CONVERSATIONAL CHATBOT FOR FINANCIAL SERVICES

Final Year
Project Report

Submitted by

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Under The Guidance Of

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In partial fulfillment for the award of the degree of

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INFORMATION TECHNOLOGY

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Certificate

This is to certify that the project entitled “Conversational Chatbot for Financial Services“is the bona fide work carried out by Ravi Sista, Ritesh Rana, Koustubh Sharma & Varun Kumar Nyalapelli of MBA. Tech (IT), MPSTME, Mumbai, during the VII Semester of the academic year 2021-2022, in partial fulfillment of the requirements for the award of the degree of Bachelors of Technology as per norms prescribed by NMIMS. The project work has been assessed and found to be satisfactory.

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Abbreviations

NLP	Natural Language Processing
NLU	Natural Language Understanding
ML	Machine Learning
NLG	Natural Language Generation
AI	Artificial Intelligence
DL	Deep Learning

1. Abstract

A chatbot can be described as software that can communicate with people using artificial intelligence. These software programs are used to perform tasks such as responding quickly to users, informing them, helping to purchase products and providing better customer service. In this paper, we introduce the standard operating principle and basic concepts of unused intelligence and related concepts and their application in various fields such as telecommunications, banking, health, customer service centers and e-commerce.

In this technical project, we aim to develop a chatbot that caters various financial services. This report comprises information regarding the motivation for this project, literature review, user survey and stakeholder analysis, architecture, technology, and tools required for development are mentioned and discussed.

2. Overview:

2.1) Introduction

Finance is a broad term that describes activities related to banking, power or debt, debt, large markets, money, and investments. Basically, finance represents financial management and the process of obtaining the required funds.

Understanding the customer requirements and to cater the general issues faced by the general users, we will be building a financial chatbot that will address multiple domains of the financial sector, with an aim to ease users easily for their financial activities. With this chatbot, we plan to provide advanced, efficient and effective financial assistance that will be supported by a variety of artificial intelligence and machine learning strategies. With this chatbot, our main goal is to streamline personal finance travel by providing customized information and new research solutions to assist users in making better decisions regarding their financial activities.

2.2) Motivation

The Banking, Financial Services and Insurance (BFSI) sector are constantly changing. Fintech's growth, consumer change for customers, and high earnings in the first half of 2020 have accelerated the use of new digital technologies and increased the need to explore new communication channels.

Chatbots not only allows customers to handle requests faster and more efficiently but also serves as a listening channel where we can better understand our customers.

We researched and analyzed a lot of surveys and public opinion to provide us solid proof and help us to understand more about customers, their likes, dislikes, plans for the near future, or changes in circumstances. All of this information helped us to understand that personalized services are currently the key to addressing and attracting customers and will hold a significant value in the future of the financial sector.

Improving customer efficiency, minimizing personal error and resolving customer queries quickly, has a significant impact on operating costs. In fact, according to a Juniper study, the use of chatbots will save banks up to $7.3 billion worldwide by 2023. This means saving 862 million hours, or about half a million years.

All these points motivate us to develop an advanced financial chatbot to address the customers/users of financial services.

2.3) Project Specification

Financial technology (Fintech) is used to describe new technologies that seek to improve and facilitate the delivery and use of financial services. At its core, fintech is used to help companies, business owners and consumers better manage their financial performance, processes, and lives through software and specialized algorithms used on computers and, increasingly, Smartphones. Fintech, the name, is a combination of "financial technology".

When fintech emerged in the 21st century, the term was first applied to the technology used in the background systems of established financial institutions. Since then, however, there has been a shift in consumer-focused services and therefore there is a more customer-focused definition. Fintech now includes various sectors and industries such as education, retail banks, fundraising and non-profit, and investment management to name a few.

Fintech involves the development and use of cryptocurrencies such as bitcoin. While that part of fintech may see some of the most talked-about topics, big money still exists in the traditional banking industry around the world and the multi-billion dollar market capitalization.

2.4) Literature Survey

1. Standardized Architecture for Conversational Agents, a.k.a. Chatbots

This paper talks about the importance of a standardized architecture for the development of a conversational chatbot.

It highlights the need for standardized architecture as it is a foundational structure, which can be used for developing a broad range of applications and provides a model architecture.

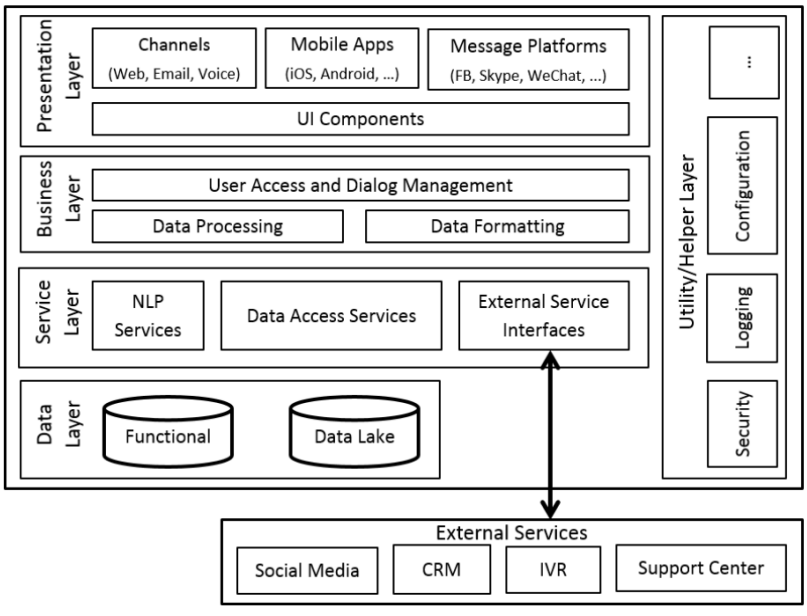


Fig I: Standardized architecture of Chatbot

2. **IntelliBot: A Dialogue-based chatbot for the insurance industry**

This paper is regarding the development of a dialogue-based chatbot that is centered around the insurance industry.

It states major steps for development as:

- Input processing
- Language understanding
- Response generation

It also states that an important component that understands the user's question by taking the word segments as its input is called the Language understanding component. Different techniques such as tokenization, POS tagging, named entity recognition, lemmatization, context identification, sentiment analysis, query classification etc. are used.

3. **Implementation of a Chatbot System using AI and NLP**

This paper regarding an AL and NLP based chatbot proposed the following system for development:

- Context Identification
- Personal Query Response system
- AIML response system
- Query Analysis & Response system
- Context Reset

4. **Privacy-Preserving Chatbot Conversations**

This paper discusses the importance and processes that ensure privacy in chatbot conversations.

It states two approaches, the first approach applies 'entity-based privacy filtering and transformation and can be applied directly on the app (client) side.

Second scheme (approach) is based on Searchable Encryption that can preserve user chat privacy, without requiring any knowledge of the chatbot design.

5. Chatbots and Virtual Assistant in Indian Banks

This paper discusses the various chatbots currently sourced, developed and deployed by Indian banks.

The Indian banking industry comprises approximately 20 banks in the public sector, 22 banks in the private sector, 56 regional rural banks, 44 foreign-owned banks, 22 scheduled state cooperatives banks, 11 non-scheduled state cooperatives banks, 54 scheduled urban cooperative banks, 1488 non-scheduled urban cooperative banks and 364 district central cooperative banks. Banks of the public sector dominate approximately 80% of the business share, transmitting relatively small fragments to its private rivals.

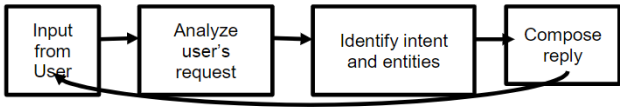


Fig II: Assistant in Indian Banks

6. Implementation of a Chatbot System using AI and NLP

This paper is regarding the deep learning involved in the development of chatbots.

Multilayer Perceptron (MLP) Multilayer Perceptron is used for speech recognition and translation operations of NLP.

Recurrent Neural Network (RNN) RNNs are extensively used for NLP tasks such as translation, speech recognition, text generation and image captioning.

The training data for a chatbot requires it to have a conversational flow. It needs to have a sentence or a question and a response.

7. CHATBOT: Architecture, Design, & Development

This paper is regarding the flow and steps involved in the development of a chatbot.

The steps mentioned in this paper are:

- Speech to Text Conversion
- Natural Language Processing

- Response generation
- Knowledge Base Generation
- Dialogue Management
- Text to Speech

8. **Pre-trained models for natural language processing: A survey**

This paper regards the use of pre-trained models and their benefits in natural language processing.

One of the advantages of these neural models is their ability to alleviate the feature engineering problem Non-neural NLP methods usually heavily rely on discrete handcrafted features, while neural methods usually use low-dimensional and dense vectors.

9. **Artificial Intelligence Powered Banking Chatbot**

This paper is regarding the use of artificial intelligence in chatbots in the banking industry.

- Preparation of Dataset (includes Web Scraping)
- Data Pre-processing (Includes Tokenization, Lemmatization, Stemming)
- Vectorization
- Classification
- Develop learning model
- Testing model
- Select the best approach
- Enquiry mapping & receiving a reply

3. Analysis and Design

3.1) Problem Statement

As stated earlier, chatbots not only allows customers to handle requests faster and more efficiently but also serves as a listening channel where we can better understand our customers and hence, we aim to develop an automated voice-enabled chatbot based on Natural Language Processing and Artificial Intelligence to serve various financial purposes. This chatbot will aim to ease the financial difficulties faced by associated users. The chatbot is desired to cater services to financial sectors such as banking.

3.2) Objective

To create an automated voice-enabled chatbot based on Natural Language Processing and Artificial Intelligence to serve various financial purposes. This chatbot will aim to ease the financial difficulties faced by associated users. The chatbot caters services to the following sector: Banking.

3.3) Scope of the project

Chatbots are everywhere. From online assistants, such as Microsoft's Cortana, to "helper bots" on messaging applications like Slack, to home applications like Amazon.com's Alexa, chatbots have become one of the most visible – and flawed – consumer-facing applications of artificial intelligence and machine learning.

We desire to create an automated voice-enabled chatbot based on Natural Language Processing and Artificial Intelligence to serve various financial purposes. This chatbot will aim to ease the financial difficulties faced by associated users. The chatbot caters services to sectors such as banking and loan.

3.4) Requirement Analysis

After conducting a user survey, we came along with the following observations:

- In a situation where the user is facing an issue in any application/service, they would choose a Human Agent for solving basic queries related to that application. Around 61.2% of the users prefer a Human-agent & 35.8% prefer a Chatbot.
- 71.6% of the users would consider talking to a chatbot before talking to a real human agent.
- 59.7% of the users prefer a voice-enabled chatbot over a normal chatbot.
- Users would like to use a chatbot for the following purposes:
    - Getting a quick response in an emergency
    - Resolving a basic query
    - Finding a human customer service assistant
- Important aspects in a chatbot according to the users are as follows:
    - Quick Response time
    - Good User Interface
    - Real-time answering of the queries
    - Being able to address the users according to their queries
- The factors which resist users from using a chatbot are:
    - Chatbot only operated for limited predefined context
    - A chatbot is not able to comprehend the user input
    - Long Response time
    - Not user-friendly
    - Concerns related to data safety
- 47.8% of the users prefer to have a 24/7 chatbot to assist them in a task or solve some query, 40.3% have a moderate stance on having a 24/7 chatbot and 11.9% don’t prefer to have a 24/7 chatbot.

- 47.8% of the users prefer to access the chatbot using a website & 37.3% of the users prefer to access the chatbot using Mobile applications.
- 64.1% of the users don't want to make a decision about buying loans only after considering the response given by the chatbot.
- The types of loan service which users would love to avail themselves are as follows:
    - Search about different loan schemes
    - To compare various interest rates provided by banks
    - To check eligibility for a loan
    - Information regarding the loan application
- The majority of the users share a moderate view on buying stocks and mutual funds based on the information received from the chatbot.
- The majority of the users are receiving online assistance from their banks via chatbots, and 37.3% of the users don't receive online assistance from their banks via chatbots. The majority of the users, who receive assistance from their banks via chatbot, found it ineffective.

3.5) Stakeholder Analysis

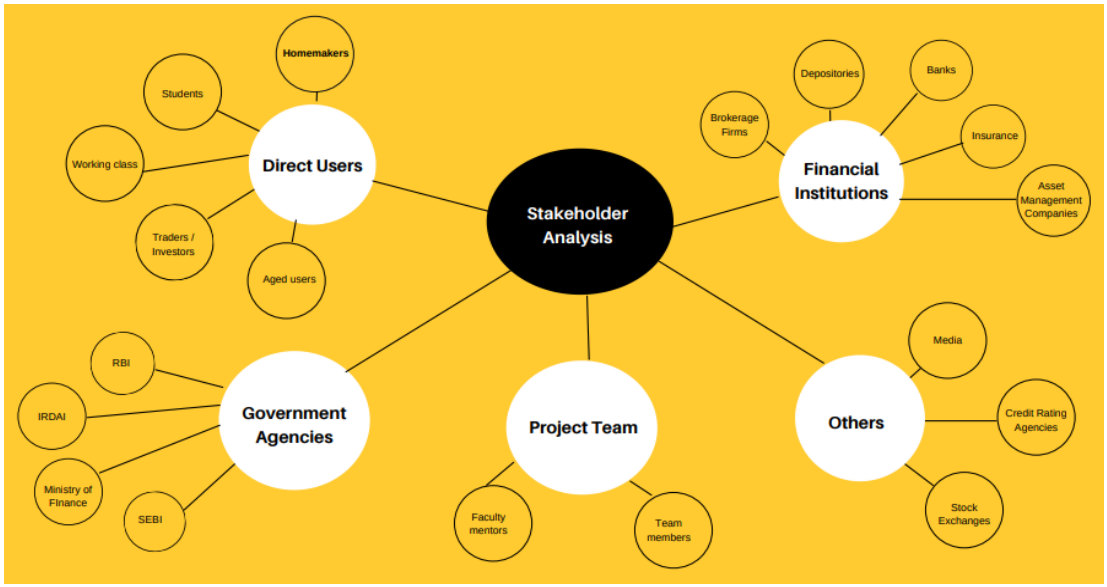


Fig III: Stakeholder Analysis

3.6) Project Planning

Phase 1 :

Sr No	Task	Start Date	End Date	Predecessors
1	Defining Problem and Scope	01-08-2021	07-08-2021	-
2	Literature Review	08-08-2021	31-08-2021	1
3	Market Survey	01-09-2021	08-09-2021	2
4	Study of Tools and Technologies	09-09-2021	20-09-2021	3
5	Selection of framework and identifying Data repositories	21-09-2021	30-09-2021	4
6	Defining architecture and Design specification	01-10-2021	19-10-2021	5
7	Initial Implementation of the project	20-10-2021	31-10-2021	6

Table 1: Timeline Phase 1

Phase 2 :

Sr No	Task	Start Date	End Date
1	Define pipeline of the chatbot	06-12-2021	16-12-2021
2	Develop Speech to Text module	17-12-2021	31-12-2021
3	Develop preprocessing pipeline	01-01-2022	14-01-2022
4	Training and developing a Deep learning / NLP model for a chatbot application	15-01-2022	15-02-2022
5	Deployment	16-02-2022	28-02-2022
6	Testing and Modifications	01-03-2022	20-03-2022

Table 2: Timeline Phase 2

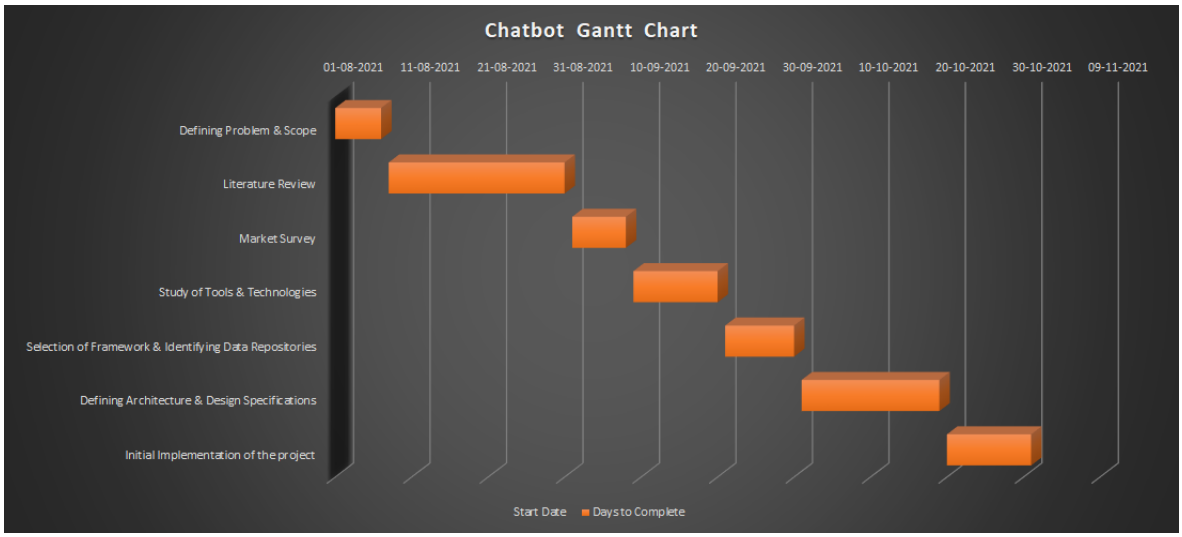


Fig IV: Gantt Chart

4. Project Description

4.1) Data Journey

A comprehensive explanation of the data journey, from the identification of the type of data requirement to the data pre-processing, is explained in the flow diagram below.

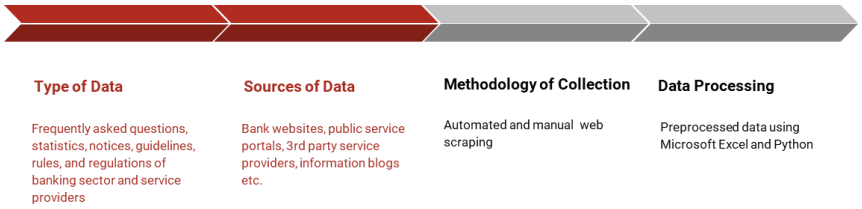


Fig V: Data Journey

4.2) Data Sources

All AI-driven chatbots rely on good, domain-specific data in order to function optimally.

We may find a chatbot that uses one of the latest, greatest, state-of-the-art models to function, but how good will it function if it doesn't have the data to back it up? Some mistakenly prioritize the quantity of the data above the quality, or aim for model accuracy above all else, and forget to invest time and energy into their data models as well. Getting great data that's both specific to

the banking industry and your specific organization is crucial to the success of your chatbot implementation.

Understanding this problem, we focused on scrapping only verified and reliable data. Majority of our data has been gathered from the official website of the Reserve Bank of India, PaisaBazar and BankBazar (an RBI registered entity).

4.3) Testing Methodology

We are developing test cases in such a way that we get to understand the accuracy of our chatbot to breath and depth. For each segment, we have developed rephrased versions of randomly selected questions which were tested for the responses received with the expected answers.

5. Project Implementation

5.1) Libraries / Algorithms

Libraries are generally used in programming languages as they are collections of rewritten code that users can use to optimize tasks. In our project we have identified the following libraries, which we feel will be useful for our project:

1) **NLTK:**

NLTK is a leading platform for building Python programs to work with human language data. It provides easy-to-use interfaces to over 50 corpora and lexical resources such as WordNet, along with a suite of text processing libraries for classification, tokenization, stemming, tagging, parsing, and semantic reasoning, wrappers for industrial-strength NLP libraries, and an active discussion forum.

2) **Hugging Face:**

Hugging Face, a company that first built a chat app for bored teens provides open-source NLP technologies, and last year, it raised $15 million to build a definitive NLP library. From its chat app to this day, Hugging Face has been able to swiftly develop language processing expertise. The company’s aim is to advance NLP and democratize it for use by everyone.

3) **PyTorch:**

PyTorch is an open source machine learning framework based on the Torch library, used for applications such as computer vision and natural language processing, primarily developed by Facebook's AI Research lab. It is free and open-source software released under the Modified BSD license.

4) **Flask:**

Flask is a micro web framework written in Python. It is classified as a microframework because it does not require particular tools or libraries. It has no database abstraction layer, form validation, or any other components where pre-existing third-party libraries provide common functions. CoreNLP currently supports 6 languages: Arabic, Chinese, English, French, German, and Spanish.

5) **SpeechRecognition :**

Library for performing speech recognition, with support for several engines and APIs, online and offline.

6) **Transformer :**

The Transformer in NLP is a novel architecture that aims to solve sequence-to-sequence tasks while handling long-range dependencies with ease. The Transformer was proposed in the paper Attention Is All You Need. It is recommended reading for anyone interested in NLP. The Transformer is the first transduction model relying entirely on self-attention to compute representations of its input and output without using sequence-aligned RNNs or convolution.

7) **Sci-Kit Learn:**

Scikit-learn (Sklearn) is the most useful and robust library for machine learning in Python. It provides a selection of efficient tools for machine learning and statistical modeling including classification, regression, clustering and dimensionality reduction via a consistent interface in

Python. This library, which is largely written in Python, is built upon NumPy, SciPy and Matplotlib.

8) Support Vector Machine :

"Support Vector Machine" (SVM) is a supervised machine learning algorithm that can be used for both classification or regression challenges. However, it is mostly used in classification problems. In the SVM algorithm, we plot each data item as a point in n-dimensional space (where n is a number of features you have) with the value of each feature being the value of a particular coordinate. Then, we perform classification by finding the hyper-plane that differentiates the two classes very well.

6. Project Screenshots


```
def get_response(usrText):

    t_usr = t_model.encode([cleanup(usrText.strip().lower())])
    class_ = le.inverse_transform(model.predict(t_usr))


    questionset = data[data['Class'].values == class_]

    cos_sims = []
    for question in questionset['Question']:
        sims = cosine_similarity(t_model.encode([question]), t_usr)

        cos_sims.append(sims)

    ind = cos_sims.index(max(cos_sims))

    b = [questionset.index[ind]]

    r = data['Answer'][questionset.index[ind]]+"    "

    return r
```

```
from flask import Flask, render_template, request

app = Flask(__name__)
app.static_folder = 'static'

@app.route("/")
def home():
    return render_template("index.html")

@app.route("/get")
def get_bot_response():
    userText = request.args.get('msg')
    return get_response(userText)


if __name__ == "__main__":
    app.run()
```

```
 * Serving Flask app '__main__' (lazy loading)
 * Environment: production
   WARNING: This is a development server. Do not use it in a production deployment.
   Use a production WSGI server instead.
 * Debug mode: off
 * Running on http://127.0.0.1:5000/ (Press CTRL+C to quit)
127.0.0.1 - - [20/Mar/2022 16:40:25] "GET / HTTP/1.1" 200 -
127.0.0.1 - - [20/Mar/2022 16:40:25] "GET /static/styles/style.css HTTP/1.1" 304 -
```

```
from sklearn.metrics.pairwise import cosine_similarity

import nltk
from nltk.corpus import stopwords
import datetime

import speech_recognition as sr
import pyttsx3
import pyaudio
```

In [2]:
```
# Reading csv file

data = pd.read_csv("FormattedDataset.csv", encoding = "ISO-8859-1", engine='python')

data.head()
```

Out[2]:

	Question	Ans	Category
0	What is the definition of Basic Savings Bank ...	All the existing No-frills accounts opened pu...	Basic Savings Bank Deposit Account
1	Whether the guidelines issued on no-frills ac...	No. In supersession of instructions contained ...	Basic Savings Bank Deposit Account
2	Can an Individual have any number of 'Basic S...	No. An individual is eligible to have only one...	Basic Savings Bank Deposit Account
3	Whether a 'Basic Savings Bank Deposit Account...	Holders of 'Basic Savings Bank Deposit Account...	Basic Savings Bank Deposit Account
4	Can an individual have other deposit accounts...	Yes. One can have Term/Fixed Deposit, Recurri...	Basic Savings Bank Deposit Account

In [25]:
```
#using decision tree
from sklearn.tree import DecisionTreeClassifier
dt_model = DecisionTreeClassifier()
dt_model.fit(trainx, trainy)
```

Out[25]:
```
DecisionTreeClassifier()
```

In [26]:
```
# using random forest
from sklearn.ensemble import RandomForestClassifier
rf_model = RandomForestClassifier()
rf_model.fit(trainx, trainy)
```

Out[26]:
```
RandomForestClassifier()
```

In [27]:
```
# using naive bayes
from sklearn.naive_bayes import GaussianNB
nb_model = GaussianNB()
nb_model.fit(trainx, trainy)
```

Out[27]:
```
GaussianNB()
```

In [30]:
```
#stochastic gradient descent
from sklearn.linear_model import SGDClassifier
sgd_model = SGDClassifier()
sgd_model.fit(trainx, trainy)
```

Out[30]:
```
SGDClassifier()
```

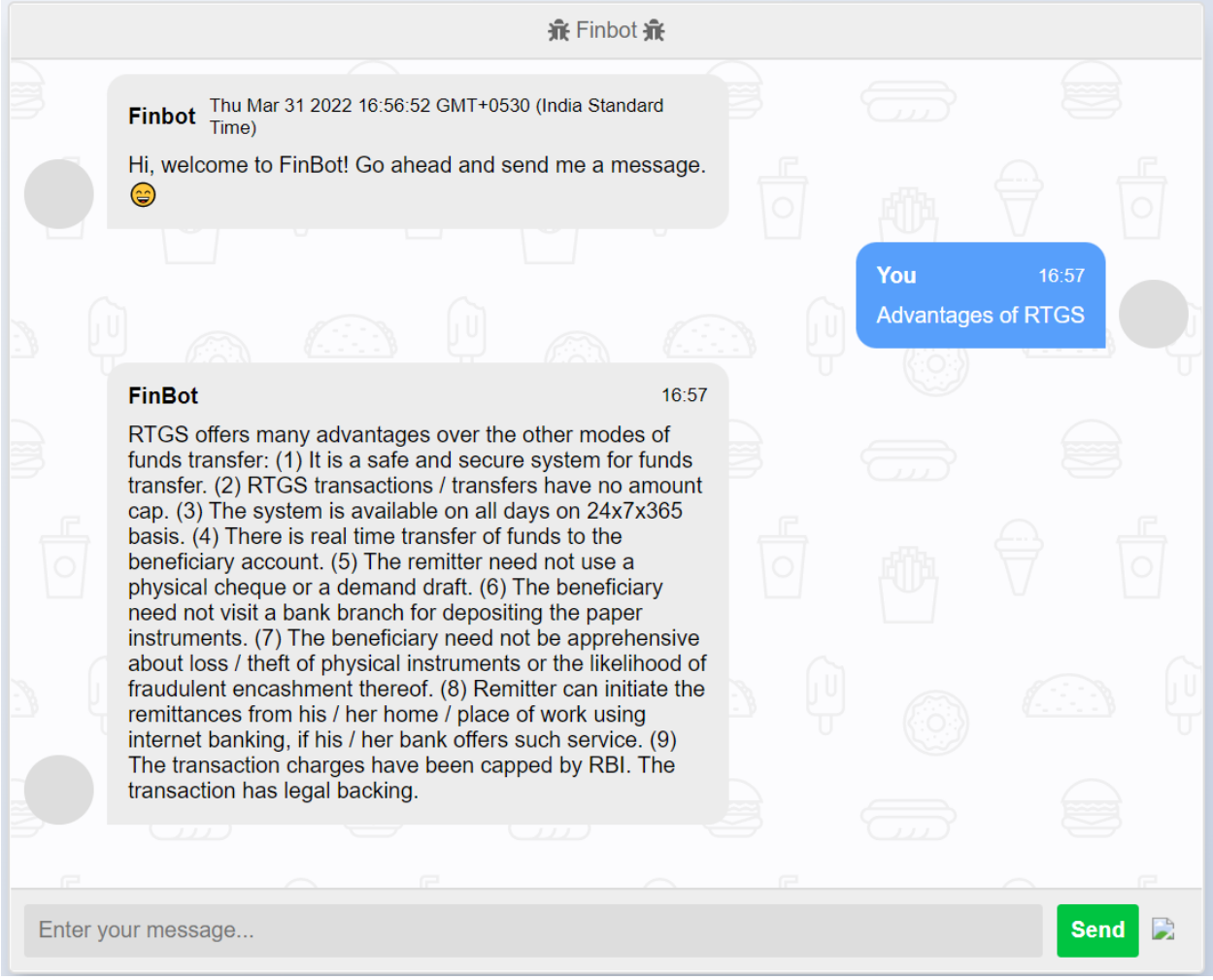
In [31]:
```
#Adaptive boost
from sklearn.ensemble import AdaBoostClassifier
ada_model = AdaBoostClassifier()
ada_model.fit(trainx, trainy)
```

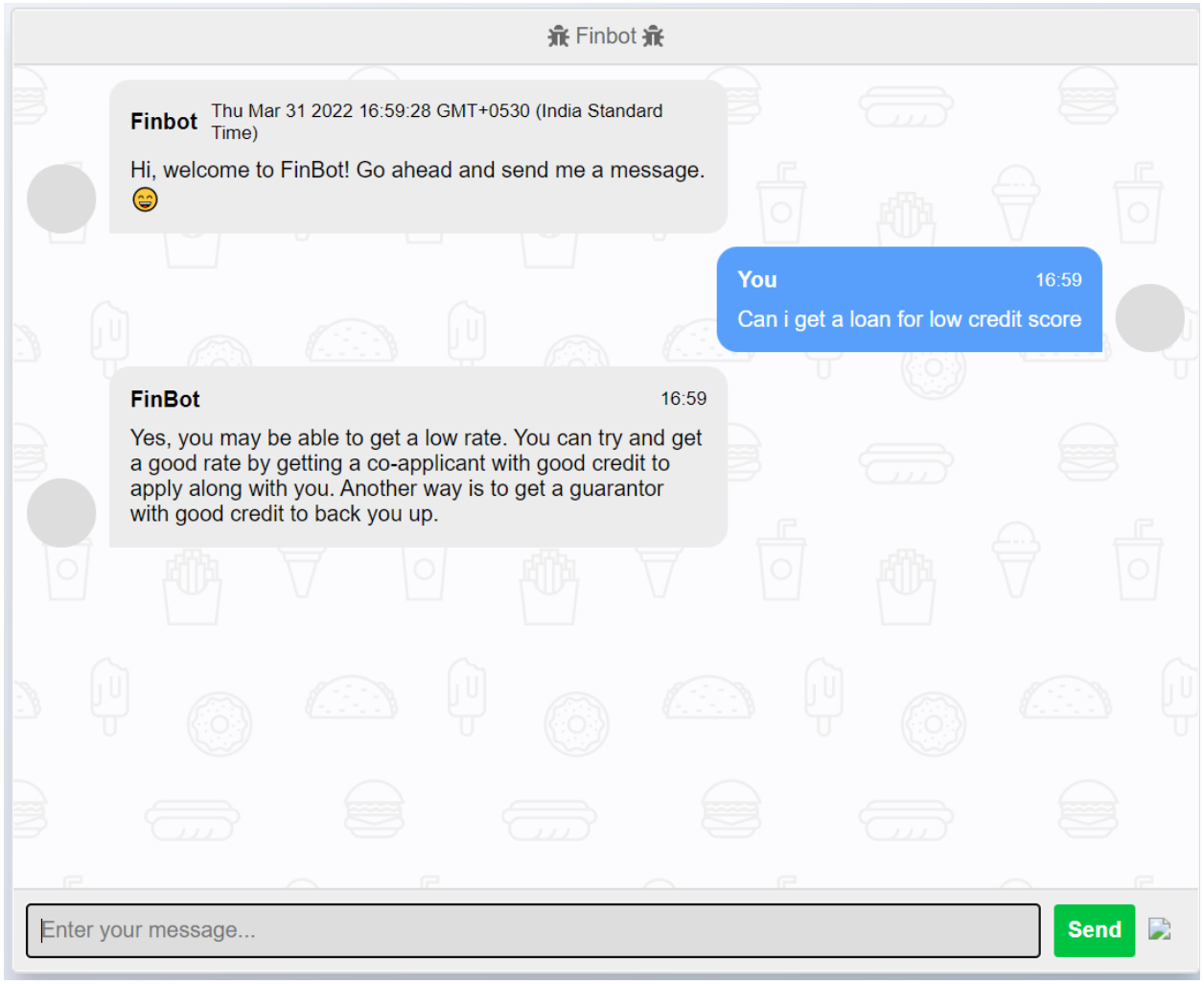
Out[31]:
```
AdaBoostClassifier()
```

In [32]:
```
# neural network
from sklearn.neural_network import MLPClassifier
nn_model = MLPClassifier(solver='lbfgs', alpha=1e-5,hidden_layer_sizes=(5, 2), random_state=1)
nn_model.fit(trainx, trainy)
```

Out[32]:
```
MLPClassifier(alpha=1e-05, hidden_layer_sizes=(5, 2), random_state=1,
              solver='lbfgs')
```

7. Project Output




Finbot
Finbot
Thu Mar 31 2022 16:59:28 GMT+0530 (India Standard Time)
Hi, welcome to FinBot! Go ahead and send me a message.
You
16:59
Can i get a loan for low credit score
FinBot
16:59
Yes, you may be able to get a low rate. You can try and get a good rate by getting a co-applicant with good credit to apply along with you. Another way is to get a guarantor with good credit to back you up.
Enter your message...
Send

8. Project Test Reports

Question	Cases	Predicted Answer	Expected Answer
Is there any minimum / maximum amount stipulation for RTGS transactions?	What is minimum limit for rtgs	The RTGS system is primarily meant for large value transactions. The minimum amount to be remitted through RTGS is 2,00,000/- with no upper or maximum ceiling.	The RTGS system is primarily meant for large value transactions. The minimum amount to be remitted through RTGS is 2,00,000/- with no upper or maximum ceiling.
	How much maximum amount can we transfer through rtgs	The RTGS system is primarily meant for large value transactions. The minimum amount to be remitted through RTGS is 2,00,000/- with no upper or maximum ceiling.	The RTGS system is primarily meant for large value transactions. The minimum amount to be remitted through RTGS is 2,00,000/- with no upper or maximum ceiling.
	What is the transaction limit for rtgs	The following should be ensured while putting through a funds transfer transaction using RTGS \x93Originating and destination bank branches are part of the RTGS network	The RTGS system is primarily meant for large value transactions. The minimum amount to be remitted through RTGS is 2,00,000/- with no upper or maximum ceiling.
What about processing charges / service charges for RTGS transactions?	how much is rtgs charge?	" With effect from July 01, 2019, the Reserve Bank has waived the processing charges levied by it for RTGS transactions. Banks may pass on the benefit to its customers. With a view to rationalise the service charges levied by banks for offering funds transfer through RTGS system, a broad framework of charges has been mandated as under: a) Inward transactions Free, no charge to be levied."	" With effect from July 01, 2019, the Reserve Bank has waived the processing charges levied by it for RTGS transactions. Banks may pass on the benefit to its customers. With a view to rationalise the service charges levied by banks for offering funds transfer through RTGS system, a broad framework of charges has been mandated as under: a) Inward transactions Free, no charge to be levied."

	What is the rtgs servicing charge	RTGS offers many advantages over the other modes of funds transfer:It is a safe and secure system for funds transfer.	" With effect from July 01, 2019, the Reserve Bank has waived the processing charges levied by it for RTGS transactions. Banks may pass on the benefit to its customers. With a view to rationalise the service charges levied by banks for offering funds transfer through RTGS system, a broad framework of charges has been mandated as under: a) Inward transactions Free, no charge to be levied."
	I want to know about charges for rtgs	" With effect from July 01, 2019, the Reserve Bank has waived the processing charges levied by it for RTGS transactions. Banks may pass on the benefit to its customers. With a view to rationalise the service charges levied by banks for offering funds transfer through RTGS system, a broad framework of charges has been mandated as under: a) Inward transactions Free, no charge to be levied."	" With effect from July 01, 2019, the Reserve Bank has waived the processing charges levied by it for RTGS transactions. Banks may pass on the benefit to its customers. With a view to rationalise the service charges levied by banks for offering funds transfer through RTGS system, a broad framework of charges has been mandated as under: a) Inward transactions Free, no charge to be levied."
What does RTGS stand for?	What is RTGS	The acronym 'RTGS' stands for Real Time Gross Settlement, which can be explained as a system where there is continuous and real-time settlement of fund-transfers, individually on a transaction by transaction basis (without netting).	The acronym 'RTGS' stands for Real Time Gross Settlement, which can be explained as a system where there is continuous and real-time settlement of fund-transfers, individually on a transaction by transaction basis (without netting).

	I want to know about RTGS	The acronym 'RTGS' stands for Real Time Gross Settlement, which can be explained as a system where there is continuous and real-time settlement of fund-transfers, individually on a transaction by transaction basis (without netting).	The acronym 'RTGS' stands for Real Time Gross Settlement, which can be explained as a system where there is continuous and real-time settlement of fund-transfers, individually on a transaction by transaction basis (without netting).
	Meaning of RTGS	The acronym 'RTGS' stands for Real Time Gross Settlement, which can be explained as a system where there is continuous and real-time settlement of fund-transfers, individually on a transaction by transaction basis (without netting).	The acronym 'RTGS' stands for Real Time Gross Settlement, which can be explained as a system where there is continuous and real-time settlement of fund-transfers, individually on a transaction by transaction basis (without netting).
	Explain what is RTGS application	The acronym 'RTGS' stands for Real Time Gross Settlement, which can be explained as a system where there is continuous and real-time settlement of fund-transfers, individually on a transaction by transaction basis (without netting).	The acronym 'RTGS' stands for Real Time Gross Settlement, which can be explained as a system where there is continuous and real-time settlement of fund-transfers, individually on a transaction by transaction basis (without netting).
What is the lowest interest rate available on personal loans?	Cheapest interest rate	PNB offer personal loans at attractive rates starting from 90% p.a. However, the interest rate may vary from customer to customer depending on certain factors, customers including credit profile and relationship with the bank, to name a few.	PNB offer personal loans at attractive rates starting from 90% p.a. However, the interest rate may vary from customer to customer depending on certain factors, customers including credit profile and relationship with the bank, to name a few.

	Which bank offers lowest interest rates	PNB offer personal loans at attractive rates starting from 90% p.a. However, the interest rate may vary from customer to customer depending on certain factors, customers including credit profile and relationship with the bank, to name a few.	PNB offer personal loans at attractive rates starting from 90% p.a. However, the interest rate may vary from customer to customer depending on certain factors, customers including credit profile and relationship with the bank, to name a few.
	Name of banks with low interest rate	PNB offer personal loans at attractive rates starting from 90% p.a. However, the interest rate may vary from customer to customer depending on certain factors, customers including credit profile and relationship with the bank, to name a few.	PNB offer personal loans at attractive rates starting from 90% p.a. However, the interest rate may vary from customer to customer depending on certain factors, customers including credit profile and relationship with the bank, to name a few.
	I want to know lowest interest rate possible	PNB offer personal loans at attractive rates starting from 90% p.a. However, the interest rate may vary from customer to customer depending on certain factors, customers including credit profile and relationship with the bank, to name a few.	PNB offer personal loans at attractive rates starting from 90% p.a. However, the interest rate may vary from customer to customer depending on certain factors, customers including credit profile and relationship with the bank, to name a few.
Can I get a low rate of interest even if my credit score is bad?	My credit score is bad, will I still get low interest rate	Yes, you may be able to get a . You can try and get a good rate by getting a co-applicant with good credit to apply along with you. Another way is to get a guarantor with good credit to back you up	Yes, you may be able to get a . You can try and get a good rate by getting a co-applicant with good credit to apply along with you. Another way is to get a guarantor with good credit to back you up
	I am worried I will not get low interest rate loan because I have less credit score	Yes, you may be able to get a . You can try and get a good rate by getting a co-applicant with good credit to apply along with you. Another way is to get a guarantor with good credit to back you up	Yes, you may be able to get a . You can try and get a good rate by getting a co-applicant with good credit to apply along with you. Another way is to get a guarantor with good credit to back you up

	Can I get loan with poor credit rating	Yes, you may be able to get a . You can try and get a good rate by getting a co-applicant with good credit to apply along with you. Another way is to get a guarantor with good credit to back you up	Yes, you may be able to get a . You can try and get a good rate by getting a co-applicant with good credit to apply along with you. Another way is to get a guarantor with good credit to back you up
How much will I have to pay if I miss paying an EMI?	I missed my EMI, how much penalty I have to pay	Your lender will charge you a late payment fee if you fail to pay your EMI on time. This fee will be mentioned in your loan document. Apart from this, you may also have to pay a penalty for late payment	Your lender will charge you a late payment fee if you fail to pay your EMI on time. This fee will be mentioned in your loan document. Apart from this, you may also have to pay a penalty for late payment
	I forgot to pay my EMI, do I have to pay any charge?	Your lender will charge you a late payment fee if you fail to pay your EMI on time. This fee will be mentioned in your loan document. Apart from this, you may also have to pay a penalty for late payment	Your lender will charge you a late payment fee if you fail to pay your EMI on time. This fee will be mentioned in your loan document. Apart from this, you may also have to pay a penalty for late payment
	How much will my bank charge if I miss my EMI	Your lender will charge you a late payment fee if you fail to pay your EMI on time. This fee will be mentioned in your loan document. Apart from this, you may also have to pay a penalty for late payment	Your lender will charge you a late payment fee if you fail to pay your EMI on time. This fee will be mentioned in your loan document. Apart from this, you may also have to pay a penalty for late payment
How would one know the IFSC number of the receiving branch?	I want to know IFSC number of the bank	Bank-wise list of IFSCs is available with all the bank-branches participating in NEFT scheme. List of bank-wise branches participating in NEFT and their IFSCs is also available on the website of RBI at . All member banks have also been advised to print the IFSC of the branch on cheques issued to their customers.	Bank-wise list of IFSCs is available with all the bank-branches participating in NEFT scheme. List of bank-wise branches participating in NEFT and their IFSCs is also available on the website of RBI at . All member banks have also been advised to print the IFSC of the branch on cheques issued to their customers.

	Where can I find IFSC number for bank	Bank-wise list of IFSCs is available with all the bank-branches participating in NEFT scheme. List of bank-wise branches participating in NEFT and their IFSCs is also available on the website of RBI at . All member banks have also been advised to print the IFSC of the branch on cheques issued to their customers.	Bank-wise list of IFSCs is available with all the bank-branches participating in NEFT scheme. List of bank-wise branches participating in NEFT and their IFSCs is also available on the website of RBI at . All member banks have also been advised to print the IFSC of the branch on cheques issued to their customers.
	Please tell me the IFSC code for my bank	IFSC or Indian Financial System Code is an alpha-numeric code that uniquely identifies a bank-branch participating in the NEFT system. Its a 11-digit code with the first 4 alpha characters representing the bank, and the last 6 characters representing the branch. The 5th character is 0 (zero). IFSC is used by the NEFT system to identify the originating / destination banks / branches and also to route the messages appropriately to the concerned banks / branches.	Bank-wise list of IFSCs is available with all the bank-branches participating in NEFT scheme. List of bank-wise branches participating in NEFT and their IFSCs is also available on the website of RBI at . All member banks have also been advised to print the IFSC of the branch on cheques issued to their customers.
How does my credit score impact the cost of my loan?	Will my loan cost differ because of credit score	A good credit score indicates that you are responsible in handling your finances. This keeps your risk rating low. If your credit score is 750 and above, most likely you will be offered preferential rates	A good credit score indicates that you are responsible in handling your finances. This keeps your risk rating low. If your credit score is 750 and above, most likely you will be offered preferential rates

	Does credit score have an effect on my loan amount	A good credit score indicates that you are responsible in handling your finances. This keeps your risk rating low. If your credit score is 750 and above, most likely you will be offered preferential rates	A good credit score indicates that you are responsible in handling your finances. This keeps your risk rating low. If your credit score is 750 and above, most likely you will be offered preferential rates
	What is the relation between credit score and loan amount	A good credit score indicates that you are responsible in handling your finances. This keeps your risk rating low. If your credit score is 750 and above, most likely you will be offered preferential rates	A good credit score indicates that you are responsible in handling your finances. This keeps your risk rating low. If your credit score is 750 and above, most likely you will be offered preferential rates

9. Results and Discussion

- Huggingface Transformer provides a higher validation rate in comparison to the TF-IDF vectorizer.
- We trained our model using various Machine Learning Classification algorithms, and observed that SVM provides better results.
- We created sample test questions according to the different service segments, and also created different forms of questions, which can be given as an input to the chatbot.
- We've also deployed our chatbot on the Heroku server.

10. Conclusion

Chatbots or smart assistants with artificial intelligence are dramatically changing businesses. There is a wide range of chatbot building platforms that are available for various enterprises, such as e-commerce, retail, banking, leisure, travel, healthcare, and so on.

We have analyzed and defined the problem statement and its scope, we understood and learned about the various nuances associated with chatbot and its development process. We have studied various existing researches done for chatbot development and deployment and have also developed the tentative timeline and are done with the work distribution. Furthermore, we are done with the selection of framework and identification of data repositories and have defined the architecture and design specifications.

11. References

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