Designing an Interactive User Interface for Tutor Finder and Course Recommendation System

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Abstract – **Private tutoring has become one of the key components in today's educational system. It not only helps a student clear their basics but also allow them to get a detailed knowledge of what they are learning. Many students need some extra focus from the teacher, which is not possible in their regular school classes, so they take help of private tutoring. They aim at clearing the doubts of the students and helps in building strong roots for the students in their core subjects. Private tutoring is also the source of bread for many teachers who are not part of any organization, but still possess good knowledge and skills to teach. In Fact, many tutors who are already affiliated to some organizations find it difficult to fulfil their requirements just by teaching in one place so they also give private tutoring sessions to earn some extra money. The design and execution of a course recommendation system for higher education are presented in this research report. Research was carried out to gauge the system's efficacy. According to the study, the tailored and pertinent course recommendations made by the course recommendation system increased student happiness and involvement with the course selection process. The course recommendation system described in this work has the potential to enhance the way that college students choose their classes while also giving academic advisors and course designers useful information.**

Keywords— Machine Learning, Deep Learning, Natural Language Processing, Education, Budget Friendly Learning.

I.   INTRODUCTION

Private tutoring system has experienced rapid growth over the past year as many students that lack understanding of the concepts prefer to have some guidance from an educator that can guide them properly, and this is no assumption, in fact from the recent research this is quite clear. This growth is not only in physical mode but in online mode of education as well. Private tuition centers that have a brand name associated with them have the mindset of a tutoring system as a business to grab large amounts of money rather than a system to teach and frame the future of capable students who are the future of the country. The issue with this is that many students cannot afford the fees of these coaching centers but since they are not aware of any other options, they and their parents had too many financial difficulties for getting proper education. But what

if students can find a tutor for them under their preferred budget, that will be a lot helpful for them. Our platform acts like a mediocre that helps students find the best tutor for them. Based on their requirements, students are shown the list of available tutors that meet the requirements, and this gives students a chance to find the best tutor for them. If the student finds a tutor whose profile attracts them, they can request the tutor and can contact the tutor to fix a meeting [1-2]. Recommender systems can be used in different fields including educational environments. These types of systems are mainly based on providing a good educational standard. There are many students who know what to do but do not know how to do. A very good example we can take is that a first-year computer science engineer knows that he must study data structures and algorithms. But the main problem arises from where he/she should go. They must take advice from seniors, must do a lot of research, and then select a course to proceed forward in that path. Sometimes in these processes the student loses a lot of time. So, our website will help them in recommending the courses searched upon. Besides selecting passable courses, it is essential to recommend beneficial courses. We have used the vast growth in volume and variety of information available on the internet. This has offered to the development of a course recommender system on our website which will in turn increase the benefits of the user. There is only one tutor finder website for India, rest there are only a handful of tutor finder websites over the world. The main problem in the websites which are not from India, they use their country domain in their site link. This shows us that they are mainly focused towards the development of their country's local tutors only. The one site which we can see in India has a major problem which is a fee which has to be paid in order to seek their consultation or seek their tutors.

Finding a place where a student can find both a tutor and get the recommendations for their further learning at the same time can help any aspirant in developing strong roots for their future. This is what the basic idea which is being followed while building this system. There is not any specific course recommendation system which we are comparing but there are many datasets available across the internet with their accuracy in the range of 70-80 percent
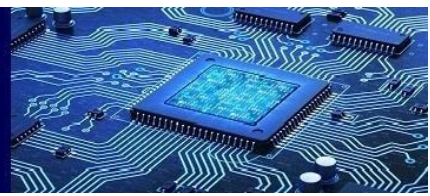
only. While considering from educational point of view this much accuracy is not enough to rely upon. From education aspect recommendations should be more precise. These days NLP is very trending when it comes to the development of recommendation systems. Sentence segmentation, tokenization, stemming, lemmatization, and stop word analysis are all important techniques used in natural language processing (NLP) to preprocess text data before it is used for various applications such as text classification, sentiment analysis, and machine translation [3]. The process of sentence segmentation entails locating the boundaries of sentences within a given text. This is significant because many NLP algorithms process individual sentences rather than the entire text as a single block of text. Tokenization is the process of dissecting a sentence or document into its component words or tokens. Usually, this is accomplished by designating punctuation and whitespace as delimiters. Stemming is the process of stripping suffixes and prefixes from words to return them to their basic or root form. This helps organize words that share a stem and increases the effectiveness of NLP algorithms. Lemmatization is a more sophisticated form of stemming that accurately determines a word's root form by considering the context of the word in the sentence. Although more computationally expensive than stemming, this may be more accurate. Stop words, which include words like "the," "and," and "is," are words that are frequently used but do not add much meaning to the text. Stop words can increase the accuracy of NLP algorithms and decrease the dimensionality of the data [4].

II. LITERATURE SURVEY

A. Students Engagement with Online Tutoring

Recent years have seen a rise in the popularity of online tutoring programmes, and several of these programmes are now funded by major colleges. This popularization, which was made feasible by a combination of accessibility, interesting content, and the lack of attendance requirements, is not, however, being genuinely successful due to the low levels of student retention. Instead of a more thorough investigation of student engagement and retention, most of the research on online tutoring systems concentrates on technical problems or implementation difficulties. By referring various articles for our research work we have gathered the information about how much attention a student shows in online training program based on the methodical analysis of prior work. By reading multiple articles and papers the concepts required for our research work were determined and mapped. We have focused on removing the barriers a student face in online tutoring and by engaging the students in study by making various connections they should be making during study. Focus is to provide the student with the best possible

education they can get under their budget, and for this our system helps them find a tutor for them.
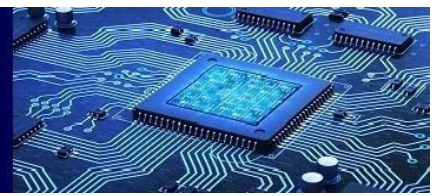
B. Authentication using JSON Web Token

JWT stands for JSON Web Tokens. This is a very popular and widely used technology for providing authentication to the system. The proposed method helps in securely transformation of information between any parties. Since JWTs may determine resource rights when users access an information system, they have advantages over other token authorization mechanisms for SSO. User roles and authorization can be communicated simultaneously in a single token by taking advantage of JWT's ability to encapsulate entities. Since JWTs can represent a set of claims between two parties, they can verify the sender of the request on the recipient. In this case it is being used for authentication of tutors or the students from the login page. JWT uses a pair of public/private keys in signing of the certificate from both sender's and the receiver's end. It is commonly used in the programming languages as it is directly converted into objects. JWT has a natural document for object mapping. It is widely used in this because with a small overhead of format, it can easily request for access routes, services, or resources after the authentication of the users. The password of the users is stored in an encrypted format in the database. After authenticating the credentials, the authentication server generates JWT that is signed with a private key. The JWT is used by the user's client to access protected resources by including it in the HTTP Authorization header. The resource server then uses the public key to confirm the authenticity of the token. In this way the JWT helps secure an authenticated connection between the user and client and protects the application from malicious attackers.

C. Online Tutoring System in Colleges

In India, the education sector accounts for about 91.7 billion USD in revenue in 2018, rising to over 117 billion USD in 2020, and has been growing ever since. With so many schools, colleges, universities, and other educational institutions in existence, the top coaching sector alone contributes around 3.5 billion USD to this. Most of the parents understand the crucial role of coaching in a student's life. They feel that it helps their child to consolidate their knowledge which school cannot do. Coaching to a student enhances the conceptual learning which is very important in selection of students in many prestigious institutions.

The burden of studies has been one of stress in a student's life. In India as the student goes up the ladder, more and more new concepts pertaining to many aspects of life are added. The rate of teaching goes on increasing but the rate of acquiring knowledge stays the same when a student starts to feel that the knowledge, he/she is studying

at school is a burden on them. After this, parents are worried about their child's decreasing grades. So, they decide to go to pioneered institutions to help their child in increasing his/her grades. Little did they know that they are more concerned about money with education instead of giving knowledge to their students. The parents did not know there are many private small business tutors ready to help their child. They just not help in coping up with stress of studies but also help them in increasing their performance in school/college.

D. Personalized Course Recommender System

The process of selecting the right course can be quite hectic and time consuming. Here, we are using the term course, which is equivalent to any study programmes or the set of skills that an individual requires. It can be a high school, intermediate, undergraduate, or postgraduate programmes. Artificial intelligence can be used to deal with this situation. Recommendation systems are very helpful for this scenario, as they can provide results based on an individual's field of interest by finding the most appropriate set of information from the vast amount of data available and filtering it as per the user's needs. The study focuses on ontology support, expansion-based information retrieval, and N-gram query classification for course recommendation. The best and most appropriate advice is provided. The system's precision in gathering the results is rather good, and it has provided us with satisfactory outcomes. Finding similar students based on their areas of interest and the needs of the targeted students is the goal of employing neighborhood formation.

E. Collaborative Recommendation System

The suggested system makes use of data mining techniques to identify trends among the courses. In order to produce association rules, the Apriori algorithm was applied twice, once with the entire dataset and once with clusters that were constructed based on the course preferences of the students. The findings show that rules developed on clusters have a better converge. To find patterns between courses, the suggested method makes use of data mining techniques. Once with the entire dataset and once with the clusters that are created based on students' course preferences, the Apriori method was used to develop association rules. The most pertinent and important information that may be utilized to calculate results is revealed after the data has been filtered through several processes. This is especially useful when students choose a course based on the talents they already have or the skills they are interested in gaining. Integration techniques for methods that can precisely anticipate a student's performance in a course and methods that assist a student in choosing a subject or courses based on interests and learning goals.

F. Deep Learning in Recommendation Systems

During our research work and development of this paper it was quite evident for us that recommendation systems can play a key role in educational field in recommending courses to users. Since deep learning has been successful in many other applications, including recommender systems, it is sense to assume that it will also be successful in these applications. Sentence segmentation, tokenization, stemming, lemmatization, and stop-word analysis are the phases of language processing. All these processes dissect the input, partition it into parts, and assign priority ratings to each component. It is planned to use deep learning in this system so that the system can carry out the recommendations from a larger dataset. Deep learning helps in training larger dataset for better feature extraction. This makes it easier to handle large sets of data in achieving more accurate results.

G. Web-Based Education and Accessibility

Technology is around us is every aspect of our day-to-day life, educational system is also greatly impacted by the technology in improving the learning experience for students. Web-based learning is not only gaining significant importance in today's learning standards but also improving the experience of students in their learning. The website would be improved by using accessible formats or by coming up with new solutions to the issue. In these situations, the user will understand what should be there if the designer utilizes an image that has HTML code incorporated in it as the title. With such benefit, the website would get more visitors no matter what type of browser they use. No matter a person's technology, software, language, location, or aptitude, the Web is essentially made to operate for everyone. The impact of disability is fundamentally transformed on the Internet because the Web removes many of the physical obstacles in communication and interaction that many people experience. Nonetheless, users may encounter barriers when trying to access the Web due to poorly designed websites, applications, tools, or technology. In our research work we have also focused on designing a high-quality educational website according to general standards of learning. The visual design of the sites should be appropriate. Websites can be considered as the sources of information, tools for assessments and platforms to produce and share products. Educational websites should provide a good user experience to users and should wisely enhance the learning for not just particular groups or individuals but for everyone.

H. Online Meeting Applications for learning

Our daily life and our educational system are both significantly impacted by the pandemic. Online meeting technologies are now being used much more frequently for

educational purposes. When it came to remote study during COVID-19, numerous platforms—including Google and Zoom—were initially considered to be helpful. But later, looking on the fact that how simple they make learning, they are now extensively employed. In order to lessen the effects of outbreaks, the community has remote learning as a choice. In favor of online and virtual learning, this alternative shifts the focus of traditional classroom instruction. For students and teachers to attain learning objectives outside of the classroom, using online meeting tools offers a variety of conveniences. Our program will not only enable easy virtual communication between teachers and students, but it will also enable users to receive help while at home rather than having to look for a counselling appointment.

III.   EXISTING SYSTEM

Existing systems belong to old well established coaching institutes. They are mainly concentrated on money which is given by the students to help them. These institutes mainly focus on giving extra homework to the students rather than focusing on the basics which a student lacks. These institutes are not able to give attention to every student [5 -6]. The private tutors are out of business due to these education selling institutions. These institutes use their fancy exhibition and advertisements for attracting the youth. Students cannot use the resources until they are enrolled under these coaching institutions. Students can find multiple options over the internet but the process of choosing the right one can be quite hectic and time consuming. There are many courses available on the internet which can be of great use but that does not mean that it will helpful for any student without having a certain set of pre-requisite skills, also since many courses are not presented in a refined form so a student cannot select and pursue that course no matter how good the content is. The students spend a lot of money and time on courses which are of no use to them. Instead of wasting these resources a student can make good use of them if they are provided with the relevant course and proper teaching method.

A. Drawbacks

The previous system had several shortcomings. Among them are:

- Lack of Personalization: Some recommendation systems take a straightforward approach, such as advising students to enrol in the most well-liked courses or those taken by classmates. These suggestions, however, are not tailored to the student's particular requirements and interests.

- Restricted Data Access: Due to privacy issues, some recommendation algorithms could not have access to comprehensive student data, which could lead to less reliable suggestions.

- Lack of Transparency: Certain recommendation systems may not give sufficient explanations of their decision-making processes. Students and faculty may become distrustful as a result of this.

- Lack of Capability to Consider Dynamic Changes: Certain recommendation systems might not be able to consider dynamic changes like modifications to the curriculum, course offerings, or student preferences.

- Bias: Based on previous data, a recommendation system could favour a specific courses, departments, or instructors. This could lead to recommendations that do not reflect the objectives or interests of the student.

In order to create efficient recommendation systems which is individualized and accurate enough it is imperative to address the issues which are mentioned in this section.

IV.   PROPOSED SYSTEM

Through this system we attempt to provide capable students the education they deserve and a chance for skillful local tutors to teach students and showcase their talent. The system acts as an intermediate which helps in connecting teachers and students. A student will register on the system and create an account. Similarly, the teacher will also register and create an account. After creating an account, the teacher will add the courses that they are offering along with the price for that course. A student will search the course based on his requirement and his budget. All the courses that will be available based on the given requirements will be shown to the student and the student can view a detailed description of the course offered. This filtration of courses is purely based on the interest and budget specified by the student. After that if the student is interested in taking that course, then he can apply for it and as soon as a student applies for a course the teacher will be notified and will receive a notification containing the details of the student that wants to connect. After that the teacher can contact the student on the given details (email, phone number). This is how the system is acting as mediocre and connecting teachers and students.

Apart from it the system also has a consultation system that will help students to have a better idea of what they should learn with the skills they already have to excel in their carrier, for example a student who knows devops will be given a suggestion to learn AWS or Azure which will help him using his devops skills in a much better way. For this the students must go to the consultation section and they must type the skill they already know, and based on that our system will show them recommendations for the courses they should learn [7].
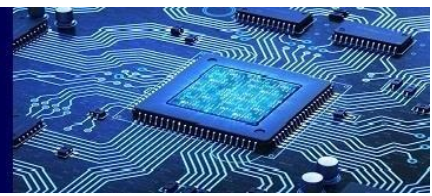
V. METHODOLOGY

The purpose of this study was to understand the importance and use of the recommendation system in the educational and consultation field. We aimed at developing a system that can be used by teachers and students or any person who wants to acquire some skills but does not know how to start and what to do. We have done research on this topic and have read multiple articles and papers regarding online tutoring systems, educational limitations for various students, lack of opportunities for skillful tutors to be in the market and lack of guidance for individuals who want to pursue their career in any specific field.

We have gathered information from various surveys which shows that many students are not able to get proper learning facilities because they are not able afford the education provided by a renowned coaching institute and they are not aware of any other source where they can get a good education in their budget. Also, many students as well as professionals are not even clear about what they should learn which will help them grow their career. Most of them are just learning numerous skills without even thinking whether that skill will be useful for them [8]. Our system not only helps students find the perfect tutor for them but also guides them and helps them in knowing what they should do. We have used the NLP (Natural Language Processing), deep learning model for implementing this. There are various ways of doing the implementation, but we have used deep learning due to certain capabilities that deep learning provides us over any other technique. Since they can handle non-linear data processing, deep learning-based recommender systems perform better than conventional ones. The main advantages of using DL (Deep Learning) for recommendations include non-linear transformation, representation learning, sequence modelling, and flexibility.

VI. IMPLEMENTATION

We have utilized a variety of programming languages and methodologies for the implementation part. We will start with website development. We used the "MERN" stack to create the website. NodeJS, ReactJS, and MongoDB collectively form the MERN stack. Determining that ReactJS would help us maintain the code in a more modularized manner, where each component would be segregated from the others and the code would be better optimized, react was utilized to construct the frontend of the website.

The Reason for using NodeJS is that node allows you to create a robust backend for your website. One of the most prominent NodeJS advantages is that it uses a single programming language (JavaScript) for frontend and backend development. Node is single threaded and asynchronous. In node the input output operations are asynchronous, and the CPU based operations are handled by the thread. In contemporary IT stacks, MongoDB and Node.js coexist without conflict. Modern apps work well with MongoDB, a general-purpose document database. Web servers are frequently powered by Node.js, a JavaScript runtime. These two tools can be used by developers to swiftly build cutting-edge apps, along with MongoDB Atlas, a fully managed multi-cloud database service. The MongoDB Node.js driver makes it easy to use MongoDB with Node.js. Developers may simply deal with their data because the driver automatically converts JavaScript objects to BSON documents. The fundamental goal of the MERN stack is to create apps that solely use JavaScript. This is because all four of the technologies that comprise the technology stack are JS-based. So, the backend, frontend, and database may be operated simply if one is familiar with JavaScript (and JSON).

There are different stages on which our model works. Starting with sentence segmentation where the model breaks the input into multiple individual sentences and understands the meaning of them independently. Then it uses tokenization by which a token, or a substitute value, is used in place of a sensitive piece of data that symbolizes a critical component. These values are used in prioritizing the data based on their importance in deriving a result.

Then Stemming, which affixes to suffixes, prefixes, or the "lemmas" of words, is the process of stripping a word down to its stem. Natural language understanding (NLU) and natural language processing both benefit from stemming (NLP). Then we apply Lemmatization which is the procedure of assembling various inflected versions of a single word. It is used in computational linguistics, chatbots, and natural language processing (NLP). After all this Stop word analysis is used to eliminate unimportant words or you can say words with less or zero values [9-11]. We perform all these steps to derive the best possible results and then results are analyzed by various graphs and heat maps. In the Fig 1.1 below, we have shown a heatmap for our model, which is being used to represent the null data. A heat map represents coefficients to show the degree of association between variables. It aids in the discovery of features that are optimal for the development of Machine Learning models. The correlation matrix is converted into color coding via the heat map. After assigning the values to components, this is used to analyze and eliminating the unimportant data with null values.
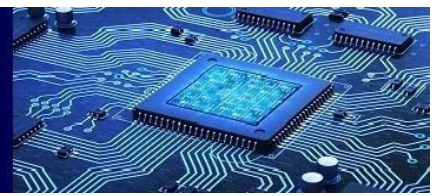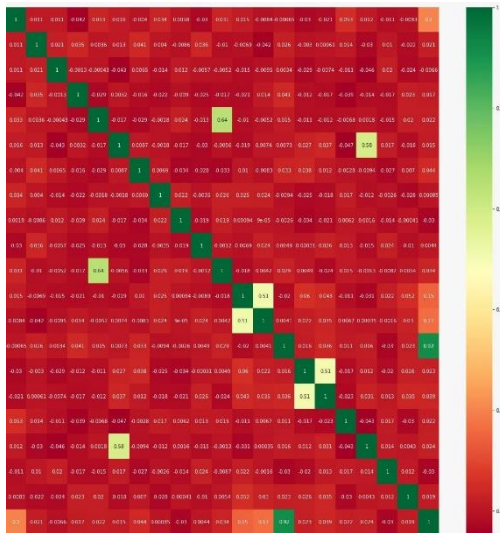
Fig 1.1 Heat map for analyzing the results

Fig 1.2 Table for result analysis

VII. RESULT

Recommendation systems have gathered our attention because they are already used in many applications. In this paper we have discussed the need for recommendation systems in the educational and consultation field and have also created a system that will provide the best possible choice of course we can provide to an aspirant. Our system works on NLP and deep learning technique and apply various steps on the input requirement to give accurate results. Fig 1.2 below shows the table showing the recommendations made by our system and their accuracy. We have achieved and accuracy between 90-92%, which shows the precision of the system and make it reliable for use.

Fig 1.3 is the Cumulative Gain Chart which helps us in algorithm prediction. The chart plots a comparison between percentage of sample represented by the x-axis to the gains represented by the y-axis. Blue line indicates the model and the red line indicated the random. As displayed, the blue line is closer to the top left corner which signifies more gain.
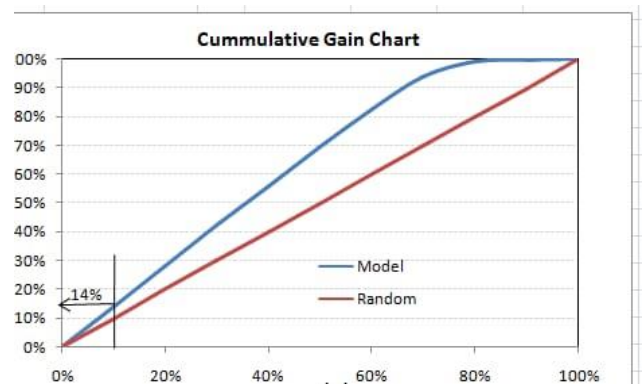

Fig 1.3 Graph showing accuracy

For now, our model is working fine on the dataset we have provided to it but in future we are planning to gather more data about the courses, training programs and user information so that we can expand the system even more. Feedback from the students based on their experience will also be gathered about the course and the recommendation

and will also incorporate in the further process of recommending a course. But overall, for now the system is working and providing the best possible result it, so that a student can get proper guidance and can have an idea about the courses he/she can go for, for building a good career.

ACKNOWLEDGEMENT

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