# AI – Based Chatbot to Improve Self-Guided Learning

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## ABSTRACT

Dialogue generation or wise conversational agent like chatbot machine entice big hobby in the latest years in lots of different field. It is a computer program, programmed in such a way that is capable of having a human-like conversation with a user by receiving and sending text messages for the purpose of automating a business process. Chatbots can range from simple to advance. They fall on a range of artificial insight. It uses deep learning, natural language processing or different machine learning techniques. These agents are generally used in an attempt to increase the efficiency and shortening the business process execution time replacing the human to human communication with a human to machine conversations and queries in natural languages. These agents today have several levels of capabilities as task oriented or general purpose chatbots. In practical terms, they allows businesses to increase their efficiency and reduce overhead. The lower of staff for monotonous cycles requiring client provider representatives is the best assure of chatbots within the lengthy haul. Some chatbots are vicinity specific that are specific scenario based totally commercial corporation purpose. They are normally used by financial organizations like investment companies, banks, brokerage funds, insurance companies, credit card companies. Among current chatbots which are deployed by companies majority of them are rule based which have limited capability. In this project I am building a self-learning conversational agent.

## I.      STATEMENT OF THE PROBLEM

A chatbot needs a purpose to be developed. In the world of technology there has been a fundamental shift in customer digital expectations. Gone are the days when people used to stand in queues to avail services. Artificial intelligence is substantially changing the world. It is leading to better customer experience, assistance and satisfaction of another level to the customer. However we all know that most organizations' service providers struggle to get many of their customers to use their service. They recognize absence of consumer loyalty when utilizing internet banking administrations to be a significant reason. Service quality, web design and content, security, privacy, speed and convenience are the top factors influencing customer satisfaction. Consumers expressed their frustration with websites that are hard to navigate, do not address simple questions, and difficult to find basic details about the organization. The existing web interface which is being used by business enterprises and multinational corporations have disappointed customers. Current chatbots also which are deployed for customer interaction are not much efficient enough to answer their queries. This proposes that there is an absence of innovation set up to upgrade the client web based financial experience which could be improved by coordinating a chatbot to give a proficient, advantageous and individual help. This led to search for some more promising solutions in chatbot.

## II.      INTRODUCTION
### 2.1 CHATBOT

A chatbot is a piece of programming that directs a discussion by means of hear-able or printed techniques. Such undertakings are continuously deliberate to convincingly reproduce how a human could keep on as a conversational

associate. Chatbots are mostly applied in alternate frameworks for special reasonable functions such as purchaser care or records acquiring. Some chatbots utilize complex regular language getting ready frameworks, however severa less complicated ones check for catchphrases within the info, at that point pull an answer with the maximum coordinating watchwords, or the most comparative phraseology design, from a facts base. It is an associate that speaks with us through instant messages, a virtual partner that incorporates into sites, applications or moment couriers and causes business people to draw nearer to clients. Such a bot is a motorized game plan of correspondence with customers.



**Figure 1:** Chatbot

Chatbot work by analyzing and identifying the intent of the user's request to extract relevant entities, which is the most important task of a chatbot. When the examination is done suitable reaction is conveyed to the client. The chatbot work by adopting NLU and NLP methods. Natural language understanding (NLU) is the capacity of the chatbot to comprehend a human. It is the direction in the direction of converting over substance into coordinated records for a system to understand. NLU follows three specific concepts. They are entities, context, and expectancies. Entities represents an idea to the chatbot. For example, it may be a refund system in our ecommerce chatbot. Setting implies whilst a characteristic language expertise calculation identifies the solicitation and it has no chronicled history of discussion, it might not have the option to study the solicitation to present the response. Assumptions implies Bot have to have the choice to fulfill the purchaser assumptions after they make ask for or ask a question consumer says sends a request. Natural Language Processing (NLP) bots are designed to convert the text or speech inputs of the user into structured data. The information is additionally used to pick an applicable answer. It comprises Tokenization, Sentiment Analysis, Normalization, Entity Recognition, and Dependency Parsing.

As of late, there have been significant increment of interest being used and sending of discourse age frameworks. Many major tech companies are using virtual assistant or chat agent to fill the needs of customers. Some of them include Google's Google Assistant, Microsoft's Cortana and Amazon's Alexa. In spite of the fact that they are basically question noting frameworks, their reception by significant organizations has topped interest in clients and appears to be encouraging for further developed conversational specialist framework innovative work.

Banks are also using chatbot these days to improve their service. Bank of America's remote helper chatbot Erica can take orders through sort and voice order and perform capacities, for example, booking an installment and investigating ongoing exchanges inside their application.Kotak Mahindra Bank is the first to ever launch the voice chat bot named Keya. HDFC Bank's EVA (electronic virtual assistance) is largest artificial intelligence powered chatbot. EVA has already answered 5 million queries with 85 % accuracy.

A chatbot can paintings for the company depending on preparing gave to it and increment the efficiency of the work. A few helping advances assist the chatbot to fill in as a authentic partner. For example NLP, AI and IoT upheld apparatuses and applications are functioning as a spine for the chatbot.

A chatbot is a free element that offers authoritative types of assistance to the clients and specialized and social help to the customers. It can paintings in one of a kind modes like secretarial paintings, consumer assistance uphold, showcasing via net-based totally media, too as can do the net altering venture for a particular website or application. For making commercial enterprise arrangements, setting updates, arranging activities, going to calls; those chatbots are applied.

lTypes of chatbots:

The chatbots are of two types:

- Rule based chatbot.
- AI chatbot.

Rule Based chatbot are the one which works on the set of predefined rules. In this sort of bots, discussions map out to imagine what a customer may ask and how the chatbot should respond. They even can't answer the question outside their scope, like outside the predefined set of rules. They don't gain from the historical backdrop of discussions. These sorts of chatbots are quicker as contrast with AI-Powered chatbots. These bots are used as an FAQ resource, used

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when there are a few conversations to feedbasically used by small companies and organizations.

We all have been exposed to robots but most likely have not noticed that. Every time we use the Google search engine we almost the use of a robot, engine spiders, that indexes web web page. Chatbots had an outstanding growth within the beyond few years and being utilized in numerous forms in public and personal sectors via websites, social media, and mobile systems. Future Market Research in a current article claimed that the Chatbots marketplace with major gamers together with Facebook (USA), WeChat (China), IBM (USA), and Artificial Solutions (Sweden) will attain 6 billion via 2023.

In recent years there has been a fundamental shift in customer digital expectations. Consumers expressed their frustration with website sites that are hard to navigate, do not address simple questions, and difficult to find basic details about the organization. Customers would rather to pay more attention to the personal message and one-to-one conversation than broadcasted messages, access information on-demand 24/7 and no tolerance to search or wait for information via emails. They prefer to use messaging (text or talkto-text) more than any other modes of communication and would like to have interactions with smarter speech-enabled applications like Siri or Amazon Echo. The existing web interface used by the public and private sectors have caused disappointment and unpleasant experience for users as they lack a standard interface.
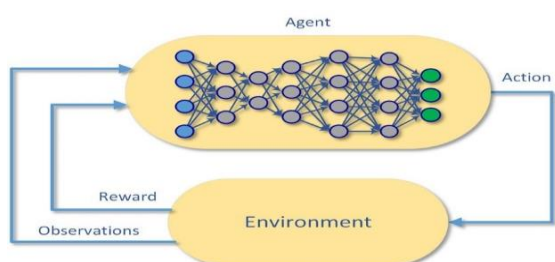


**Figure 2:** Drnn

### III.     OBJECTVES

Chatbots are constructed to help business by way of supporting and delivering actions or messages wherein humans cannot reach due to time or budget. The main aim of chatbot is to support business teams in their relations with customers, by offering efficiency and scalability.

The main objective of a chatbot is to engage with a user and provide the necessary information which has been asked. But as the query length increases the accuracy of the chatbot decreases. So another objective is to increase the accuracy of the chatbot so that if the user gives his/her query which is long or comprises multiple sentences our chatbot gives an intelligent reply. Sometimes chatbots are not ecient sufficient to recognize a couple of queries which can be definitely the a part of a unmarried question. They deal with it as a person query. Therefore the end end result isn't always just like anticipated through the patron. So the objective is to make a chatbot which senses the nature of the query.

### IV.     LITERATURE REVIEW

In today's era digital technology is making our life simple and convenient. Either its finance, retail, sports, transportation or healthcare industry, technology has played an exceptional role. Let's take an example of banking industry. It has multiple electronic delivery channels in use to distribute technology assets and services for the benefit of their customers. Online banking is a commodity of commerce within financial services as well as banking industries. Progressions in innovation has changed a significant number of our administrations into the computerized time and the financial business is one of the essential enterprises to profit of these headways to improve their services.

Gone are the days when people used to stand in queues to avail the banking services. Artificial intelligence is substantially changing the world. It is leading to better customer experience, assistance and satisfaction of another level to the customer. As a result banking professionals understand the importance of these chatbots which helps in conversing with the customers and helps in providing better assistance. Banks implement technology to strengthen their processing capacity, acquire a larger market capital with customer base and expand the services they could offer. Internet banking has gotten more mainstream as it nullifies the requirement for clients to visit their nearby office as they can deal with their finances in a hurry to meet the demand of modern life. However we all know that most internet banking service providers struggle to get many of their customers to use their service. They identify lack of customer satisfaction when using online banking services to be a major cause. "Service quality, web design and content, security, privacy, speed and convenience" are the top factors influencing customer satisfaction.

This indicates that there is a lack of era in location to beautify the client on-line banking revel in which could be improved with the aid of

integrating a chatbot to provide an efficient, convenient and private carrier.

Chatbots can analyses and understand not only the content but also the context of the customer's questions. As the research topic involves various terms like chatbots, perception and attitude it becomes imperative to explain each of them. Chatbots are defined as an artificially conversational agent which is enough intelligent to initiate and simulate human-like conversation.

## Related Work

There have been numerous new turn of events and experimentation in conversational specialist framework. Apart from traditional chatbot improvement strategies that use rule primarily based techniques, or simple device gaining knowledge of algorithms, many advanced chatbots are using advanced Natural Language Processing (NLP) techniques and Deep Learning Techniques which includes Deep Neural Network (DNN) and Deep Reinforcement Learning (DRL).
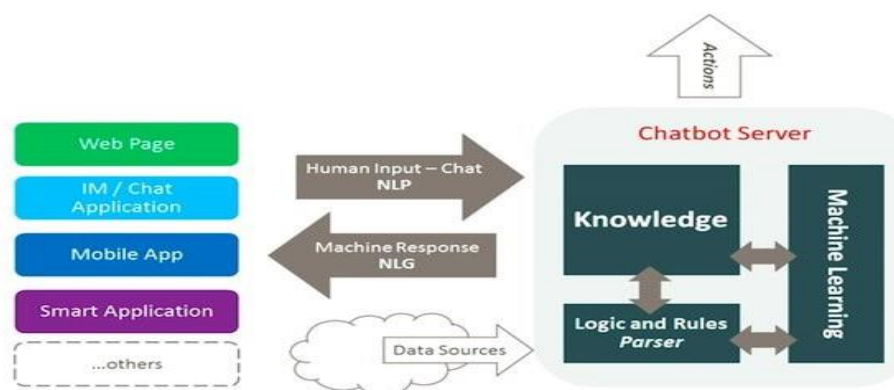


**Figure 3:** Anatomy of chatbot

## Deep Reinforcement Learning

Profound support learning consolidates artificial neural organizations with a fortification learning design that empowers programming defined specialists to gain proficiency with the most ideal activities in virtual climate to accomplish their objectives. That is, it joins work guess and target enhancement, planning state-activity sets to anticipated prizes. This field of research has been able to solve a extensive range of complex decision-making tasks that have been previously out of attain for a gadget. Seq2Seq version can generate coherent dialogues but might also produce repeated time-honored responses regardless of enter and may get stuck in a loop in longer conversations. This happens as Seq2Seq predicts expressions each in turn while disregarding their influence on future results. Seq2Seq models tend to generate highly frequent repeated responses like "I don't know". This is due

to high frequency of generic responses in the training set, also this replies are more compatible with a wide range of input text.

## Sequence to Sequence (Seq2Seq) Model

Seq2seq is a group of AI approaches utilized for language preparing. The calculation was created by Google for use in machine interpretation. Seq2seq turns one sequence into another sequence. It does as such by utilization of a recurrent neural network (RNN) or all the more frequently LSTM or GRU to stay away from the issue of evaporating inclination. The essential parts are one encoder and one decoder organization. The encoder transforms everything into a relating concealed vector containing the thing and its specific circumstance. The decoder inverts the cycle, transforming the vector into a yield thing, utilizing the past yield as the info setting.
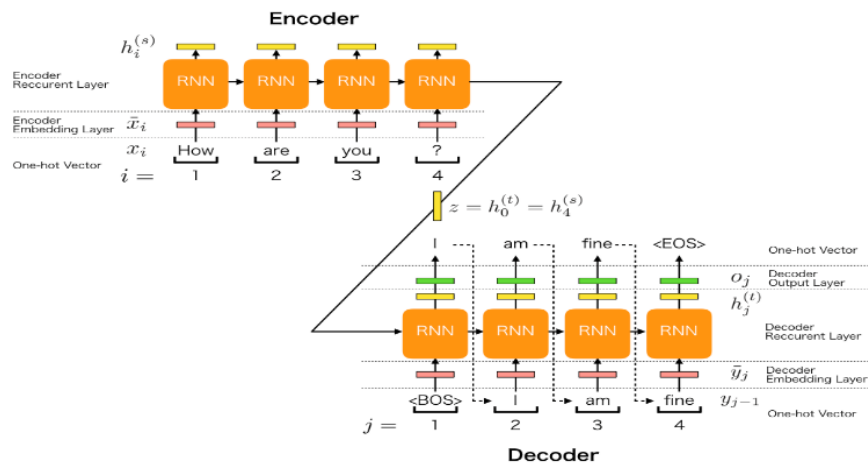
**Figure 4:** Seq2Seq

**Frameworks**

Botkit is a development kit from Howdy for growing and integrating bots, primarily based on Node.Js and offers several choices of NLP offerings, messaging structures and databases.

Chatterbot is a Python library which implements a conversational dialog engine for chatbots using several human language and provides training and logic adapter that matches the user input against the training data.

Botpress is a framework for creating bots using independent modules and third parties.

BotMan is a PHP library for building chatbot that can be used by itself or in a Laravel-based bundle and supports several popular messaging channels as well as own drivers.

## V. RESEARCH METHODOLOGY

**Recurrent Neural Network**

Recurrent Neural Network is a special Deep Neural Network Architecture used predominantly in Natural Language Processing (NLP) problems. In traditional Deep Neural Network, memory or sequence information is not taken into account. But, in Recurrent Neural Network, the sequential information is stored in memory and utilized for further processing which makes RNN suitable for sequential data or time series data where dependency exists in sequence.

**Recurrent Neural Network Architecture**

Recurrent Neural Network (RNN) is composed of input layer, multiple hidden layers and output layer. In info layer, input is feed as vector portrayal. Then, input vector is multiplied by some weight and some biases are added. Then, the output from input layer is passed to next hidden layer where each consecutive hidden layer is composed of numerous RNN cells. After getting output from input layer, the cells in hidden layer multiplies the generated output from enter layer via their very own cellular weights and biases. Next, in each of the hidden layer cells, some global activation function (sigmoid, tangent) is applied to generate output from hidden layer. Then, output from each hidden layer cells is passed to successive hidden layer. Similar to previous hidden layer cells, some weight, biases and activation function is applied to the input of current hidden layer cell. This procedure propagates though all consequent hidden layers. Finally, output generated from the final hidden layer is passed to output layer and the output layer applies some function (e.g. Softmax) to generate final output. For RNN, the output vector from final output layer is then again fed into the input layer as an input vector.

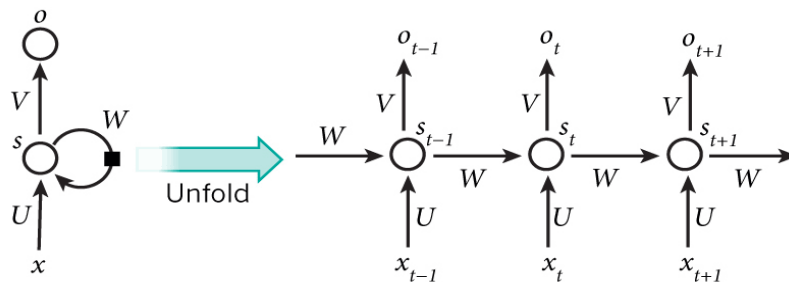Hence, the sequence information is stored in the memory and utilized.

**Figure 5:** RNN

But, vanilla RNN stores the complete sequence information. For large dataset with longer sequences, this can cause information bottleneck for the network. It may cause network to perform poorly due to information overload. As in many cases, complete sequential information may not be relevant in many NLP task including dialogue generation and can cause model to perform poorly. This problem is solved by special type of RNN cell Long-Short-term-Memory (LSTM).

**Long-Short-Term-Memory**

Long-Short-Term Memory (LSTM) is a special form of Recurrent Neural Network cell, which solves the facts bottleneck for longer sequences. LSTM has overlook gate together with the input and output gates. This helps remember longer sequence without overloading the network by discarding less relevant information.
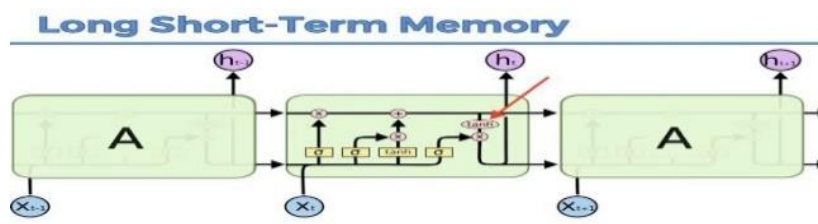


**Figure 6:** LSTM

Both encoder and decoder unit can be composed of different cell types other than vanilla RNN cell, including Long Short-term Memory (LSTM), or a gated recurrent unit (GRU). Also, encoder and decoder may be composed of unidirectional or bidirectional RNN. But, it has been empirically found that, LSTM works well for dialogue generation and other language problems as full sequence text can become information bottleneck and in many cases complete sequence is not required for efficient dialogue generation. Also, bidirectional RNN can help improve performance further more.

## VI.    DATA COLLECTION
**Results**
Data has been collected from Kissankerala an Integrated, multi-modal agricultural information system for Kerala.

**Data Preprocessing**
The principle issue with text information is that it is all in text format (strings). Nonetheless,

Machine learning calculations need a type of mathematical component vector to play out the assignment. So before we start with any NLP challenge we want to pre-measure it to make it best for paintings. Basic text pre-processing includes:
Changing over the whole content into capitalized or lowercase, with the goal that the calculation doesn't treat similar words in different cases as different.
Tokenization: Tokenization is only the term used to portray the way toward changing over the typical content strings into a rundown of tokens i.e. words that we really need. Sentence tokenizer can be utilized to find the rundown of sentences and Word tokenizer can be utilized to find the rundown of words in strings.
Eliminating Noise i.e. all that isn't in a standard number or letter.
Removing Stop words. Here and there, some amazingly normal words which would have all the earmarks of being of little incentive in choosing archives coordinating a client need are

rejected from the jargon totally. These words are called stop words.

Stemming is the way toward diminishing inflected (or some of the time determined) words to their stem, base or root structure — for the most part a composed word structure. Model if we somehow managed to stem the accompanying words: "Stems", "Stemming", "Stemmed", "and Stigmatization", the outcome would be a solitary word "stem".

Lemmatization: A slight variant of stemming is lemmatization. The major difference between these is, that, stemming can frequently make non-existent words, while lemmas are real words. Along these lines, your root stem, which means the word you end up with, isn't something you can simply turn upward in a word reference, however you can look into a lemma. Occurrences of Lemmatization are that "run" is a base construction for words like "running" or "ran" or that "better" and "extraordinary" are in a comparative lemma so they are seen as the same.

### TF-IDF

An issue with the Bag of Words approach is that exceptionally successive words begin to rule in the archive (e.g. larger score), yet, may not contain so much "educational substance". Likewise, it will give more weight to longer reports than more limited records.

One method is to rescale the frequency of phrases by means of how often they seem in all documents so that the ratings for common phrases like "the" which can be additionally frequent across all documents are penalized. This technique to scoring is referred to as Term Frequency-Inverse Document Frequency, or TF-IDF for short, where:

Term Frequency: is a scoring of the frequency of the phrase inside the modern record.

TF = (Number of times term t seems in a record)/ (Number of phrases within the report)

Reverse Document Frequency: is a scoring of ways unusual the word is throughout reviews.

IDF = 1+log (N/n), where, N is the number of documents and n is the number of documents a term t has appeared in.

Tf-IDF weight is a weight regularly utilized in data recovery and text mining. This weight is a authentic degree used to evaluate how massive a word is to a report in a set or corpus.

### VII.    ALGORITHM DETAILS

Algorithm: Deep Neural Network (DNN), Recurrent Neural Network (RNN)

Main Technique: Sequence to Sequence (Seq2seq) modeling with encoder and decoder. Network (RNN)

Enhancement Technique: Long Short Term Memory (LSTM) based RNN cell, Bidirectional LSTM

**Hardware Specification**

Processor: Intel(R) Core(TM) i-5 3337 CPU @ 1.80GHz

Ram: 4 GB

Framework Type: 64-bit Operating System, x-64 based processor.

Graphics Card: 2GB AMD Radeon 520 Graphics.

### VIII.    RESULT

A chatbot was developed in python with the help of sequence models and recurrent neural networks. Enhancement techniques played a crucial role in improving the response which is given back to the user. Response derived after training on a full dataset with training text had moderately coherent sentences.

### IX.    CHALLENGES

The challenge in developing chatbot or dialogue generator lies in developing coherent dialogue generation system. As the model used in this experiment is for machine translation, the dialogue generation is treated as translation problem, where history of earlier conversations are not taken into account. Hence, the model can be limited in performance regarding long conversation. Also, training is a long process which demands higher processing power and configured computing machine. Another problem is finding right hyper parameters to optimize the translation module for chatbot or dialogue generation system. There are multiple chatbots developed using GNMT or Seq2Seq module. GNMT is a rather self-contained with Bi-directional LSTM cells, Neural Attention mechanism and Beam search techniques. Most of this features improve dialogue generation as well as machine translation. Bidirectional LSTM cells with attention mechanism seems to produce better output. Seq2Seq module also has some of the advanced features of GNMT. Nevertheless, developing chatbot algorithm from scratch by building RNN, bidirectional LSTM and neural attention techniques would be better suited option as GNMT is primarily for machine translation. But, this may require more than one trial and mistakes earlier than attaining greatest overall performance for the comprehensive chatbot module and hence is better perfect as research problem. After training, chatbot produced outcomes with slight relevancy.

But many of the output have been reparative and usual. Also, due to loss of real lifestyles first-class records the chatbot achieved by some means below choicest for imitating human interaction. Also, many utterance was discarded because of longer length or discrepancy. And, number of schooling

utterance was a great deal less than required and test and development dataset turned into quite larger in assessment which might have caused the version to underperform. Also, as data was limited, longer period of training may not have suited the dialogue generation problem.
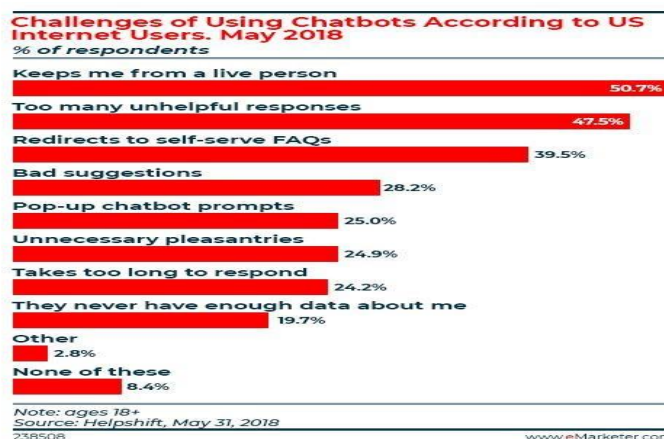


**Figure 7:** Challenges of Using Chatbots

Sometimes the unhelpful nature of chatbots aside, it's possible that it could take more time for consumers to get accustomed to this type of customer service. According to CGS, 60to forty four suppose groups are shifting too speedy to update human beings with chatbots. This sentiment was shared by some younger generation and older consumers, but still one-third of those 18 to 24 and 4255 to 64 had concerns about companies making it harder to connect with live customer service agents.

## X.     FUTURE WORK

Looking ahead to the future scope of chatbots, bots need to additionally build up their NLP and capacity to go off-content. In organizations with numerous alternatives, items or administrations, clients will normally be moderate, distracted and interruptive. Chatbots will want to reflect the nuances of verbal exchange, human reminiscence and improvement so that it will grow to be a valid alternative for customer service retailers who – even notwithstanding language barriers can showcase persistence, intelligence, information and flexibility. The utilization of chatbot preparations will increase its viewpoints sooner in place of later. The chatbots details show that bots will be significantly more set up to coordinate human conduct and offer comparative administrations looking ahead to the future scope of chatbots, bots need to additionally build up their

NLP and capacity to go off-content. In organizations with numerous choices, items or administrations, clients will normally be moderate, distracted and interruptive. Chatbots will want to reflect the nuances of communication, human memory and development a good way to emerge as a legitimate alternative for customer support sellers who – even notwithstanding language obstacles can exhibit patience, intelligence, expertise and flexibility. The execution of chatbot arrangements will enlarge its viewpoints faster as opposed to later. The chatbots details show that bots will be considerably more set up to coordinate human conduct and offer comparative administrations.

According to Global Market Insights, the general market size for chatbots worldwide would be more than $1.3 billion by 2024. But businesses using AI still find chatbots aren't perfect. It has far to convey a more prominent effect. However, the challenges still remain. Major challenges includes Chatbots often misinterpret the requests because they are not able to understand the right intent of the customer. Another challenge is misunderstanding the nuances of human dialogue. Because of absence of conversational insight, chatbots often overlook to decipher the subtleties of the discourse and that prompts a faulty dialogue.

**Voice Interface**

In the event that the future requests progressed chatbots that accomplish more than

utilize scripted, single-turn trades, at that point their strategy for interface will likewise need to progress. A voice interface can help clients with incapacities or the individuals who are doubtful of innovation, however it likewise requires another layer of NLP advancement. Some specialists tells that destiny isn't always all voice interfaces, however alternatively it need to attention on operating inside device abilities to boost person accessibility and flexibility. Some chatbots can off er voice-to-textual content interfaces, voice-to voice interfaces or textual content-to-voice interfaces, all relying on consumer need or emblem selection.

### Futurebots

While voice interface might be discretionary, chatbots have been in the venture long enough for designers and specialists to start distinguishing what components of chatbots are backbone necessities. Natural Language Processing development, human-like conversational flexibility and 24/7 service are crucial to keeping chatbots sturdiness in organization settings. Chatbots are AI gadgets and in future they want to do crucial changes and keep up with AI trends, such as automated device studying, clean device integration and developing intelligence.

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