

# Conversational Chatbot Powered by Artificial Intelligence for Banks

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## Abstract

As the world is growing rapidly with new technologies emerging every day and with seamless growth in natural language processing and artificial intelligence in most of the fields requiring human touch to make things happen. This paper mainly focuses on establishing a human-machine interaction to quickly give appropriate responses to the users for their asked queries either by entering the text or by speaking which will be our future scope. A conversational chatbot is a tool that will allow the user to interact with the machine either by using a text manually entered by the user or through speech, Appropriately, what is been entered or Spoken by the user the chatbot will provide their desired result. The result might be partially correct or incorrect, depending upon the amount of data the chatbot is being trained. Since to develop a chatbot with multiple functions and to give the result that a user expects, it has to be trained on a huge corpus of different types of data and should be trained for hours. As we all know how a chatbot is developed and being used in almost every sector in the world and how useful it might be in improving the productivity of the company or increasing its revenue, Chatbots have really taken over the world in recent times. One such example being is OPENAI's project CHAT-GPT which has taken the world by storm in recent few months by clearing some of the world's toughest exams and helping a lot of companies to improve their productivity and increase their revenue, Although, CHAT-GPT is a very vast project and requires humongous amount of data to get the results of what we are seeing. Nevertheless, a slightly similar approach had been incorporated with a negligible amount of data collected from various data repositories in our case. The paper mainly focuses on the problems of traditional banking services offered, Techniques incorporated to build the model, and the machine learning algorithm used to train and give the desired answer for the query. Chatterbot NLP library has been used to develop the chatbot along with the Support vector machine algorithm to train the model which has given more than 95% accuracy. The dataset has been collected from a private data repository and some of it is acquired from nearby private banks. The model has been trained and deployed on the Flask web framework to ease the interaction between the user and the machine. This project has been solely created for the elderly people who face difficulty standing in a long queue in the banks just to enquire about simple issues being faced by their account or even a simple question they want to ask the service agent in the bank.

**Keywords:** CHAT-GPT, NLP, Banking sector, Chatbot, Data, Human-machine, dataset, corpus, Machine Learning.

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## I. INTRODUCTION

Linear As we all know how Conversational chatbots have grown in popularity in recent years, and with good reason. They provide a variety of benefits that can be beneficial to people in a variety of ways. First and foremost, conversational chatbots are beneficial because they can provide customer service 24 hours a day, seven days a week. This means that people can get information and help whenever they want, without having to

wait for a human agent to become available. This is especially useful for people who require assistance after regular business hours or who live in different time zones. Because they can handle a lot of inquiries at once, chatbots are also useful. [5] Chatbots can handle multiple requests concurrently in contrast to human agents who can only handle one inquiry at a time, enabling quick and effective support for a large number of users. When there are sudden spikes in demand, like during a product launch or promotional event, this can be especially helpful.

The banking industry is a crucial component of the world economy and has a significant impact on how the world is shaped. Banks offer crucial financial services that support social impact, financial stability, innovation, economic growth, and environmental sustainability. The banking industry will continue to change the world in novel and exciting ways as it develops.

Banking is one of the world's most heavily regulated and data-intensive industries. [12] Banks, with millions of customers and trillions of dollars in assets, must rely on technology to manage their operations and maintain client trust. AI has transformed the way banks operate, providing advanced solutions that allow banks to streamline their processes, improve customer experience, and gain a competitive advantage in the market. [3] Banks have also been able to improve their risk management strategies thanks to AI. AI-powered risk models can assess creditworthiness and make loan approval decisions by analyzing customer data, credit history, and other relevant factors. These models can also assist banks in managing risks related to investments, portfolios, and compliance. Banks can use predictive analytics to anticipate customer needs and identify potential growth opportunities. This enables banks to provide personalized products and services that are tailored to the specific needs of their customers.

Artificial intelligence (AI) technologies are having an increasing impact on our lives, from instant translation to conversational interfaces. This is especially true in the financial services sector, where AI-powered innovations are already being launched by disruptors. To remain competitive, incumbent banks must transform their entire capability stack, including the engagement layer, AI-powered decision making, core technology and data infrastructure, and operating model, as discussed. If fully integrated, these capabilities have the potential to significantly increase customer engagement by supporting their financial activities across multiple online and physical contexts with intelligent, highly personalized solutions delivered via an intuitive, seamless, and fast interface. (McKinsey&Company, 2020) [1]

Automating repetitive tasks is another important advantage of AI in banking. Data entry, report generation, and compliance checks are just a few of the tasks that can be automated using robotic process automation (RPA) technology. By doing this, banks can increase productivity, decrease manual errors, and give staff members more time for challenging tasks. Banks can cut costs and increase overall operational efficiency by automating tasks that are currently done by humans.

Over several decades, banks have continually adapted the latest technological innovations to redefine how customers interact with them. ATMs were first introduced by banks in the 1960s, followed by electronic, card-based payments in the 1970s. The spread of mobile-based "banking on the go" in the 2010s followed the adoption of 24/7 online banking in the 2000s. Few of us would argue that we have entered the AI-powered digital age, thanks to lower data storage and processing costs, increased access and connectivity for all, and rapid advances in AI technologies. When used after risk mitigation, these technologies can often outperform human decision making in terms of both speed and accuracy. Due to which AI has the potential to generate \$1 trillion in additional value each year. (McKinsey&Company, AI-bank of the future: Can banks meet the AI challenge?, 2020) [2]

To Sum it up, artificial intelligence has revolutionized the banking sector by providing cutting-edge solutions that let banks run more effectively, enhance customer experiences, and maintain market competitiveness. [10] AI has permeated every aspect of the banking sector, from chatbots and virtual assistants to predictive analytics and robotic process automation. We can anticipate even more sophisticated solutions to help banks meet changing customer needs and remain competitive as AI technology continues to advance.

The remainder of the paper is structured as follows: Section II: Related work, Section III: Workflow and methodology, Section IV: Algorithm Description and NLP Libraries, Section V: Dataset Description, Section VI: Conclusion and Future Scope.

## **II. RELATED WORK**

Below are some papers referred to get an in-depth understanding of how chatbots work and how they are implemented in different sectors.

(Shashank Bairy R, 2021) This paper mainly focuses on identifying the novel application of chatbots and how they are used in the banking sector. It emphasizes the role chatbots play in financial institutions which helps the institutions grow financially and economically huge. The authors also briefly explained about the anatomy of a chatbot and its components involved and its functionality, which gives us some understanding of how they can be used and developed furthermore. Specifically. The authors have put more emphasis on how artificial intelligence chat boards can really change the way banking industries work with by briefly explaining some of its major advantages. Not to mention that they have also talked about some of the major improvements that can be incorporated into the chatbots to increase the user experience.[3]

(Alt, 2021) In this paper, the authors have discussed the techniques and evaluation formula to identify the factors that influence customers to use a chatbot in the banking industry. The authors have used a measurement model to evaluate and technology acceptance model known as Partial Least Squares-Structural Equation Modelling (PLS-SEM) extended with compatibility, customer perceived risk, and awareness to test the hypothesis. 287 samples were collected and validated among the 24% of people who have used banking bots earlier and these were the important sample among the data to identify perceived ease of use and the risk on usage intentions. The authors in this paper have observed a 48% variance in the behavioral intention which makes perceived ease of use and compatibility a major factor for users to use banking bots. Along with that among the 2 factors discussed awareness of service also played a major role in the usage intention of the customers. Along with the above factors, perceived ease of use and privacy risk is found to be not very significant with the behavioral intention when compared to usefulness and compatibility. Apart from their research, the authors have also made an immense contribution to academics and future practitioners by giving them a notion of how some factors affect users using chatbots.[4]

(S. F. Suhel, 2020) The authors in this paper discuss some of the artificial intelligence patterns, activities, and alternate theories of how AI is used today. They also talk about how Artificial intelligence is rapidly improving day by day and emphasized on how there is not enough data about artificial intelligence. However, the authors have introduced a novel methodology to address machine intelligence and how they affect the intelligent system being developed using artificial intelligence. This paper mainly focuses on briefly explaining on how disruptive and powerful artificial intelligence systems can be in developing the country if they are properly used in the finance and banking industries. Finally, the authors have concluded about the strategies involved in identifying the best response to give to the users in the banking sector based on ontology. The future scope of this project might be developing the framework and building the intelligent question management model to answer the user queries and learn by itself whenever it answers incorrectly which intern helps to increase productivity and reduce the human load. [5]

(Singh, 2019) This paper discusses about the virtual assistants and chatbots used in the different categories of banks in India both private and public. Along with their characteristics and how the chatbots are structured along with its services offered and technology used and its accuracy. The authors have derived some important information such as how the Indian banks are investing heavily to incorporate chatbots and virtual assistants in their banks to ease interaction with the customers. Although, there is investment but the chatbots being developed were very vague and answered to simple questions which are already available on the internet. The most important thing the authors have found is the reachability and awareness which is very low among the customers in India which makes it very difficult for the developers to improve the model if the existing one is not used properly. Finally, the authors have concluded by providing some helpful insights on how virtual assistants and chatbots can be improved further given the vast network India has and how powerful and helpful chatbots can be used it used properly with all the people's support.[6]

(Adam, 2021) In this paper, the authors have briefly discussed about how Artificial intelligent chatbots are widely being used and being replaced by human chat service agents and how popular live chat interfaces have become nowadays by increasing the communication between the customers and the service providers. The authors have come to a conclusion by performing an experiment by comparing both the methods termed as Verbal anthropomorphic design and foot in the door. The experiment results have demonstrated remarkable

results where the users mostly depend on chatbot service request feedback. Moreover, the authors have noted that this study has been a stepping stone for future research where they have studied how AI chatbots can improve customer service by reducing the workload of humans and staying consistent in the electronic market.[7]

(Følstad, 2021) The authors in this paper have performed a series of experiments to identify the customer interaction with the chatbot and their experience related to the chatbot dialogues. This paper mainly discusses about the qualitative analysis of the chatbot dialogues to understand whether the answers provided for the queries asked by the user are really what the user was expecting. In order to better understand this problem, the authors have divided this problem into 3 case examples such as response relevance of the chatbot, chatbot improvement in practice, and insights of theoretical and practical relevance. The framework developed by the authors has shown remarkable insights into improving the chatbot experience with the customers and also can be used for benchmarking and comparison across the various chatbots. The authors have termed the framework can be further improved to work on a broader range of chatbots.[8]

(Jain, 2018) This paper mainly focuses on briefly explaining what is natural language processing, the things involved with it and how does it work. The authors have given an in-depth analysis and tools involved in this area. Natural language processing has revolutionized the world in terms of chatbots, text-to-speech, and speech-to-text models. The authors have presented the results of various algorithms being tested over the past decade, along with that they have also done gap analysis between different algorithms. Some of the algorithms used are LSTM, Seq2Seq Model, Recurrent Neural Networks, named entity recognition model, Word embedding and to name a few others, along with voice processing algorithms. Every algorithm has been clearly explained along with the pre-processing techniques to be incorporated before training the model. Finally, the authors have shown that text processing algorithms are well maintained and trained, compared to speech processing algorithms which are lagging behind but have improved a lot compared to the past decade. A major breakthrough in the NLP is using Neural Networks to enhance the output and increase the efficiency of the problem. Along with this, a combination of text-processing and speech-processing algorithms has shown more sophisticated output.[9]

(Brandtzaeg, 2017) The authors of this paper have briefly discussed how Chatbots, which are machine agents that serve as natural language user interfaces for data and service providers, are becoming more and more popular. However, no empirical studies have examined the reasons why people use chatbots. 146 US citizens between the ages of 16 and 55 who used chatbots were asked to answer questions about their usage on an online survey for this study. The primary drivers of chatbot use are identified by the study. The most frequently cited motivator is productivity, and chatbots make it possible for users to get help or information quickly and effectively. Users of chatbots also mentioned their interest in what they perceived to be a novel phenomenon, as well as entertainment, social, and relationship motives. The findings are discussed in terms of the uses and gratifications theory and shed light on why people decide to interact with automated agents online. The research could be used by upcoming developers to improve interactions between humans and chatbots. Different user motivations for chatbots are reflected in possible design principles.[10]

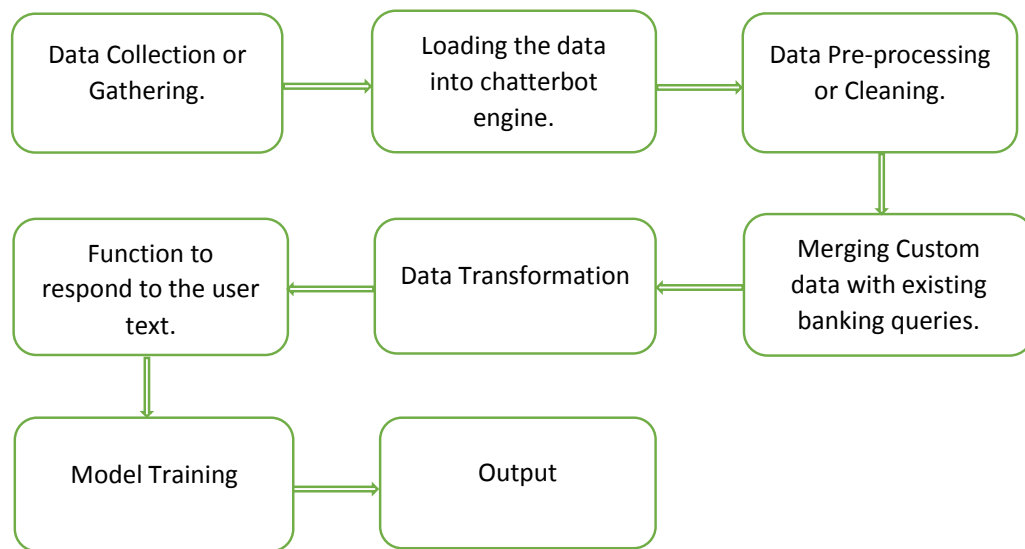
(Dole, 2015) The main goal of this paper was to comprehend how a chatbot could be taught to respond to a user's banking question. A smart chatbot is used to answer user questions about banks and provide information. First, the intelligent system will receive input from the bank customer. Regardless of whether the input is spoken or written, it will be processed. Based on the input, an intelligent system will respond to the user's query. The most important and practical element in this project is artificial intelligence. Online access is available for this program. The authors have used the system as a guide to building an intelligent chatbot. It will use a technological demonstration to verify a suggested framework that is required to support such a bot. Even though a black box approach is used by controlling the communication structure to and from the web service, the web service allows all types of clients to communicate to the server from any platform. The service is made available through a generated interface that enables seamless XML processing, and its extensibility lengthens its useful life. The web-based bot uses an artificial brain to generate personalized user responses that fit the desired character. In order to improve artificial intelligence's capacity to produce answers in the future, unanswered questions posed to the bot are further processed using a separate expert system.[11]

(Aruna, 2022) Artificially intelligent development tools for banking operations known as "banking bots" are capable of comprehending and responding to customer inquiries. The main objective of the author was

to develop a banking bot using artificially intelligent algorithms that could evaluate and comprehend user requests and react appropriately. Any inquiries regarding banking should be made to the bank or customer service. Bank employees are frequently extremely busy, and it takes a lot of time and effort. However, customer service agents do not provide us with complete information. The author suggested a banking bot where users could directly chat with a bot, link all of their bank accounts to a single account, and access them easily to post their questions directly online or chat with the bank representatives and receive a prompt response. The author wanted to contribute to the solution of the issue of direct communication between customers and banks. It can offer customer service twenty-four hours a day, seven days a week, allowing current and prospective customers to try to resolve their banking issues after work and on the weekends. Customers and banks will both profit from it. The account balance or transaction status of customers can be viewed. Banks can check how available schemes are used as well.[12]

### III. METHODOLOGY

#### 1. Workflow Architecture



**Step1:** Dataset has been gathered from data repositories and by visiting various banks to acquire simple banking related queries.

**Step2:** Collected dataset has been loaded into chatterbot engine to generate a sql file before training a machine learning model using Support Vector Machine.

**Step3:** Pre-processing and cleaning the data using Lancaster Stemmer and removing stopwords using nltk.corpus.stopwords.

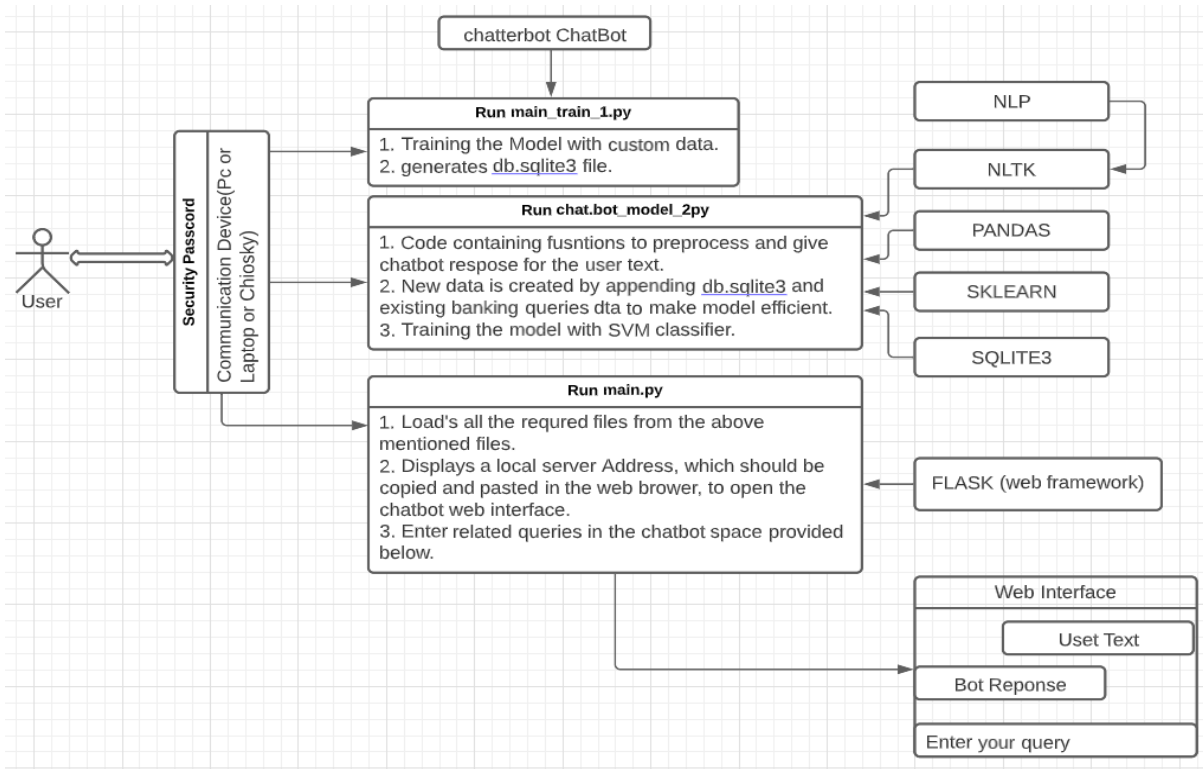
**Step4:** Transforming data into vectors using TfidfVectorizer, to determine the most important words in the entered text and to give appropriate answer for the query.

**Step5:** Creating a master function(get\_response()), to call the above written functions. This will apply all the transformations from the top when a new query is entered by the user after training the model.

**Step6:** Train\_Test\_Split the data and building the model using Support Vector Machine and printing the accuracy score of the model.

**Step7:** Running the python files to display the output on the webserver.

## 2. UML DIAGRAM



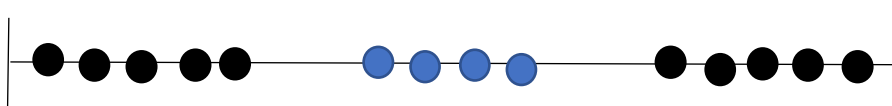
## IV. ALGORITHM DESCRIPTION AND NLP LIBRARIES

### 1) Support Vector Machine

Support Vector Machine [13] is a popular machine learning algorithm which is mostly used for classification type of problems. Support Vector Machines uses a concept of hyperplane which is used to classify between different categories or classes. The hyperplane in the support vector machine is just a threshold line which is represented in the 3-dimensional space to separate different classes in the data. Other than hyperplane, there is also another two important terms, such as maximal margin classifier and soft margin classifier, which are mostly used in a 1 dimensional or two-dimensional space. These two terminologies are mostly referred in support vector classifier. The margin in the above-mentioned classifiers is described as the distance between the Threshold line drawn in between two observations. The two observations are two different classes. The reason for interpreting support vector machine and support vector classifiers as different is because they behave differently with different type of data. For example, support vector classifiers cannot work with the type of data where the distribution of the observations are not in sequence. It is because of the reason it cannot draw a proper threshold or hyperplane with this type of data. But this problem can be solved by using support vector machine aware.

**Black – Patients Not Cured with Low and High dosage**

**Blue – Patients Cured with Moderate Dosage**



The Support Vector Machines will use Kernel functions to map these 1-dimensional points into two dimension or higher dimensional space on a graph, so that a proper hyperplane can be drawn. Which helps us to classify between the classes. The term support vectors refer to the observations present within the soft margin. The major advantage of using support vector classifier is they work well in training and testing data which can very well handle outliers and allow misclassifications. Kernels in the support vector machines are only used to calculate the relationship between the observations or points, but not for transforming them. This method is called the kernel trick.

## 2) SQL:

SQL stands for structured query language, which is basically a database management system, software which allows the users to perform CRUD operation such as Create, Retrieve, Update and Delete the data efficiently and easily and also used to perform analysis on large amount of data. As the name suggests Structured query language, we can only use SQL when our data is structured in a proper format i.e., Table Form. In the case of data that is not structured properly we have other type of database, such as NOSQL, DynamoDB, MongoDB, Cassandra, etc. To support the client server architecture, most of the software engineers use SQL to make a connection with the back end and the front end, where in the back end they deal with the SQL, in order to maintain their database inorder to transfer that data to the front end.

### NLP Libraries:

#### A. NLTK [14]

##### a. Tokenizer

Tokenization is a process of converting a large string or a document into small chunks of words or sentences. Tokenization plays a very important role in any natural language processing project, since it helps to preprocess irrelevant words in the text and also easier to map parts of the speech for the words. Python provides an inbuilt tokenization library sub built in nltk library known as word\_tokenizer, sent\_tokenizer, regexp\_tokenizer, TweetTokenizer. Other than these, we can also create our own tokenizers using Regular expressions. Other common advantages of using tokenizer are, matching common words.

##### b. TfidfVectorizer

TFIDF vectorizer [17] is used in natural language processing to convert text into numerical format. TFIDF stands for term frequency inverse document frequency, which not only helps us to convert text into a vector, it also helps us to determine the most important word in our document or in the corpus. Each corpus or a list may have shared words within them beyond just stop words. These words are should be given less importance, in order to do so, they are down weighted. The two important terminologies involved in TFIDF are term frequency and document frequency. Where term frequency refers to the number of times a specific word has occurred in a document, whereas a document frequency refers to in how many documents that specific term had occurred. Using these values along with a weight of the term calculated using a logarithm function, a tfidf score is calculated. Finally, Higher the weight of the word in the document the more importance it is given.

##### c. Stemming

Stemming and lemmatization is a process of transforming words into their root forms. Although stemming and Lemmatization works similar, but they have a major difference i.e., Stemming dosent care about the whether the word is in the English word or not, irrespective to it, it will cut it to its root form. Unlike Lemmatization, it will do the same job, but converts the word into its root form only if it is in the English dictionary. In order to stem a sentence, we need to first word\_tokenize and then apply stemming or lemmatization to each word. Some of the stemming algorithms [18] used in the natural language processing are:

- i. Potters' stemmer algorithm.
- ii. Lovins Stemmer.
- iii. Dawson Stemmer.

- iv. Krovitz stemmer.
- v. Xerox Stemmer.
- vi. N-gram Stemmer.
- vii. Snowball Stemmer.
- viii. Lancaster Stemmer.

**d. Cosine Similarity Metric**

Cosine similarity is a metric in natural language processing, which allows us to determine how much. How much similar to data objects are? There are also other similarity metrics, such as Minkowski distance, Manhattan distance, Euclidean distance, and Jaccard similarity. This metric is calculated by using a formula such as.

a. 
$$\text{Cos}(x, y) = x \cdot y / \|x\| * \|y\|$$

In the above formula, The X&Y represents two vectors or 2 words converted to numerical format. Since the cosine similarity is measured using theta. If Theta equal to 0 degrees, Then the two vectors overlap that means they are similar to each other, if Theta is equal to 90 degrees, then the two vectors are termed as dissimilar.

**B. Chatterbot [16]**

Chatterbot is a very popular python built natural language processing library, which is basically a conversational dialog engine. Allows the users to create a simple chat bot by creating their own intents in the form of yml files. This particular conversational dialog engine is a language independent and allows the users to train it on any language. At the moment, there are around dozen languages incorporated in this particular chatterbot module, if we want to use any language model or different type of data to train. We can use it by creating our own data in the form of Yaml file and then training it from scratch again, which we have done in our own project. This particular module uses SQL database to store and retrieve the data.

**3) Sklearn or scikit-learn [15]**

Sklearn or scikit-learn is a very popular machine learning library which allows the users to perform or work on any machine learning related stuff easily and efficiently. Escalon of diverse range of machine learning algorithms for both supervised and unsupervised learning. Apart from consisting of algorithms the site. The sklearn also consists of many preprocessing utilities which allows the users to clean and transform the data before training and evaluating the model. This library is simple and efficient to use, since it is built on top of numpy, SciPy and Matplotlib.

**V. DATASET DESCRIPTION**

The dataset has been downloaded form a private data repository consisting of multiple YAML files. YAML stands for Yet another Markup Language is a data-serialization format which makes easier to understand and configure. YAML is mostly used for storing and transmitting data using python style inline and indentation. Some of the data files used to train the chatbot are:

- Loan.yml
- Personal\_information.yml
- General\_banking\_queries.yml
- Greetings.yml
- Specific\_bank\_queries.yml

The above files contain multiple queries along with their answers which are fed into chatbot model to train and evaluate. Along with the yaml files, just to increase the amount of data to train, we have also used a csv file downloaded from Kaggle data repository consisting of 3 columns namely Questions, Answers and Class(accounts, Cards, Fund transfer, Investments, Insurance, Loans, Security) with 1773 entries.



**CSV File**

Question	Answer	Class
What are the documents required for opening a Current Account of a sole proprietorship firm	Following documents are required to open a Current Account	accounts
Can I transfer my Current Account from one branch to another	Yes, Current Accounts can be transferred from one branch to	accounts
My present status is NRI. What extra documents are required for opening a Sole Proprietorship Current Account	NRI/PIO can open the proprietorship/partnership firm subject	accounts
What are the documents required for opening a Current Account of Limited Liability Partnership	Following documents are required for opening a Current Acco	accounts
What documents are required to change the address of an entity	Following documents are required to change the address of a	accounts

**YAML Data Representation**

```

- - hi there
  - hi. How are you today?
- - Hello
  - Hi. How are you today?
- - I'm good.
  - ok
- - Hi
  - Hello. How are you today?
- - Greetings!
  - Thank you. How can i assist you? How are you today?
- - How do you do?
  - I'm doing well. How are you today?

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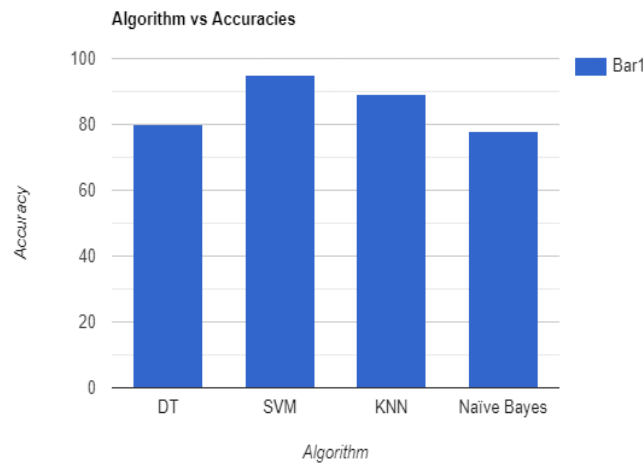
**VI. COMPARISION ANALYSIS**

The below table mentioned is a pictorial representation of comparison between different papers and its respective accuracies, the above table consists of author names, methodology, data set and the accuracy. 4 papers have been used and compared in order to get an in depth understanding on how Chatbots are incorporated in banking.

Authors	Methodology	Dataset	Accuracy Score
(Cardona et al., 2019)	Chatbot adoption and spread in the German insurance industry	Semi-Structured, Expert Interviews, N=7, Web Based Cross, N-300, Data Collected in Germany	89.40%
(Gupta and Sharma, 2019)	Analysis of customers' attitude towards the chatbots in banking	Data collected using Facebook and WhatsApp groups, Data collected in India in 2019	76.00%
(Richad et al., 2019)	An analysis of the factors influencing millennials' adoption of chatbots in Indonesia's banking sector	Data collected in Indonesia in 2018, LFW and YTF Dataset	92.00%
(Sarbabida and Saha, 2020)	Examination of the role of chatbots in customer service of the banking industry of Bangladesh	Loan Stats Dataset, bigml	94.00%

Proposed Approach	The paper's primary areas of interest are the issues with the traditional banking services currently provided, the techniques used to build the model, and the machine learning algorithm that was employed to train and provide the desired response to the query.	Data downloaded from Kaggle Data Repository and Privately collected by visiting banks.	95.00%
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### ALGORITHM VS ACCURACIES



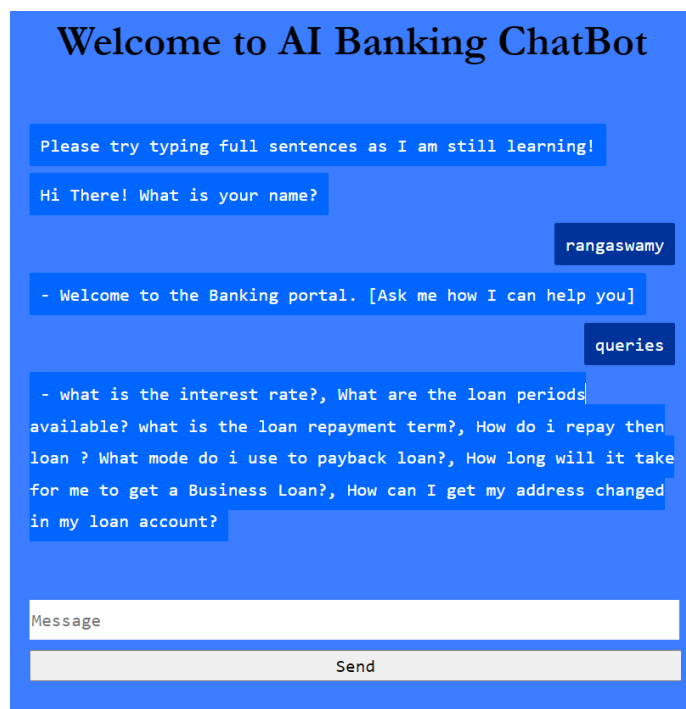
The graph above depicts algorithm accuracy comparisons. There, we can see that the support vector machine, which is our proposed model, outperforms the other three algorithms. The bar chart is a great way to visually compare different types of labels.

### VII. CONCLUSION AND FUTURE SCOPE

This paper mainly discusses about how Artificial intelligence can be widely incorporated to eliminate the time constraint and workload in the fields where human-customer accommodation interaction is required. Albeit, there is a plethora of chatbots being deployed in different sectors throughout the world, but the only quandary they face is a lack of data and appropriate training algorithm, which plays a vital role in giving desired answers to the query asked by the utilizer. Similarly, there is an abundance of banking bots deployed across different banks across the country and throughout the world, Since the project is in a development phase, there are a lot of checkboxes to be ticked in terms of data and preprocessing which is considered as future scope. We firmly believe that this project will be a stepping stone for further researchers who wish to work on chatbots in the banking industry. The data required for the project has been downloaded from a private data repository and some data has been manually amassed by visiting different banks and gathering obligatory information. A sizably voluminous number of natural language processing libraries have been used to pre-process the data so as to make it trainable with the machine learning algorithm used i.e., Support vector Machine. The Model has given a precision of about 89% while giving felicitous answers whenever a query is asked by the utilizer. Considering the model precision, there are some bugs in the chatbot, which will be tested and cleared in the future afore determinately deploying the model. The chatbot has been well maintained and aesthetically designed to make the interactions well and good by integrating it with a Flask framework. As a result of the cumulation of Flask, an SQL database for storing and retrieving data from the database along with natural language processing, this chatbot might makes a paramount contribution to society and academic professionals who wish to work in this area, if well maintained and trained with the astronomical amplitude of data, if appropriate data related to banks is made public to the researchers to work on authentic-time data. In addition,

the chatbot has the potential to be integrated with sundry platforms such as social media, websites, and mobile applications to provide a seamless experience for the users. This will increment its accessibility and usability among a wider audience, making it a valuable implement for businesses and individuals alike.

### Sample Output



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