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College Assistance Chatbot Using NLP

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ABSTRACT: These days, chatbots are frequently employed in a variety of applications, especially in those that provide users with intelligent support. These systems frequently have chatbots installed that can interpret user requests and provide pertinent responses in a prompt and accurate manner. This chatbot operates in the field of education. To help university students with their inquiries, a method was developed. The main objectives were to design a particular architecture, produce a communication management model, and give the pupils the appropriate answers. For this reason, a system that uses Deep learning algorithm and natural language processing has been created to identify questions from students and respond to them. Ultimately, when the intended concept was put into practice, an experimental campaign was conducted to confirm its efficiency and enforceability.

KEYWORDS: Education, Chatbot, Deep learning algorithm, NLP, Information retrieval and question answering.

I. INTRODUCTION

Universities and colleges are using technology more and more to help students adjust to life on campus. The College Chat Bot, a virtual assistant that provides individualised advice throughout the college experience, is one noteworthy innovation. Chatbots were first utilised for straightforward tasks, but as natural language processing and artificial intelligence have advanced, they have been able to handle increasingly complicated requests in real time. Chatbots have become an essential aspect of student support services in a number of sectors, including career counselling and admissions, since they increase efficiency and streamline procedures. They are essential in helping prospective applicants navigate the admissions process by answering questions on requirements and deadlines. After being accepted, chatbots assist students with choosing courses, getting academic advice, and using university facilities.

PyTorch is an open-source machine learning toolkit designed mainly for deep learning applications, especially neural networks. It was created by Facebook's AI Research unit (FAIR). Its use of dynamic computational graphs, which allows for the quick and simple creation of graphs during operations, is one of its distinguishing characteristics. This allows for increased flexibility and debugging ease. Similar to NumPy, PyTorch offers a robust tensor computing toolkit that makes it easier to perform mathematical operations on multidimensional arrays, or tensors.

II. RELATED WORK

The Chatbot System [1] is a web application that uses AI concepts to converse with humans, breaking user sentences into predefined input patterns and set responses. It uses a heuristic approach to deliver a suitable response, ensuring that the system answers as though it is answered by the user. The chatbot [2] uses mathematical models and algorithms, such as the Bag of Words model and machine learning algorithm BOW, to extract features from text. The College Chatbot System [3] is a web-based application that responds to user queries, greeting them and allowing them to log in. The chatbot uses NLP techniques to pre-process data, dividing user input sentences into questions and answers. It uses a vocabulary dictionary and a PHP framework to analyze user queries. The system [4] provides answers to scholars and users' queries, enhancing their online experience. The chatbot system is an AI-based tool that answers user queries about facilities, academics, fee structure, and placement activities. It pre-processes queries, fetches remaining

keywords, matches them with knowledge base keywords, and provides appropriate responses. The system [5] uses natural language processing (NLP) to analyze grammatical structure and meaning in context. The chatbot [6], using AI techniques like NLP and machine learning, answers college-related queries from new students. It includes two main functions: user registration and complaint submission, and a Chat BOT Responding System.

III. METHODOLOGY

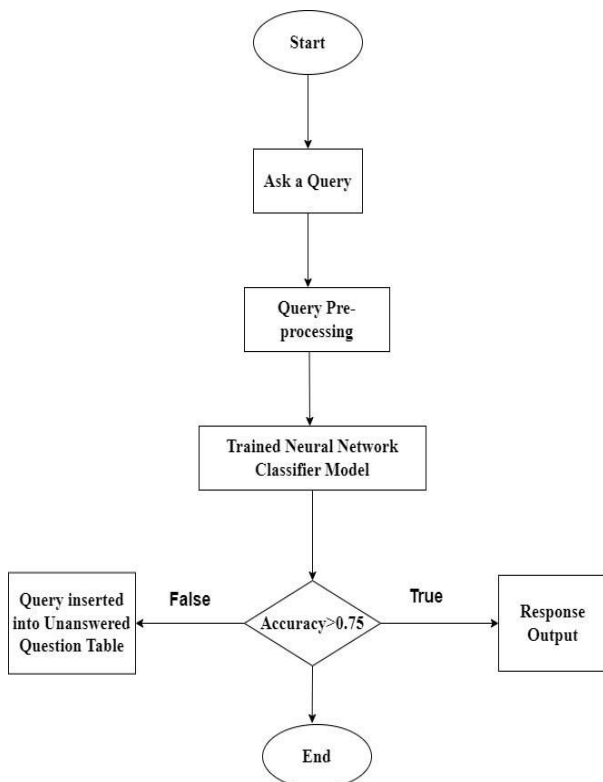


Fig. 1. Work Flow of the project

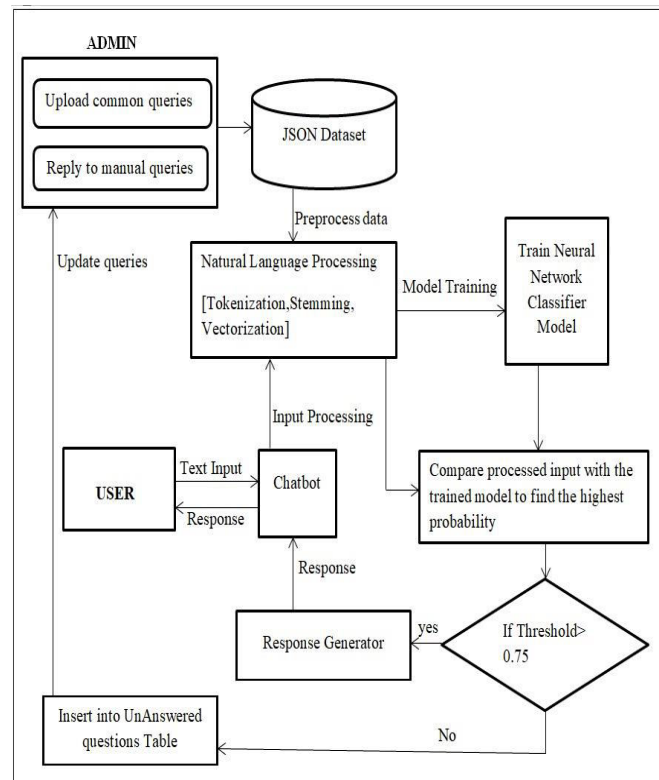


Fig. 2. System design

System design:

A systematic approach is used during the chatbot creation process to guarantee efficient operation and user involvement. Platforms for deployment are selected, together with the intended audience and extent of capability. PyTorch is used to implement NLP and Deep Learning for the chatbot. The dataset's patterns are pre-processed and transformed into a format that the model can be trained with. The complete list of unique terms in the response vocabulary is included in the bag of words. If the word is in the bag of words, the bag NumPy array is set to 1; otherwise, it is set to 0. For every training pattern, a NumPy array is constructed. The label is provided as the tag index. To generate the dataset, the NumPy array and label are provided with the chat dataset. The training datasets are loaded into batches using the data loader.

System Development:

For a predetermined number of epochs, the model repeatedly runs over the dataset. The Neural Network classifier model uses each batch of datasets as input to produce predictions, which are compared to labels and computed as a loss. The optimizer can modify the parameters and minimize the loss by computing the gradients of the loss function with respect to the model parameters using backpropagation. Until the predetermined number of epochs is reached, this iterative process of forward pass, loss computation, backward pass, and parameter tuning is carried out. Once a user submits a query, it is tokenized, transformed into a numerical form, and fed into a neural network classifier model to produce a prediction.



From the list of responses linked to that intent, a response is chosen at random if the expected probability for the intent is greater than a predetermined threshold, in this case 0.75. A default response indicating lack of information, "I am sorry, but at this time I don't have information about the same," is returned if the confidence level is below the threshold.

IV. SYSTEM ARCHITECTURE

Dataset:

The model is trained using a JSON dataset. The intentions JSON dataset. Predefined 2015 patterns, 525 tags, and their answers about college acceptance, branches, cost plans, libraries, and placements are all contained in json. The JSON format, which consists of patterns of user input and the chatbot's accompanying responses, represents the intent for a chatbot.

Data Processing and Analytics Layers:

Pre-processing, a critical stage in deep learning, is converting unprocessed input data into a format appropriate for modelling. The Natural Language Toolkit (nltk) is used for pre-processing.

The following pre-processing methods are used:

- Tokenization: dividing a statement into a collection of tokens, or words. The chatbot requests are divided using a word tokenizer. For this, use the nltk. Word_tokenize method.
- Stemming: Produce the word's root form. Suffixes are eliminated from tokenized words using the Porter Stemmer algorithm from nltk.
- Lowercase the stemmed words and eliminate punctuation: Lowercase words are transformed into lowercase, and punctuation is eliminated.

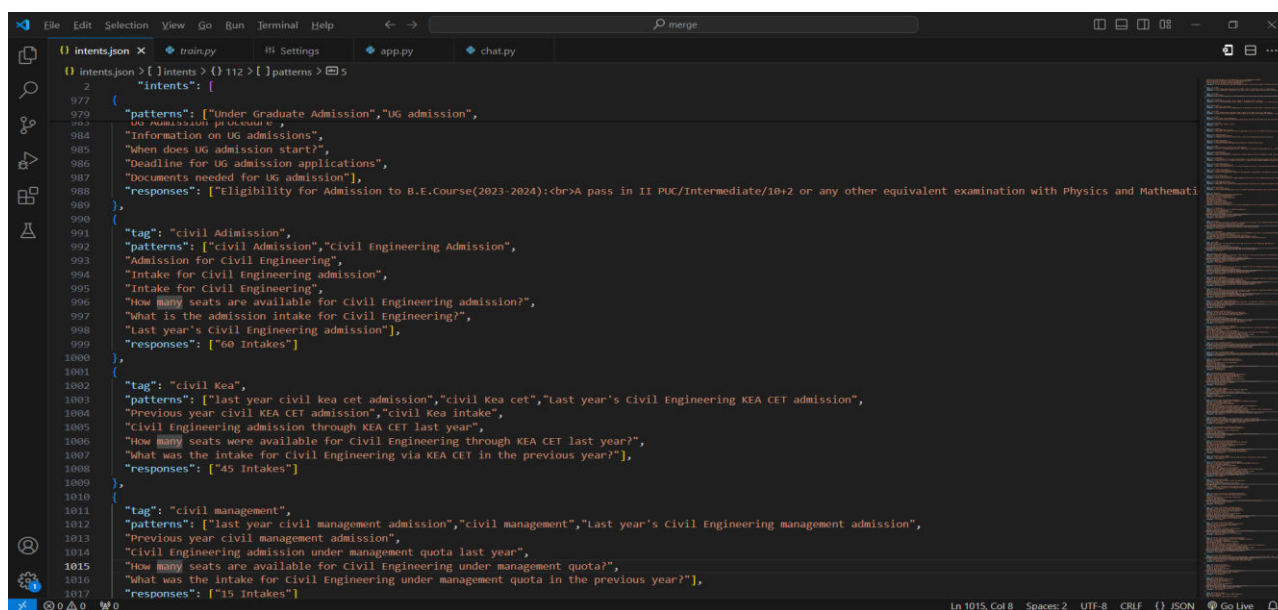


Fig. 3. Sample Dataset

V. EXPERIMENTAL RESULTS

As long as the college inquiry system has a dataset associated with it, such as a JSON file, it can be used for any institution or educational setting. The chatbot is trained using a large number of Tags and response samples from the dataset. The JSON file was selected because it is clearly presented in easily understood simple English and is well-organized. After producing a lot of data to maintain our present data, we started extracting data from the university website. This action will enhance our chatbot's capacity to respond to users' questions promptly. The number of tags in the dataset is up to you; it should contain multiple patterns that you may compare to the user's input. The team members collect the dataset with the help of certain departments in the university and the information available on the university's website.

Backpropagation and feed-forward ANN are used to train the dataset, as was indicated in the section on the suggested model. Following dataset training, the following figures were obtained:

- 1) 2015 patterns are included in the model.
- 2) There are 525Tags in the model.
- 3) The accuracy of the model after 1000 epochs of iteration is 78.80%.

Anytime new data is added to the JSON file or the existing data is updated and improved, the prior figures could be affected (for example, improving the data could mean changing the patterns to make them more accurate).

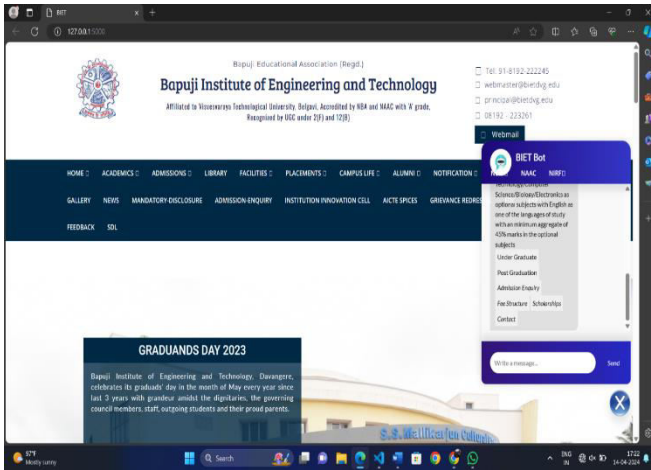


Fig.4. Snapshot1

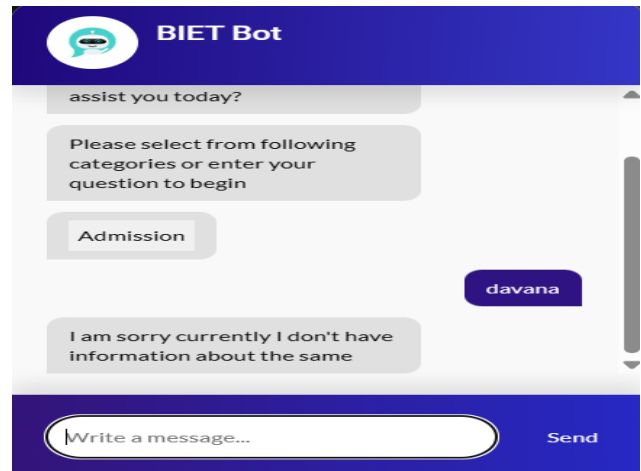


Fig.5. Snapshot2

VI. CONCLUSION

Comprehensive information can frequently be difficult and time-consuming to obtain through a variety of interfaces or in-person college visits. In order to solve this problem, the college chatbot provides parents and students with a centralized, intuitive interface via which they can easily address their questions. The chatbot lets users freely express their questions in an effort to mimic human conversation, fostering an engaging and organic engagement experience. The suggested chatbot searches for query responses quickly and effectively. By using deep learning models and search algorithms, the chatbot finds pertinent responses to these questions quickly and effectively, making it easier to find knowledge on a range of college-related subjects. All users need to do is enter their questions in text format, which guarantees accessibility and convenience of use.

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