**TITLE: AI BASED CHATBOT WITH DEEP NLP.**

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**ABSTRACT**

An artificial intelligence (AI)-powered chatbot is a software programme that imitates human interaction making use of text messages. It adopts machine learning and artificial intelligence to manage responses from the users, understand it, and also to respond accordingly. Several industries, including customer service, healthcare, e-commerce, and education, can gain benefit with the utilization of AI chatbots. AI chatbots can assist users by responding to the queries, delivering the information, helping the users through a process, or even guiding the users with making a decision to purchase.

The main aim of the project is to develop an AI chatbot using natural language processing (NLP) and sequence-to-sequence (seq2seq) architectures. This chat is using the Cornell Movie Dialogue Dataset to train this model. The objective is to create a chatbot that provides meaningful and required output to the user.

The preprocessing involves text cleaning, like clearing the vocabulary and grammer errors, and tokenization. Encoding and decoding are the parts of the deq2seq model where the encoder converts input keywords to fixed-length vectors, while the decoder provides or generates the response on the basis of the encoded keyword.

**CHAPTER 1**

**INTRODUCTION**

**TITLE OF THE PROJECT: AI BASED CHATBOT WITH DEEP NLP.**

**1.1 Background of the Project**

An artificial intelligence (AI)-powered chatbot is a software programme that imitates human interaction making use of text messages. It adopts machine learning and artificial intelligence to manage responses from the users, understand it, and also to respond accordingly. Several industries, including customer service, healthcare, e-commerce, and education, can gain benefit with the utilization of AI chatbots. AI chatbots can assist users by responding to the queries, delivering the information, helping the users through a process, or even guiding the users with making a decision to purchase.

**1.2 Problem Statement**

However, accurate and effective conversations among humans and robots is the primary issue that chatbots strike to solve. Users may find it problematic and exhausting when interacting with the machines because the traditional ways of communication are limited to rigid interfaces and tricky commands. Furthermore, human customer support agents can grow overextended with habitual and repetitive queries, which leads to hinder and poor customer experiences. By rendering a natural and conversational interface that can oversee basic queries and roles, chatbots aim to resolve these challenges while releasing the human agents to perform on more complicated issues. The problem lies in creating a chatbot that can understand and react to human language with exactness and efficiency. The heart of AI-based chatbots is the desire for productive and realistic human-machine conversation, with a priority on accuracy, flexibility, and confidentiality.

# 1.3 Objective of the Work

* Interact with the AI based bot wherein humans cannot be accessible all the time.
* To make conversations more naturally with the AI bots.

# 1.4 Scope and Limitations

# 1.5 Proposed Method

The initial phase is to figure out the chatbot's objectives, target market, and the nature of inquiries and queries, it is strong enough to respond. The chatbot must be trained on a huge dataset of user interactions, in an attempt to increase its accuracy and responsiveness. Several varieties of frequently insisted inquiries and queries ought to be leveraged in the collection. The dataset is required to be pre-processed in order to handle missing data, eliminate noise from the text, and transform the text to create a format that machine learning models can employ. The NLP pipeline involves the steps of tokenization, stemming, lemmatization, and entity recognition. The pre-processed dataset is trained, then an appropriate chat interface must be enhanced and linked to the machine learning models. A constrained sample of users shall be used for testing and evaluating the chatbot in the sense to determine its accurateness, responsiveness, and user experience. depending on the comments, the chatbot can be improved and customized for greater productivity.

**CHAPTER 2**

**LITERATURE SURVEY**

**2.1 Explanation of the literature survey Conducted**

Chatbots that are powered by AI, possess the ability to offer both customer and governmental services. In an effort to improve chatbot accessibility and efficiency in replying to user queries, the study outlines the various soft computing techniques employed by researchers. It additionally, highlights the benefits of utilizing chatbots in public administration, having the capacity to facilitate individuals in acquiring government services with no need for administrative employees. The study recommends that, banks equip the “May I Help You?” counter at bank entrances along with chatbots to facilitate instant communication among employees and the customers through the outbreak. In summary, this study illustrates the huge opportunity for enhanced leadership and customer service that chatbot technologies combined plus AI assist provide [1].

The study presents an in-depth examination of conversation-driven chatbot management techniques. The study offers guidelines for organizing, developing and evaluating chatbots that can interact with users in natural language. Post-deployment content management’s importance for maintaining the knowledge base compliant with customer behaviour is also addressed. The study comprises various references on the usage of chatbots, machine learning and artificial intelligence [2].

The positive aspects and negative aspects of a hybrid model K-12 E-Learning Assistant Chatbot are covered. The study makes the evident that online learning provides multiple benefits over traditional classroom training, like the flexibility to study and the capacity to decide a location and time which are appropriate for the user. Chatbots used in educational institutions, fortunately, must be customized to K-12 student’s level of cognition and also take into account user psychology as well [3].

The study examines the effect of AI-based chatbots in customer service on customer satisfaction. The authors analyse the application of chatbots in e-commerce setups along with how it impacts the client satisfaction and adherence. The usage, collaborations, modification, distribution, and replication of the study are all permissible within the terms of a creative commons attribution 4.0 international licence [4].

An AI-based medical chatbot model for identifying infectious diseases is offered in this study. Clients have the choice of phoning, messaging, or using voice commands to communicating with the chatbot. The study proposes a deep feedforward multilayer perceptron-based interactivity and predicting model for AI based chatbots. The chatbot’s characteristics and behaviour towards humans are clarified by the authors using natural language processing. The key objectives of this work are to further develop chatbots in the medical industry and deliver appropriate disease prevention strategies [5].

The success rate of E-learning is analysed in connection with the usage of Brain Computing Interface and the Bio-Inspiring Learning Style Chatbot inventory. It offers information on chatbots and their possible usage in knowledge management, mentoring support and smart teaching systems together with data on particular author’s area of study. In the end, it offers wise advise on the best ways to utilize technology to enhance educational opportunities [6].

The study performed an organized assessment of 36 publications to take a look at latest attempts to employ chatbots in learning. The review focuses at seven components: the educational setting, the platform, chatbot utilization, interaction tactics, evidence to support, and possible drawbacks. The study offers an in-depth examination of the methodologies and varieties of learner chatbot communication that are currently employed in enhancing the process of learning. It also addresses the obstacles that remains along with potential future research domains, along with the design concepts that has served as an outline for the creation of educational chatbots. In short, this study aims to encourage the development and assessment of chatbots for education in the field of education and HCI [7].

The primary objective of this study is Retrieval-polished Response Generation for Chatbot interaction. The study presents an creative strategy to Chatbot interaction that employs a Retrieval- polished model for generating responses. The modal discovers a prototype with a similar environment and enhances the draught response in order to offer an outstanding end response. The findings from experiments provided in this study demonstrate that this approach surpasses existing strategies. The primary goal is to solve the chatbot interaction issues which includes a lack of variety and a shortage of contextual relevance [8].

The challenging analysis of the study on the usage of chatbots in the digital business transformation includes publications from acknowledged publications. The study’s goal is to outline the present situation of chatbot research, describe how thy contribute in the transformation of digital enterprises, and highlight areas that needs additional research. This involves an examination of chatbot applications and area of focus, along with the data how the chatbot impact the user engagement and experience. It highlights the limitations and boundaries of using chatbots in the digital business transformation and provides suggestions for enhancements. As a whole, this offers enlightening data on the rising number of study on chatbots and how they affect enterprises [9].

The utilization of chatbots for enabling students to take part in completely online activities is addressed in this study. In the two experiments, one upon the setting objectives, the other on social presence. The authors employed chatbots to assist students throughout online tasks. The study examines the efficiency of the chatbots and offers advice for developing educational chatbots [10].

The approach adopted in this study involves an extensive review of the literature on chatbots regarding education. The method has three basic phases:

1. Describing the steps associated with the method review, which includes the research queries, the most effective way to respond them, the method of search, and the selection and exclusion criteria.

2. Performing the research through choosing appropriate papers, evaluating their value, and collecting the outcomes.

3. Describing the results of the study.

The study examines the literature in keeping with the instructions in order to offer a basis for new method and techniques and to discover area of interest for additional research. The study addresses the negative aspects of using chatbots in education, which includes technological limits that limits their effectiveness as well as legitimate, technical and maintenance issues. The study highlights difficulties from a range of viewpoints, which includes chatbot design and student communication with educational chatbots [11].

A few of these techniques are included in the usage of multi-modal chatbots to assist staff with activities and offer crucial data. The creation of smart decision-making systems for assurance of quality, and the utilization of machine learning algorithms for proactive maintenance. The study additionally addresses the significance of information gathering and analysis in these procedures, including the necessity for collaboration throughout various departments and stakeholders beneath a manufacturing company. The techniques addressed in this study basically seek to employ AI technology to enhance industrial setting’s productivity, effectiveness and quality control [12].

The suggested method is user-centered and makes use of geographical representation of the word space to define measurements for the ability of the users for abstraction. The method was used to figure out how effectively an entertaining chatbot built for elderly peoples with no prior experience with technology caried out. The benefit of the chatbot for bettering the users data searching skills was examined with a wide variety of user groups, and the findings were favorable. Furthermore, if customers showed interest in previous papers, the chatbot might collect keywords from the users conversation to focus on future queries for new materials. the entertaining chatbot was created as it was essential for elderly individuals to offer with an exciting and personalized way to access current information and news while overcoming the gap in technology that might prevent them from being fully involved in the community [13].

The primary goal of the study on JAICOB is to offer a chatbot with a modular framework called jaicob, it was created to teach data science methodologies and seeks to make use of each of the advantages for education. Because of its modular design, it can be customized to a variety of educational fields. Jaicob is a chatbot it is designed with a modular architecture it was created to help students in learning Data science skills. The chatbot communicates with students and provides them with customized educational opportunities. The chatbot’s interaction process is flexible and simple to maintain. It can additionally be used for knowledge domains besides data science [14].

The SEQ2SEQ++ model uses a multitasking-based approach in order to generate informative and appropriate responses for chatbots that answers to queries. The method makes use of novel attention mechanism known as comprehensive attention mechanism along with a dynamic task loss weight technique for MTL loss calculation. When compared to the other methods, SEQ2SEQ++ exceeds two previously suggested models on bilingual evaluation understudy, also word error rate and District-2 metrics. The researchers used the SEQ2SEQ++ as a model and platform to train their question and answer system based on other dataset or the topic. The outcome of the study is used to develop applicable and relevant responses to the queries asked by the user, which will improve the functioning of chatbot systems which are currently in use. The SEQ2SEQ++ model is used to train the chatbots in various fields, also includes customer service and education, and it is restored frequently with new information in order to keep up with the latest findings [15].

The survey begins up by highlighting a variety of factors that influence Seq2seq model’s weaknesses including input query’s inability in providing an appropriate result, the presence of uncommon words in training data, and the effects of the language model. Beyond that the study goes through the several changes that researchers have put forward for fixing the issues. The researchers have recommended a several kinds of modifications to Seq2Seq models, namely the usage of additional embedding and encoders, using variety of loss functions and training methodologies, along with additional methods like copying the source words and concentrating on a specific portion of the input. One of the main serious drawbacks is a lack of in-depth research study on the training data and evaluation standards utilized by multiple researchers. The lack of study on the impact of different languages and cultures on the development of natural responses has additionally been identified as a research gap. A search technique is applied in beam search to pick the most effective responses from a wide variety of potential responses [16].

The authors built a transformer-based neural network for answer selection, wherein the authors employed a Bidirectional Long Short-Term Memory to gather both the global information and sequential characteristics derived from the question or answer contents. The Transformer-Based network places greater focus on sentence embedding than Seq2Seq. in addition it is unlike the common transformer, the author employed a BiLSTM to include sequential features instead of position encoding. Furthermore, they make use of max pooling, and also the attentive pooling to build phrase embeddings over queries and responses. The three of these aggregated techniques provide three related transformer-based models, named as QA-TFWP, QA-TFMP, QA-TFAP. The experimental findings showed that, when it was compared with numerous competitive baselines, the proposed Transformer-based response selection models are capable of producing a better results [17].

The Match-LSTM framework, an important contribution to the area, is brought up by the researchers in the study. It also focuses regarding the QANet model, which quickens up and improves the precision of answer generation through combining Convolutional Neural Network with LSTM. The study additionally draws attention to a new approach for classifying Chinese queries that involves CNN and an attention mechanism. The study discusses the Wang and Nyberg approach, which generates answers using Bidirectional Long-Short Term Memory Network. It additionally makes reference to the MATCH-LSTM network layout, which was proposed by the Wang and jiang, which serves to find continuous terms in the study. Some of the limitations are: the drawbacks of CNN and convolutional recurrent neural network in collecting whole semantic data as well as capturing contextual relationship, The challenges related with using few of the current techniques, such as MATCH-LSTM network topology, for predicting the longer responses [18].

Using Neural-Network based dialogue models, the study proposes a novel approach for improving chatbot applications. In an effort to improve the quality and accuracy of chatbot responses, the study addresses the challenges of developing suitable responses for input queries. It also offers the suggestion for a solution which involves, unstructured textual data. The suggested approach thoroughly analyzes knowledge embeddings relevant to the dialogue context and derives few of its idea from the ways individuals conduct dialogue generation. A significant challenge with modeling and generating informative terms, including named entities, particularly when the entities are limited in the training sample. Developing a number of responses that are specific and take into account of user identity, personal expertise and other details is an additional obstacle. The study evaluates the efficiency of the suggested methods towards strong baselines using the ubuntu dataset. Both automated evaluation and human evaluation metrics are utilized to evaluate the model. The study also addresses the objective measures, which include distinct-1, distinct-2, average entropy, in order to evaluate the ability of suggested approach to support diversity and provide more additional information during the dialogue creation [19].

The Seq2Seq model is a deep learning architecture, this helps midoBot, which is Arabic chatbot mentioned in the study by the author, understands the inputs from the user and provides the relevant responses to user-queries. The authors used a dataset of 81,659 sets of talks which was manually created without using any hand-crafted rules for training the algorithm on a Google Cloud virtual machine. The outcomes were noteworthy, as midobot had the ability to reproduce accurate responses to the most of the queries. In addition, arabic happens to be the most common used languages in chatbots as well as other NLP technologies. The complexity of Arabic NLP, which offers a variety of problems that includes a very rich morphology and a high level of inconsistency and continuous spelling variations, is the reason for its slow progress [20].

Bias and discrimination are the two potential ethical problems with the usage of AI-driven chatbots in medicine. This was due to AI systems that can be biased or discriminating if the data that were trained on is biased. This could end up in the unfair treatment of particular group of individuals, such as patients with racial background. Additional concerns include issues with the confidentiality and safety information of patient, in addition to the likelihood that AI systems might replace medical healthcare professionals and degrade the standard of care [21].

The study explores an innovative way of hiring fellow which makes use of chatbot with artificial intelligence and real-time synchronous virtual question and answer session. Enhancing interaction and providing academic departments a helpful data are the primary goal of the strategy. The author speaks about the drawbacks of traditional interview forms, especially in the context of COVID-19 pandemic, along with online hiring technologies like chatbots and live Q&A sessions could help candidates overcome those limitations. The author also additionally goes through the importance of online media-specific content on influencing candidate’s early impressions of a program and choice-making, also including information on residency portals and social media [22].

The study explains the benefits of developing chatbots that are able to convey particular emotions and it has control over the way they convey those feelings. According to the study, it can greatly improve chatbot functionality and user happiness, which has the possibility to be beneficial over a various sectors that uses chatbots for customer service or other additional purposes. The proposed chatbot in the study has been designed to handle direct control over the selection of replying emotion categories and also emotional response generation with the words that are emotional, it draws influence from an existing emotion analysis technique. The suggested chatbot exceeds standard baseline algorithms on both semantic fluency and emotional consistency factors, in accordance to experimental analysis. It also means that providing chatbots the capacity to manage the expression of the specific emotions can enhance their functionality and customer satisfaction [24].

The goal of the study was to investigate the usability, user satisfaction and experience of the chatbot itself including the impacts of text-based chatbot over the Australian New South Wales GambleAware website. The IBM Watson platform, that possesses advanced machine learning and natural language processing abilities, was employed for developing the chatbot, which was named as Lilibot. A randomly chosen group of Australian citizens was separated into 32 for the web page with chatbot availability and 28 for the website alone. The study found that, the site with chatbot access group revealed significantly higher ratings of the site’s accessibility and factors related to user satisfaction and not the user experience when compared to the website-only group [25].

In accordance with a meta-analysis of 18 studies 61 samples, the success rate of chatbot-assisted language learning (CALL) is extensively investigated in this study. The goal of the study was to gain sight into general impact of CALL along with how potential moderators could have affected it. The study collected data from experiments and semi-experiments, along with few papers which only queried participants regarding the efficiency of CALL. The study discovered nine potential moderating factors, namely educational level, target language, and also the length of training, which could impact the efficiency of CALL. The outcomes were equally favorable, irrespective of the moderator, indicating that CALL can be helpful across different contexts [26].

**2.2 Summary of relevant studies and research in the field**

|  |  |  |  |
| --- | --- | --- | --- |
| **S.No** | **Method** | **Year** | **Accuracy Score** |

**2.3 Identification of existing gaps and shortcomings**

**2.4 Comparison of different approaches and methodologies**

**CHAPTER 3**

**DESIGN PHASE**

**3.1 Detailed explanation of the design phase**

1. **Problem Definition:** Defining the issue which is to be solved for assign the chat where the humans beings are not available all the time and introduce new technology in the field where the information or guidance are needed, and the use the newly available technology wisely and in an efficient manner.
2. **Collection of Data:** Gathering a collection of information which consists of conversations between the movie characters from around 600 movies and different movie characters. Where the dialogues are used in the movie by different characters.
3. **Pre-processing Data:** Pre-processing procedure involves cleaning the null values from the dataset, clearing the grammatical errors, removing some special characters, converting to lower case and encoding the inputs or the data which feed to the model.
4. **Selection of Model:** Choosing the effective and appropriate machine learning model or the algorithm to generate appropriate output from the model, also which is effective and provide more accurate data within a short time.
5. **Training Model:** Training the model is the process of splitting the dataset in to training and testing. Train the model using the train data and test the model with the testing data, and calculate the accuracy that the model provides.
6. **Evaluating the Model:** Analyzing the trained model’s performance with the help of the testing data. And with the help of the Loss and accuracy value calculate the model performance and output which its providing.
7. **Deployment:** Making use of python and with the help of the Jupiter notebook the customization are made and provide an User Interface (UI) to interact with the chatbot and get the result.

**3.2 Description of Proposed System**

I gathered a dataset that contains the dialogues from almost 600 movies that were used by the characters in those movies. Preprocessed that dataset in order to train the model. Preprocessing includes text cleaning like removing unnecessary characters, grammatical errors, and special characters. The seq2seq model architecture is used to implement encoders and decoders using recurrent neural networks (RNNs), such as LSTM or GRU. encoder is used to convert the input text to a fixed-length numerical vector. The decoder is used to decode or convert the encoded input and generate the output of the chatbot. The model was trained and the accuracy was calculated using these data.

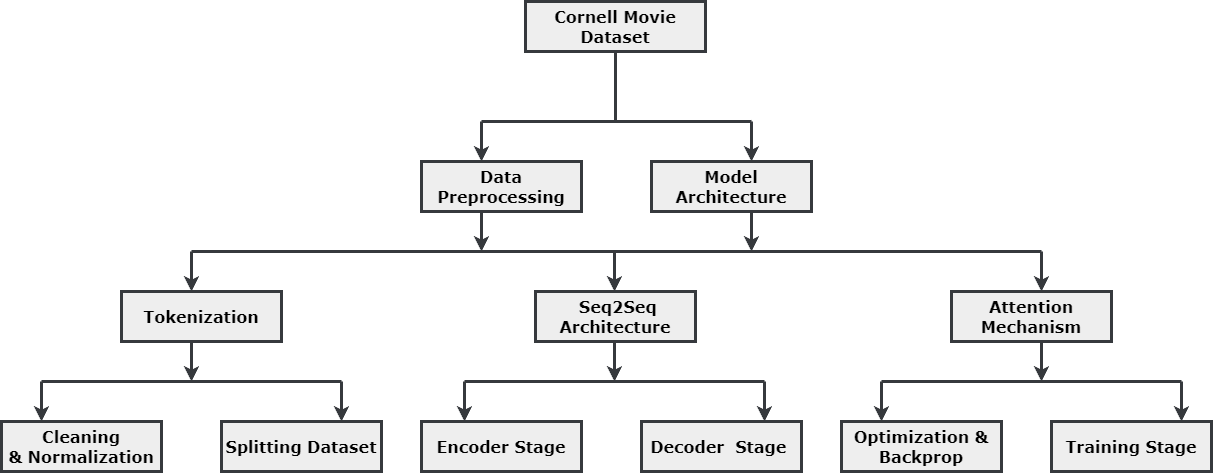


Figure 3.2 – The Proposed System.

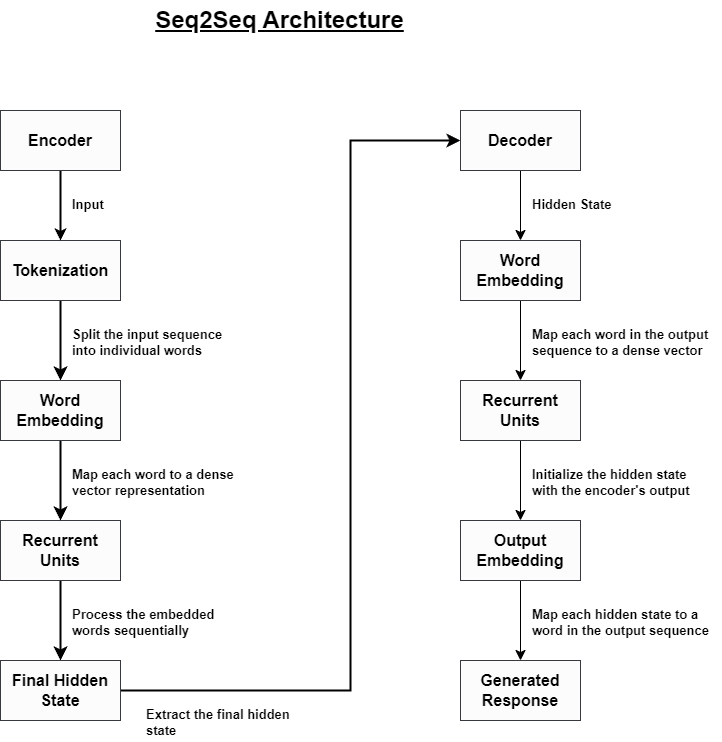
**3.3 System Architecture and Components**

Figure 3.3 – The Complete Model of Seq2Seq Architecture.

The given seq2seq architecture diagram represents how the entire architecture works, the procedures it has in that model, and the step-by-step procedures involved in the architecture. The diagram represents the entire flow of how the data flows through the architecture, from the initial state through the model output.

**3.4 Design decisions and Justifications**

1. **Collection of Data:** Specifying the data source and methods for obtain the suitable and large data set of the different conversations
   * **Justification:** The large dataset helps the model to get more data to provide out put and improve the interaction features, where the large dataset contains more amount of data where the model can utilize that in an efficient manner.
2. **Model Selection:** Selecting and adopting suitable machine learning model in order to provide the suitable output or response for the user.
   * **Justification:** By selecting the appropriate model can result the suitable output, also selecting the suitable model which will provide the result more accurate and in an efficient manner, which is capable of more processing to generate the output.
3. **Evaluation and Training:**  Providing the steps and methods for training and testing the chatbot in order to generate the appropriate output.
   * **Justification:** Specifying the correct ratio for the testing and training with the correct strategy. The dataset contains the conversations dialogues which is used to train and test the model and the model provides the output based on this dataset.
4. **Integration of Model:** Using the python and Jupyter Notebook in order to interact and integration of model or the chatbot and get the result from the chatbot.
   * **Justification:** Importing or adopting the model which is trained and performing the execution or training the model based on the input given by the user, and analyze the result for finding the accuracy or for the further analysis, training or immporvement.

**3.5 Design diagrams**

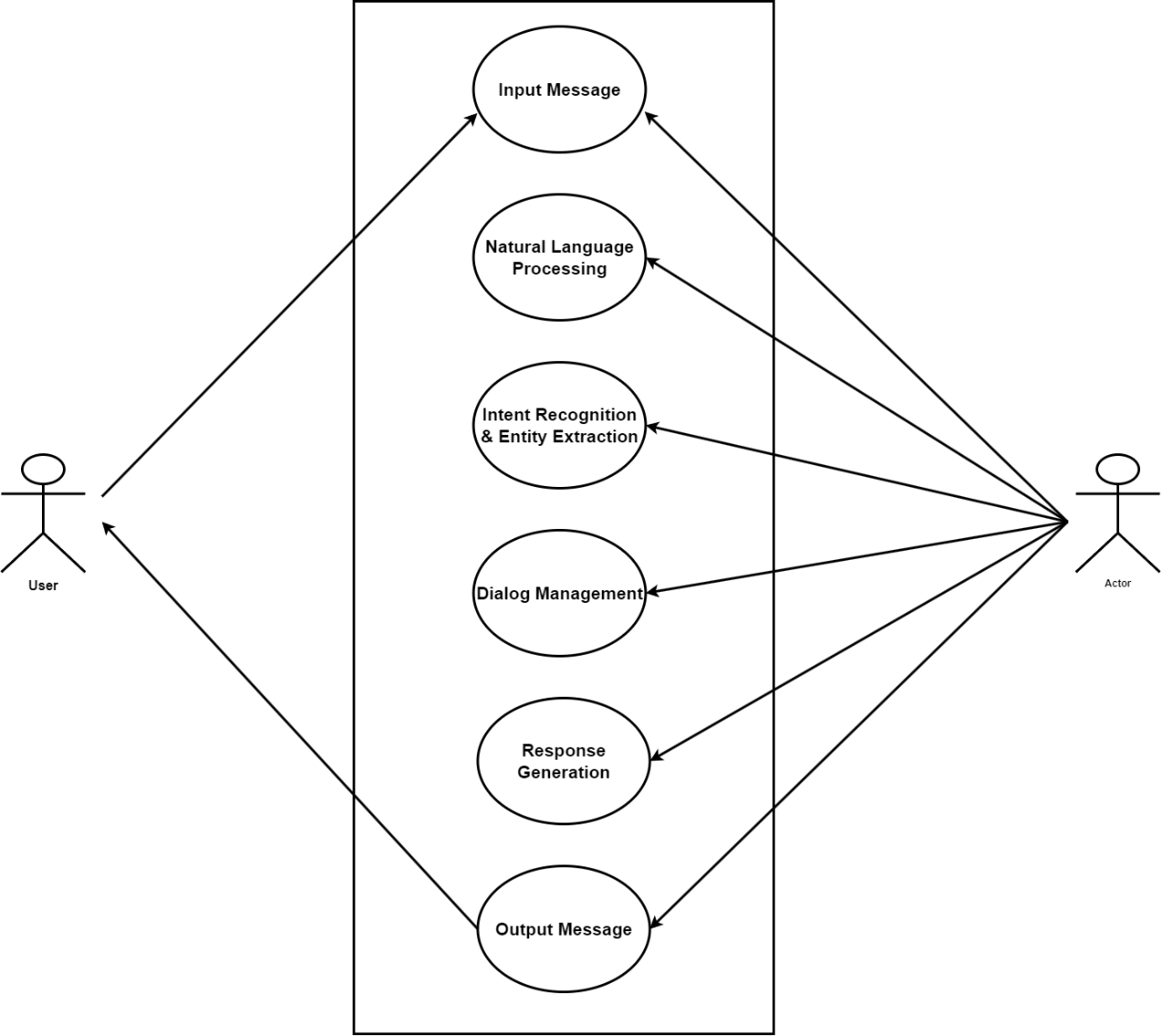
**3.5.1 Use Case Diagram**

Figure 3.1.2 – Use case diagram for fake news detection system.

Use case diagram is a outline of relationship between actors and the system it illustrates the features and operations of system through the perspective of its end users. In the above use case diagram, the user gives the input for the chatbot and gets the output message from the chatbot. In between, the system will perform the preprocessing and input and output management in the model, and after that, the model will provide output for the user.

**CHAPTER 4**

**IMPLEMENTATION**

**4.1 Description of the Implementation Process**

1. Downloading the software and resources which is needed for the development, such as Python, libraries like Tensor Flow, Keras, Ipython, and other required libraries.
2. Making use of appropriate Pre-processing tasks for cleaning up the dataset or which used for the training of the model and before training the pre-processing will completed. Pre-processing includes removing the null values from the dataset, clearing the grammatical errors, removing the special characters and encoding the data to fee the model.
3. Train the model with the data which is Pre-processed, so the use will get appropriate output for the model, if the input data is clean and clear the accuracy will also improve.
4. Building an interface with the help of the Ipython, using some basic CSS to improve the User Interface, in that interface user can interact with the model or with the chatbot in an efficient manner and get the output in the neat and clear way.

**4.2 Technologies, Tools and Framework used**

**4.2.1 Python**

Python is a well-known programming knowledge, that is famous for its ability to be easy to learn and understandable. It has a large number of developers and offers an extensive number of tools and framework for various purposes, which include web development, data analysis, machine learning and beyond. Python has a broad ecosystem of modules and frameworks that is able to be installed through package managers like pip.

**4.2.2 Jupyter Notebook**

# It is an open-source web programme, it allows to develop and share documents with running code, illustrations, justifications and other functionalities. It is extensively used in machine learning, research, scientific computing, and data analysis. Several programming languages like Pyhton, R, Julia and others, have been supported by jupyter notebook.

**4.2.3 Hardware Requirement**

* Minimum of 4GB – 8GB.
* Operating system: Windows, Linux.
* Processor: Intel corei5 or other.

**4.3 Challenges Faced During Implementation and their Solutions**

**4.4 Code Snippets**

**4.5 Testing methodologies and Quality Assurance Measures**

**CHAPTER 5**

**RESULTS AND DISCUSSION**

**5.1 Presentation and Analysis of the Obtained Results**

**5.2 Comparison of the Results with the Project Objectives**

**5.3 Discussion of any Deviations or Unexpected Outcomes**

**5.4 Interpretation of the results in the Context of the problem Statement**

**5.5 Evaluation of the System’s Performance and Effectiveness**

**CHAPTER 6**

**CONCLUSION AND FUTURE WORK**

**6.1 Summary of the Key Findings and Contributions of the Project**

**6.2 Recapitulation of the Project Objectives and Their Fulfillment**

**6.3 Discussion of the Implications and Significance of the Project**

**6.4 Suggestions for Future Research and Improvements**

* Enhancing an AI-powered chatbot’s capability to address challenging and puzzling queries is one of conceivable future goal.
* To improve the chatbot's reactions, this could qualify for designing more elegant Natural Language Processing techniques or taking into account of external information sources.
* Applying more customized and context-sensitive user interactions is a potential upcoming venture. This might demand using a Machine-Learning algorithms to examine user behaviour and preferences and then modifying the chatbot's responses.
* The chatbot's capability to understand and deliver more natural language replies could possibly enhanced in future study. sophisticated neural network designs like transformers or generative adversarial networks (GANs) ought to be utilized to improve the chatbot's language modelling capabilities.

**6.5 Reflection on the Lessons Learned During the Project**

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