

Skill-Oriented Job Recommender Chatbot

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ABSTRACT

A software known as an artificial intelligence chat-bot mimics a conversation between a human and a computer via written or audio communication. These bots automatically simulate human interaction by responding to user inquiries by utilising AI and NLP. Modern technology has advanced to the point that practically everyone now regularly uses a smartphone. Everything that can be done at the press of a button may be done so—from getting information from the internet to offering personal help to organising leisure activities—by just clicking a button. During the past several years, chatbot usage has grown across a range of industries, including websites, customer service, healthcare, education, and IT. In today's rapidly advancing business sectors, IT technology has made significant strides and continues to progress. The advent of conversational chatbots has revolutionized the way we address frequently asked questions and provide guidance. Utilizing text recognition and natural language processing technologies, chatbots can offer immediate solutions in various contexts. The deployment of chatbots has become increasingly user-friendly and practical, allowing for seamless interactions. Over time, chatbot capabilities have been enhanced, thanks to innovative updates driven by technological advancements. These advancements enable chatbots to engage in text-based conversations and effectively communicate with users, fostering meaningful interactions and delivering real-time assistance.

Keywords

Chatbot, job prediction, skills, Resume, XG-Boost, Suitable jobrole.

1. INTRODUCTION

A chatbot is a piece of artificial intelligence (AI) software that can facilitate a discussion (or chat) with a user using natural language via mobile apps, websites, telephones, and other messaging tools. One of the most cutting-edge methods for establishing a connection between people and robots is a chatbot. A chatbot is just the logical advancement of a Question and Answering system that makes use of Natural Language Processing from a technology standpoint (NLP). One of the most prevalent examples of Natural Language Processing being used in many enterprise end-user applications is the

generation of responses to inquiries in natural language. Chatbots have made waiting a thing of the past. Instead of waiting for an email answer, being put on hold etc., clients/users may get an immediate response from the chatbot without paying any additional expenses. Users can engage with a chatbot to address a wide range of queries and concerns. The chatbot provides relevant information and offers prompt instructions to efficiently resolve their worries. In situations where waiting for an in-person visit can be frustrating, individuals can rely on chatbot technology to receive quick responses to their questions. Additionally, the chatbot ensures accurate assessment of any required follow-up actions. This immediate assistance enables users to obtain important guidance without delay.

As chatbots become more intelligent, they can assess users' requests and provide job recommendations or offer further assistance as needed. Users can benefit from the chatbot's easily accessible functionality, receiving swift responses and improved job profile filters from its extensive database. This helps the chatbot to gain a better understanding of the user's preferences. By asking a series of predetermined questions, the chatbot can identify relevant job roles that the user may be interested in. Users can now request a list of suitable job positions from the chatbot and choose the most appropriate one from the available options. It is never too late to pursue a career change, as individuals often switch professions due to various reasons like monotony or lack of motivation. By leveraging technology, we can suggest suitable job profiles based on an individual's preferences, making a positive impact and enhancing their quality of life.

2. LITERATURE REVIEW

To evaluate previous research studies and surveys, we conducted an extensive literature review on chatbots and their applications. This comprehensive assessment allowed us to identify any existing knowledge gaps in our field. The publications were categorized based on the platforms, algorithms, datasets (if applicable), and tools/software used. Additionally, we examined several survey studies that focused on currently deployed chatbots, comparing their features and functionalities. This literature study provided valuable insights for our research, enabling us to build upon existing knowledge and contribute to the advancement of chatbot technology.

Predicts the crime property and Actions which would lead for solving the crime investigation with the help of XGBoost, Pred POL algorithms show in the table below [1].

Authors claim that chatbots designed to mimic human conversation partners are able to recognise a specific human response. It might be difficult to find the ideal candidate fast and accurately in the current environment. A simple chatbot might be utilised to solve this problem. Recruiters may utilise this on a regular basis to automate time-consuming tasks. The authors classified the outcomes of a job interview between the interviewer-bot and the user using the Nave Bayes approach.[2]

XG Boost algorithm with ML and Ai based Diabetes Mellitus Detection and self management and dataset used id PIDD (pima Indian diabetes datasets) For testing (32percentage) is taken [3].

The author talk about the the career consultation by chatbot by the means of answering some question so that the user can get a reliable path for further life. Here the author uses the various types of algorithms such as XG boost, Decision tree [4].

Selecting the ideal candidate to fill a post is incredibly challenging and requires a lot of attempts. Many companies have trouble finding applicants who match the requirements listed in the job description (JD). By reviewing resumes, the AI system assesses and predicts a qualified candidate. JD and CR separate primary skills, secondary skills, adjectives, and adverbs into four groupings. A similarity- based appropriateness index is proposed based on cluster features. Candidate suitability is predicted using Adaboost, XGBoost, decision trees, and linear regression. Using the XGBoost classifier, a maximum average accuracy of 95.14 percent is attained.[5].

As Naive bayes is mostly preferred algorithm for working of chatbot the multi logic adapter, response selection, training system is done to obtain output adapters are used to create an output which will be displayed to the user [6].

In reality, a collection of pertinent skill criteria, interpersonal dynamics, and academic considerations all play a role in

prediction accuracy. The research also helped teachers identify the students who need special attention. The model was tested and found performing well in constraint based learning environment. [7].

The development of a web-based Career Guidance and Employment Management System is presented in this work (CGEMS). The goal of CGEMS is to assist users who are seeking for employment opportunities or career assistance. The goal of CGEMS is to create a central meeting place for students, job seekers, career advisors, and consultants. A job description can be posted by CGEMS users, including businesses and organisations.[8].

The author of the career counselling chatbot is a student who is seeking a bachelor’s degree, primarily in the fields of IT, CE, or CSE. This chatbot will ask the user a variety of questions, to which the user must respond with a 1 for true or a 0 for false. The chatbot may be used to counsel various pupils and assist them in identifying their areas of interest. It communicates with users in addition to providing career coaching. [9].

The author walks students through the educational and professional process using Krishna - The Career Advice Chat Bot. The purpose of the career counselling bot is to facilitate communication between people and robots. The gadget has information built into it that allows it to recognise phrases and select one as an answer to a query. It encompasses a variety of subject-related advice. Instead, the kid must deal with the issues of decision-making, choosing a vocation, being confused about one’s chosen path, and what to do after high school.[10].

A summary result is produced by the author’s system based on a student’s test performance. It employs AI approaches to forecast student performance and makes use of prediction algorithms to find characteristics in student data. Its primary goal is to give an overview of various methods.[11].

In the paper defines a system as software that connects to students by asking for input, preprocessing it, retrieve keywords from queries, compare them to the knowledge base, and return a response[12].

Table I: Findings of Literature Survey

Title	Author	Date of publication	Datasets	Algorithm	Accuracy rate
[1] Big data analytis inter-communication	M-Z-Kastouni	2020	SEMMA	XG BOOST Pred POL	48 percent 92 percent
[2] Literature Survey of various Chatbots	Harsha Pariyani AnshikaS- inha, PreetiBhat, Roshni Rote, Asst.Prof. N. A. Mulla	2020	—	NAIVE BAYES PHRASE REINFORCEMENT	—
[3] ML and AI based Diabates Mellitus Detection and self management	Jyothi and maitachaki	2022	PIDD (pima Indian diabetes datasets) For testing (32 percent) is taken	XG BOOST	93 percent
[4] Chatbot for Career counseling	Mr Mandeep	2021	PCM ARTS COMMER- CAIL (25percent testing)	XG- BOOST SUM DECE- SION TREE	79.23 percent 92.62 percent 98.06 percent

[5]	AI based Suitability measurements and predicts job description	Sri devi	2022	—	XG- BOOST LIN- EAR RE- GRES- SION DECI- SION TREE ADA BOOST	95.14 percent 85 percent 94.47 percent 94.78 percent
[6]	Classification Techniques of interviewer- Bot Result	Martin Fatnuryah	2018	MOOC (Massive Open Online Course)	NAIVE BAYES PHASE REEN- FORCE- MENT	86.93 percent
[7]	Predicting career using data mining	Yeasin Arafath	2018	—	ID3 CART RAN- DOM FOR- EST SVM NEU- RAL NET- WORK MLP	75percent 95.24percent 95.04 percent 80.41percent 95.24percent
[8]	Career Guidance and employment management system	Kasem Seng	2014	—	NAIVE BAYES	—
[9]	Career counselling chatbot	Dr Parthshah Prof Pinal shah	2019	CHATTERBOT CORPUS	DECISION TREE	80 percent
[10]	Krishna the career guidance chatbot	Riteshsharm RitikRaut	2021	QUAC (Question Answering in Context) 30,000 records	—	—
[11]	Online Career Counselor System based on Artificial Intelligence	Kartikey Joshi Amit Kumar	2020	—	Support Vector Machine (SVM)	—
[12]	Online Career Counsellor System based on Artificial Intelligence	Divya Manoj Bhnushali, Prashant Itankar	2020	—	NAIVE BAYES SVM	—

3. PROPOSED METHODOLOGY

Using the pre-processed dataset from our study’s previous chapter’s literature review as a guide, chose and assessed a number of classification models. Decision Tree, SVM, Random Forest classifier, and XGBClassifier were the models taken into consideration. The outcomes showed that XGBoost had the highest accuracy, hitting 95 present. The accuracy of the Decision Tree and Random Forest classifiers after XGBoost was 87 percent, and the accuracy of the SVM classifier was 83 percent. These results highlight XGBoost’s greater accuracy in classifying the dataset when compared to other models, as suggested by the literature review.

A Dialogflow chatbot was built by creating a new agent and

setting up unique intents, training words, and responses for

job suggestion questions. The agent records user preferences and abilities, and Flask was used to interface with Ngrok and act as a server for Dialogflow webhook queries. The dataset was divided into training and testing sets, and an xg boost model was built using the training data to create a job recommendation model. One-Hot encoding was used to handle categorical features on relevant variables. Responses

were saved to a JSON file in the Flask back-end, which were encoded and used as input for the model.pickle file. The model made predictions on the job role, and the predicted role was sent to the front-end for display to the user.

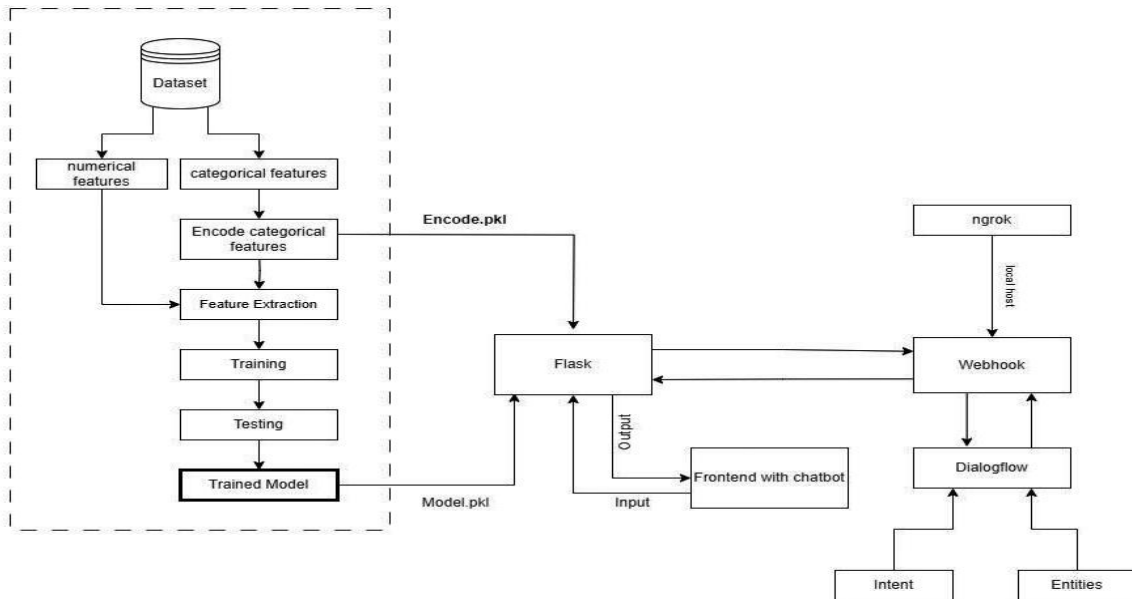


Fig:1 Block Diagram of the chatbot operation

3.1 Dataset Preparation

The dataset for this analysis was compiled from github. Their

intellectual, technical, and interpersonal characteristics are all covered in the dataset. The collection initially has 20703 records.

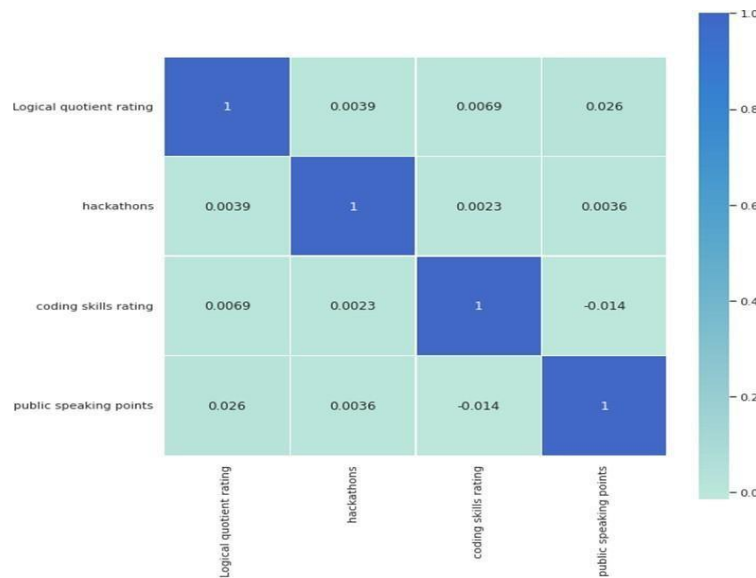


Fig:2 confusion matrix of data gathering

3.2 Data description and analysis

In this section, we only showed the final features after pre-processing and these features are ready to be used for the data processing. The dataset has 21 attributes and 6901 records (1 class variable). The dataset contains attributes such as 'Logical quotient rating', 'hackathons', 'coding skills rating', 'public speaking points', 'self-learning capability?', 'Extra-courses did', 'certifications', 'workshops', 'reading and writing skills', 'memory capability score', 'Interested subjects', 'interested career area', 'Type of company want to settle in?', 'Taken inputs from seniors or elders', 'Interested Type of Books', 'Management or Technical', 'hard/smart worker', 'worked in teams ever?', 'Introvert', 'Suggested Job Role'.

The analysis will begin by importing essential libraries such as in the title-cnt variable. Pastel color palette is employed to color the bars.

"pandas" for data manipulation and analysis, "numpy" for numerical operations, "matplotlib" for data visualization, "seaborn" for enhanced visualizations, and "scikit-learn" (sklearn) for machine learning functionalities. The DataFrame's columns attribute is used to obtain and print the column names. The `df.isnull().sum(axis=0)` code segment calculates and displays the count of missing values in each column.

A loop is then established to iterate over each column in the categorical-col variable. The `value-counts()` method is applied to the selected column, generating a count of unique values in descending order. Subsequently, a horizontal bar plot is created using the `barh()` function. An example can consider if "Interested subjects" column is counted, sorted, and stored

Furthermore, employment of the `value-counts()` method is carried out to determine and print the count of each unique book

type respondents are interested in this process will be same for the whole set of attributes. A cleanup-nums dictionary is defined to map categorical values ("poor," "medium," and "excellent") to their corresponding numeric representations (0, 1, and 2). The replace() method is utilized to convert the categorical values to their numeric counterparts in the DataFrame df.

For model serialization, the pickle.dump() function is employed to save the trained dtree object into a file. This function requires two arguments: the object to be serialized (dtree) and the file object where the serialized object will be stored. On the other hand, the joblib.load() function is utilized to load the serialized model from the file, using the file path of the saved model as an argument.

The XGBoost algorithm classifier is considered for training and fitting on the training data. Similarly, the trained model is saved to a file using the joblib.dump() function, with the model object (rf) saved as a file named 'trained-model.joblib'. To load the saved model from the file, the joblib.load() function is applied, and the loaded model (loaded-model) is then used to make predictions on new data using the predict() method. The resulting predictions are printed using print(predictions), displaying the predicted job role for the new data point.

4. CONCLUSION

It is important to note that the main purpose of the computer-generated algorithm for work recommendation is to recommend to the user or individual which jobs are relevant to them based on the skills they possess in the most accurate manner possible. As a result, this is considered to be one of the most significant characteristics of the chatbot. There are a number of prediction algorithms being used in this study, including SVM, KNN, Nave Bayes, Decision Tree, Random Forest Classifier, XGBoost, etc., and a variety of tests were conducted on the same dataset to gauge how accurate each predictor was. Based on the results of the survey, the result that is gained from the XGBoost algorithm on the Job Recommendation Dataset gives the maximum accuracy among all the algorithms such as Random Forest Classifier, Decision Tree, and SVM. The chatbot conducts a question-and-answer session with the user, providing suggestions available 24x7 for free. The targeted audience is students aged 22-28, who can seek job guidance without waiting in line or paying high fees. The chatbot helps them make clear decisions for a fresh start in their career.

5. FUTURE SCOPE

Further exploration for real-time data extraction will be performed based on additional data set acquisition, and enhanced algorithms will be used to make it more efficient and effective. Association rules will be developed further with these massive datasets to explore interesting patterns that can improve performance. This research can be expanded into an intelligent system in the future.

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