AI-Based Deep Learning Chatbot for Career and Personal Mentorship

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***Abstract*- Mentoring is an inseparable part of any student's life. As the level of education increases, every student requires support and guidance regarding career choice, program and major selection, as well as individual and personal counseling. The proposed system has been made to meet this facility, where a student can express themselves anonymously, and without any criticism and partiality. The chat-bot will be used to interact with the student regarding their professional and personal life both, which will solve their issues and doubts based on the questions they have asked. The student will input their query through text, and the bot will generate an output best suited in the student's interest. The proposed system created can provide the students with an alternative to hectic and physical mentoring sessions.**

I. INTRODUCTION

Mentoring is the process of helping and guiding another person to develop their personality and choices professionally as well as personally. In higher education, every student requires guidance and facilities regarding program choice, career paths, individual problems and honest opinion regarding their capabilities and qualifications, and whether or not they are suited for the said major they have chosen. A student's evolution and development is highly impacted based on the information they have, its source and the amount and quality of support they receive.

In the traditional method, a student is required to schedule a session with their mentor, where the mentor is supposed to have prior knowledge about the generic behavior, their track record along with the student's educational response and experiences. Sometimes, due to the hectic schedule of both the parties and critical judgment along with the lack of information regarding certain concepts may lead to unexpected outcomes, and a suitable solution may not be found.

A chatbot is a computerized system which can simulate human conversations, either in written or speech format, allowing humans to interact with machines just like they do with a normal person. A mentoring chatbot uses AI algorithms and framework that enables it to act as a 24/7 available virtual mentor for students. They are hence able to interact and share their doubts and issues freely and anonymously to achieve the highest level of results and satisfactions. This facility can be enjoyed anywhere, from the comfort of your home and at the click of one button.

The appropriate solutions can not only help the students to advance in their career, but also maintain their mental health.

II. LITERATURE SURVEY

- Artificial Intelligence Chat Bot for Counseling Therapy: This system judges the internal turmoil of a person through facial, voice and text analysis, and produces a confidence value regarding the emotional state of the patient. It uses Tensorflow framework and acts as a simulation to help people be able to answer an actual therapist without feeling mentally stressed and unable to express themselves; accurately mapping the emotional state of a person.However it fails to properly understand the hidden feelings of a person which one is unable to express at times, and can only be understood by a fellow human. [1]

- Artificial Intelligence Based Career Counseling Chatbot- A System for counseling: This chat-bot aims at acting as a career counselor, helping students to decide their career choices anonymously and comfortably with enough information. This System will be helpful for the student for reducing stress, help and guide them without any fee as it is 24/7 available on different platforms, and will provide the most accurate answer. Sometimes the result may not be up to the caliber of the student and may end up disregarding the interest of the said student. [2]

There are many other researches that have been carried out in this field. The following are the researches that have been carried out regarding the similar problem statement, upon which our proposed system has been built.

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Table 1: Literature Survey

Author	Title	Description	Framework	Pros	Cons
Ajay Rasave, etc.	Artificial Intelligence Chat Bot for Counseling Therapy [1]	This system judges the internal turmoil of a person through facial, voice and text analysis, and produces a confidence value regarding the emotional state of the patient.	TensorFlow	Acts as a simulation to help people be able to answer an actual therapist without feeling mentally stressed and unable to express themselves; accurately maps the emotional state of a person.	Fails to properly understand the hidden feelings of a person which one is unable to express at times, and can only be understood by a fellow human.
Danyal Zaidi, etc.	Artificial Intelligence Based Career Counseling Chatbot: A System for counseling [2]	This chat-bot aims at acting as a career counselor, helping students to decide their career choices anonymously and comfortably with enough information.	DialogFlow	This System will be helpful for the student for reducing stress, help and guide them without any fee as it is 24/7 available on different platforms, and will provide the most accurate answer.	Sometimes the result may not be up to the caliber of the student and may end up disregarding the interest of the said student.
Monalisa Das, etc.	A Chatbot System For Mental Health Care [3]	This chatbot is designed to provide relief and help to people suffering from mental illness, providing daily conversations, as well as motivating them for better mental health, through a system called cognitive behavioral therapy (CBT) method.		The system helps people track their mood using natural language processing methodology. This method has been clinically tested and has a positive success rate among the patients.	Chatbot shouldn't be used as a replacement for physical therapists if one suffers from severe mental problems, and hence it should be taken as a warm-up session before the physical therapy sessions and not the primary therapist.
Sanchi Satam, etc.	Mentoring Chatbot using Artificial Intelligence Framework [4]	The given system uses an AI framework where the user needs to type their query in the text box of the Chatbot interface, receiving an answer accordingly, and generating a weekly report for mentors.	Flowxo	This chatbot can help students to make decisions and offer different aspects of information and recommendations, 24/7, while providing official information as well as faculty opinions.	The future scope may include addition of the voice recognition system so as to extend the Mentoring Chatbot system with voice command acceptance system.
Gillian Cameron, etc.	Towards a chatbot for digital counseling [5]	The aim of this paper is to propose the basic design of a chatbot to be used in mental health counseling.		This chatbot uses sentimental analysis through emojis, in which the user selects an emoji and gets appropriate responses. The user can then select several issues and problems, and then be provided with a brief overview, and some tips on how to address them.	Chatbots can be transformed into a more user-friendly and empathetic way to screen for mental health issues and problems found in the patient.
Jorge Melegati, etc.	Digital Mentor: Towards a Conversational bot to identify hypotheses for software startups [6]	This paper presents a Digital Mentor, a working-in-progress conversational bot to help create a HyMap without the need of a human facilitator.	React JS	The NLU is trained to detect the intent of the person- desire and difficulty, hence generating respective outputs.	In the current state of development, the NLU is not able to always correctly identify the intent as designed.

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Pranav Kapoor, etc.	Therapy Chatbot: A Relief From Mental Stress And Problems [7]	This paper introduces a Therapy Chatbot that may assist and check with the person regarding his mental state. The user gets to share his feelings, reducing the number of deaths because of depression.	Android Studio, Flutter/Dart, DialogFlow	The bot is successful in detecting a user's problem and in responding with some ways in which the user can feel better and get out of depression, where the user is not in a zone to be judged by anyone.	The bot has been trained on only four basic user cases and needs to be constantly updated to keep up with the emerging problems.

III. PROPOSED METHODOLOGY

3.1 Dataset

Data is the crucial part of the system proposed, and without it, the chatbot won't be able function and produce outputs based on the user's input. We have created a basic dataset which meets the user's needs and issues, such as greetings, introduction, problem solving statements along with a comforting sequence, and finally the exit command which would redirect the user to the first page of the application.

3.2 Tools used

There are several tools and modules that have been used to create the chatbot mentor, which are listed as follows:-

- Tensorflow Keras- Proposed machine has used TensorFlow, an open source platform offered by Google which is widely used for Machine Learning and Artificial Intelligence models. It can train and run deep neural networks, image recognition, machine translation, natural language processing, etc. The framework used in this model is Keras, which runs on top of TensorFlow.

- HTML and CSS- HTML and CSS have also been implemented in order to create the graphics and GUI of the chatbot. These are the two main languages used for building interactive web pages, in which HTML is used to provide structure while CSS provides the visual layout of the page.

- Flask- This model has been empowered by the Flask framework, in order to integrate HTML with the Python model to make a user-friendly web application which can perform efficient mentoring tasks in just a few clicks. This module is implemented on Werkzeug and Jinja2, through which the user will be able to interact with the chatbot.

3.3 Implementation methodology

The following is the methodology of the proposed model:-

- The user inputs their query as a text message.

- After that, the chatbot identifies the intent of the inputted query. Intent refers to the customer's goal when inserting a question or a comment.

- On intent identification, the TensorFlow API implemented in this chatbot chooses the best suited answer for the issue, by referring to the dataset created for the same purpose.

- The best suited answer is rechecked by the API and only then it is sent back to the user in the form of speech or textual output.

- The conversation is carried out in the form of a loop and it continues until the user inputs an exit greeting, due to which the API shuts down and the user is able to exit from the chat.

Below is the brief illustration of the operations carried out by the chatbot:-

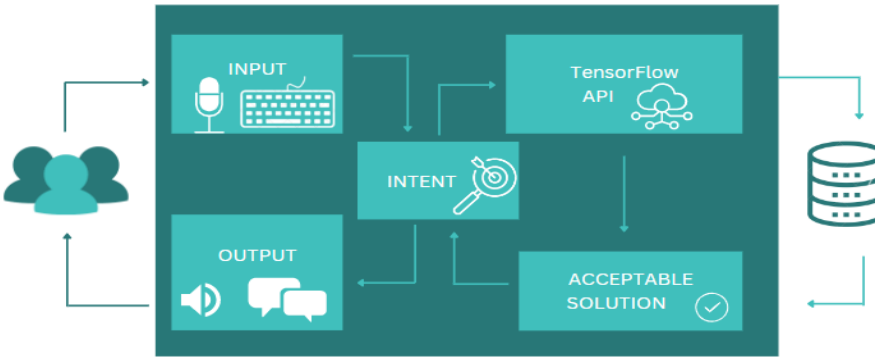

Fig 1: Basic working methodology of chatbot

3.4 Training and testing

- The dataset which has been stored in json format is divided into two sets of training and validation dataset in the ratio of

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80 to 20%. After the division of data, the neural model is trained continuously for several cycles, hence increasing the accuracy of the model until it reaches the perfect score of 1.

- Though this is not a desirable score and it depicts that the model has been overfit, which means that the outcome of the model is highly biased, even with the outcome having low variance from the provided dataset response.

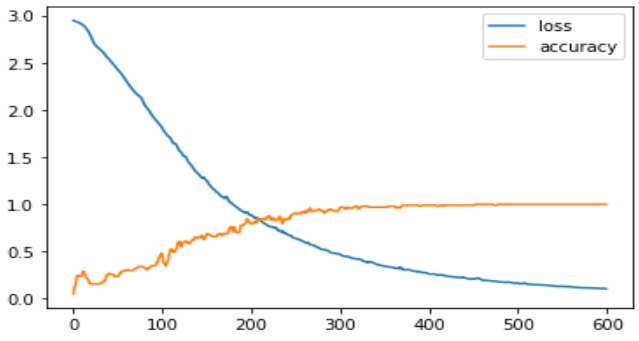
```
Epoch 369/600
4/4 [==============================] - 0s 11ms/step - loss: 0.3343 - accuracy: 0.9691
Epoch 370/600
4/4 [==============================] - 0s 12ms/step - loss: 0.3177 - accuracy: 0.9794
Epoch 371/600
4/4 [==============================] - 0s 10ms/step - loss: 0.3075 - accuracy: 0.9897
Epoch 372/600
4/4 [==============================] - 0s 10ms/step - loss: 0.3106 - accuracy: 0.9897
Epoch 373/600
4/4 [==============================] - 0s 10ms/step - loss: 0.3091 - accuracy: 0.9897
Epoch 374/600
4/4 [==============================] - 0s 11ms/step - loss: 0.3030 - accuracy: 0.9897
Epoch 375/600
4/4 [==============================] - 0s 11ms/step - loss: 0.3072 - accuracy: 0.9897
Epoch 376/600
4/4 [==============================] - 0s 10ms/step - loss: 0.3097 - accuracy: 0.9897
Epoch 377/600
4/4 [==============================] - 0s 12ms/step - loss: 0.3091 - accuracy: 0.9897
Epoch 378/600
4/4 [==============================] - 0s 10ms/step - loss: 0.3069 - accuracy: 0.9897
```

Fig 2: Epochs and accuracy with each training set

IV. OBSERVATIONS

The proposed system has been created using NLP (Natural Language Processing) and is a type of retrieval-based chatbot, which is why it needs to be trained repeatedly for different batches of the dataset in order to produce an even more accurate model.

The accuracy with each epoch or cycle of model training keeps increasing until it reaches the highest perfect score and that is 1. However, such a dataset is overfitted and can create a highly biased model, even though the variance is the least for such models.



The above graph shows the accuracy growing with each epoch, until it reaches 1 and becomes stable at that point, showing that the model is trained with perfect accuracy.

Below is the frontend layout of the flask chatbot created:-

Fig 4: Chatbot layout

In the end, the chatbot was able to perform the following tasks:-

- Respond according to the user input
- Provide information and help in the academic section and career choice
- Able to create a friendly atmosphere to make the user comfortable enough to share their troubles

V. ADVANTAGES

There are several advantages and facilities that are offered by the proposed system. Some of them are listed below as follows:-

- Mentoring chatbot enables us to clear our problems and doubts at the comfort of our home without having to leave the place we are at.
- We can share our issues and troubles to this mentor freely and anonymously, expecting the most accurate results with a comforting sequence of responses provided by the chatbot.
- The chatbot offers the results and mentoring without any critical judgment and harsh notations, if mentioned otherwise in the dataset.

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- The dataset has been created for the general crowd, this is why the responses provided by it will be suitable for most of the users trying this chatbot.

- While physical human mentors cannot offer time sometimes, and both the individuals need to be available at a certain time, mentoring chatbot gives us the facility to have such sessions anytime, as it can be accessed 24/7.

VI. LIMITATIONS

Even with a number of advantages that are being provided by the chatbot, there are certain limitations it faces, and cause problems for the user. They are listed as follows:-

- However much the chatbots are able to carry out the mentoring process, they are only limited to the dataset provided to it and cannot think of their own answer, hence making them pretty rigid and unemotional while responding.

- Chatbots have the same answer to the same query, irrespective of different people who require different approaches to questions.

- Due to being limited to a certain dataset because of being a retrieval based chatbot, the user is not free to text anything and has to stick to the inputs set in the given dataset, or else the chatbot may end up giving the wrong response.

- They don't possess any humane feelings, hence are not able to respond based on the person who may require an answer but twisted in a different way in order to convince him or her.

- They are only able to answer questions related to their field and not any more than that. A huge amount of data is required to be updated and managed frequently to keep up the efficiency of the chatbot.

VII. FUTURE SCOPE

There has been a huge amount of work that has been done in this field in order to create an emotional chatbot so that they can take over the mentoring process, driven by the power of artificial intelligence and hence revolutionizing the whole education and therapy system. Our model has mainly focused on creating a detailed and efficient dataset with numerous inputs and responses so that the model can learn to respond even more humanly and mentor the students and mentally ill patients alike. There is a lot of work that can be still done in this domain, which has been listed as follows:-

- Mentoring process can be created and held out in a more humane way where the bots are able to learn based on the response by the student, through effective sentimental analysis and natural language processing model.

- The dataset that the bots use can be expanded even more for the chatbots to answer even more queries which are not related to the academic field, but also diversified to deal with depression and other mental illnesses like any professional therapist would do.

- Reinforcement learning can be applied instead of providing the model with a predefined dataset so that the chatbot model can learn to predict outcomes on its own, thus creating an even more efficient model for the same.

- The user interface can be made even more efficient and user friendly by providing speech input and output , creating a better mentoring assistant.

- The chatbot can also use a translation module in order to make it available to people all around the world.

VIII. CONCLUSION

Mentoring is the process of helping and guiding another person to develop their personality and choices professionally, as well as personally. It is a really diverse field and cannot only be limited to issues like career counseling and depression.

A chatbot is a computerized system which can simulate human conversations, either in written or speech format, allowing humans to interact with machines just like they do with a normal person. A mentoring chatbot allows interaction to share our doubts and issues freely and anonymously to achieve the highest level of results and satisfactions, which can be enjoyed from the comfort of our home.

Though they offer so many advantages and facilities, they also have some cons. They don't possess any humane feelings, hence are not able to answer based on the person who may require an answer but twisted in a different way in order to convince him or her. Due to the same reason, the limitation of dataset causes the user to be unable to input text freely according to their wish. ML algorithms such as natural language processing and sentiment analysis can be implemented in order to make our bot learn and predict the outcome statement for interaction by itself, though this may require a lot of time and resources for training the model.

There has been a huge amount of work that has been done in this field in order to create an emotional chatbot so that they can take over the mentoring process, driven by the power of artificial intelligence and hence revolutionizing the whole education and therapy system. Our model has mainly focused on creating a detailed and efficient dataset with numerous inputs and responses so that the model can learn to respond even more humanly and mentor the students and mentally ill

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patients alike. There is a lot of work that can be still done in this domain in the future.

IX. REFERENCES

[1] Patil, Sunita, and Ajay Rasave. "Artificial Intelligence Chat Bot for Counselling Therapy." Papers.ssrn.com, 7 May 2021, papers.ssrn.com/sol3/papers.cfm?abstract_id=3866861

[2] Zaidi, Danyal, et al. "Artificial Intelligence Based Career Counselling Chatbot a System for Counselling." Annals of the Romanian Society for Cell Biology, vol. 25, no. 6, 14 June 2021, pp. 11732–11735, www.annalsofrscb.ro/index.php/journal/article/view/7695

[3] Das, Monalisa, and Sanjeev Prasad. A Chatbot System for Mental Health Care, https://ijcrt.org/papers/IJCRT_195305.pdf

[4] Satam, Sanchi, et al. Mentoring Chatbot Using Artificial Intelligence Framework Publication Info. 2010, https://smsjournals.com/index.php/SAMRIDDHI/article/download/1925/854

[5] Cameron, Gillian, et al. "Towards a Chatbot for Digital Counselling." Undefined, 2017, www.semanticscholar.org/paper/Towards-a-chatbot-for-digital-counselling-Cameron-Cameron/b6be404914aea002ed99b693b6dc9a2504f24c1a

[6] Melegati, Jorge, and Xiaofeng Wang. "Digital Mentor: Towards a Conversational Bot to Identify Hypotheses for Software Startups." IEEE Xplore, 1 May 2022, ieeexplore.ieee.org/abstract/document/9814673

[7] Kapoor, Pranav, et al. "Therapy Chatbot: A Relief from Mental Stress and Problems." International Journal of Scientific & Engineering Research, vol. 12, no. 5, 2021, p. 1117, www.academia.edu/49572174/Therapy_Chatbot_A_Relief_From_Mental_Stress_And_Problems

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