PROJECT REPORT

AI BASED DISCOURSE FOR BANKING INDUSTRY

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ABSTRACT

The implementation of chatbot technology is evolving rapidly in the banking industry, yet customer acceptance is behind. The aim of the present paper is to identify the factors that influence consumers intention to use chatbot technology applied in the banking industry.

To promote the easy convenience of communication between the customers and the bank administrators this chatbot is made up with the help of the IBM services such as IBM cloud and IBM Watson assistant. The findings highlight the importance of perceived compatibility and perceived usefulness in the adoption of banking chatbot technology. Awareness of the service has an effect on perceived ease of use, perceived privacy risk, and it indirectly affects usage intention of banking chatbots through perceived usefulness. The chatbot provides services for saving account related actions, current account related actions, loan related accounts, general queries related actions. As a chatbot it must be able to resolve customer queries at any time, provide accurate and relevant information to the customer, provide links and attachments to certain queries, avail customers to learn more about banking features. Chatbot applications offer benefits for both banking sectors and customers. First, chatbots enable customers to get in touch with the bankers anytime from anywhere using their own mobile devices, thus they can get quick and relevant responses to their questions. Second, the implementation of these chatbot allows bankers to target consumers in a more direct and personal way, and administrators can save on personnel costs in the area of customer services. . The role of chatbots in customer service of the banking industry positively brought by advisory services, ease of use and convenient service, cost effective and efficient service, customer-friendly service, customized service, relationship banking services, responsive service, trustworthy service, value-based useful service and maintaining customers security and privacy.

KEYWORDS:

NLP (Natural Language Processing), Flask web page, Watson chatbot, Deep Learning techniques

INTRODUCTION:

Overview:

- ➢ Technology advancements and the modern market drive industries to change and modernize their procedures. One of the most sophisticated industries, banking constantly seeks out cutting-edge technical advancements to boost productivity.
- ➢ The websites for net banking are complicated, and finding the information you need often requires scrolling through many pages. When speaking with customers directly, bank employees are put through several trying circumstances. By adopting chatbots, such circumstances can be tactfully avoided.
- ➢ According to a research by Salesforce, only 32% of organisations in the banking sector now employ AI chatbots, and 37% expect to do so within the next 18 months. This yields a prospective growth rate of 118%, demonstrating the industry's demand.
- ➢ A smart chatbot understands natural language requests from users and responds with the right information. This study intends to analyse the applicability of chatbots in the banking sector and investigate how chatbots may be developed using NLP methods that can be applied in the banking sector.

LITERATURE SURVEY:

Existing Problem:

- ➢ The paper [1] demonstrates the use of the RASA framework for creating intelligent, context-aware chatbots, as well as how Rasa NLU functions and how intent recognition and entity extraction improve its performance. The results reveal that Rasa NLU performs better to extract entities when entire

sentences are provided as opposed to neural networks which require segmented inputs. It also compares the accuracy of entity extraction using Rasa NLU and a NN. The implementation of a chatbot in the finance industry that allows users to request stock-related information is used to discuss Rasa in this paper.

- ➢ RASA NLU can introduce a vital component in intelligent chatbot systems. We can compose the system to extract the entity after intent recognition. This can be further improved for complicated sentences and more entities.
- ➢ The development of AI and how it has caused significant changes in the way some organisations operate are briefly discussed in this study [2]. It also discusses how the banking sector has shifted to using chatbots to give consumers an interface so they can have a service assistant available to them all day long. This study evaluates the capability of the available chatbots to offer all the services a user requires.
- ➢ It includes several strategies for managing dialogue in the banking and finance industry based on ontology. Although further use of AI can make the chatbot not only respond to questions but also self-learning to improve itself in more stages, improving user service quality and also reducing human load.

Proposed solution:

- ➢ Artificial intelligence in the banking industry, which makes banks effective, reliable, helpful, and more understanding, is the solution to the issue. In this digital age, it is enhancing the competitive edge of modern banks. The expanding influence of AI in the banking sector reduces operational costs, enhances customer service, and automates processes.
- ➢ In order to take use of the possibilities of next-generation AI, close to 40% to 50% of financial and banking service providers are incorporating AI into their operations. The businesses think that artificial intelligence will revolutionise the banking industry by enabling a variety of banking tasks to be completed more quickly, simply, and securely.

- ➢ AI banking Customers can benefit from chatbots in a variety of ways. One of the important applications of AI in the banking business is the chatbot service for the financial sector. AI chatbots in banking are revolutionizing how organizations give services to their clients.

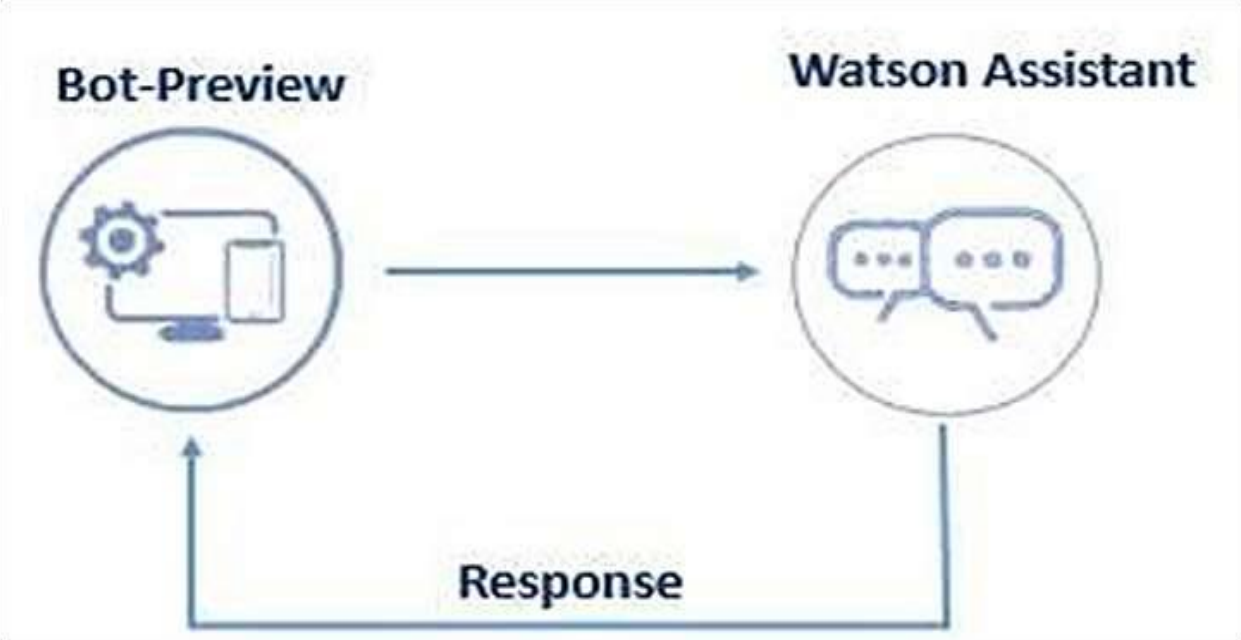
- ➢ AI chatbots in the banking industry can assist customers 24*7 and give accurate responses to their queries. These chatbots provide a personalized experience to users.
- ➢ AI chatbots in banking is providing a better customer experience.
- ➢ Hence, AI chatbots for banking and finance operations let banks attract customer attention, optimize service quality, and expand the brand mark in the market.

THEORETICAL ANALYSIS:

Services Used:

- IBM Watson Assistant

Block diagram:



Hardware / Software designing:

The hardware and software requirements are the mainly requisites for the completion of the project, to complete the project the following requirements are needed.

Software:

- ➢ Visual studio code
- ➢ IBM Watson studio

Packages:

➢ Flask

Hardware:

- Processor: quadcore or dual core
- RAM: Minimum 256 MB
- Processor Speed: Minimum 600MH
- Operating System: Windows2000/Professional or higher.

Technologies used:

- Python flask
- IBM Watson assistant
- IBM cloud
- Natural language processing
- Artificial intelligence
- Deep learning

Python flask:

Flask is a web framework; it's a Python module that lets you develop web applications easily. It's has a small and easy-to-extend core: it's a microframework that doesn't include an ORM (Object Relational Manager) or such features.

It does have many cool features like url routing, template engine. It is a WSGI web app framework.

What is a Web Framework?

A Web Application Framework or a simply a Web Framework represents a collection of libraries and modules that enable web application developers to write applications without worrying about low-level details such as protocol, thread management, and so on.

What is Flask?

Flask is a web application framework written in Python. It was developed by Armin Ronacher, who led a team of international Python enthusiasts called Pocco. Flask is based on the WSGI toolkit and the Jinja2 template engine. Both are Pocco projects.

WSGI

The Web Server Gateway Interface (Web Server Gateway Interface, WSGI) has been used as a standard for Python web application development. WSGI is the specification of a common interface between web servers and web applications.

Microframework

Flask is often referred to as a microframework. It is designed to keep the core of the application simple and scalable.

Instead of an abstraction layer for database support, Flask supports extensions to add such capabilities to the application.

Why is Flask a good web framework choice?

Unlike the Django framework, Flask is very Pythonic. It’s easy to get started with Flask, because it doesn’t have a huge learning curve.

On top of that it’s very explicit, which increases readability. To create the simple app, you only need a few lines of code.

IBM WATSON:

Watson was created for an question answering (QA) computing system that IBM built to apply natural language processing, information retrieval, knowledge representation, automated reasoning and machine learning technologies to the field open domain question answering.

IBM stated that in Watson "more than 100 different techniques are used to analyse natural language, identify sources, find and generate hypotheses, find and score evidence, and merge and rank hypotheses."

In recent years, Watson's capabilities have been extended and the way in which Watson works has been changed to take advantage of new deployment models (Watson on IBM Cloud), evolved machine learning capabilities, and optimized hardware available to developers and researchers. It is no longer purely a question answering (QA) computing system designed from Q&A pairs but can now 'see', 'hear', 'read', 'talk', 'taste', 'interpret', 'learn' and 'recommend'.

Software

Watson uses IBM's Deep QA software and the Apache UIMA (Unstructured Information Management Architecture) framework implementation. The system was written in various languages, including java, C++ and Prolog and runs on the SUSE LINUX ENTERPRISE SERVER 11 operating system using the Apache Hadoop framework to provide distributed computing.

Hardware

The system is workload-optimized, integrating massively parallel POWER7 processors and built on IBM's *Deep QA* technology, which it uses to generate hypotheses, gather massive evidence, and analyse data.[2] Watson employs a cluster of ninety IBM Power 750 servers, each of which uses a 3.5 GHz POWER7 eight-core processor, with four threads per core. In total, the system has 2,880 POWER7 processor threads and 16 terabytes of RAM.

According to John Rennie, Watson can process 500 gigabytes (the equivalent of a million books) per second.[1] IBM master inventor and senior consultant Tony Pearson estimated Watson's hardware cost at about three million dollars. Its Lin pack performance stands at

80 Tera FLOPs, which is about half as fast as the cut-off line for the Top 500 Supercomputers list. According to Rennie, all content was stored in Watson's RAM for the Jeopardy game because data stored on hard drives would be too slow to compete with human Jeopardy champions.

Data

The sources of information for Watson include encyclopaedia, dictionaries, thesauri, newswire articles and literary works. Watson also used databases, taxonomies and ontologies including DBpedia, wordnet. The IBM team provided Watson with millions of documents, including dictionaries, encyclopaedia and other reference material, that it could use to build its knowledge

IBM CLOUD:

What is IBM Cloud?

IBM Cloud is a suite of cloud computing services from IBM that offers both platform as a service (PaaS) and infrastructure as a service (IaaS).

Why is IBM Cloud used?

With IBM Cloud IaaS, organizations can deploy and access virtualized IT resources -- such as compute power, storage and networking -- over the internet. For compute, organizations can choose between bare-metal or virtual servers.

With IBM Cloud PaaS -- which is based on the open source cloud platform Cloud Foundry -- developers can use IBM services to create, manage, run and deploy various types of applications for the public cloud, as well as for local or on-premises environments. IBM Cloud supports various programming languages, such as Java, Node.js, PHP and Python and extends to support other languages.

IBM Cloud products and services

IBM Cloud platform supports access to other IBM tools and services -- including IBM Watson and IBM Cloud Functions for serverless computing -- as well as those from thirdparty vendors.

IBM Cloud features

There are a number of IBM cloud services that are a part of the IBM cloud. These services are grouped into 16 categories:

- AI/machine learning: A collection of Watson-based AI resources and tools for building your own AI models.
- Automation: Automation resources enable business workflows to be automated using IBM Cloud Pak. Turbonomic is also available as an automation resource and can be used for application resource management and cost optimization.
- Containers: IBM offers its own cloud Kubernetes service, as well as access to the container registry, Red Hat OpenShift and Istio (a server mesh for microservices).
- IBM Cloud Paks: IBM Cloud Paks are applications that are certified for use on Red Hat Open Shift. Cloud Paks exist for business automation, data, integration, network automation, security and Watson.
- Quantum: Provides the ability to run workloads on quantum systems through IBM Quantum composer, the IBM Quantum Lab and the Qiskit SDK.
- Compute: Offers various compute resources, including bare-metal servers, VMs and serverless computing on which enterprises can host their workloads.
- Networking: Provides cloud networking services, such as a load balancer, a content delivery network, VPN tunnels and firewalls.
- Storage: IBM's cloud storage offerings include object, block and file storage for cloud data.

- Logging and monitoring: Provides tools to log, manage and monitor cloud deployments, including Cloud Activity Tracker, Cloud Log Analysis and Cloud Monitoring.
- Security: Includes services for activity tracking, identity and access management and authentication.
- Databases: Provides a variety of SQL and NoSQL databases, as well as data querying, warehousing and migration tools.
- Analytics: Offers data science tools such as Apache Spark, Apache Hadoop and IBM Watson Machine Learning, as well as analytics services for streaming data.
- Internet of things (IoT): Includes the IBM IoT Platform, which provides services that connect and manage IoT devices, and analyses the data they produce.
- Developer tools: Includes a CLI, as well as a set of tools for continuous delivery, continuous release and application pipelines.
- Blockchain: Provides IBM's Blockchain Platform, a SaaS offering to develop apps, enforce governance and monitor a blockchain network.
- Integration: Offers services to integrate cloud and on-premises systems or various applications, such as API Connect, App Connect and IBM Secure Gateway.

IBM Cloud deployment models

IBM offers three deployment models for its cloud platform:

1. Public: A public cloud that provides access to virtual servers in a multi-tenant environment. An enterprise can choose to deploy its applications in one or multiple geographical regions.
2. Dedicated: A single-tenant private cloud that IBM hosts in one of its data centers. An enterprise can connect to the environment using a direct network connection or VPN, and IBM manages the platform.

3. IBM Cloud Private: A version of the IBM platform that an organization deploys as a private cloud in its own data center behind a firewall.

IBM Cloud pricing

The exact cost of IBM Cloud varies depending on resource usage, deployment model, support and other factors. As of 2022, IBM offers two main pricing models. Those who signed up for a lite account prior to October 25, 2021 are able to keep that account, but all new accounts are automatically created as pay-as-you-go plans.

IBM Cloud rebranding and competitors

In 2013, IBM acquired SoftLayer, a public cloud platform, to serve as the foundation for its
IaaS offering. In October 2016, IBM rolled the SoftLayer brand under its Bluemix brand of PaaS offerings, giving users access to both IaaS and PaaS resources from a single console. In October 2017, IBM then rebranded its entire cloud portfolio as IBM Cloud.

IBM's main competitors in the cloud computing market include AWS, Microsoft Azure and Google Cloud Platform.

Natural language processing

Natural language processing (NLP) refers to the branch of computer science—and more specifically, the branch of artificial intelligence or AI—concerned with giving computers the ability to understand text and spoken words in much the same way human beings can.

NLP combines computational linguistics—rule-based modeling of human language—with statistical, machine learning, and deep learning models. Together, these technologies enable computers to process human language in the form of text or voice data and to ‘understand’ its full meaning, complete with the speaker or writer’s intent and sentiment.

NLP drives computer programs that translate text from one language to another, respond to spoken commands, and summarize large volumes of text rapidly—even in real time. There's a good chance you've interacted with NLP in the form of voice-operated GPS systems, digital assistants, speech-to-text dictation software, customer service chatbots, and other consumer conveniences. But NLP also plays a growing role in enterprise solutions that help streamline business operations, increase employee productivity, and simplify mission-critical business processes.

NLP tasks

Human language is filled with ambiguities that make it incredibly difficult to write software that accurately determines the intended meaning of text or voice data. Homonyms, homophones, sarcasm, idioms, metaphors, grammar and usage exceptions, variations in sentence structure—these just a few of the irregularities of human language that take humans years to learn, but that programmers must teach natural language-driven applications to recognize and understand accurately from the start, if those applications are going to be useful.

Several NLP tasks break down human text and voice data in ways that help the computer make sense of what it's ingesting. Some of these tasks include the following:

- **Speech recognition**, also called speech-to-text, is the task of reliably converting voice data into text data. Speech recognition is required for any application that follows voice commands or answers spoken questions. What makes speech recognition especially challenging is the way people talk— quickly, slurring words together, with varying emphasis and intonation, in different accents, and often using incorrect grammar.
- **Part of speech tagging**, also called grammatical tagging, is the process of determining the part of speech of a particular word or piece of text based on its use and context. Part of speech identifies 'make' as a verb in 'I can make a paper plane,' and as a noun in 'What make of car do you own?'
- **Word sense disambiguation** is the selection of the meaning of a word with multiple meanings through a process of semantic analysis that determine the word that makes the most sense in the given context. For example, word sense disambiguation helps distinguish the meaning of the verb 'make' in 'make the grade' (achieve) vs. 'make a bet' (place).
- **Named entity recognition,** or NEM, identifies words or phrases as useful entities. NEM identifies 'Kentucky' as a location or 'Fred' as a man's name.

- **Co-reference resolution** is the task of identifying if and when two words refer to the same entity. The most common example is determining the person or object to which a certain pronoun refers (e.g., ‘she’ = ‘Mary’), but it can also involve identifying a metaphor or an idiom in the text (e.g., an instance in which 'bear' isn't an animal but a large hairy person).
- **Sentiment analysis** attempts to extract subjective qualities—attitudes, emotions, sarcasm, confusion, suspicion—from text.
- **Natural language generation** is sometimes described as the opposite of speech recognition or speechto-text; it's the task of putting structured information into human language.

NLP tools and approaches

Python and the Natural Language Toolkit (NLTK)

The Python programming language provides a wide range of tools and libraries for attacking specific NLP tasks. Many of these are found in the Natural Language Toolkit, or NLTK, an open-source collection of libraries, programs, and education resources for building NLP programs.

The NLTK includes libraries for many of the NLP tasks listed above, plus libraries for subtasks, such as sentence parsing, word segmentation, stemming and lemmatization (methods of trimming words down to their roots), and tokenization (for breaking phrases, sentences, paragraphs and passages into tokens that help the computer better understand the text). It also includes libraries for implementing capabilities such as semantic reasoning, the ability to reach logical conclusions based on facts extracted from text.

Statistical NLP, machine learning, and deep learning

The earliest NLP applications were hand-coded, rules-based systems that could perform certain NLP tasks, but couldn't easily scale to accommodate a seemingly endless stream of exceptions or the increasing volumes of text and voice data.

Enter statistical NLP, which combines computer algorithms with machine learning and deep learning models to automatically extract, classify, and label elements of text and voice data and then assign a statistical likelihood to each possible meaning of those elements. Today, deep learning models and learning techniques based on convolutional

neural networks (CNNs) and recurrent neural networks (RNNs) enable NLP systems that 'learn' as they work and extract ever more accurate meaning from huge volumes of raw, unstructured, and unlabelled text and voice data sets.

NLP use cases

Natural language processing is the driving force behind machine intelligence in many modern real world applications. Here are a few examples:

- **Spam detection:** You may not think of spam detection as an NLP solution, but the best spam detection technologies use NLP's text classification capabilities to scan emails for language that often indicates spam or phishing. These indicators can include overuse of financial terms, characteristic bad grammar, threatening language, inappropriate urgency, misspelled company names, and more. Spam detection is one of a handful of NLP problems that experts consider 'mostly solved' (although you may argue that this doesn't match your email experience).
- **Machine translation:** Google Translate is an example of widely available NLP technology at work. Truly useful machine translation involves more than replacing words in one language with words of another. Effective translation has to capture accurately the meaning and tone of the input language and translate it to text with the same meaning and desired impact in the output language. Machine translation tools are making good progress in terms of accuracy. A great way to test any machine translation tool is to translate text to one language and then back to the original. An oft-cited classic example: Not long ago, translating "*The spirit is willing but the flesh is weak"* from English to Russian and back yielded "*The vodka is good but the meat is rotten*." Today, the result is "*The spirit desires, but the flesh is weak*," which isn't perfect, but inspires much more confidence in the English-to-Russian translation.
- **Virtual agents and chatbots:** Virtual agents such as Apple's Siri and Amazon's Alexa use speech recognition to recognize patterns in voice commands and natural language generation to respond with appropriate action or helpful comments. Chatbots perform the same magic in response to typed text entries. The best of these also learn to recognize contextual clues about human requests and use them to provide even better responses or options over time. The next enhancement for these applications is question answering, the ability to respond to our questions—anticipated or not—with relevant and helpful answers in their own words.

- **Social media sentiment analysis:** NLP has become an essential business tool for uncovering hidden data insights from social media channels. Sentiment analysis can analyse language used in social media posts, responses, reviews, and more to extract attitudes and emotions in response to products, promotions, and events– information companies can use in product designs, advertising campaigns, and more.
- **Text summarization:** Text summarization uses NLP techniques to digest huge volumes of digital text and create summaries and synopses for indexes, research databases, or busy readers who don't have time to read full text. The best text summarization applications use semantic reasoning and natural language generation (NLG) to add useful context and conclusions to summaries.

Artificial Intelligence (AI)

Artificial intelligence leverages computers and machines to mimic the problem-solving and decision-making capabilities of the human mind.

While a number of definitions of artificial intelligence (AI) have surfaced over the last few decades, John McCarthy offers the following definition in this 2004 paper (PDF, 106 KB) (link resides outside IBM), " It is the science and engineering of making intelligent machines, especially intelligent computer programs. It is related to the similar task of using computers to understand human intelligence, but AI does not have to confine itself to methods that are biologically observable."

However, decades before this definition, the birth of the artificial intelligence conversation was denoted by Alan Turing's seminal work, "Computing Machinery and Intelligence" (PDF, 89.8 KB) (link resides outside of IBM), which was published in 1950. In this paper, Turing, often referred to as the "father of computer science", asks the following question, "Can machines think?" From there, he offers a test, now famously known as the "Turing Test", where a human interrogator would try to distinguish between a computer and human text response. While this test has undergone much scrutiny since its publish, it remains an important part of the history of AI as well as an ongoing concept within philosophy as it utilizes ideas around linguistics.

Stuart Russell and Peter Norvig then proceeded to publish, Artificial Intelligence: A Modern Approach (link resides outside IBM), becoming one of the leading textbooks in the study of AI. In it, they delve into four potential goals or definitions of AI, which differentiates computer systems on the basis of rationality and thinking vs. acting:

Human approach:

- Systems that think like humans
- Systems that act like humans

Ideal approach:

- Systems that think rationally
- Systems that act rationally

Alan Turing's definition would have fallen under the category of "systems that act like humans."

At its simplest form, artificial intelligence is a field, which combines computer science and robust datasets, to enable problem-solving. It also encompasses sub-fields of machine learning and deep learning, which are frequently mentioned in conjunction with artificial intelligence. These disciplines are comprised of AI algorithms which seek to create expert systems which make predictions or classifications based on input data.

Today, a lot of hype still surrounds AI development, which is expected of any new emerging technology in the market. As noted in Gartner's hype cycle (link resides outside IBM), product innovations like, self-driving cars and personal assistants, follow "a typical progression of innovation, from overenthusiasm through a period of disillusionment to an eventual understanding of the innovation's relevance and role in a market or domain." As Lex Fridman notes here (01:08:15) (link resides outside IBM) in his MIT lecture in 2019, we are at the peak of inflated expectations, approaching the trough of disillusionment.

As conversations emerge around the ethics of AI, we can begin to see the initial glimpses of the trough of disillusionment. To read more on where IBM stands within the conversation around AI ethics, read more here.

Types of artificial intelligence—weak AI vs. strong AI

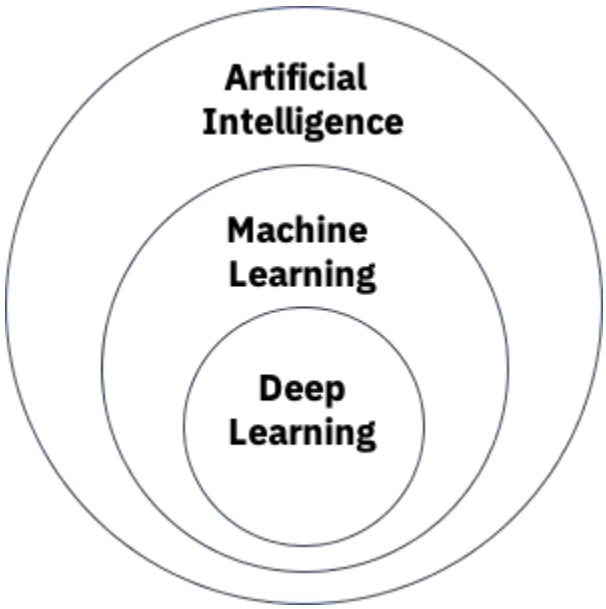
Weak AI—also called Narrow AI or Artificial Narrow Intelligence (ANI)—is AI trained and focused to perform specific tasks. Weak AI drives most of the AI that surrounds us today. 'Narrow' might be a more accurate descriptor for this type of AI as it is anything but weak; it enables some very robust applications, such as Apple's Siri, Amazon's Alexa, IBM Watson, and autonomous vehicles.

Strong AI is made up of Artificial General Intelligence (AGI) and Artificial Super

Intelligence (ASI). Artificial general intelligence (AGI), or general AI, is a theoretical form of AI where a machine would have an intelligence equalled to humans; it would have a self-aware consciousness that has the ability to solve problems, learn, and plan for the future. Artificial Super Intelligence (ASI)—also known as superintelligence—would surpass the intelligence and ability of the human brain. While strong AI is still entirely theoretical with no practical examples in use today, that doesn't mean AI researchers aren't also exploring its development. In the meantime, the best examples of ASI might be from science fiction, such as HAL, the superhuman, rogue computer assistant in *2001: A Space Odyssey*.

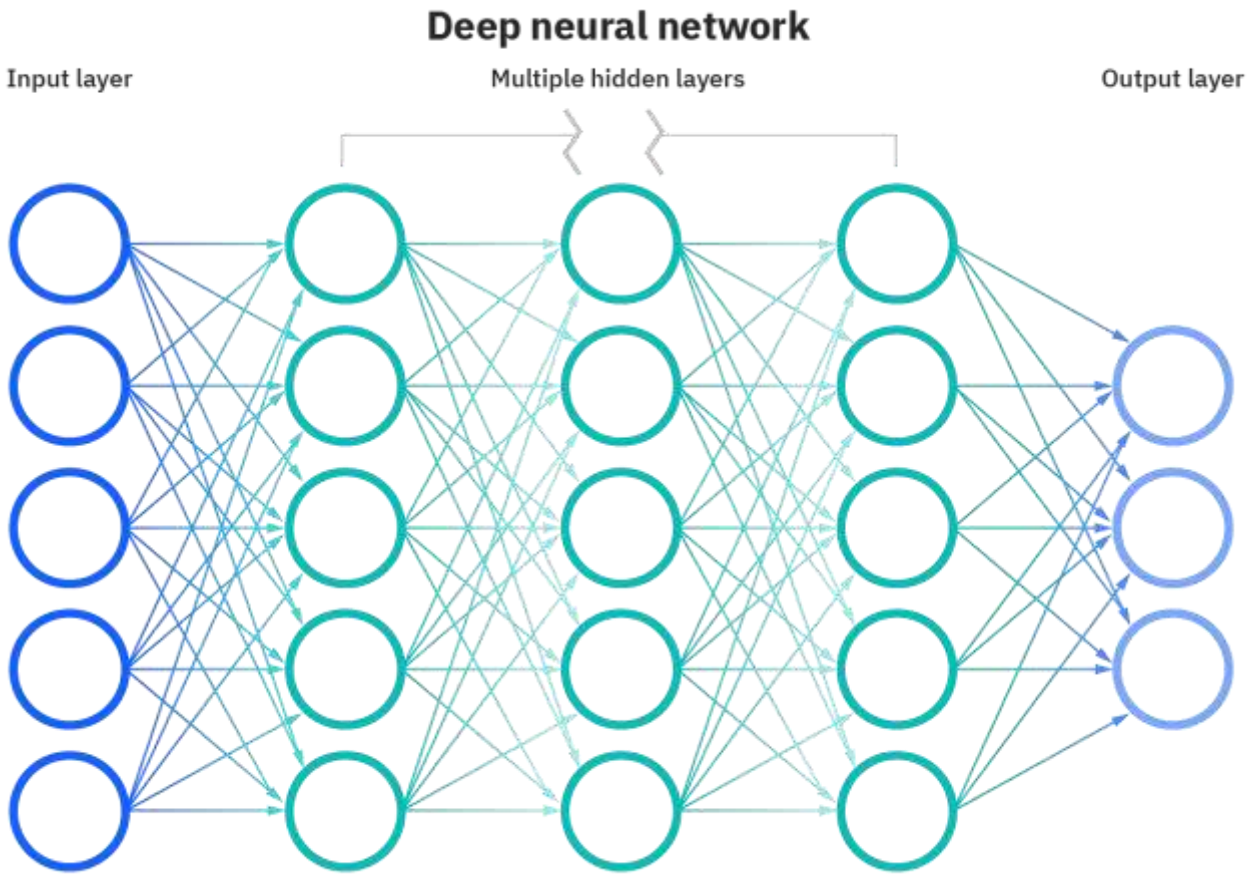
Deep learning and machine learning

Since deep learning and machine learning tend to be used interchangeably, it's worth noting the nuances between the two. As mentioned above, both deep learning and machine learning are sub-fields of artificial intelligence, and deep learning is actually a sub-field of machine learning.



Deep learning is actually comprised of neural networks. "Deep" in deep learning refers to a neural network comprised of more than three layers—which would be inclusive of the

inputs and the output—can be considered a deep learning algorithm. This is generally represented using the following diagram:



The way in which deep learning and machine learning differ is in how each algorithm learns. Deep learning automates much of the feature extraction piece of the process, eliminating some of the manual human intervention required and enabling the use of larger data sets. You can think of deep learning as "scalable machine learning" as Lex Fridman noted in same MIT lecture from above. Classical, or "non-deep", machine learning is more dependent on human intervention to learn. Human experts determine the hierarchy of features to understand the differences between data inputs, usually requiring more structured data to learn.

"Deep" machine learning can leverage labelled datasets, also known as supervised learning, to inform its algorithm, but it doesn’t necessarily require a labelled dataset. It

can ingest unstructured data in its raw form (e.g. text, images), and it can automatically determine the hierarchy of features which distinguish different categories of data from one another. Unlike machine learning, it doesn't require human intervention to process data, allowing us to scale machine learning in more interesting ways.

Applications of AI:

There are numerous, real-world applications of AI systems today. Below are some of the most common examples:

- **Speech recognition:** It is also known as automatic speech recognition (ASR), computer speech recognition, or speech-to-text, and it is a capability which uses natural language processing (NLP) to process human speech into a written format. Many mobile devices incorporate speech recognition into their systems to conduct voice search—e.g. Siri—or provide more accessibility around texting.

- **Customer service:** Online virtual agents are replacing human agents along the customer journey. They answer frequently asked questions (FAQs) around topics, like shipping, or provide personalized advice, cross-selling products or suggesting sizes for users, changing the way we think about customer engagement across websites and social media platforms. Examples include messaging bots on ecommerce sites with virtual agents, messaging apps, such as Slack and Facebook Messenger, and tasks usually done by virtual assistants and voice assistants.

- **Computer vision:** This AI technology enables computers and systems to derive meaningful information from digital images, videos and other visual inputs, and based on those inputs, it can take action. This ability to provide recommendations distinguishes it from image recognition tasks. Powered by convolutional neural networks, computer vision has applications within photo tagging in social media, radiology imaging in healthcare, and self-driving cars within the automotive industry.

- **Recommendation engines:** Using past consumption behavior data, AI algorithms can help to discover data trends that can be used to develop more effective cross-selling strategies. This is used to make relevant add-on recommendations to customers during the checkout process for online retailers.

- **Automated stock trading:** Designed to optimize stock portfolios, AI-driven high frequency trading platforms make thousands or even millions of trades per day without human intervention.

Deep Learning

Deep learning attempts to mimic the human brain—albeit far from matching its ability—enabling systems to cluster data and make predictions with incredible accuracy.

What is deep learning?

Deep learning is a subset of machine learning, which is essentially a neural network with three or more layers. These neural networks attempt to simulate the behavior of the human brain—albeit far from matching its ability—allowing it to "learn" from large amounts of data. While a neural network with a single layer can still make approximate predictions, additional hidden layers can help to optimize and refine for accuracy.

Deep learning drives many artificial intelligence (AI) applications and services that improve automation, performing analytical and physical tasks without human intervention. Deep learning technology lies behind everyday products and services (such as digital assistants, voice-enabled TV remotes, and credit card fraud detection) as well as emerging technologies (such as self-driving cars).

If deep learning is a subset of machine learning, how do they differ? Deep learning distinguishes itself from classical machine learning by the type of data that it works with and the methods in which it learns.

Machine learning algorithms leverage structured, labeled data to make predictions—meaning that specific features are defined from the input data for the model and organized into tables. This doesn't necessarily mean that it doesn't use unstructured data; it just means that if it does, it generally goes through some pre-processing to organize it into a structured format.

Deep learning eliminates some of data pre-processing that is typically involved with machine learning. These algorithms can ingest and process unstructured data, like text and images, and it automates feature extraction, removing some of the dependency on human

experts. For example, let's say that we had a set of photos of different pets, and we wanted to categorize by "cat", "dog", "hamster", et cetera. Deep learning algorithms can determine which features (e.g. ears) are most important to distinguish each animal from another. In machine learning, this hierarchy of features is established manually by a human expert.

Then, through the processes of gradient descent and backpropagation, the deep learning algorithm adjusts and fits itself for accuracy, allowing it to make predictions about a new photo of an animal with increased precision.

Machine learning and deep learning models are capable of different types of learning as well, which are usually categorized as supervised learning, unsupervised learning, and reinforcement learning. Supervised learning utilizes labeled datasets to categorize or make predictions; this requires some kind of human intervention to label input data correctly. In contrast, unsupervised learning doesn't require labeled datasets, and instead, it detects patterns in the data, clustering them by any distinguishing characteristics. Reinforcement learning is a process in which a model learns to become more accurate for performing an action in an environment based on feedback in order to maximize the reward.

Deep Learning usage in the project:

Deep learning neural networks, or artificial neural networks, attempts to mimic the human brain through a combination of data inputs, weights, and bias. These elements work together to accurately recognize, classify, and describe objects within the data.

Deep neural networks consist of multiple layers of interconnected nodes, each building upon the previous layer to refine and optimize the prediction or categorization. This progression of computations through the network is called forward propagation. The input and output layers of a deep neural network are called *visible* layers. The input layer is where the deep learning model ingests the data for processing, and the output layer is where the final prediction or classification is made.

Another process called backpropagation uses algorithms, like gradient descent, to calculate errors in predictions and then adjusts the weights and biases of the function by moving backwards through the layers in an effort to train the model. Together, forward propagation and backpropagation allow a neural network to make predictions and correct for any errors accordingly. Over time, the algorithm becomes gradually more accurate.

The above describes the simplest type of deep neural network in the simplest terms. However, deep learning algorithms are incredibly complex, and there are different types of neural networks to address specific problems or datasets. For example,

- Convolutional neural networks (CNNs), used primarily in computer vision and image classification applications, can detect features and patterns within an image, enabling tasks, like object detection or recognition. In 2015, a CNN bested a human in an object recognition challenge for the first time.
- Recurrent neural network (RNNs) are typically used in natural language and speech recognition applications as it leverages sequential or times series data.

Application of Deep Learning in the Project

Real-world deep learning applications are a part of our daily lives, but in most cases, they are so well-integrated into products and services that users are unaware of the complex data processing that is taking place in the background. Some of these examples include the following:

Law enforcement

Deep learning algorithms can analyze and learn from transactional data to identify dangerous patterns that indicate possible fraudulent or criminal activity. Speech recognition, computer vision, and other deep learning applications can improve the efficiency and effectiveness of investigative analysis by extracting patterns and evidence from sound and video recordings, images, and documents, which helps law enforcement analyze large amounts of data more quickly and accurately.

Financial services

Financial institutions regularly use predictive analytics to drive algorithmic trading of stocks, assess business risks for loan approvals, detect fraud, and help manage credit and investment portfolios for clients.

Customer service

Many organizations incorporate deep learning technology into their customer service processes. Chatbots—used in a variety of applications, services, and customer service portals—are a straightforward form of AI. Traditional chatbots use natural language and

even visual recognition, commonly found in call center-like menus. However, more sophisticated chatbot solutions attempt to determine, through learning, if there are multiple responses to ambiguous questions. Based on the responses it receives, the chatbot then tries to answer these questions directly or route the conversation to a human user.

Virtual assistants like Apple's Siri, Amazon Alexa, or Google Assistant extends the idea of a chatbot by enabling speech recognition functionality. This creates a new method to engage users in a personalized way.

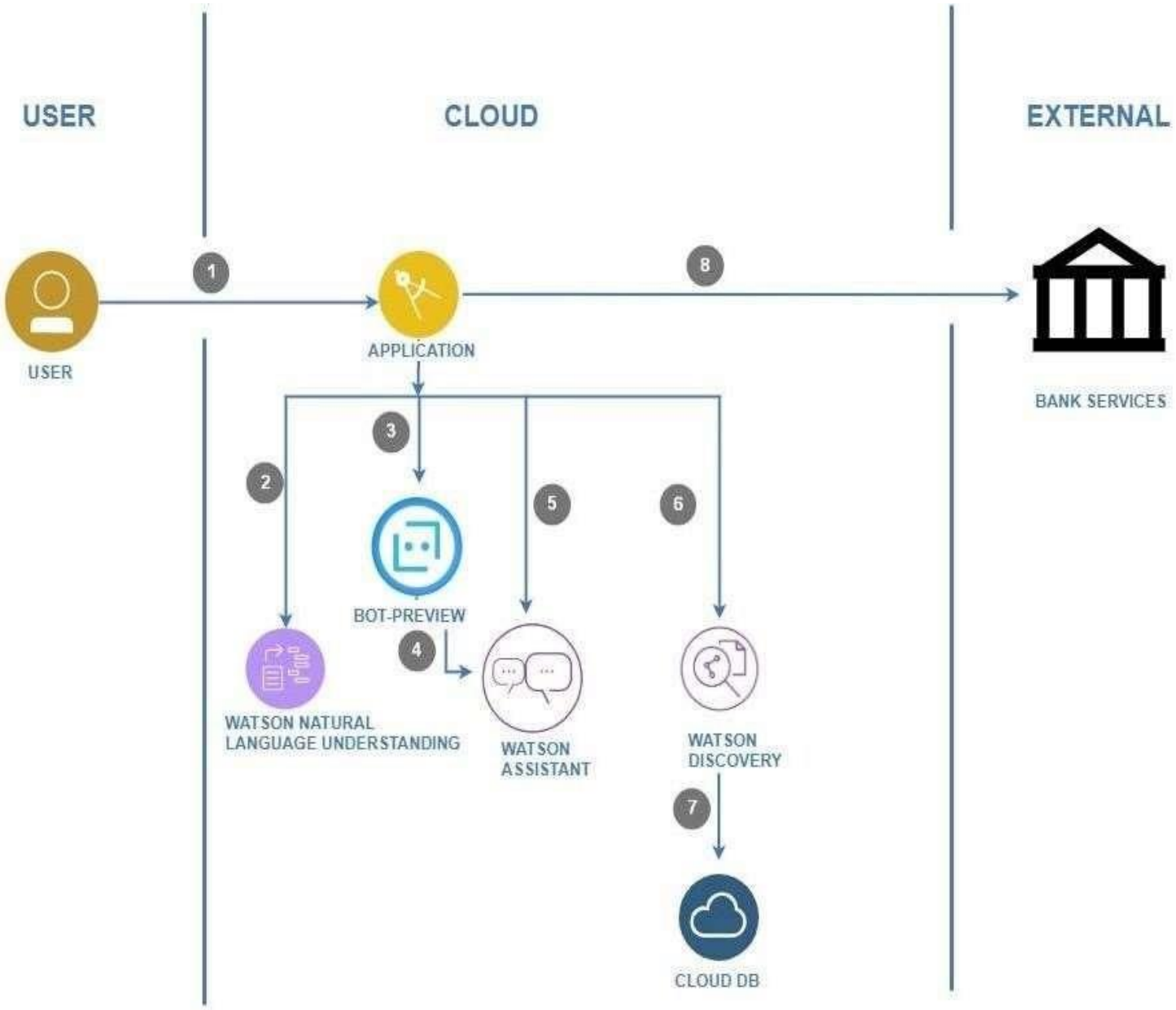
Healthcare

The healthcare industry has benefited greatly from deep learning capabilities ever since the digitization of hospital records and images. Image recognition applications can support medical imaging specialists and radiologists, helping them analyze and assess more images in less time.

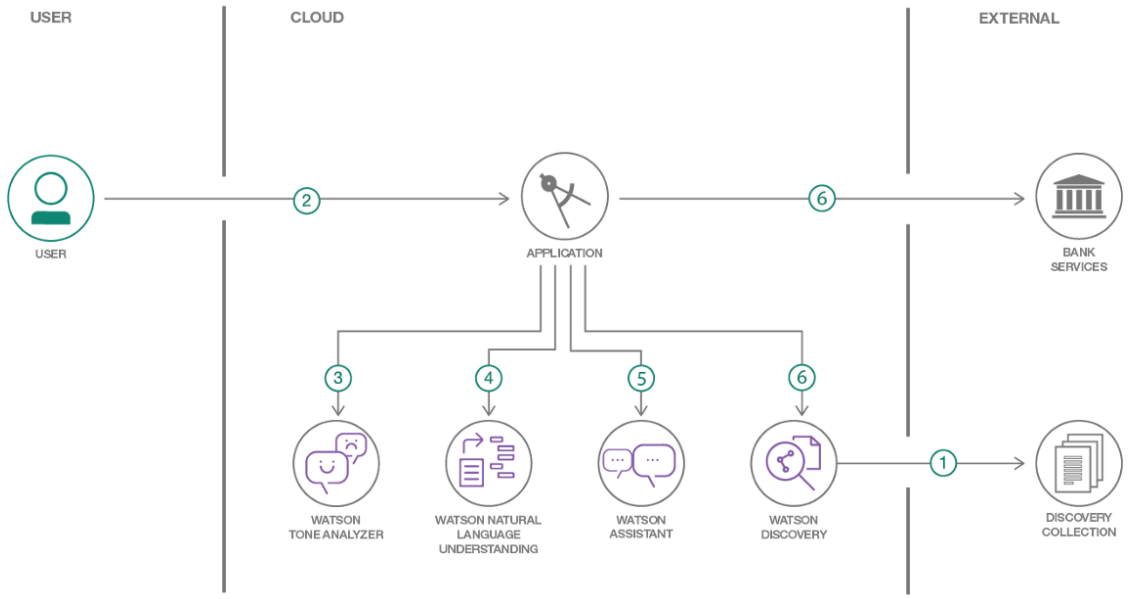
Hardware Requirements for Deep Learning:

Deep learning requires a tremendous amount of computing power. High performance *graphical processing units (GPUs)* are ideal because they can handle a large volume of calculations in multiple cores with copious memory available. However, managing multiple GPUs on-premises can create a large demand on internal resources and be incredibly costly

ARCHITECTURE DESIGN:


USER
CLOUD
EXTERNAL
1
8
USER
APPLICATION
BANK SERVICES
3
2
5
6
BOT-PREVIEW
4
WATSON NATURAL LANGUAGE UNDERSTANDING
WATSON ASSISTANT
WATSON DISCOVERY
7
CLOUD DB

Flowchart



TASKS

To accomplish the above task, you must complete the below activities and tasks:

- Create IBM Services.
- Creating skills & Assistant for Chatbot.
- Creating Savings account action.
- Creating Current account action.
- Creating Loan account action.
- Creating a general query action.
- Creating a Net banking action.
- Create HTML web page.
- Integrate the Watson Chatbot with web page.

ADVANTAGES & DISADVANTAGES

Advantages:

- Round-the-clock service.
- Brand Consistency.
- Increased Productivity.
- Reduced Staffing Needs.
- Consistent Response Rate and Availability.
- Helps with Fraud Prevention.
- Chats can be saved.
- Lower costs.

Disadvantages:

- Questions must be programmed beforehand.
- Impersonal
- Must keep information up-to-date.
- Technology issues.
- Needs additional measures to protect identities.

APPLICATIONS:

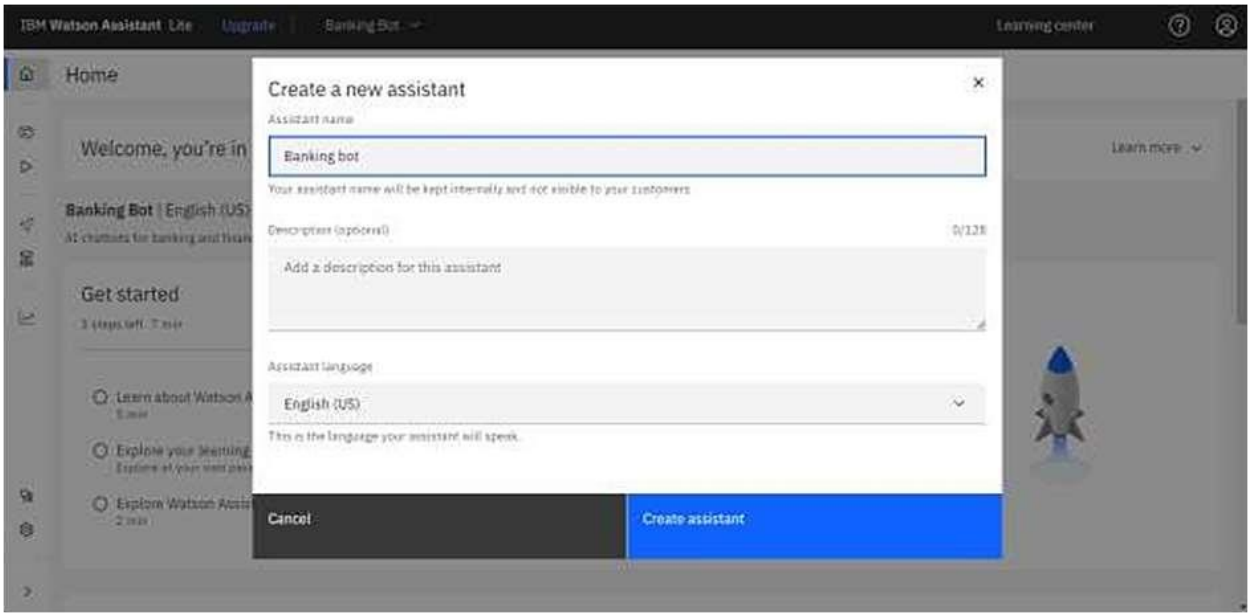
- Banking chatbots have all the data to predict the spending habits of customers and help them keep their finances on track.

APPENDIX:

Create IBM Service

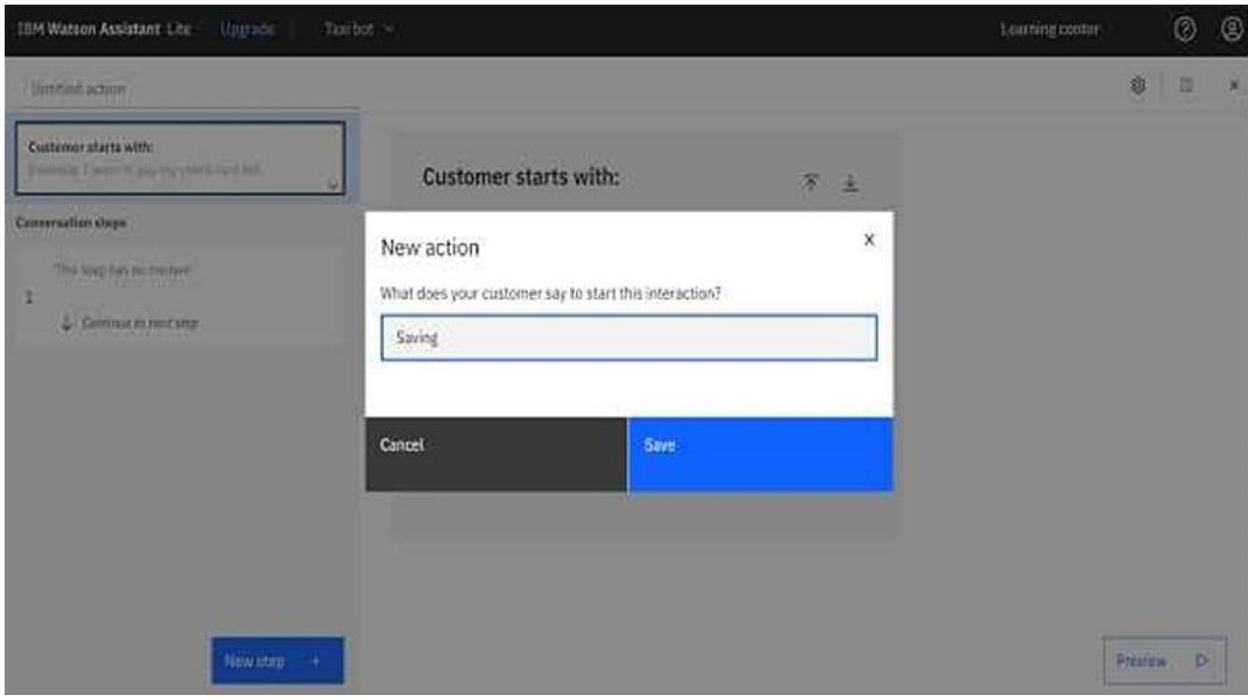
In this activity, you will be creating the Necessary IBM service. The following are the service that you have to create.

- Watson Assistant

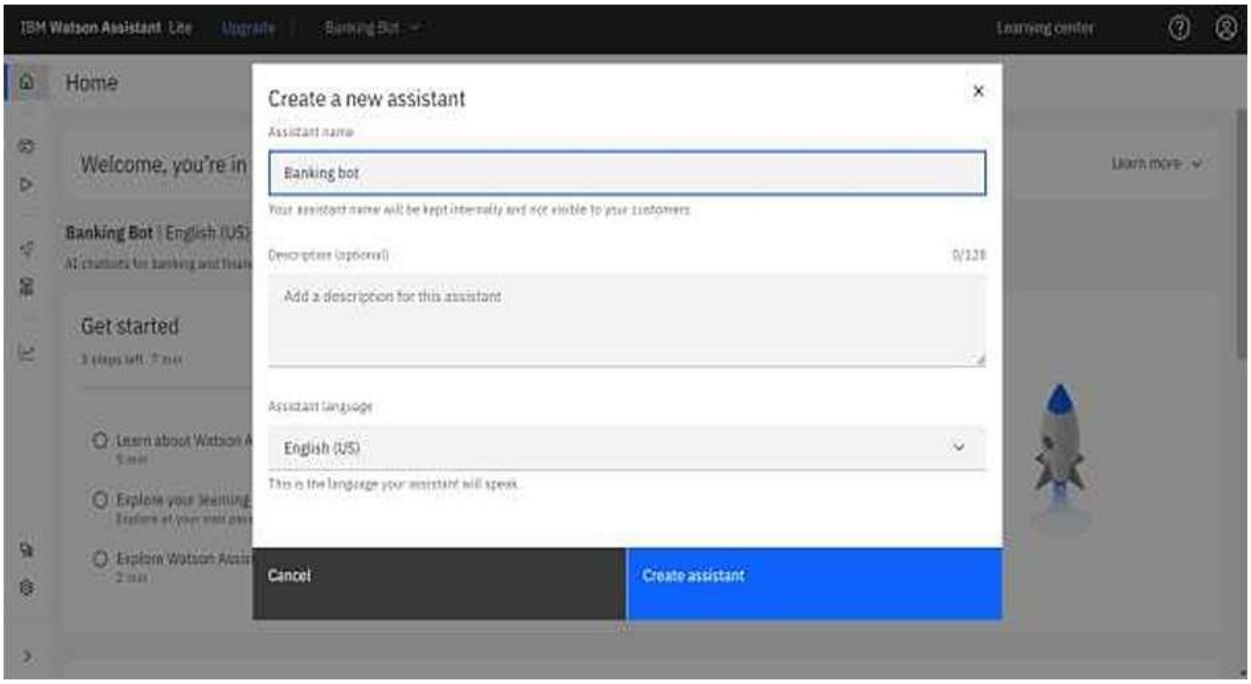


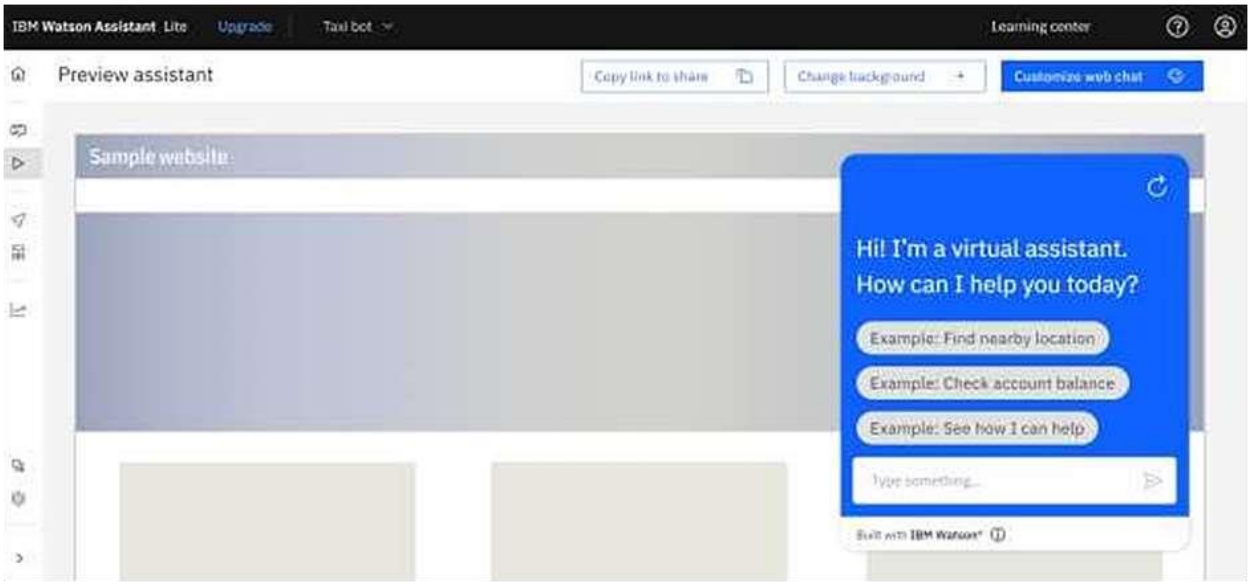
Creating Skills & Assistant for Chatbot

Skills are nothing but actions and steps. Steps are the subset of actions where conversations are built and Assistant is used to integrate skills.



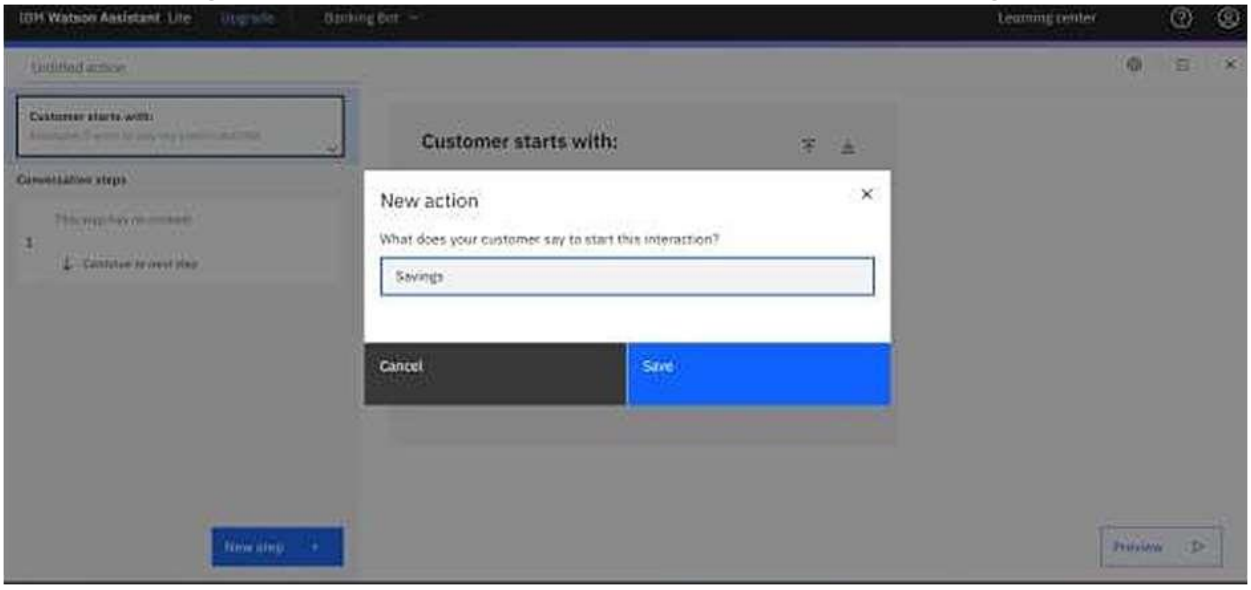
A default template chatbot is created. Need to add actions.



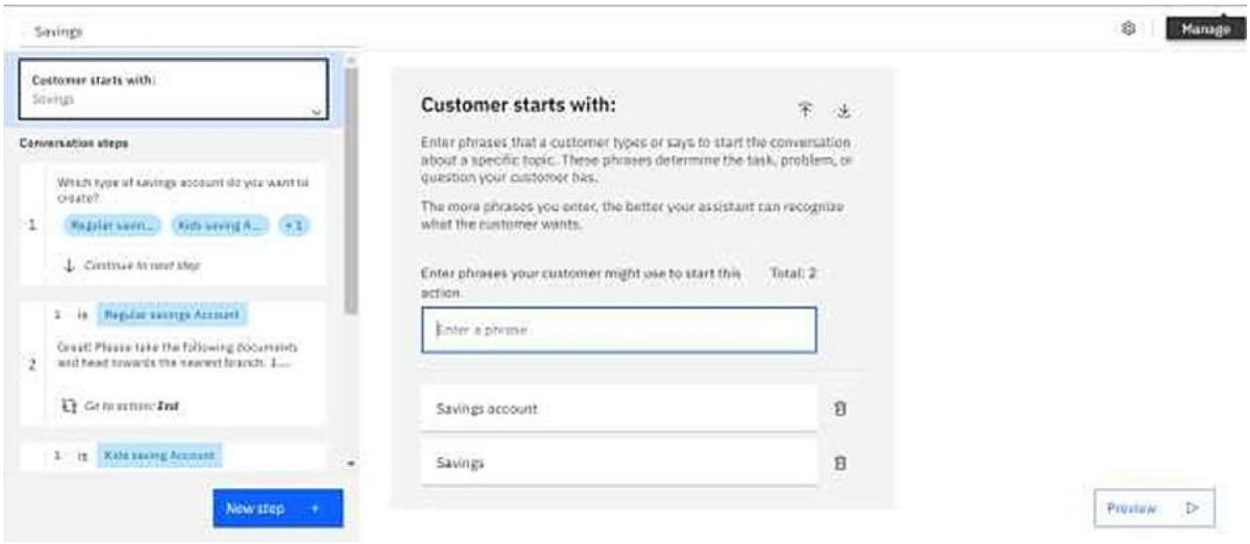


Creating Saving Account Action

Create a saving account in IBM Watson. Create new **Action** Saving.

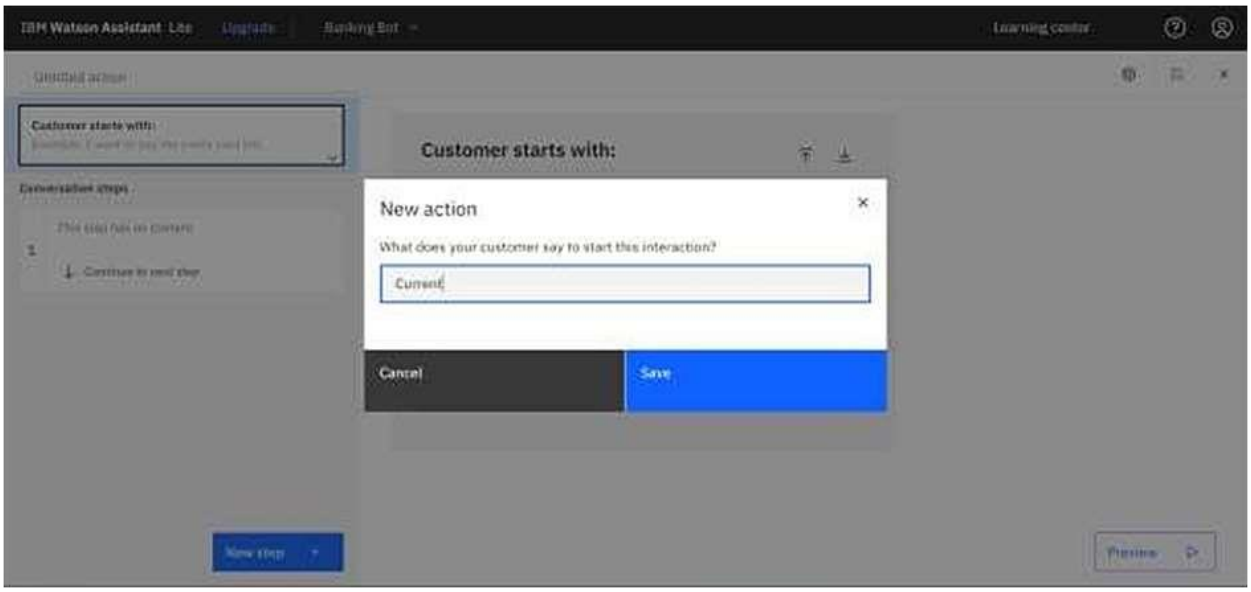


Add steps in savings action.

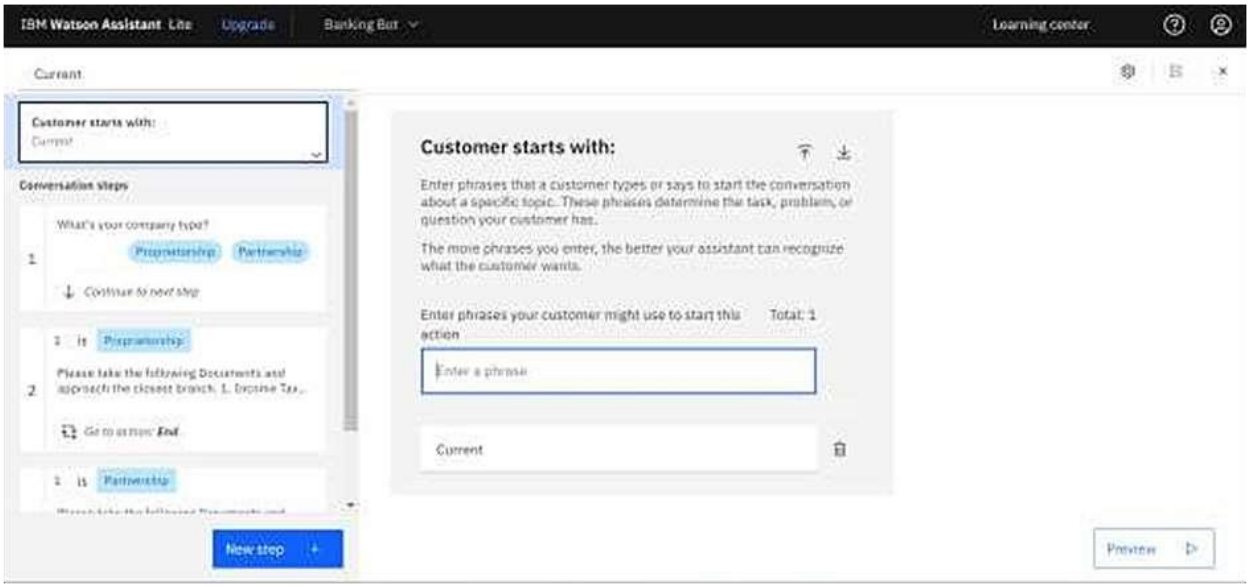


Creating Current Account Action

Create a new **Ac on** Current for the account on.

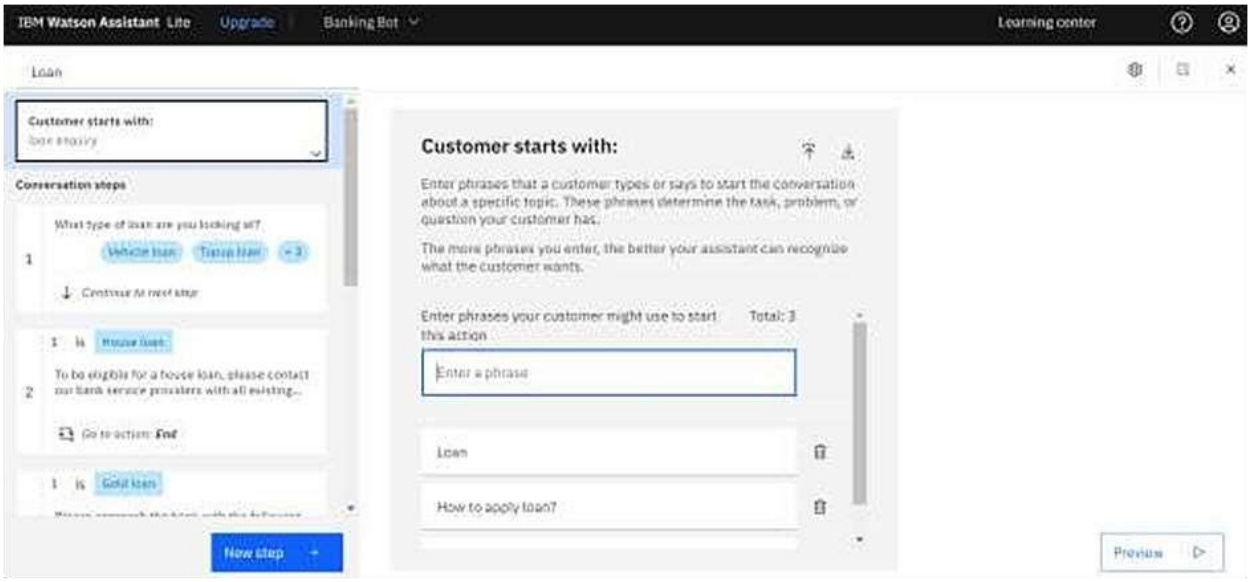


Add steps in savings ac on.



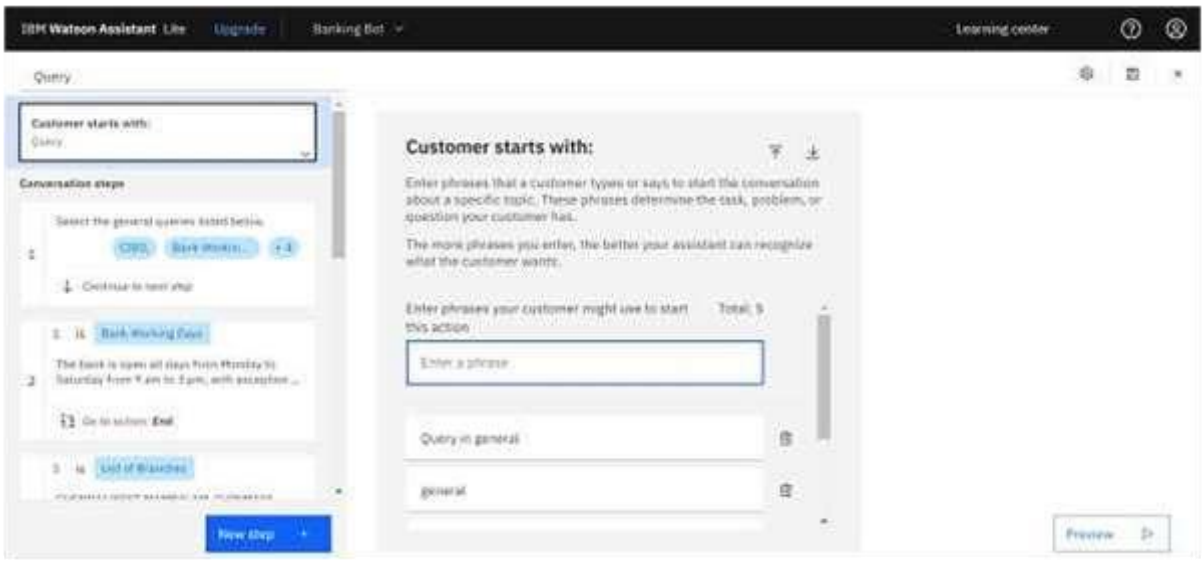
Creating Loan Account Action

Loan ac on is created with the necessary steps.



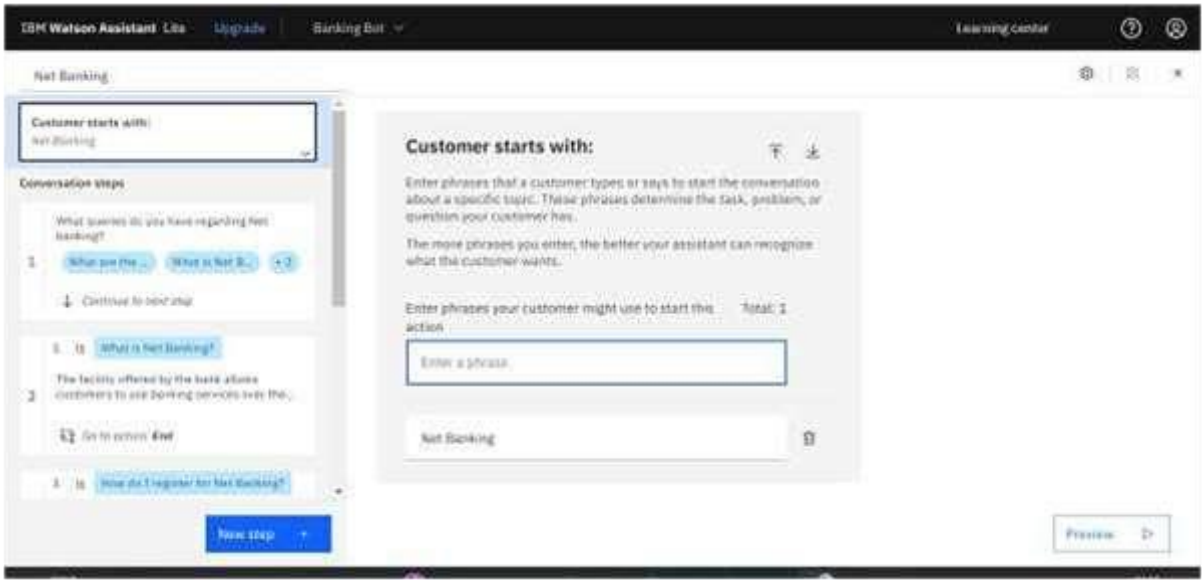
Creating General Query Account Action

General query ac on is created with the necessary steps.

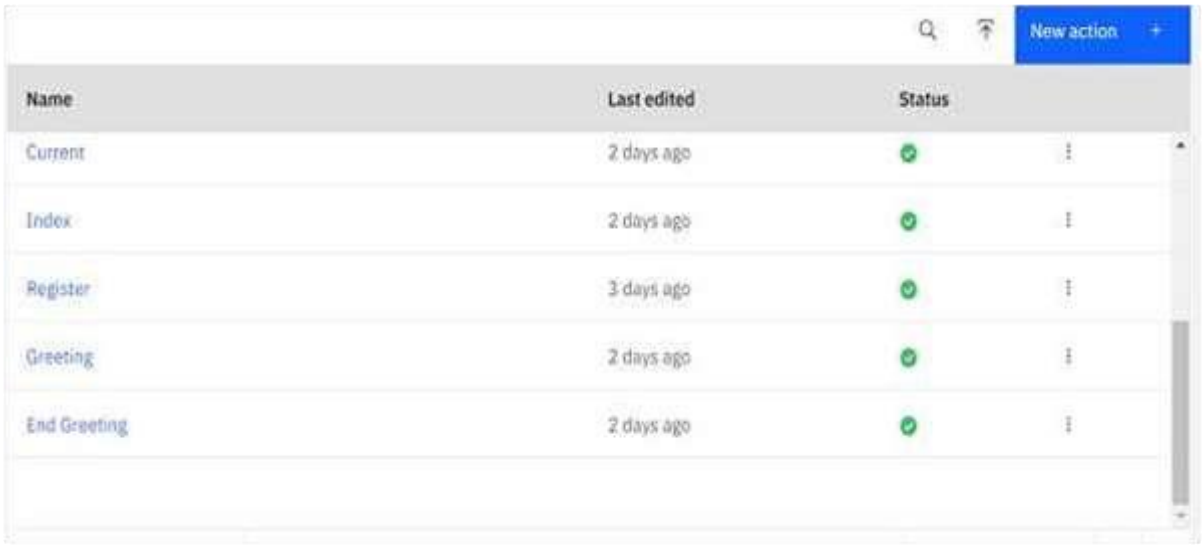


Creating Net Banking Account Action

Net banking ac on is created with the necessary steps.

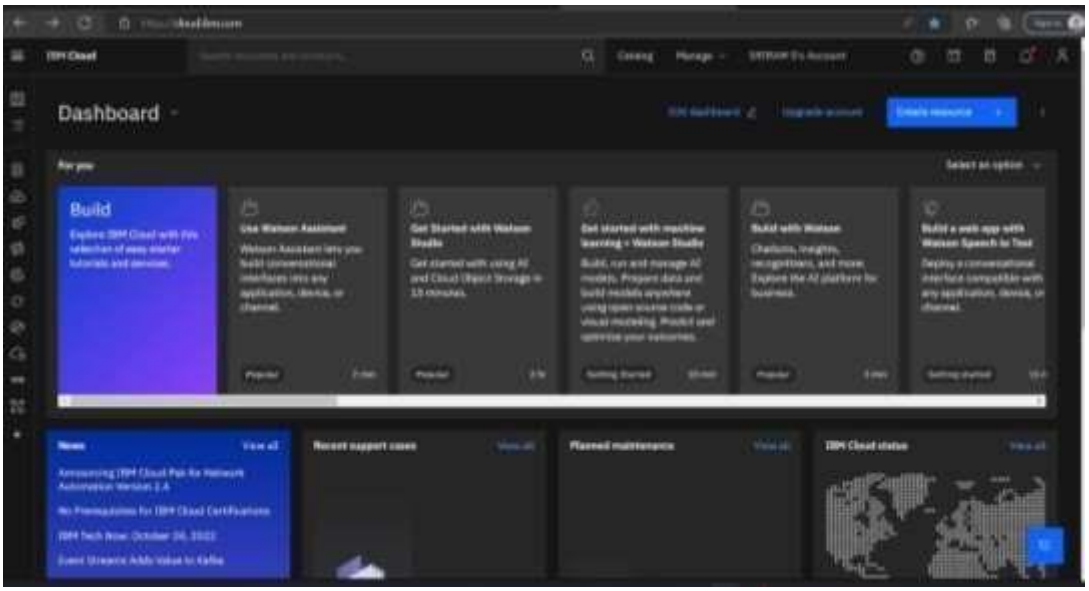


In addition to this greeting, end greeting , index and end actions are also created.

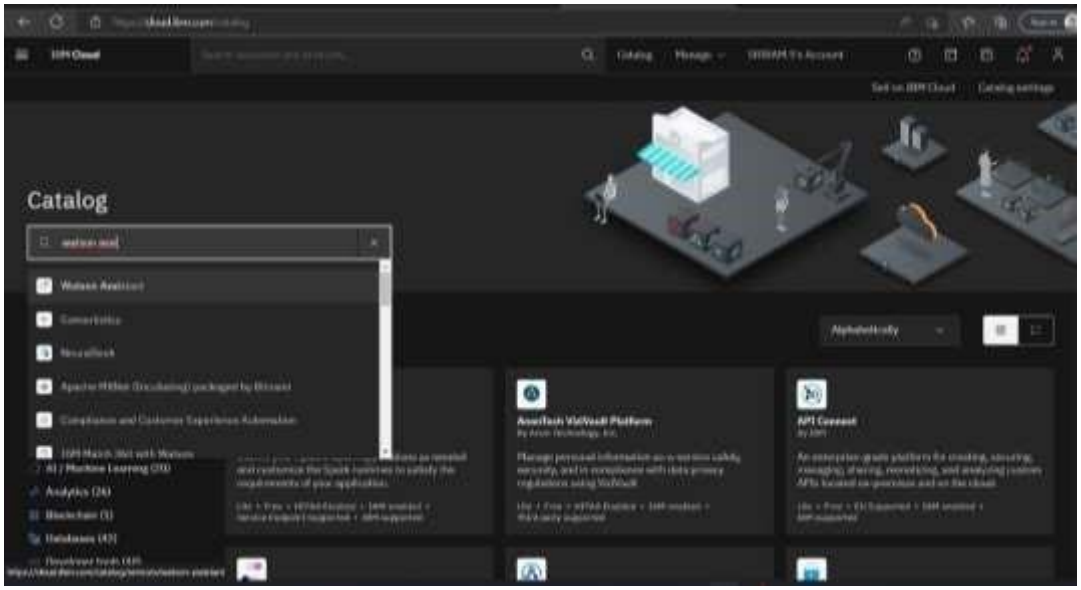


Creating IBM Watson Assistant Account

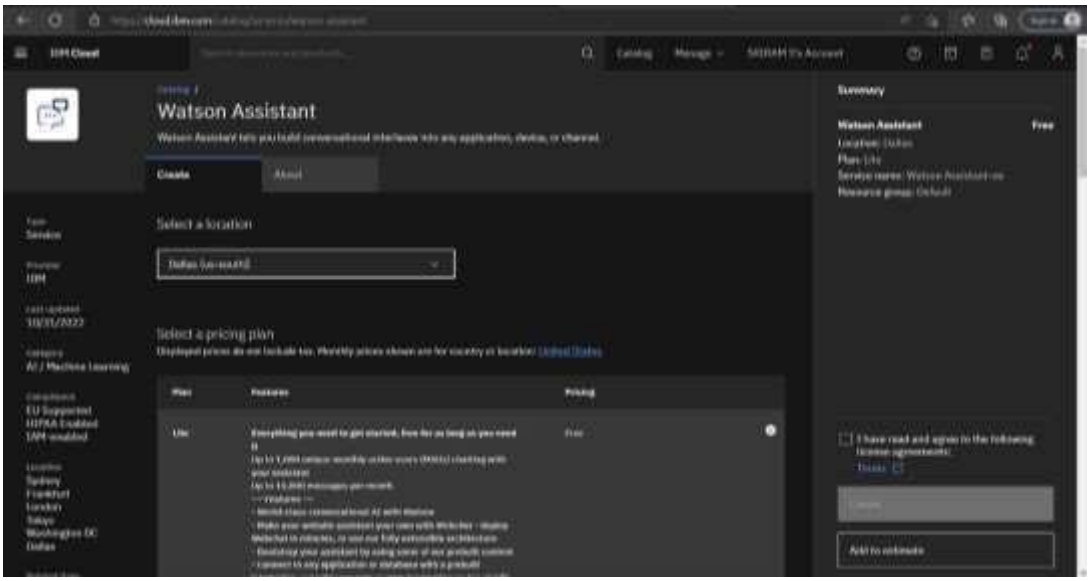
Create an account in IBM Watson.



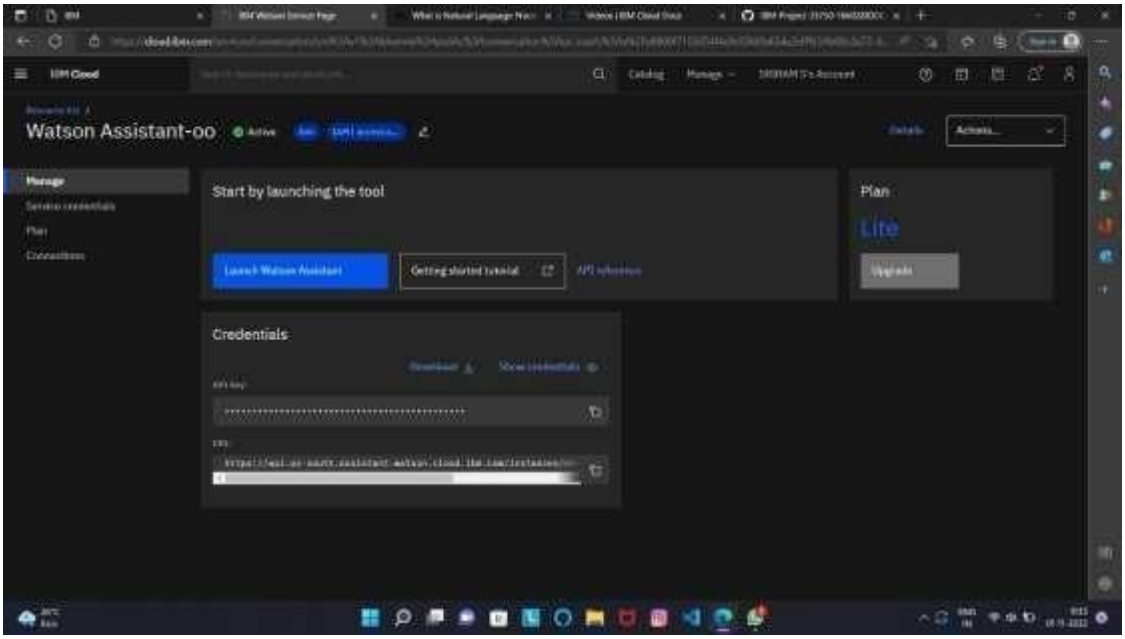
Search for the Watson Assistant.



Select the version according to your convenience and create a account.



Launch the Watson Assistant by clicking on “Launch Watson Assistant” Option.



Creating Assistant & Integrate With Flask Web Page

You will be creating a banking bot in this activity that has the following capabilities

1. The Bot should be able to guide a customer to create a bank account.
2. The Bot should be able to answer loan queries.
3. The Bot should be able to answer general banking queries.
4. The Bot should be able to answer queries regarding net banking.
5. With the help of this bot, you can get all the required details related to banking.

Let us build our flask application which will be running in our local browser with a user interface.

In the flask application, users will interact with the chatbot, and based on the user queries they will get the outcomes.

Build Python Code

1: Importing Libraries

The first step is usually importing the libraries that will be needed in the program.

```
from flask import Flask, render_template
```

Importing the flask module into the project is mandatory. An object of the Flask class is our WSGI application. Flask constructor takes the name of the current module (_name_).

2: Creating our flask application and loading

```
app = Flask(__name__)
```

3: Routing to the Html Page

Here, the declared constructor is used to route to the HTML page created earlier.

The '/' route is bound with the bot function. Hence, when the home page of a web server is opened in the browser, the HTML page will be rendered.

```
@app.route('/')
def bot():
    return render_template('chatbot.html')
```

Main Function

This is used to run the application in localhost.

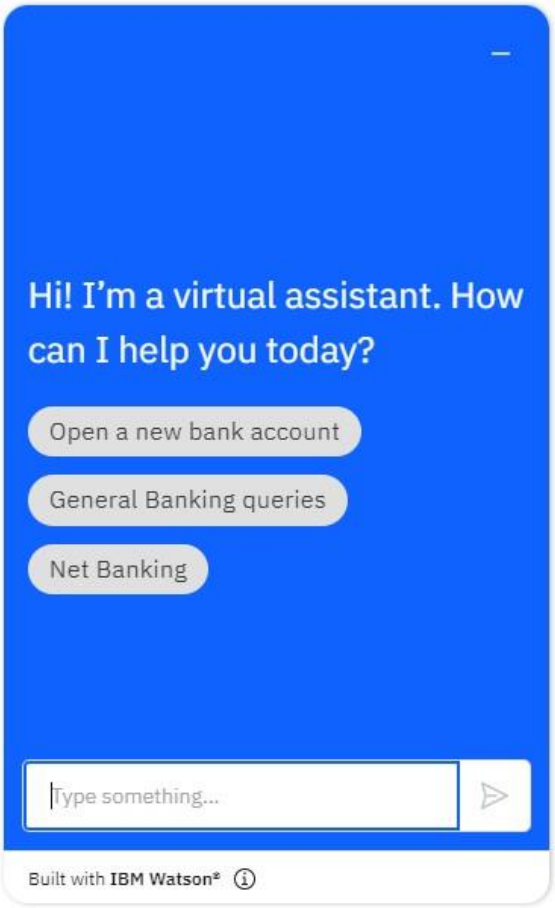
Build HTML Code

- We use HTML to create the front-end part of the web page.
- Here, we have created 1 HTML page-Chatbot.html
- Chatbot.html displays the home page which integrates with Watson Assistant.
- A simple HTML page is created. Auto-generated source code from IBM Watson Assistant is copied and pasted inside the body tag

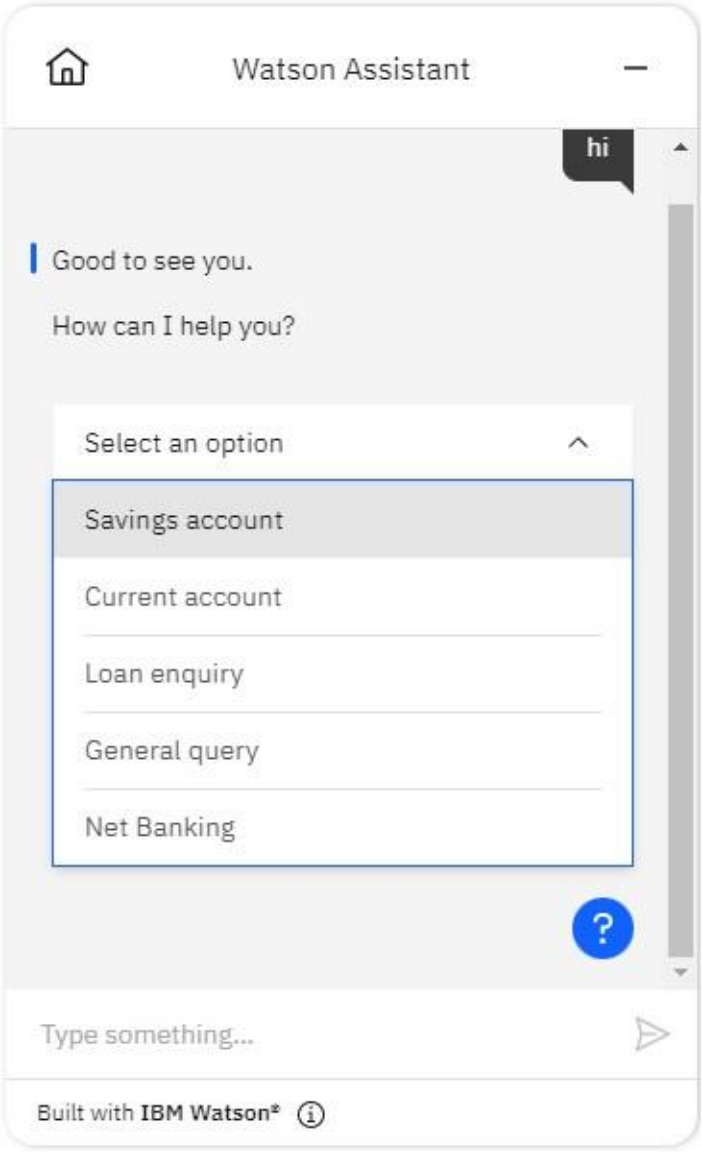
Run the Application

- Open the anaconda prompt from the start menu.
- Navigate to the folder where your app.py resides.
- Now type the “python app.py” command.
- It will show the local host where your app is running on http://127.0.0.1.5000/
- Copy that localhost URL and open that URL in the browser. It does navigate to where you can view your web page.

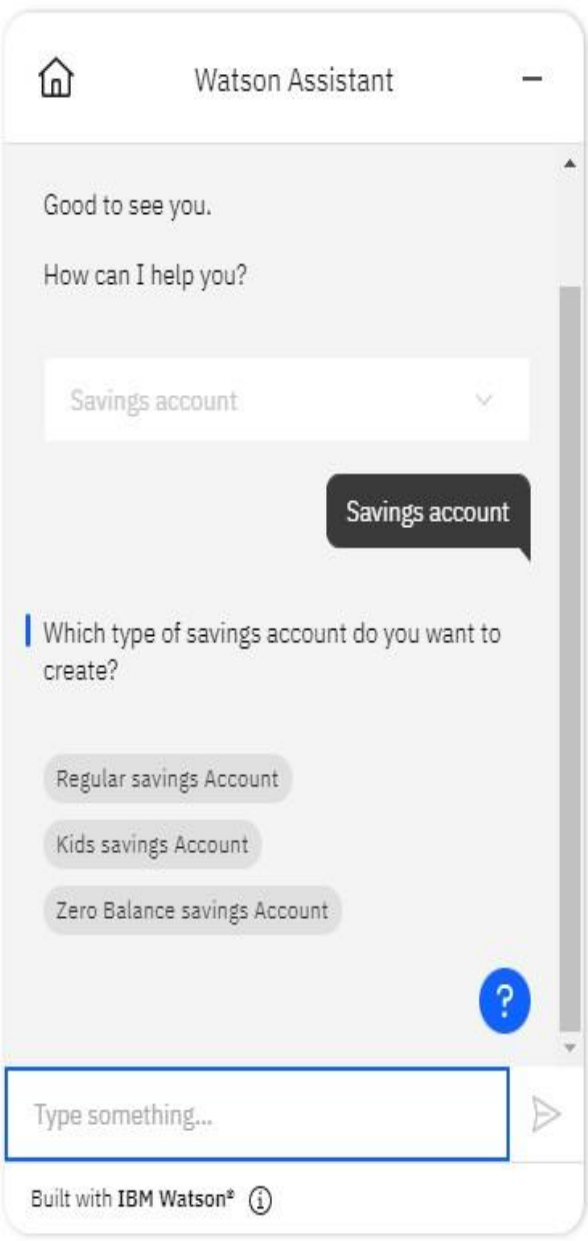
Working Images of Watson Chatbot:

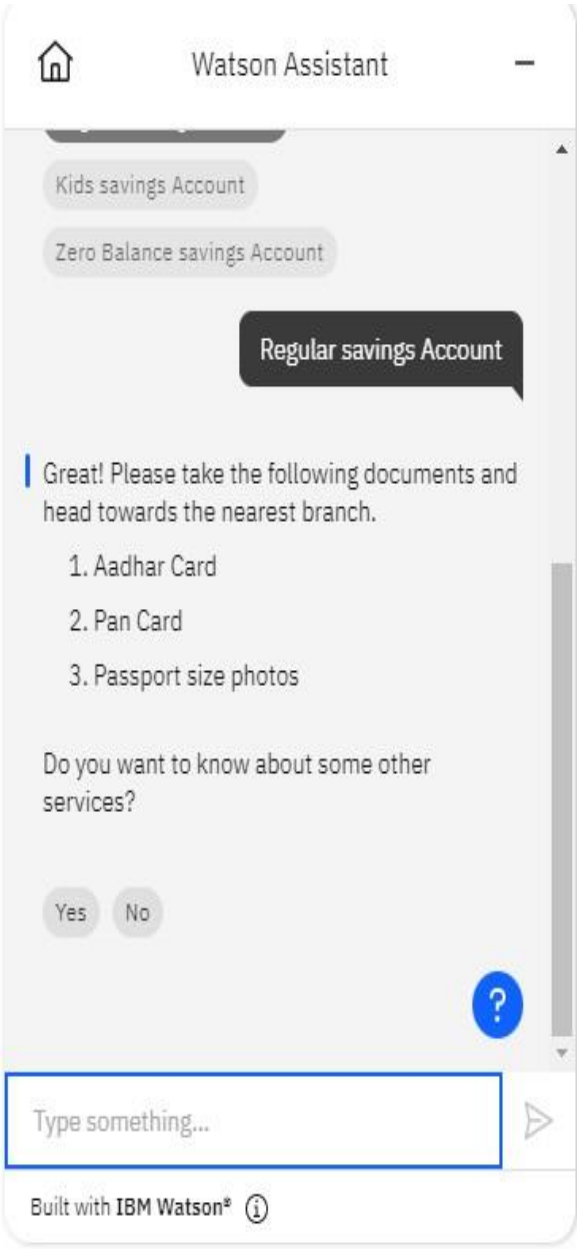


Available Actions:

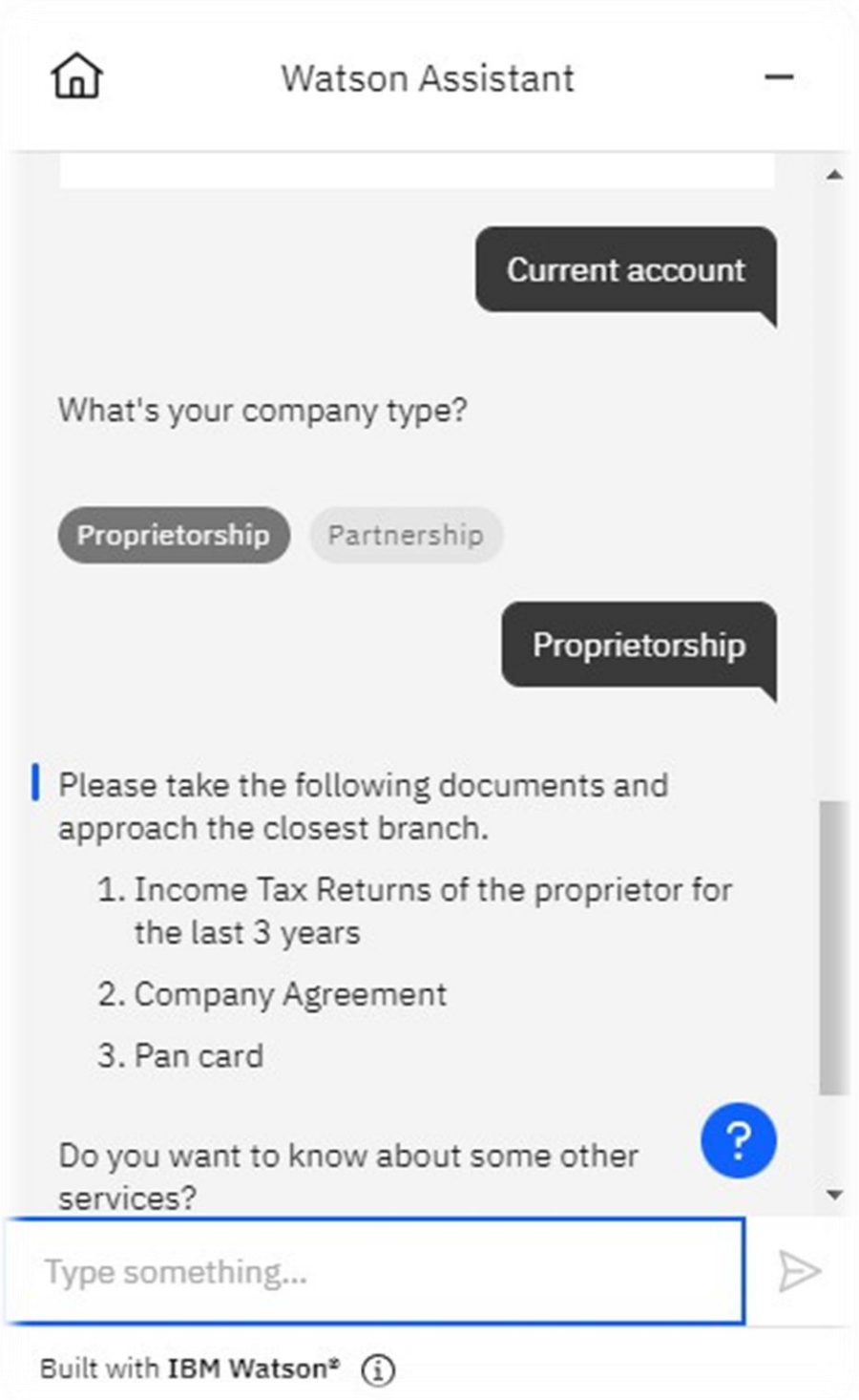


Saving Account Actions:

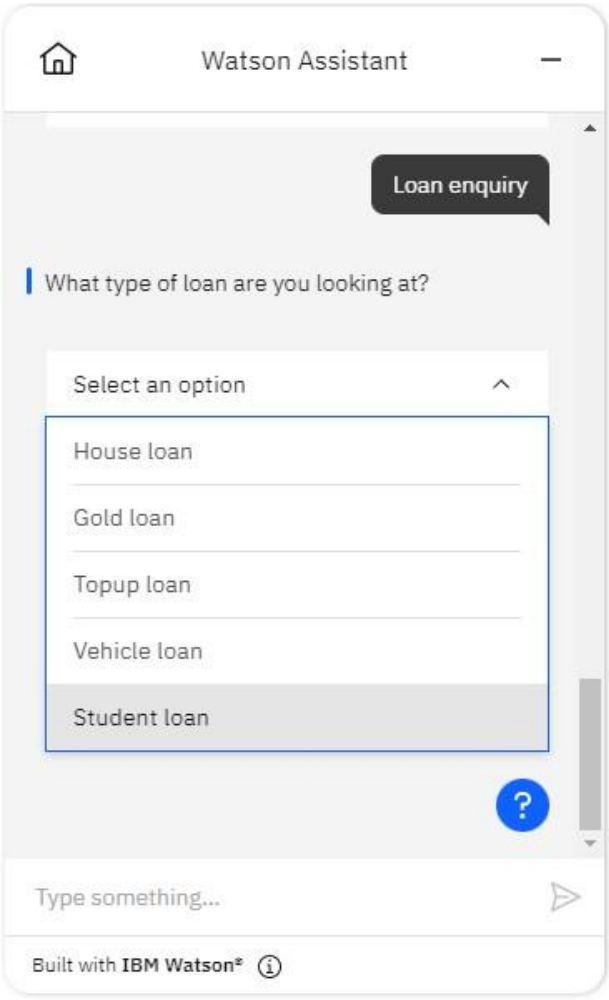


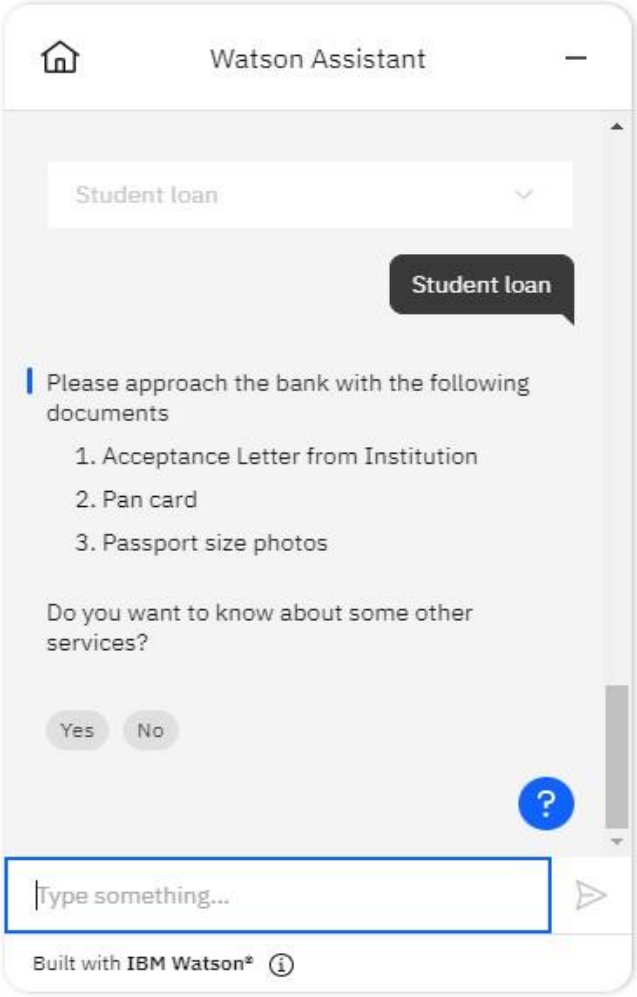


Current Account Actions:

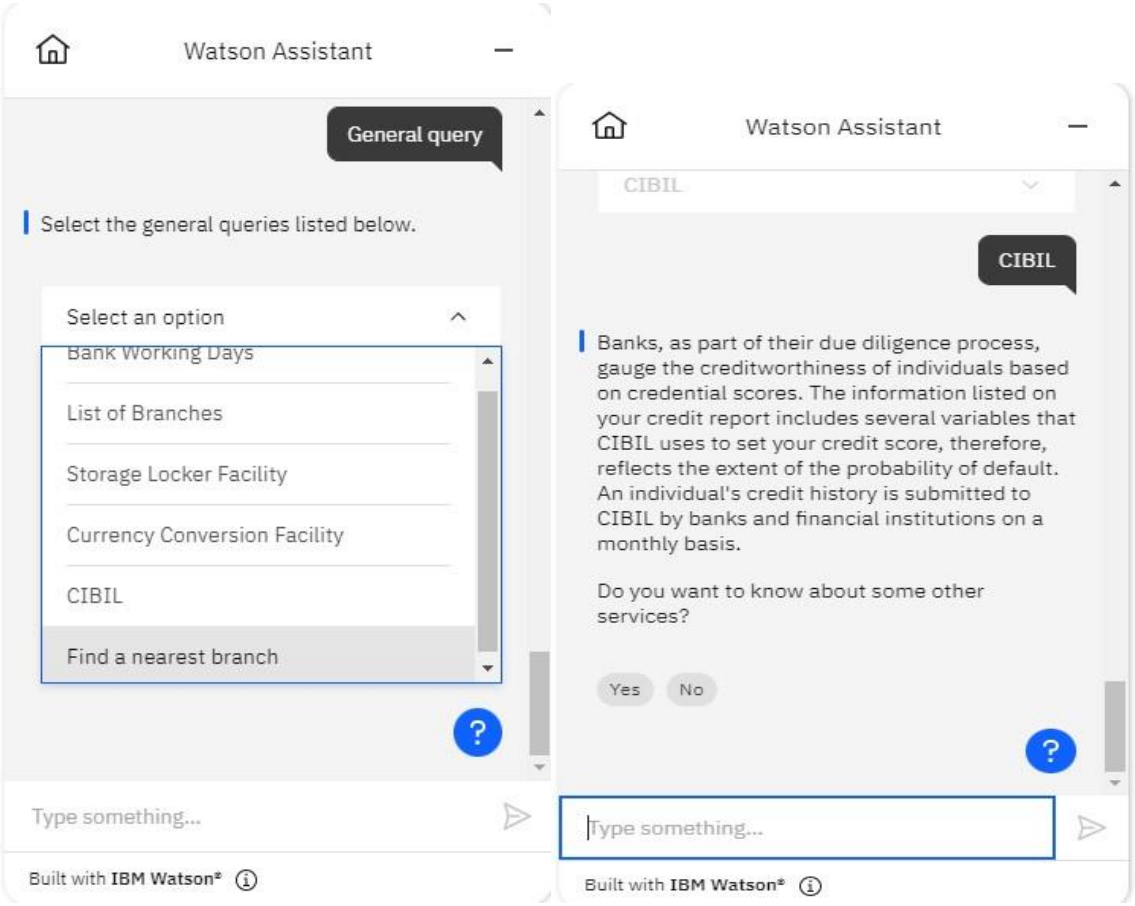


Loan Enquiry Actions:

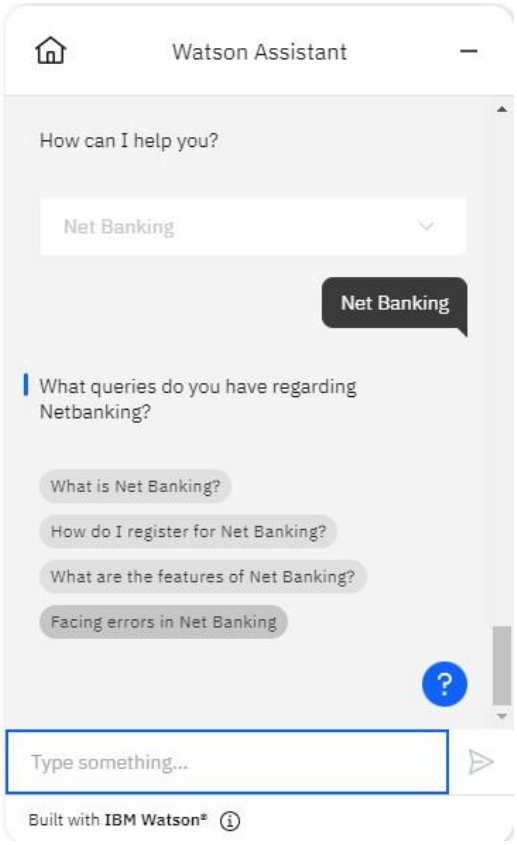


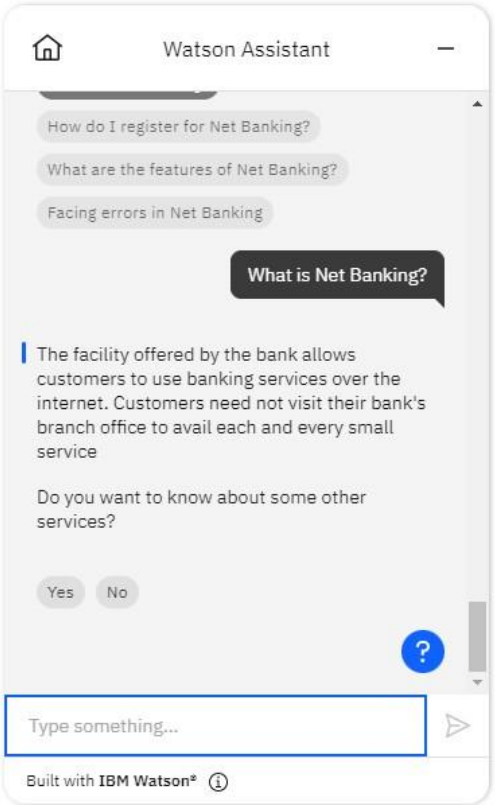


General Query Actions:



Net Banking Actions:





CONCLUSION

The adoption of technologies applied in the banking industry are widely studied in the literature. However, a more and more popular and frequently implemented technology, namely chatbot technology in the context of the banking industry, has received limited attention. To address this research gap, the present study was conducted with the aim of identifying the main factors that influence customers' intention to use the banking chatbot technology. The proposed research model was built by adopting concepts from the TAM model, extending it with compatibility, customers' perceived privacy risk and awareness of the service. Data for the present analysis was collected from consumers via online, applying a self-administrated survey method. The findings supported the conceptual model by predicting 56.5% of variance in the behavioural intention. Perceived usefulness and perceived compatibility significantly predicted the customers intention to use the banking chatbot. Awareness of the service had an effect on perceived ease of use, perceived privacy risk, and it indirectly affected usage intention through perceived usefulness. Also, perceived ease of use influenced perceived usefulness, and perceived compatibility had an effect on both perceived ease of use and perceived usefulness. Yet, perceived ease of use and perceived privacy risk were not found to be significant determinants of behavioural intention. As a result, the current study was able to make a significant contribution to the field for both academics and practitioners.

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