

**Proposal for the Student Innovative Project under Center for Technology  
Development and Transfer Research Support Scheme**

# **Design and Implementation of Intelligent Teaching Chatbot**

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## **OBJECTIVES**

Ideally, the chatbot should be able :

- To provide means to automatically extract summarized content from the input data.
- To auto-evaluate answers from given data.
- To allow authors of textbooks and literary documents to utilize the chatbot to provide a brief summarization and allow users to efficiently navigate their material.
- To be able to reply to users in real-time.
- To help users with a subset of problems that they often experience while analyzing textual information and providing feedback on their articles and writing.
- To ask the user for more information if their intent is not clear enough.
- To request human intervention when appropriate, if software is released and controlled by a provider to the student.
- To allow tuning of the bot's responses.

## **INTRODUCTION**

The 21st century students are tech savvy, and they expect the learning system to be seamless, real-time and customized. Social media has become a preferred tool of communication for connecting and bringing students closer despite the geographical and time boundary that limits the traditional forms of communication. The use of the social media platform is also ideal for online chatbots, which has significant benefits for learning.

Online pedagogy and utilizing the world of software and the internet has become vital in advancing standards of education and making educational material and information open source and accessible to all.

*Chatbot: A computer program which was designed to simulate conversation with human users.*

It functions as an automated tool that can be implemented in a customizable fashion such that it learns based on input as per the user's needs using Machine Learning models and the algorithms that now work at the frontier of advancing Artificial Intelligence.

A chatbot is an AI that can serve as a conversational tool that is the pinnacle of our achievements in the domain of Natural Language Processing (NLP). Chatbots today are implemented in e-commerce websites to answer repeated customer queries to save the time and resources of companies and ease the experience of customer service from clients etc.

Chatbots have risen to prominence during the COVID-19 pandemic to facilitate the online education needs of both the faculty and the students. However, the scope of the applications of Natural Language Processing goes beyond the classroom if we were to truly harness the power of Text Analysis and Summarization, Sentiment Analysis, plagiarism detection etc.,

## **LITERATURE SURVEY**

***A short history of the scholar data chatbot:*** The main users of this chatbot are school directors, academics and students. This technique can build an Associate in the AI system to clear the queries of the scholar with respect to pre-input text content. A student will use the technology to visualize their schedule, grades, and attendances. [1]

### ***User moral problems***

A challenge sweet-faced in education by the utilization of Chatbots is the angle of the user. In a case study, it's disclosed that individuals' activity intentions to use AI in pedagogy are influenced by the user's attitudes. Likewise, another analysis on the adoption of code engineering product established that user angle influences the adoption of software tools (Okonkwo et al, 2019) [2 ].

### ***Performance Assessment***

Performance assessment and metrics is one among the areas of improvement within the field of informal agents that is employed to quantify the standard of the chatbot's behavior. Liu et al. in "How to not measure Your Dialogue System: Associate in Nursing Empirical Study of unsupervised analysis Metrics for Dialogue Response Generation" shows however unrelated commonplace metrics tend to be against natural human judgement like the cheese and ROUGE scores [5].

## **PROPOSED WORK WITH METHODOLOGY**

**i) Lack of features in existing systems that are available in this project as a whole:**

### ***Requirement of a mock questioner:***

Chatbot auto generates questions and auto evaluates answers given by the user for student's practice.

### ***Machine-to-human transition:***

Analyzing the nature of the responses and deciding whether human intervention is required.

### ***Understanding user intention:***

Understanding the queries of the students is essential to prevent miscommunication.

### ***Ethical issues:***

Most chatbot apps use telemetry, but this project does not collect user's personal data for marketing purposes to address security concerns.

### ***Imitation:***

Chatbots end up imitating the style of the author of the input data. However, this chatbot will strictly adhere to professional language for output generation.

### ***Supervision:***

This chatbot will have inbuilt features that avoid input of inappropriate data that can be classified as spam, or done with malintent by using spam filter features tailored for educational material.

### ***Personalisation:***

A lack of less or more adequate replies is constantly seen.

### **ii) Methodology:**

The stages of this project include text pre-processing and model training. Text preprocessing stages involve multiple levels like Stemming, Lemmatization, Tokenization, Part of Speech Tagging, Word Vectorization, Identifying Regular Expressions (Regex), Named Entity Recognition, Feature Extraction etc. Above stages are involved in the Syntactic, Morphological, Lexical and Semantic Analysis of Text.

After this, Discourse Integration and Pragmatic Analysis is done. This is followed by implementing neural networks to train the model for standard response generation and understanding.

Epoch analysis, also known as Chree analysis, is a statistical tool used in data analysis to detect periodicities within a time sequence or to reveal a correlation between two data sequences. It is used overtime to re-evaluate model input and output overtime to identify common phrases and requested answers to give quick and optimized answers and remove redundant information.

During training of the model, adjustments and tests are made to resolve issues. Finally, backend simulation, console execution and manual testing is done to resolve production issues.

## **IMPLEMENTATION:**

- The chatbot will be implemented as a web service as the web is accessible from all environments such as an Android, iOS, Linux OS, Windows OS, Mac OS etc and does not depend on the nature of the platform the student wishes to use.
- The chatbot will be using Python as the working programming language as it is open-source and is the industry standard for Machine Learning model development across the world. It has a rich library of resources tailored specifically to the Machine Learning field.
- The website will be developed with the Flask-Python Micro-framework as it is highly modifiable and extensible for backend development of a website.
- A cloud web hosting platform such as Heroku and Replit, will be used to host the user data.
- Other open-source Machine Learning Libraries used to develop the chatbot will be Tensorflow, Scikit-learn, NLTK and Gensim.
- The chatbot will function using a the BERT model developed and published by Google as an open source pre-trained transformer ML technique.

## **WORK PLAN:**

The work plan to develop this chatbot are as follows:

1. Defining the chatbot's purpose and managing expectations.
2. Understanding the audience.
3. Defining the personality of the chatbot.
4. Designing the user journey and conversations.
5. Integrating Natural Language Processing algorithms for text pre-processing.
6. Implementing Machine Learning algorithms for model training.
7. Testing the relevance of output for the respective user input.
8. Analyzing user feedback and upgrading the software.

## **EXPECTED OUTCOME/ RESULTS:**

The project will function as an optimized tool tailored to the purposes of student usage as a web service to all students in need of NLP tools to aid and assist them in their learning curve for quick summarization and revision of concepts, clarification of queries with the input knowledge that the student has supplied to the NLP model.

## **APPLICATIONS:**

- It extracts summarized content from the input data.
- It auto generates mock questions from the reference data and auto evaluates answers provided by the user.
- It interacts with users in real time.
- It provides feedback on the nature of the user's writing.
- It asks the user for more information if their intent is not clear and if the input data provided is insufficient.
- Authors can create custom models for their literature.
- It will request human intervention under appropriate circumstances, if software is released as a customized distribution.

## **CONCLUSION:**

In conclusion, the chatbot is a web service that uses emerging Artificial Intelligence technology known as "NLP", which will provide answers to the analyzed queries and assist the user in multiple other regards. It can also be used as a normal and traditional message system as well. The main purpose of building this web service is to make the chatbot faster, easier and highly customizable to the user (Students). This web service tries to break this barrier and allows the user to perform interaction and other activities and enhance AI Based Net Student System among the students. If this chatbot is to be further developed, this could be something to draw upon.

## **REFERENCES**

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- 2. Chatbot Development as a Digital Learning Tool to Increase Student's Research Knowledge by Patchara Vanichvasin*
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- 4. Chatbots applications in education: A systematic review by Chinedu Wilfred Okonkwo and Abejide Ade-Ibijola*
- 5. Masters Thesis: Design and implementation of a chatbot in the context of customer support by Florian Peters, University of Liège - Faculty of Applied Sciences supervised by Prof. Louis Wehenkel*

## **FINANCIAL ASSISTANCE**

A production level app such as customer facing or internal web apps and APIs costs \$25 and up per month on platforms such as Heroku. We estimate our cost to be around \$50 dollars per month for the duration of the project, which in INR costs 24500.