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Subject -

Problem Statement -

Develop an elementary chatbot for any suitable customer interaction application.

Theory -

*Introduction to Chatbots

Chatbots are not a recent development. They are simulations which can understand human language, process it and interact back with humans while performing specific tasks. For example, a chatbot can be employed as a helpdesk executive. The first chatbot was created by Joseph Weizenbaum in 1966, named Eliza. It all started when Alan Turing published an article named "Computer Machinery & Intelligence" and raised an intriguing question "can machine think?" & ever since we have seen multiple chatbots surpassing their predecessors to be more naturally conversant & technologically advanced. These advancements have led us to an era where conversations with chatbots have become as normal & natural as with another human. Today, almost all companies have chatbots to engage their users & serve customers by catering to their queries. As per a report by Gartner, chatbots will be handling 85% of the customer service interactions by the year 2020. Also, 80% of businesses are expected to have some sort of chatbot automation by 2020 (Outgrow 2018). We practically will have chatbots everywhere but this doesn't necessarily mean that all will be well-functioning. The

Challenge here is not to develop a chatbot but to develop a coe functioning one.

*What are AI chatbots?

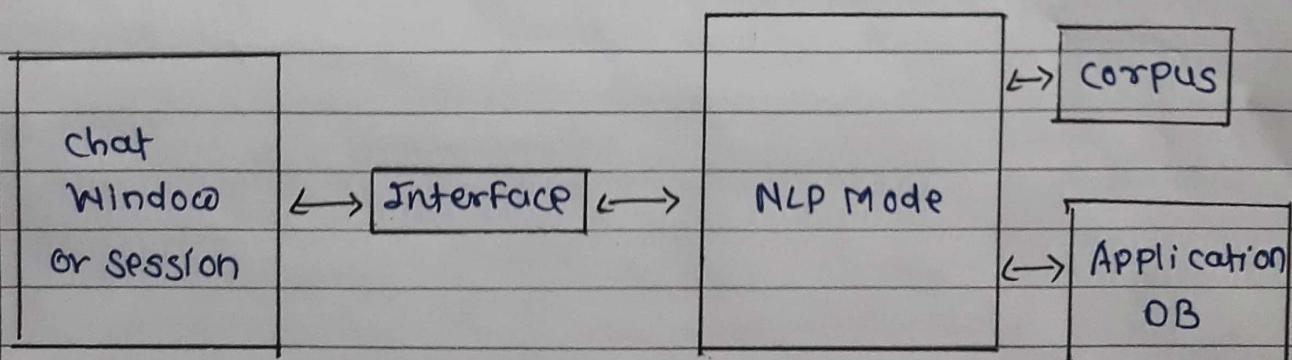
Artificial Intelligence chatbots are text- or voice-based interfaces that provide support and connect human users with the services or information they need by simulating a traditional person-to-person conversation. Text-based chatbots are often deployed online on websites and social media platforms to provide customer support and outreach. Voice-based chatbots, on the other hand, are most typically used for call deflection & sorting or over-the-phone customer service. Most smart phones come equipped with built-in chatbot, and smart speakers with chatbot functionality have been trendy gift-giving items for several years.

The Architecture of Chatbots

Typical chatbot architecture should consist of the following:

- Chat Window / Session / or front end application interface.
- The deep learning model for Natural Language Processing [NLP].
- Corpus or training data for training the NLP model.
- Application Database for processing actions to be performed by the chatbot.

Please refer the below figure to understand the architectural interface:



*NLP = Natural Language Processing

corpus or Training Data -

corpus means the data that could be used to train the NLP model to understand the human language as text or speech and reply using the same medium. Corpus is usually huge data with a lot of human interactions.

corpus can be designed using one of the following methods:

- Manual
 - Accumulated over time in an organised fashion.
- Following are the components of a corpus :
- Input Pattern
 - Output Pattern
 - Tag

Let us take a business scenario where we need to deploy & design a chatbot which acts as a virtual help desk assistant keeping this business scenario in mind a sample corpus is manually designed as follows:

Pairs - collection of all transactions [Input & Output] to be used for training the chatbot.

Read/pattern - patterns which are or could be delivered as outputs from the chatbot to end users.

Response - patterns which are could be delivered as outputs from the chatbot to end users.

Regular Expressions -

patterns which are used to generalise patterns for read & response. This is mainly used to optimise the corpus by making it more generic & avoid generating static read & write responses.

Tag - To group similar text instances & use the same as targeted outputs to train neural networks.

* Types of chatbots -

There are many types of chatbots available, a few of them can be majorly classified as follows:

Text-based chatbot - In a text-based chatbot, a bot answers the user's questions via text interface.

Voice-based chatbot - In a voice or speech-based chatbot, a bot answers the user's questions via a human voice interface.

Traditional chatbot - Traditional chatbots are given by system & automation mainly through scripts with minimal functionality & the ability to maintain only system context.

Current Chatbot - Current chatbots are driven by back & forth communication between the system & humans. They have the ability to maintain both system & task contexts.

Future Chatbot - Future chatbots can communicate at multiple levels with automation at the system level. They have the ability to maintain the system, task & people contexts. There is a possibility of introduction of master bots & eventually a bot OS.

There are mainly two approaches used to design the chatbots described as follows:

- In a Rule-based approach - a bot answers questions based on some rules on which it is trained on. The rules defined can be very simple to very complex. The bots can handle simple queries but fail to manage complex ones.
- Self learning bots are the ones that use some Machine Learning based approaches & are definitely more efficient than rule based bots. The bots can be further classified in two types: Retrieval Based or Generative.

* Where chatbots are used &

- 1) Virtual assistant chatbots - Almost everybody these days have heard about Siri, Cortana, Alexa, etc. & even asked questions from them ranging from the important like "Open my calendar"

to the silly like "What is the color of the sky?"! These chatbots are virtual assistant chatbots that are available in mobile phones, laptops, smart home devices, etc. and they can be used to retrieve information from the internet, call people, schedule appointments, etc. Almost like a personal assistant that is just not physical!

2) Customer Service Chatbots - Almost all companies use chatbots to help their customers with the basic issues they face. These customer service chatbots can help the customers to easily navigate the company websites, answer basic questions and forward the customers to the relevant human customer service agents if their queries are more complex. For example, suppose your Samsung earphones are not working then you can contact the Samsung customer service chatbot on their site to resolve your problems.

3) E-commerce Chatbots - E-commerce companies also use chatbots to help their customer easily complete their transactions & also help them if any problem arises. These chatbots are specially designed to lead the customers from the starting which involves browsing the items of E-commerce website & ending with purchasing to complete the transaction. If you are buying something on Amazon, the Amazon chatbot can guide you through the whole process of online shopping.

TOP APPLICATIONS OF CHATBOTS -

- ① Virtual reception assistant
- ② Virtual help desk assistant
- ③ Virtual tutor or teacher
- ④ Virtual driving assistant
- ⑤ Virtual email, complaints or content distributor

- ⑥ Virtual home assistant [Example- Google Home]
- ⑦ Virtual Operations assistant [Example- Jarvis]
- ⑧ Virtual entertainment assistant [Example- Amazon Alexa]
- ⑨ Virtual Phone assistant [Example: Apple Siri]
- ⑩ Assist the visually impaired person
- ⑪ can help a warehouse executive in locating the stocked product.

*Best AI chatbots -

- | | |
|---------------------------|-----------------------|
| ① Hubspot Chatbot Builder | ⑧ Proprofs ChatBot |
| ② Intercom | ⑨ Salesforce Einstein |
| ③ Watson Assistant | ⑩ Rulai |
| ④ Drift | ⑪ LivePerson |
| ⑤ Mindsay | ⑫ Inbenta |
| ⑥ Bold 360 | ⑬ Ada |
| ⑦ Zendesk Chat | ⑭ Acquire. |

Advantages of chatbots -

- ① 24/7 Availability - Customers needn't wait for the next available operator when chatbots are part of the communication strategy on a round-the-clock basis.
- ② Instant Response - Chatbots can handle the queries of thousands of customers instantly as well as simultaneously and improve the average response time.
- ③ Consistency in Answers - The use of chatbots can help businesses maintain a great level of consistency in answers & improve customer experience with the brand.
- ④ Omni-Channel - AI-powered bots come with omni-channel messaging support features which helps customers communicate with businesses through various channels such as websites, facebook, etc.

- ⑤ Personalization → Bots can ensure a touch of personalization by engaging customers with one-on-one conversations, maintaining a natural-sounding tone and by being good at interactive communication.
- ⑥ Multilingual - your business can program the sales bot to answer queries in the language of customers & expand the reach to new markets or territories.
- ⑦ Order without human help - Thanks to bots-driven automation, customers can book orders or do transactions without any human help.

* Disadvantages of ChatBots -

- ① Lack of feelings & emotions -

Sometimes it becomes critical for Chatbots to interact in an effective manner since chatbots have no feelings or emotions.

- ② Requires Maintenance -

AI based chatbots require continuous ongoing optimization, analysis & maintenance.

- ③ Difficult to Create -

Developing Chatbot from scratch is a very hard task.

There are many different ways a chatbot can positively impact customer communication & drive business growth.

- ① Increase Customer Engagement.

- ② Improve Lead Generation.

- ③ Reduces Customer Service Costs.

- ④ Monitor Customer Data to Gain Insights.

- ⑤ Derive a Conversational Marketing Strategy.

- ⑥ Balance Automation with Human Touch

- ⑦ Meet Customer Expectations.

- ⑧ Achieve Scalability of Support

- ⑨ Streamline Your Customer Onboarding Process

- ⑩ Make the Customer Journey Smoother

*Limitations of chatbots-

- As the database used for output generation is fixed & limited, Chatbots can fail while dealing with an unsaved query.
- A chatbot's efficiency highly depends on language processing & it's limited because of irregularities such as accents & mistakes.
- Chatbots are unable to deal with multiple questions at the same time & so conversion opportunities are limited.
- Chatbots require a large amount of conversational data to train. Generative models, which are based on deep learning algorithms to generate new responses word by word based on user input are usually managing non-linear conversations that must go back & forth trained on a larger dataset of natural languages phrases.
- Chatbots have difficulty managing non-linear conversations that must go back & forth on a topic with a user.
- As it happens usually with technology-led changes in existing services some consumers more often than not from older generations making it obvious that their requests are being dealt with by machines.

Conclusion -