can be deployed across various platforms, including web applications, mobile apps, and messaging services, ensuring a seamless user experience. |
| 8 | Support for Underprivileged Students – By democratizing access to counseling, AI chatbots bridge the gap for students in remote or underserved areas who lack access to quality college guidance. |

## 8. Evaluation (Previous Works Supporting the Proposal)

Several studies have explored the application of AI-powered chatbots in various fields, particularly in education and counseling, demonstrating their potential in enhancing college guidance services. Le Hoanh Su et al. (2022) proposed an AI-driven chatbot aimed at streamlining college application processes by assisting admission teams in evaluating applications based on institutional requirements. Their work aligns with AI systems like LISA, which provide real-time responses and adapt through user interactions [7]. Similarly, Akhil Siva Sai Jupalli et al. (2024) analyzed the impact of AI chatbots across multiple domains, emphasizing their role in enhancing user experiences through personalized 24/7 support. Their study highlights ongoing challenges in AI chatbot implementation, such as privacy concerns, bias, and the need for more natural conversational capabilities [6].

Furthermore, Labadze et al. (2023) examined AI chatbots in education, identifying their benefits in personalized learning, administrative support, and interactive skill development. However, they also noted concerns regarding reliability, academic integrity, and data privacy, stressing the importance of ethical guidelines and further research [2]. Alazzam et al. (2023) further reinforced this perspective by discussing how AI models are prone to biases due to limitations in training data. Their research highlights the risks of outdated or skewed datasets, which can lead to inaccurate guidance in education and career counseling [3]. Privacy concerns also remain a significant limitation, as highlighted by Suresh et al. (2021), who investigated the security risks associated with AI-powered career counseling chatbots, emphasizing the necessity of strict data protection measures to prevent breaches of sensitive student information [4].

Additionally, Le Hoanh Su et al. (2020) investigated the use of AI chatbots for university admissions and career counseling, recommending improvements in speech processing, data integration, and chatbot functionalities to extend support beyond admissions into broader aspects of student life [7]. The relevance of AI-driven chatbots in specialized domains is further reinforced by Himanshu Gadge et al. (2021), who developed "CureBot," an AI-powered medical chatbot leveraging deep learning for healthcare diagnostics, particularly for underserved populations. Their study demonstrated the chatbot's ability to bridge gaps in service accessibility through NLP and speech-to-text features, showcasing AI's broader potential beyond education [8].

Collectively, these studies validate the feasibility and benefits of AI-powered chatbots in improving accessibility, efficiency, and user experience in counseling and admissions. However, challenges related to contextual understanding, data bias, and privacy risks, as highlighted by Labadze et al. (2023) [2], Alazzam et al. (2023) [3], and Suresh et al. (2021) [4], reinforce the need for further development and refinement of AI-driven college guidance solutions to ensure reliability and ethical implementation.

## 9. Challenges with Solution You Provided

Despite its numerous advantages, integrating AI chatbots into college counseling comes with several challenges. One of the most pressing issues is accuracy and reliability—AI models may provide incorrect or misleading advice if trained on biased or incomplete datasets. This can lead to students making misinformed decisions about their academic future. Additionally, lack of human empathy and emotional intelligence remains a concern, as chatbots, even with sentiment analysis, may not fully comprehend or appropriately respond to students' emotional needs during stressful decision-making periods. Data privacy and security also present major hurdles, as student data must be securely stored and handled to prevent breaches or misuse. Furthermore, limitations in complex problem-solving can hinder the chatbot's effectiveness in answering nuanced questions that require deep contextual understanding, such as long-term career planning or unique scholarship eligibility scenarios. Lastly, adoption resistance among educators, parents, and students may slow the implementation process, as some may prefer human counselors over AI-based guidance due to concerns about trust and accuracy. Addressing these challenges through continuous improvements, rigorous testing, and ethical AI regulations will be crucial for the successful deployment of AI-powered college counseling solutions [14].

## 10. Limitations

While AI chatbots offer promising solutions for personalized college counseling, they come with several limitations that need to be addressed. One major concern is limited contextual understanding, as chatbots may struggle with complex, nuanced queries that require human reasoning, such as balancing personal aspirations against financial constraints. Additionally, their lack of emotional intelligence makes them less effective in providing the empathetic support that students often need during stressful decision-making periods. Another critical challenge is data bias and accuracy issues—if the chatbot is trained on biased or outdated data, it may provide misleading recommendations, potentially leading students to make poor academic or career choices.

Furthermore, privacy and security risks pose significant concerns, as handling sensitive student information requires strict compliance with data protection regulations like GDPR or FERPA. The dependence on internet access can also limit the chatbot's accessibility for students in remote or underserved areas who may not have consistent connectivity. Moreover, chatbots often struggle with unique and complex cases, such as non-traditional educational paths, highly specific financial aid situations, or dual-degree programs with unique requirements, which human counselors are better equipped to handle.

Another challenge is user trust and adoption barriers, as many students and parents may remain skeptical about relying on AI-driven solutions for crucial academic decisions. This hesitation can slow adoption rates, making it difficult to replace traditional human counseling entirely. Additionally, continuous improvement and maintenance are necessary for chatbots to stay relevant, as they require regular updates and retraining to adapt to changing university admission policies, new scholarships, and evolving student preferences. Without these updates, the chatbot risks becoming obsolete, reducing its effectiveness over time. Addressing these limitations through rigorous testing, ethical AI regulations, and human-AI collaboration will be key to ensuring the chatbot serves as a reliable and effective tool for students [13].

## 11. Conclusion

AI-powered chatbots provide an evolutionary approach to universalizing availability to college counseling. With help of Machine Learning (ML) and Natural Language Processing(NLP), which would enable provision to high school students with counseling/guidance that fits them, coming at a reasonable price, which now won't be a limitation for high school students to avail college counseling services compared to traditional college counseling services. While human counselors aren't available 24/7, chatbots are ! Making it possible for students to get instant replies to their queries. This is mainly for the students that can't purchase counseling packages due to monetary issues or maybe due to geographical reasons. By being able to automate response to frequently received questions and answering back with tailored advice.

AI chatbots offer real-time, individualized support, they have drastically changed a number of industries, including healthcare, education, and career advice. For best results, however, issues like bias, data privacy, and conversational correctness need to be resolved. Future developments in machine learning, ethical AI, and natural language processing will be essential to improving chatbot efficacy and user experience.

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