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An Educational CRM Chatbot for Learning Management System

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Abstract
An educational customer relationship management (CRM) Chatbot is a learner support service automation tool that enhances the human computer interaction and user experience in higher education institutions through effective online conversation and information exchange. The machine with embedded knowledge is trained to identify the sentences and taking a right decision itself in response to answer a question. An E-learning platform is a web-based platform designed to streamline the administration, delivery of online educational courses and training programs. It serves as a centralized hub where educators, learners, and administrators can interact, collaborate, and access learning resources anytime, anywhere. The research objective is to design and build a E-Learning Management System with CRM chatbot for effective user interaction. A website is developed for managing course materials in the form of videos, flip-books and quiz using HTML, CSS, JavaScript, PHP, and MySQL. Students can access the course materials from anywhere and anytime. The queries may arise from user at any moment. In this case, the chat bot will primarily assist students and will respond to queries by guiding them through the functionalities and features of this application at any time. Chatbot will enhance customer service. This proposed CRM-chatbot uses natural language processing (NLP) and Feed forward Neural Network model to understand students questions and automate responses to them.

Keywords: E-Learning, Chatbot, NLP, Feed Forward Neural Network, Educational CRM.

Introduction

The globalization of education and the increasing need for remote learning options contributed to the rise of e-learning. An E-learning management system is a web-based platform designed to streamline the administration, delivery of online educational courses and training programs. It serves as a centralized hub where educators, learners, and administrators can interact, collaborate, and access learning resources anytime, anywhere. The system contains functionalities, such as course creation, content management, student enrolment, assessments.

The primary goal of an e-learning management system is to enhance the learning experience by providing a structured and organized platform for the delivery of educational content. It allows educators to create and deliver online courses, and manage various aspects of the learning process. It gained significant popularity in recent years, especially with the increased demand for online education and remote learning. They provide a flexible and scalable solution for educational institutions, corporations, and individuals to deliver and manage high-quality digital learning experiences.

An application aid chat bot refers to an intelligent virtual assistant designed to assist users in navigating and utilizing software applications effectively. This type of chat bot acts as a support system that provides guidance, information, and troubleshooting solutions related to application functionalities, features, settings, and processes. It leverages artificial intelligence, natural language processing, and machine learning techniques to understand user queries, provide relevant responses, and offer personalized recommendations. The goal of an application aid chat bot is to enhance the user experience, streamline interactions, and ensure users can make the most of their chosen software applications.

Literature Survey

Daqar and Smoudy (2019) examines the role of artificial intelligence (AI) on Enhancing Customer Experience in Palestine through different industries, such as banks and telecommunication companies. Interviews and a structured questionnaire were the primary data of this study. The results of the study revealed that there is a positive significant relationship between AI and Customer Experience.

In the paper, (Daradoumis et al., 2008) we consider how the field of CRM application has expanded beyond the corporate sector to a broader relationship context, wherein the inclusion of non-profit organisations seems logical. We specifically analyse how well universities and other higher education institutions that specialise in e-learning can embrace CRM methods. Although there is a lot of potential with this topic, it hasn't gotten much attention in the research thus far, in our perspective.

Dahiya (2017) addresses the design and implementation of a Chatbot system. It outlines the methodology and techniques employed to build the chatbot. It also says the study of another application where Chatbots could be useful and techniques used while designing a Chatbot. It also presents the results of the evaluation, and strengths of the proposed chatbot model.

Rabiman et al. (2020) explores the key aspects involved in the development of an e-learning management system, examining the various components, functionalities, and challenges associated with such systems. The paper aims to provide a comprehensive overview of the current state of e-learning management system development and highlight potential avenues for future research and improvement in this field.

The paper (Coates et al., 2005) offers a thorough analysis of the potential effects of these online learning environments on university teaching and learning. The prospective effects of LMS on teaching methods, student involvement, the character of academic work, and the control over academic knowledge are all specifically covered in this paper.

Graf et al. (2010) proposes a mechanism for enhancing the capability of LMSs to offer students classes that are customised to their unique learning preferences, utilising adaptive sorting and adaptive annotation to draw attention to the learning objects (LOs) that best aid students' learning processes. With the help of a flexible course structure and the mechanism, teachers can add adaptability to their previously existing courses without reducing the variety of available learning resources and materials.

Methodology & System Architecture

The front end of the e-learning platform has been developed using HTML, CSS and JS. PHP is used to interact between the front end and the back end, SQL is used to store, retrieve and modify data from the MySQL database. The sign-in and sign-up module provides the functionality for users to create new accounts (register) and authenticate themselves (login) to gain access to an application. The super admin module holds the overall authority to manage the users. The admin module allows admins to upload, edit, and organize course content. The user module allows students and faculty to access the course content.

Figure 1 explains the overall architecture diagram for the "e-learning management system integrated with chat bot". In the user registration module, the details of the user have been registered and stored in the MySQL database. Now the user can log in with their credentials and it will redirect them to their respective homepage.

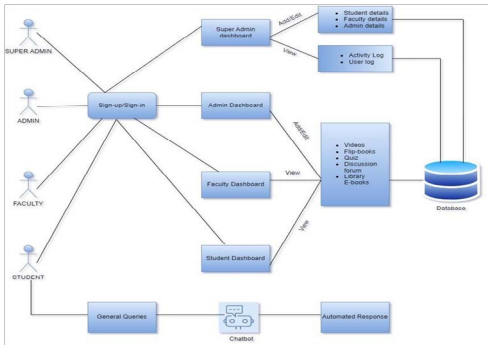

Figure 1 System Architecture of an E-Learning Management System

The user can also access videos, flip-books, and quizzes. The admin will manage the course content. The user can take help from chat bot if they have any queries regarding application.

Implementation Process Metrics

Chatbot which will primarily assist students and will respond to queries regarding application at anytime. The machine has been embedded knowledge to identify the sentences and making a decision itself as a response to answer a question. This process can be done by using natural language processing and Feed Forward Neural Network.

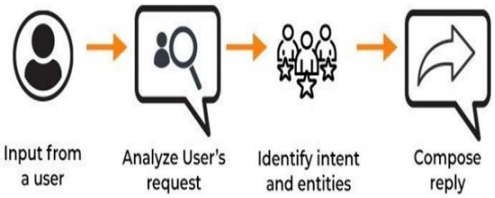

Figure 2 Work Flow of Chat bot design

Figure 2 refers to the overall work flow of the chat bot. The input from the user will be analysed and based on the intent, the response will be composed.

Text Pre-Processing

NLTK is used to pre-process user input or chatbot responses by performing tasks like tokenization, which is breaking text into individual words or sentences, followed by lowering and stemming the input. Then it will remove all the punctuation characters. Then feature extraction of text will be done with the help of bag of words. The input to the FNN is pre-processed user's text input or query.

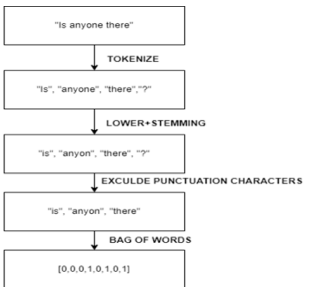

Figure 3 NLP Pre-Processing Pipeline

Figure 3 Illustrates how the user input is pre-processed using NLP

Model Implementation

The numerical input is passed through the FNN, which consists of multiple layers of interconnected nodes. Activation functions introduce non-linearity into the FNN, allowing it to model complex relationships between inputs and outputs. Back propagation algorithm is used to train the FNN by adjusting the weights and biases of the neurons based on the error between the predicted output and the desired output. The training data is labelled with the correct intents or responses, which serve as the desired outputs for the FNN during training.

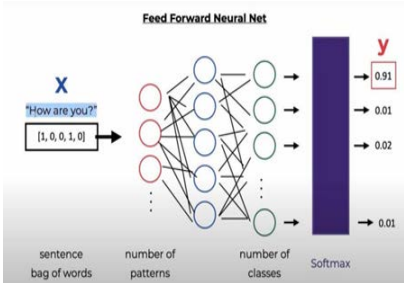

Figure 4 Implementation of FNN

Figure 4 refers to the implementation of the FNN model in the chat bot. The activation function (i.e. SoftMax) is used to determine the output.

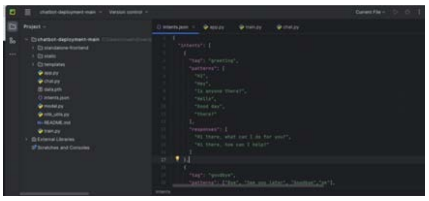

Figure 5 Screenshot of Training Data

Figure 5 refers to the training data which includes intents, tag and patterns.

Inference

The FNN takes a user query as input, performs a feed forward pass through the network, and produces a predicted intent or response based on the learned patterns from the training phase. This chatbot is created in flask. CORS package is used to integrate the chatbot with standalone website.

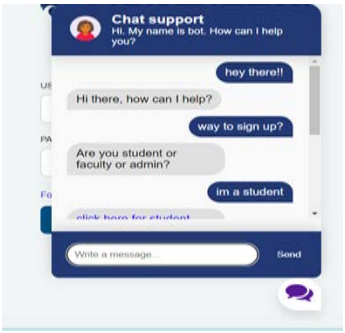

Figure 6.1 Chatbot as Application Assist

Figure 6.1 refers to the screenshot of the chat bot's response to user queries regarding application features.

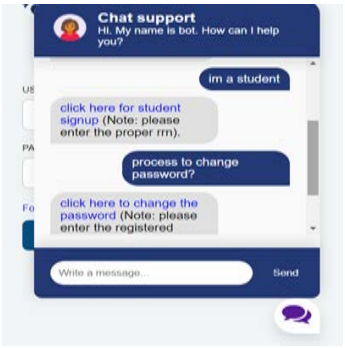

Figure 6.2 Chatbot as Application Assist

Figure 6.2 refers to the screenshot of the chat bot provided steps to change the password and a link to it.

Conclusion

The E-Learning Management System designed with a CRM chatbot has been successfully developed and deployed in a real world production environment. It is a powerful tool that can be used in an institution to run online training programs and manage their students. It provides flexibility and accessibility to the learners with anytime, anywhere access to educational resources and activities. chatbot as application assist will be available 24/7, allowing learners to access support whenever they need it. It enhances UI/UX experience and improves the customer relationship management.

Future Enhancements

The Future enhancements are given as below

Chatbot tutor: A chat bot tutor can provide personalized support to learners, answering questions and providing guidance based on each individual's needs. This can help learners stay on track and address any confusion they may have.

Live Classes

Live classes allow for real-time interaction between instructors and learners, creating a more engaging and interactive learning experience. Learners can ask questions and receive immediate feedback, leading to a deeper understanding of the course material.

Individualized Learning

By tracking the progress of each learner, e-learning management systems can provide a personalized learning experience. The system can identify areas where learners may be struggling and provide additional resources or support to help them overcome these challenges.

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