VIRTUAL TEACHING ASSISTANT

B. Tech Main Project Phase I Report

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In partial fulfillment of the requirements for the award of the Degree of

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DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

BASELIOS MATHEWS II COLLEGE OF ENGINEERING

(Approved by AICTE & Affiliated to University of Kerala)

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DECLARATION

We undersigned hereby declare that the project report VIRTUAL TEACHING ASSISTANT, submitted for partial fulfillment of the requirements for the award of degree of Bachelor of Technology of the APJ Abdul Kalam Technological University, Kerala is a bonafide work done by us under supervision of Ms. Anju Elsa Koshy. This submission represents our ideas in our own words and where ideas or words of others have been included, We have adequately and accurately cited and referenced the original sources. We also declare that we have adhered to ethics of academic honesty and integrity and have not misrepresented or fabricated any data or idea or fact or source in my submission. We understand that any violation of the above will be a cause for disciplinary action by the institute and/or the University and can also evoke penal action from the sources which have thus not been properly cited or from whom proper permission has not been obtained. This report has not been previously formed the basis for the award of any degree, diploma or similar title of any other University.

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CERTIFICATE

*This is to certify that the Main Project Phase I report entitled "***VIRTUAL TEACHING ASSISTANT***" is a bonafied record of the Main Project work done by* **AJMALSHA A R(BMC19CS003),JERIN K MATHEW(BMC19CS023),RESHMA MARIAM LIBU(BMC19CS039),ROHITH S(BMC19CS041)** *in partial fulfillment of the requirements for the award of the Degree of Bachelor of Technology in Computer Science & Engineering from the APJ Abdul Kalam Technological University of Kerala for the year 2022. Certified further that to the best of our knowledge and belief, the project report submitted herein does not from part of any reports on the basis of which a degree or an award was conferred on an earlier occasion .*

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EXTERNAL EXAMINER

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ABSTRACT

Virtual teaching assistant is a personal teaching “bot” which will take our learning to next level and faster as being our virtual tutor to communicate with us to clear doubts in certain subjects and concepts. Whenever students want to communicate with each other, research topics or find the best assignment help they can take help from this bot. This can be used to enhance the learning process and engagement of students in a subject. Since many students cannot follow the flow of teacher and they will forgot most of the concepts thought by the teacher so, our Intelligent teacher is a solution for that. We can make the Intelligent assistant to listen class with us and can ask doubts in that whenever there is a need. This personalized assistant will make so easy for the students to find information about the assignments, due dates or any other important events. This Virtual teaching assistant will work in Voice conversation. It will understand the conversation using of each student Natural language processing (NLP) algorithms. This is trained with many subjects and concepts by us using Machine Learning Algorithms so it will answer accurately and efficiently.

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ABBREVIATIONS

NPL	Natural Language Processing
MOOCs	Massive Open Online Courses
VTA	Virtual Teaching Assistant
AI	Artificial Intelligence
NLI	Natural Language Interface
API	Application Programming Interface
DNN	Deep Neural Network

CHAPTER 1

INTRODUCTION

1.1 General Background

The key for a bot to understand the humans is its ability to understand the intentions of humans and extraction of relevant information from that intention and of course relevant action against that information. NLP (Natural language processing) is the science of extracting the intention of text and relevant information from text. While NLP as a service platform helps developer in developing the NLP capabilities in as least amount of time as possible, at times the developers find themselves out of wits to understand the basic jargon of NLP and training their NLP as a service platform to the best of its ability. Each NLP service has its own corpora of Language and domain that it bootstraps with, the corpora gives ability to models to understand language, grammar and terminologies of a certain domain and you must choose the most suitable domain when you are deploying the NLP service. Computer Aided Diagonosis is a rapidly growing dynamic area of research in human and computer interactions. The recent researchers in machine learning promise the improved accuracy of chatbot systems. Here computers are enabled to think by developing intelligence by learning. There are many types of Machine Learning Techniques and which are used to classify the data sets.

1.2 Objectives

Simply put, intents are the intentions of the end-user, these intentions or intents are conveyed by the user to your bot. You can mainly put your intents in 2 categories

Casual Intents—I also call them ‘Small talk’ Intents. These intents are the opener or closer of a conversation. The Greetings like “hi”, “hello”, “Hola”, “Ciao” or “bye” are the opening or closing statements in a conversation. These intents should direct your bot to respond with a small talk reply like “Hello what can I do for you today” or “Bye thanks for talking to me”. The casual intents also comprise of Affirmative and Negative intents for utterances like “Ok”, “yes please”, “No not this one but the first one”, “Nope”. Having General affirmative and negative intents help you handle all such intents and rather take them in context with the conversation bot just had with the client. For ex—if the Bot just asked a question to end-user—you should expect

either an affirmative or a negative intent and if its anything else Bot can ask the same question again. Your affirmative and negative intents should be able to handle most such utterances.

Business Intents—These are the intents that directly map to business of the bot. For eg—if it's a Movie information Bot then an utterance from client like "When was Schindler's list released?" is a business intent that intends to find out the Release year of Schindler's list and you should label it accordingly with an understandable name like "GetReleaseYearByTitle". Ideally you should think more about business intents because rest of small talk like saying hellos or affirming choices is taken care by general casual intents. Business intents have metadata about the intent called "Entities". Let's take an example for an Intent "GetReleaseYearByTitle"—Sample Utterance "When was Schindler's list released ?" Here "Schindler's list" is the title of the movie for which the user "intends" to find out the release year. The process of finding the entities can be understood at Part of speech (POS) tagging. However as a user of NLP as a service you don't need to get into the technicalities of knowing how POS tagging work but if you do want to here is a nice paper on it

CHAPTER 2

LITERATURE SURVEY

2.1 Teaching assistant for students, July 2019

The greatest potential for VTAs lies in the menial tasks that take up teachers' time yet could be automated by AI, but VTAs are not a viable alternative to the complexity, understanding, and empathy of human teachers who perform the monumental task of shaping the lives of young students on a daily basis. Given these limitations, we consider which actors should use VTAs, when they should be deployed during a school year, and which subjects these are best suited for .There are strong incentives for individual students to seek out help from a VTA, given they can help increase their scores by 5-10 points on the gaokao , making them jump up a tier in higher education. Schools are in turn rewarded for improved performance by students on the gaokao . The incentives therefore align best for selling to schools and designing the VTA to include features relevant to both teachers and students, such as automated grading and personalized reports on student exam performance over time. According to our teacher interviewees, additional homework help, question-and-answer on the lessons given during the day, and self-study are tasks that students generally perform on their own, not with groups of other students. Products that assist students with self-study and adaptive learning have become very popular in recent years, especially up until DRP (Zhan, 2019). Furthermore, VTAs are not effective at assisting creative or collaborative tasks, so they are more well-suited to the tasks listed above. They are particularly useful in the context of review for major exams such as midterm and final tests for three reasons. In preparation for large exams, students can look back on historical reports of their performance in different quizzes and tests over the course of the semester to hone in on weak knowledge points. In this context, VTAs also help teachers grade the large amounts of exercises that students are using for review. Lastly, whilst VTAs are not a perfect solution for online education, their personalized nature, ability to engage students, and integrated use in the curriculum make them appealing as an aid to online education.

2.2 Video virtual assistant for students, June 2021

The education technology sector is huge in Asia, especially the focus on tutoring in preparation for standardized exams . Asian parents are spending considerable amounts of their income on tutoring. Concretely speaking, there are three main categories of online AI-enabled education services in China's market: teaching assistants, that can assist teachers on tasks such as grading homework and test papers autonomously; teaching management for support on matters such as course scheduling; and assistance for self-study and adaptive learning .Overall, the literature reveals that tutoring is effective, with some findings indicating that it is more beneficial to have teachers or paraprofessionals (those who might not have been 'full' teachers but still have experience in that realm) doing the tutoring than non-expert educators or tutors .Remote tutoring through video calls is one common way of providing education online today. A study in Italy found that tutoring program helped boost tutees' scores not only with standardized testing, but also increased their "psychological well-being" and "aspirations and socio-emotional skills" (Carlana & La Ferrara, 2021). Additionally, tutees not only improved their scores, but tutors also scored higher on empathy assessments, showing that there must be a focus on the effects of remote tutoring on the tutors themselves.

2.3 Remote tutoring for students , July 2021

In the case of Massive Open Online Courses (MOOCs), there are multiple case studies of VTAs. Jill Watson helps to offload mundane and routine tasks for teachers so that they can engage more deeply with students, while simultaneously helping students focus on what they know and do not know (online education). Chatbots like Jill Watson are being used to improve the student learning experience and student services in general, providing 24/7 on-demand learning support for them . Students are paired with a "lifelong learning companion" that accompanies them to classes and helps with their homework. These virtual friends are not meant to replace the teachers, but instead support them by reducing their workloads .Emotionally speaking, most VTAs currently exist either in the uncanny valley (in which they imperfectly resemble humans, evoking a sense of "uncanniness") or tend to be more robotic than human. Belpaeme et al. (2017) argue that robots' appearance and behavior affect learning outcomes, explaining how robots have a distinct social character which influences the student responses that are conducive to learning. Wang et al. (2021) suggest a "mutual theory of mind" as a

theoretical framework for designing long-term human-AI interaction, again using Jill Watson as a case study. For instance, the Kruskall-Wallis tests how anthropomorphic the AI is. Automated sentiment analysis can be employed to test the positive effects that the AI's responses have on the students' perception of a VTA .Technically speaking, robot teachers are not perfect. For instance, in speech recognition and computational vision, there is the risk of inaccurate interpretation of a learner's behavior . Moreover, there will often exist gaps between users and developers in expectations and familiarity. Hence, it is crucial for users of chatbots to understand the social and technological limitations of VTAs, to avoid frustration as a result of a mismatch between their expectations and the product's capabilities .

2.4 Online virtual assistant for students, March 2021

In the case of Massive Open Online Courses (MOOCs), there are multiple case studies of VTAs. Jill Watson helps to offload mundane and routine tasks for teachers so that they can engage more deeply with students, while simultaneously helping students focus on what they know and do not know (OnlineEducation, n.d.). Chatbots like Jill Watson are being used to improve the student learning experience and student services in general, providing 24/7 on-demand learning support for them (Teachonline.Ca, 2021). Students are paired with a "lifelong learning companion" that accompanies them to classes and helps with their homework. These virtual friends are not meant to replace the teachers, but instead support them by reducing their workloads (Furness, 2020).Emotionally speaking, most VTAs currently exist either in the uncanny valley (in which they imperfectly resemble humans, evoking a sense of "uncanniness") or tend to be more robotic than human. Belpaeme et al. (2017) argue that robots' appearance and behavior affect learning outcomes, explaining how robots have a distinct social character which influences the student responses that are conducive to learning. Wang et al. (2021) suggest a "mutual theory of mind" as a theoretical framework for designing long-term human-AI interaction, again using Jill Watson as a case study. For instance, the Kruskall-Wallis tests how anthropomorphic the AI is. Automated sentiment analysis can be employed to test the positive effects that the AI's responses have on the students' perception of a VTA (Patel et al., 2020).

CHAPTER 3

METHODOLOGY

3.1 Existing system

Need to refer the queries through books and Via browsing the Internet. Interaction with friends about particular subjects. Seeking for well knowledgeable person in particular subject. In this paper, we propose IoT-NLI, a natural language query and control interface for popular IoT platforms, which uses hierarchical semantic parsing algorithms and directed edge-tagged graph structures to efficiently parse natural language commands input by users, enabling them to perform multiple operations contained in one complex natural language command. Experiments in three domains, agriculture, industry, and smart home, show that IoT-NLI has excellent performance and reasonable response time. Finally, a IoT-NLI application was developed on the Android platform and integrated with the AliCloud platform. It enables users to query and control devices on Android phones through chat windows similar to instant messaging software.

The task of building natural language interfaces for IoT platforms has received the attention of many researchers due to its practical relevance in real-life situations .The fundamental task of the interface is to analyse the meaning of the commands ignored to identify the user's goals and send them in a certain form to the device and lead to a series of operations by the controlled device .Key-word based interaction approaches are the most popular among related studies ,constructed an intelligent virtual assistant . A natural language interface for a smart home scenario , which is used NLP tools to do semantic annotation of natural language commands to extract elements such as location, device, and actions from them, which is more goal oriented than the above approaches ,but still focuses only on the meanings expressed by individual words in the command and ignores the logical relationship contained int the natural language command statements. In the system we consider the command parsing problem as a construction process of a directed acyclic graph structure and use the command structure features to obtain the intend of each operation. In this system, we propose a hierarchical semantic parsing framework for efficient structured parsing of Chinese natural language commands in the form of directed edge-tagged graphs.

3.2 Problemstatement

The main problem that afflicts the creation of such a VTA is the lack of a corpus of interactions between students and teachers. In this scenario, trying to predict what the students will ask when designing a chatbot is an arduous task. Also, understanding the meaning of the messages coming from students is no less, because even for requests that can be predicted they can include a mix of words that could be easily misinterpreted. A first version of the implemented solution is made accessible to students enrolled to the course in the academic year 2018/2019, to observe how they interact with it and to improve its functionalities and understanding capabilities. The VTA created for the course at issue is named Rexy, from the combination of the two words Recommender Systems. Because of the lack of data, the probability that some requests get misinterpreted by the VTA is high and it was expected that it could not reply correctly to all of the students' questions, so an active monitoring of its actions was performed, in order not to let important requests unanswered and let Rexy confuse the students. Since the communication channel of the bot is an instant messaging application, users always expect an answer. Therefore if the assistant is not very confident in the interpretation of the input message, it will either ask for clarifications or say it did not understand the request. Confidence is computed by Watson Assistant for every analyzed message and plays an important role in the choice of the response for that message. To guarantee a certain level of quality in the answers sent from the VTA to the learners, especially in the early phases of the experiment, the bot forwards to human teaching assistants the questions that cannot be interpreted with enough confidence. They can easily decide whether the question should or should not be managed by the bot: in the first case they can tell the bot whether its interpretation was good or wrong, and they can instruct him on how to read the request and how to respond in the future cases; in the latter case the human designed reply is sent to the user that asked the original question. This is part of an active learning strategy performed in two different ways, by asking students if they think their messages are interpreted correctly in what will be referred to as "conformation questions", and by asking teachers their opinion on the interpretation with "teacher questions".

This mechanism is essential to make the VTA continuously learn from experience and manage in a better way known cases and new cases during its lifetime. Another important requirement of this project is the adaptability of the VTA to other courses. Indeed, a VTA that is able to converse with students from any course, with just some substitutions in his knowledge base can be arguably much more useful and interesting. This drove the design choices of this project, from the database schemas to Assistant's training data. The resulting VTA has some course-independent conversation capabilities, such as the ability to talk about the syllabus of a course and the concepts explained in the MOOC. For the first one, a simple adaptation of the responses the VTA shall give is required.

3.3 Proposed system

Once installed our Chabot can attend queries at any time of the day. Thus, the Student doesn't have to wait for the someone to help them.AI-based chat bots are capable of learning from interactions and updating themselves on their own. This is a big benefit when it comes to investing time in educating the executives about the same. Accuracy will be more while we learn from the exact information from the machine . to design entity and intent based chatbor useful for student and learner as a virtual teaching assistant. We have introduced the design principles of a chatbot. We have used the examples of some popular utilities to explain them specifically. The empirical result to create a prototype for the proposed test is shown in the form of questionnaire and recommendations. We have tried to find out a relationship between chatbot and utility. We have also presented the study of their time complexity, according to the algorithm of a chatbot. In the future, human beings are more likely to use human-computer interaction by interacting with chatbots rather than using network connections or utilities. With this research, we hope that we can provide a better understanding and some clear information for people to know better about the relationship between chatbot and utility. The key for a bot to understand the humans is its ability to understand the intentions of humans and extraction of relevant information from that intention and of course relevant action against that information. NLP (Natural language processing) is the science of extracting the intention of text and relevant information from text. While NLP as a service platforms helps developer in developing the NLP capabilities in as least amount of time as possible, at times the developers find themselves out of

wits to understand the basic jargon of NLP and training their NLP as a service platform to the best of its ability.

CHAPTER 4

SYSTEM ANALYSIS

4.1 Use case diagram

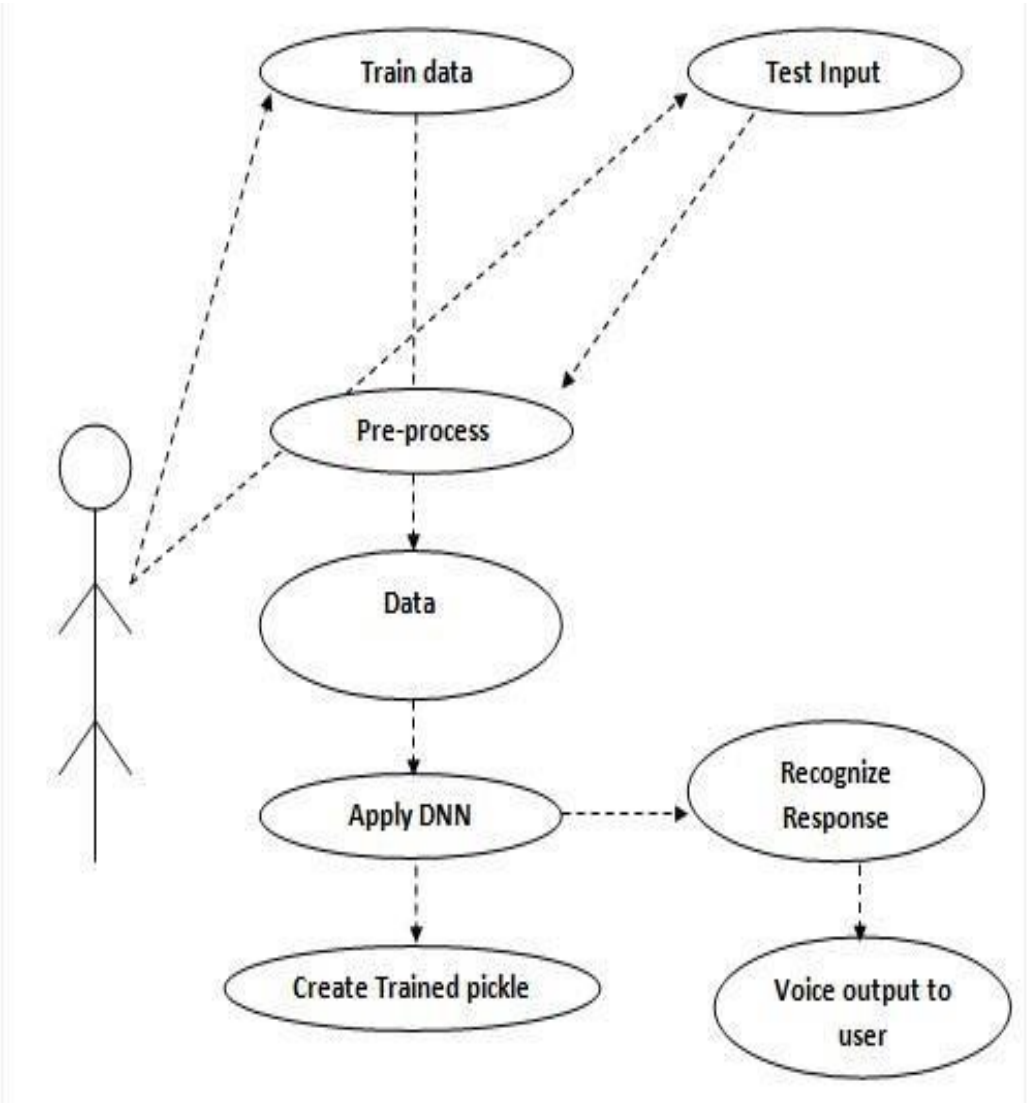

Figure 4.1.1 Use case diagram

4.2 Architectural diagram

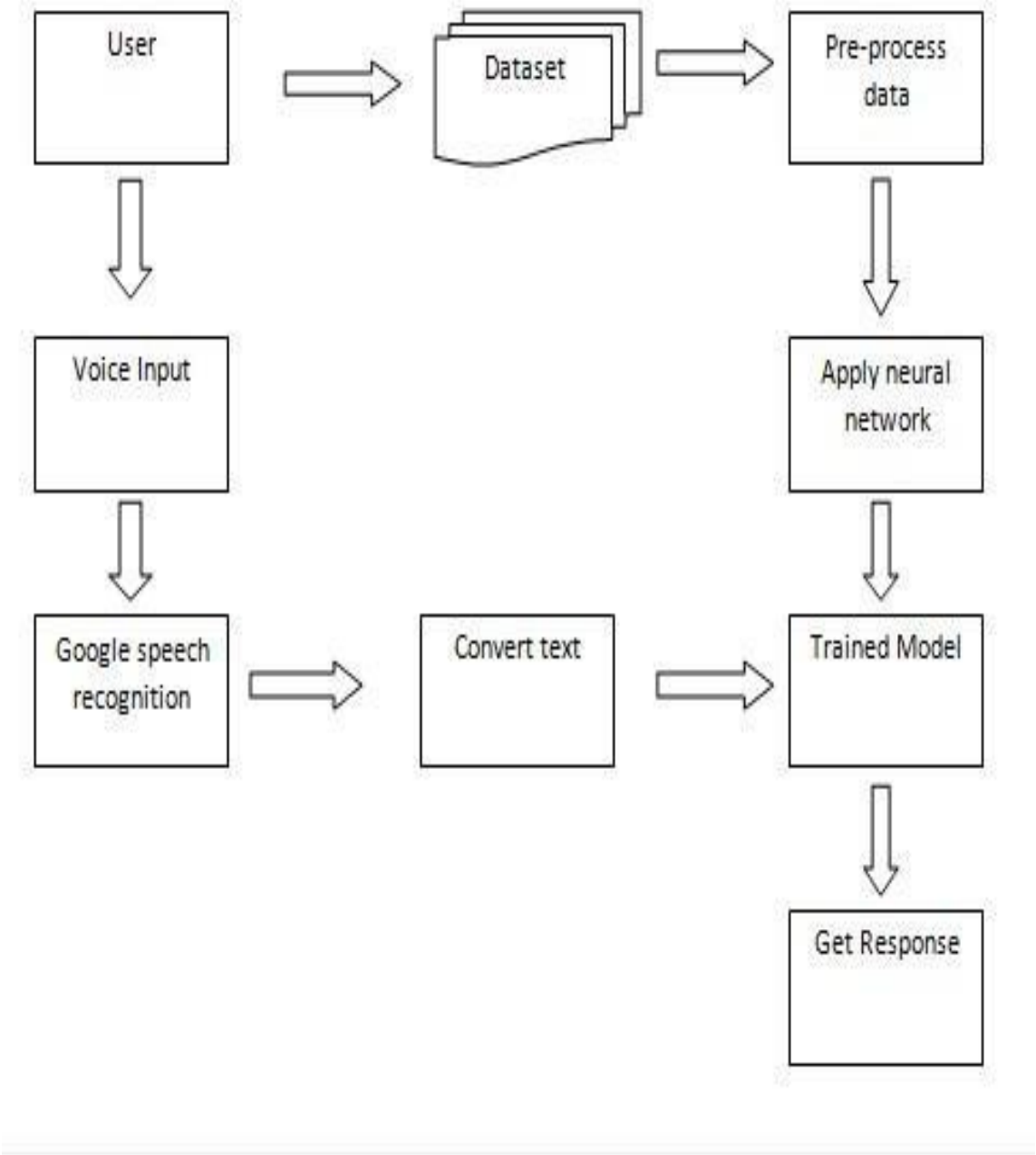

Figure 4.2.1 Architectural diagram

4.3 Data flow diagram

Level 1

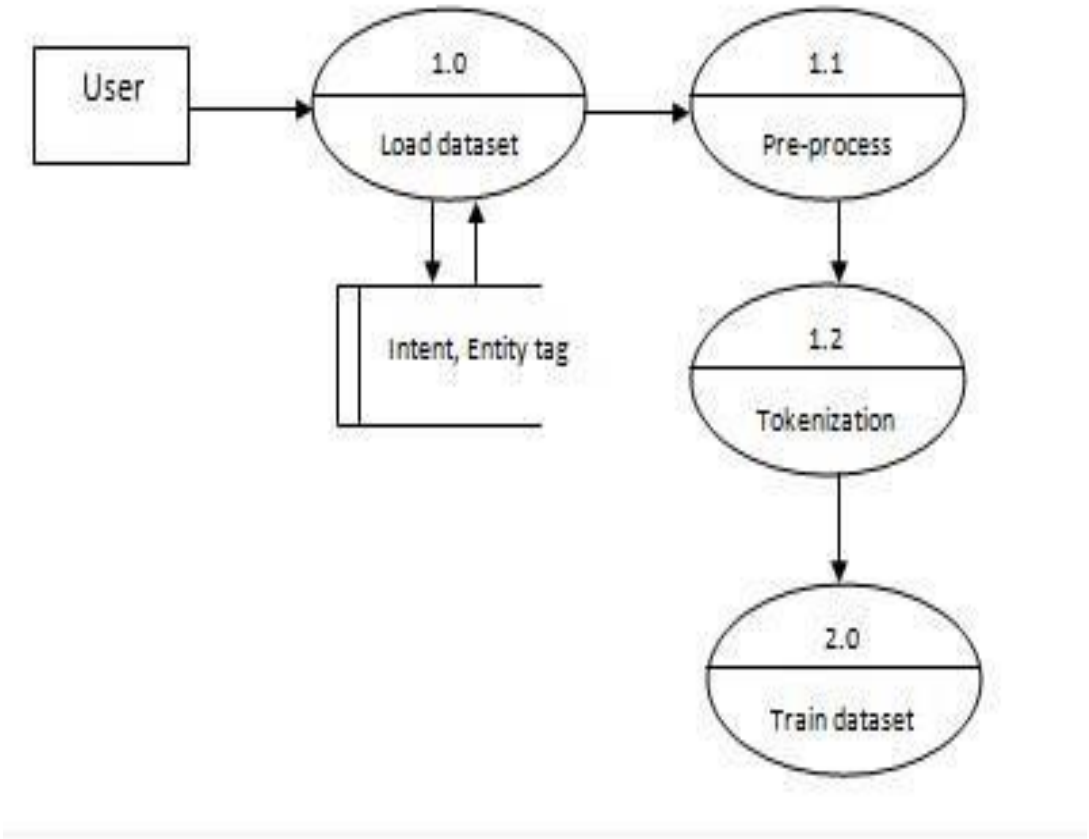

Figure 4.3.1 Data flow diagram Level – 1

The above figure represents the data flow diagram of level1, in which the user loads dataset, function module 1.0 is loading the dataset, 1.1 is pre-processing the data by ignoring the list of words. Functional module 1.2 represents the tokenization or feature extraction of words and classes the next functional module 2.0 represents the train dataset, which explained more in next diagram.

Level 2

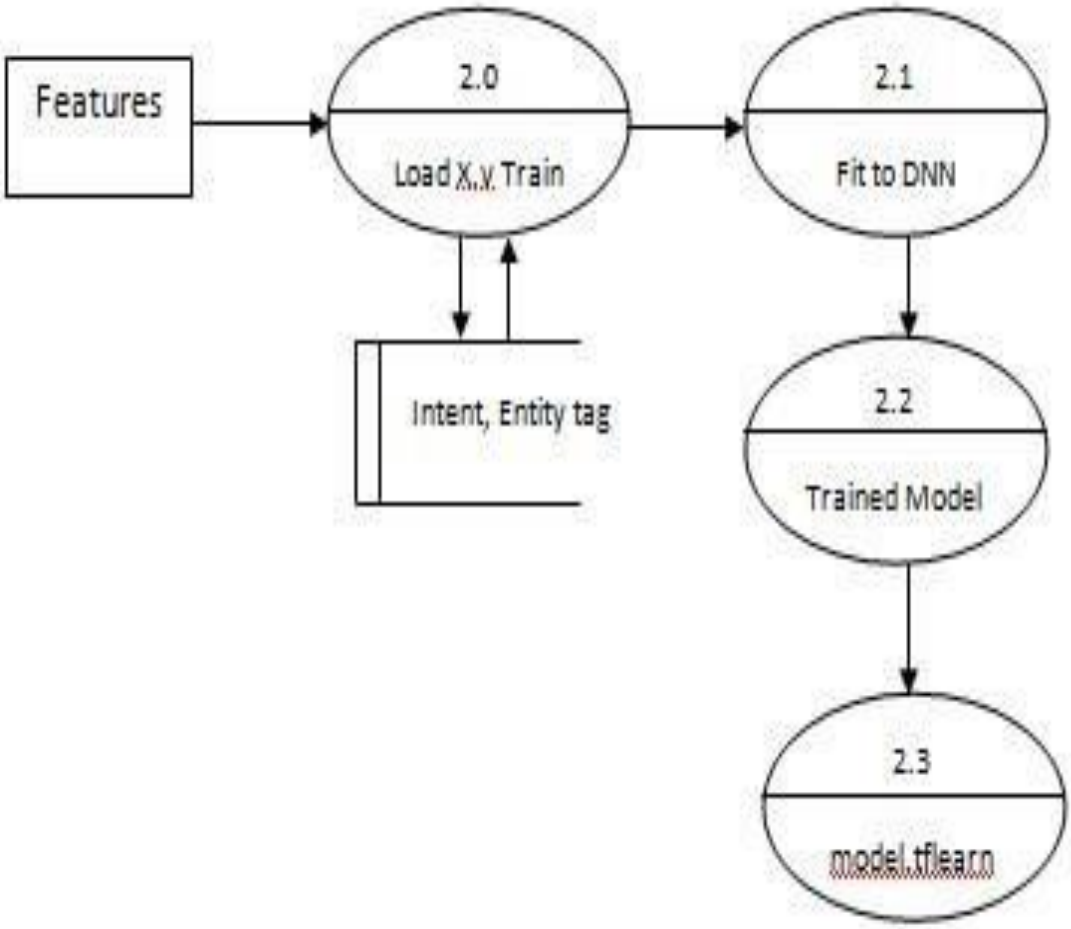

Fig4.3.2 Data flow diagram Level – 2

The above figure represents the data flow diagram of level2, in which the extracted features are loaded, function module 2.0 is loading the X-train and Y-train dataset, 2.1 is applying DNN model. Functional module 2.2 represents the training using DNN and functional module 2.3 represents the train dataset output file of model.tflearn.

Level 3

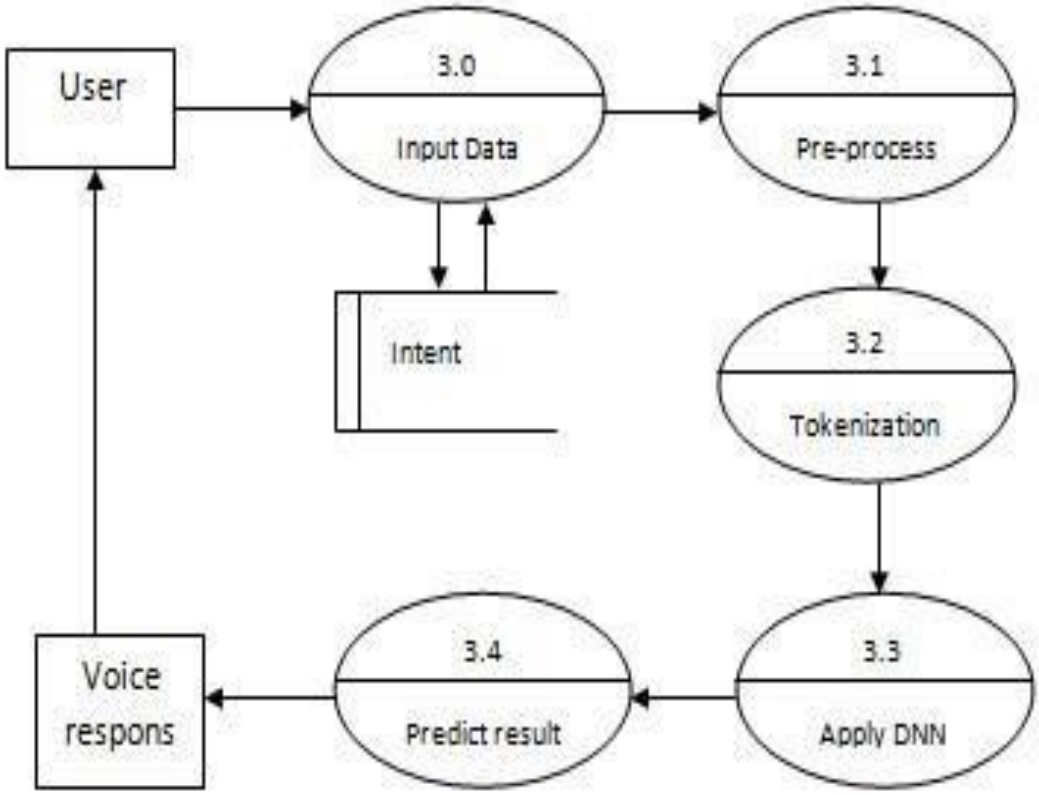

Figure 4.3.3 Data flow diagram Level – 3

The above figure represents the data flow diagram of level3, in which the user give voice input, function module 3.0 is loading the input, 3.1 is pre-processing the data by ignoring the list of words. Functional module 3.2 represents the tokenization or feature extraction of words and classes the next functional module 3.3 represents apply DNN and predict the output.

4.4 Activity diagram

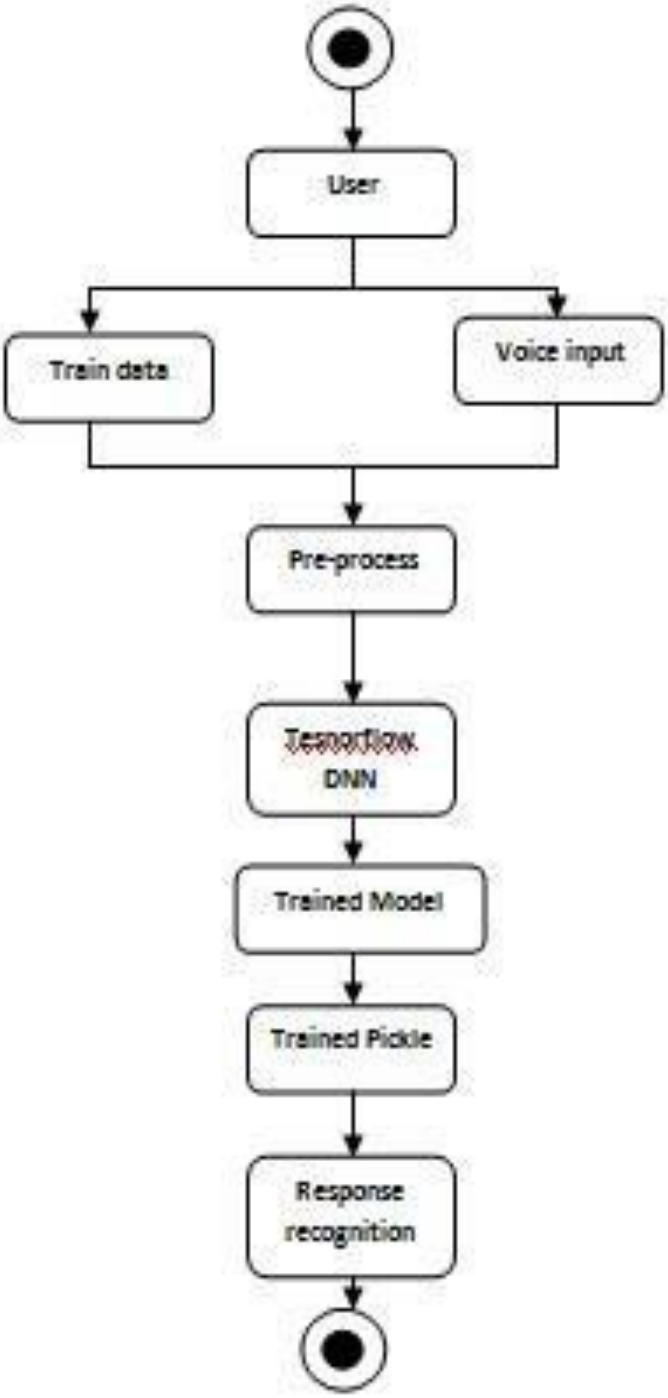

Figure 4.4.1 Activity diagram

The above figure represents activity diagram of proposed system.

4.5 ER diagram

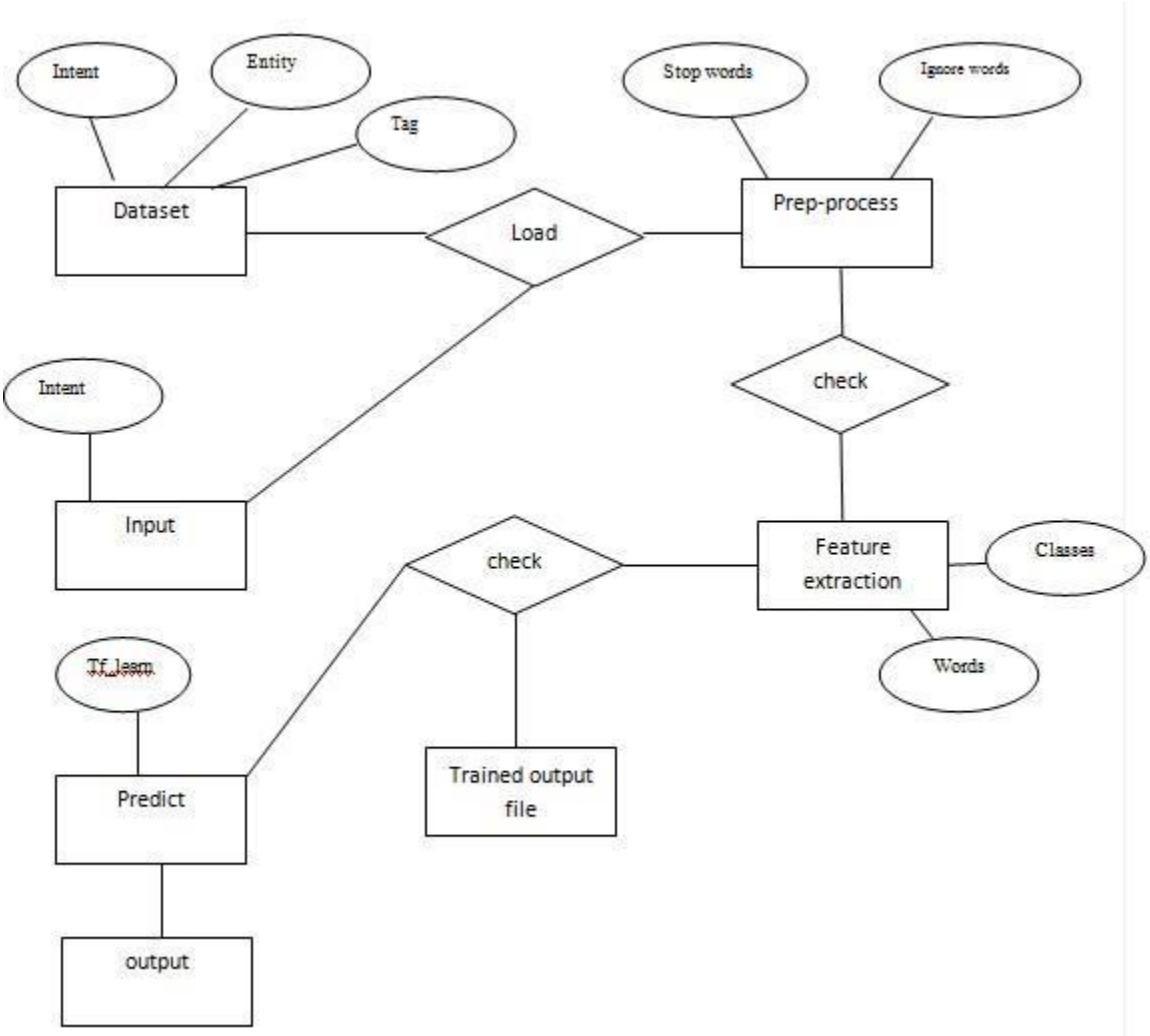

Fig 4.5.1 ER diagram

The above figure represents ER diagram of proposed system, in which oval boxes represents the data given to module. Input, output and modules are given in square boxes.

CHAPTER 5

CONCLUSION

We developed Virtual teaching assistant a bot using neural network. This can be used to enhance the learning process and engagement of students in a subject. This chatbot assists many students cannot follow the flow of teacher and they will forgot most of the concepts thought by the teacher. We can make the Intelligent assistant to listen class with us and can ask doubts in that whenever there is a need. This Virtual teaching assistant will work in Voice conversation. It will understand the conversation using of each student Natural language processing (NLP) algorithms. This is trained with many subjects and concepts by us using Machine Learning Algorithms so it will answer accurately and efficiently.

This chatbot is trained on static data, which can be even trained with the latest information available, like current events. Ideally, we would want the model to be trained automatically after a brief period of time. There are some new research on combined CNN and LSTM. The advantage of this architecture is that the model complexity is reduced, making the training time faster. Additional languages could be trained in order to cover a wider user base.

More challenging user problems could be investigated. In particular, computer vision algorithms could be trained to extract information from photos users send of their ID cards, credit cards, etc A different dynamic version of the chatbot could be designed. This variant would need to be more reactive than the variant presented in this document by displaying more small-talk capabilities and creating more direct and customized interactions with customers. This variant could then be deployed to Facebook and other instant messaging services that support the use of bots.

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