

PAPER • OPEN ACCESS

A Survey on IBM Watson and Its Services

To cite this article: Avinash Kumar *et al* 2022 *J. Phys.: Conf. Ser.* **2273** 012022

View the [article online](#) for updates and enhancements.



IOP | ebooks™

Bringing together innovative digital publishing with leading authors from the global scientific community.

Start exploring the collection—download the first chapter of every title for free.

A Survey on IBM Watson and Its Services

Avinash Kumar, Pallapothala Tejaswini, Omprakash Nayak, Anurag Deep Kujur, Rajkiran Gupta, Ashish Rajanand, Mridu Sahu

Department Of Information Technology
National Institute of Technology, Raipur

avi.kmr.y@gmail.com, pallapothalatejaswini@gmail.com,
omnayak27199@gmail.com, anuragdeepkujur758@gmail.com,
rajkiran.gupta99@gmail.com, arajanand29@gmail.com, mrishu.it@nitrr.ac.in,

Abstract. Artificial Intelligence (AI) is changing the modern way of lifestyle by helping the person do their jobs in an efficient manner. The AI is currently in its starting phase and from now on it is of great use. IBM Watson is an AI which is used globally by different organizations, institutes and corporations. In this paper we have created a chatbot using IBM Watson Assistance which is helpful in querying about the disease and hospitals related query. This paper also discusses IBM Watson in detail, its applications, its working and case studies on the use of IBM Watson in the field of healthcare, visual recognition and a software company named BOX.

1. Introduction:

In one sense, the definition of artificial intelligence is easy. It is simply the notion that we can have something nonhuman (these days, usually computers) behave in ways that either mimic or actually "exhibit" human like intelligence. Because of their capability to process natural language, cognitive systems are becoming a new milestone (NLP). This opens up a whole new level of interaction between people and computers, which could aid decision-making. IBM Watson is a cognitive system that receives and responds to questions using natural language. It can accommodate unstructured data, which accounts for 80 percent of all data on the Internet. IBM Watson understands a learning strategy by saving all relevant materials in its own repository, which it then explores for most appropriate answer.

IBM Watson is a question-answering machine that defeated former winners Brad Rutter and Ken Jennings on Jeopardy in 2011. Watson proved to be more skilled than humans on Jeopardy, a renowned American television game show that tests contestants' general knowledge. Watson is designed to mimic the human brain's ability to observe, analyse, evaluate, and make judgments. More specifically, it uses cognitive computing to replicate a human cognitive framework for decision-making. Cognitive computing systems learn by using more natural human expressions as new circumstances and emotions emerge. Watson makes extensive use of advancements in NLP, ML, and question answering [1]. The system employs corpus processing of corpus and its expansion, evaluation of all the semantics and parallelism, along with strategies for finding hints in questions, all of which are derived from natural language processing. Watson also searches for and generates candidate responses using search engines



like Lucene and Solr. Watson, according to IBM, employs over 100 different natural language processing techniques. IBM Watson is excellent for domains and applications that require a huge amount of data to be consumed, examined, and complex decision-making [2]. The method has been implemented in a variety of industries, including healthcare, finance, legal services, tourism, and so on. In 2014, IBM Watson was made available to the general public. It now has 280 business partners, as well as thousands of students and developers, who use Watson to make up to 3 billion API requests per month. In this paper, we describe the use of cognitive computing. We have developed a Chatbot on the IBM Watson services that enables a dialog-based interaction with user.

Watson has accessibility to 90 computers and a data repository of more than 200 million webpages of data. It makes use of Apache's Variety of Information Architecture framework, resources, and other features needed for unorganized analysis of data, as well as Apache's Hadoop, an open java-based programming paradigm for processing massive data sets in an ubiquitous computing environment. It has 15 Tera Bytes of RAM and 500 GB of pre-processed information [3].

The content of the paper is organized in the following manner. In the following Section 2 the applications of IBM Watson were discussed. Section 3 exhibits the different case studies on IBM Watson services. In Section 4 methodology and implementation details of chatbot using IBM Watson Assistant. Finally, we concluded the paper in Section 5

2. Working of IBM Watson

IBM Watson system is example of cognitive computing that integrate cognition and computing. Cognition is the procedure which is divide into four parts. We observe a visible phenomenon, generate several assumptions and accumulate enough evidence for supporting assumptions based on prior knowledge and make best decision on the assumption which seems best. Watson architecture first, receive and identify the question as input returns an answer and an associated confidence score as output, it contains following component:

- Query Analysis
- Hypothesis generation
- Hypothesis and evidence scoring
- Final merging and ranking

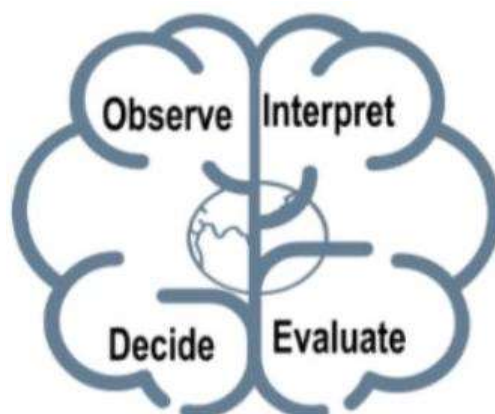


Figure 1. working of IBM Watson

1. Query Analysis: The first step in Runtime query is question analysis. It takes a question as input and apply number of detection rule and functions to identify syntactic and semantic information and relationship among phrase. Watson use natural language processing (NLP), analytic including key phrase extraction, information extraction, lexical answer type identification, and question classification. Natural language processing (NLP) allows computers to interpret natural language in the same manner that humans do. Analyzing a question proceeds through different phase including preprocessing, syntax and semantic analysis. Preprocessing or lexical analysis, it involves distinguishing and evaluating word

structure. It separates a text into a series of words then apply different technique stemming lemmatization, part of speech (POS) tagging, lexical answer type (LAT). Lexical ambiguity can remove by using pos. Lexical Answer type is noun or word phrase in question. It specifies several answers of word without semantic meaning. Question is classified based on feature. There are syntactic and semantic feature and domain-specific. Syntactic are based on grammatical rules. Semantic analysis used name entity recognition (NET), natural language generation [4]. Example-" It is third highest mountain in world." For this question noun: mountain, world, pronoun: it, verb: is, Adjective: third, highest, Preposition: in.

2.Hypothesis generation: The goal of this step is to generate possible answers to the analyzed question. Hypothesis generation takes the results of question analysis as input and performed search in the resource and produces candidate answers based on searched result. Each candidate answer filled back into question, considered a hypothesis.

- Primary Search: The goal of primary search is to find group of possible content bearing answer that come from either structure or unstructured data. It uses keyword query on search engine like Indri, Lucene. NLP converts question to structured query, so it can search on structure data.
- Candidate Answer Generation: Hundred or thousand candidate answer can be generated based on retrieved information. EX:" It is third highest mountain in world."
 - Candidate answers: Mount Everest, Kanchenjunga, K2, Lhotse, Dhaulagiri,
 - Hypothesis 1: "Mount Everest is third highest mountain in world".
 - Hypothesis 2: "Kanchenjunga is third highest mountain in world".
 - Hypothesis 3: "K2 is third highest mountain in world".
 - Hypothesis 4: "Dhaulagiri is third highest mountain in world"

3. Hypothesis and evidence scoring: Hypothesis and evidence scoring, is procedure to the gather information and support to the correct candidate answer. We need to select a correct answer from generated hypothesis or candidate answers. Therefore, we need evidence for each answer. There are thousands of algorithms work in parallel to score the evidence including deep evidence scoring algorithm, passage search, spatial relationship, temporal relationship. keyword search on search engines such as Indri and Apache Lucene. Evidence scoring compute confidence levels for each possible answer. It uses massive parallel evidence scoring algorithms.

4.Final merging and ranking: Final merging and ranking is Selects the single best supported hypothesis based on confidence score. It evaluates the hundreds of hypotheses based on potentially hundreds of thousands of scores to identify the single best-supported hypothesis given the evidence and to estimate its confidence. There is similar answer for same question. We merge the similar answer and combine weighted scores. Example "Mount Everest" and "Everest" are referring to same things. Logistic regression model is trained to decide whether to merge or not [5]. Confidence weight are ranked, and best answer is selected if score of ranked hypothesis above the threshold value. Ex-"It is third highest mount is world." Evidence for Kanchenjunga and mount Everest is 13400k and 4220k respectively. Here the evidence for Kanchenjunga is more than Everest. So, answer is Kanchenjunga.

3.Application of Watson Services:

These all applications depend on cognitive processing which empowers individuals to make a significant new sort of significant worth, observing answers and experiences which are situated in volumes of information. regardless of whether we consider a specialist diagnosing a patient, an abundance chief exhorting a customer on their retirement portfolio or even a cook making another formula. IBM Watson retrieves data from world wide web, articles, and literature in unstructured form and represents it to the user in structured form.

- 3.1 An IBM Watson Healthcare:* Watson technology was first applied in healthcare. It is changing the way healthcare is delivered by meeting business and clinical needs with cloud, data, analytic and AI solutions. IBM supercomputer brings precision medicine to cancer patients and helps researchers to identify new indications for existing drugs hence developing a new treatment for the patients. It allows doctors to review patients according to their personal and family medical history from other doctors and even insurance providers with the help of these data doctors try to find out meaningful insights about patient condition. The app contributes that data back into the wanton ecosystem that makes it more dynamic, intelligent and efficient for everyone.
- 3.2 Chef Watson:* Chef Watson application is commonly known as Bon Appétit. Now here's Chef Watson which assist you. the procedure of processing information of chef Watson is like a human rather than a computer. He's here to help you make amazingly, nice meals, exceeding your delicious expectations and those of your dinner guests. Chef Watson, however, is more than just a slick cookbook. Rather, it works and helps chefs to make better arbiters of ingredient combinations. Large number of home chef specialists have effectively experienced how extraordinary an assistance Chef Watson is in the kitchen. They evaluated the application in beta throughout the last year. Since last June it's accessible for chef all over the place, with a totally new interface.
- 3.3 Teaching assistant:* Teaching assistant application is known as Jill Watson. it is virtual Teaching Assistance. it used to amplify the voice of the teacher. We have large online classes but we don't have enough teachers. Jill is a proxy for a teacher. of course, she can't do everything a teacher can do. She is just as little as a teacher can do. it can also assist the teacher. Jill Watson can possibly be each instructor's new closest companion. A cousin of IBM's Jeopardy-winning Watson, Jill is an AI-empowered showing colleague who can respond to understudy inquiries regarding a specific class and educational program.
- 3.4 Weather forecasting:* IBM Weather Signals utilizes Watson AI to combine climate information with an organization's functional information to make a model that can foresee how expected occasional climate conditions, or even minor vacillations in temperature, wind chill or dampness. The expectation is made dependent on a sliding window calculation. The month-wise outcomes are being processed for a long time to really take a look at the exactness. The consequences of the methodology recommended that the strategy utilized for climate condition expectation is very proficient with a normal precision of 92.2

4 Case Study ON IBM Watson:

- 4.1 IBM Watson In Healthcare:* The advancement of intelligent healthcare systems is a priority for IBM Watson Health. Watson Health is able to assist our clients with their digital transformations due to a combination of Watson's strengths, including significant experience in health, sophisticated technological solutions, including options for AI, blockchain, data and analytics, and a reputation for trust and security. We help businesses become more efficient, resilient, and robust institutions capable of delivering on their mission to their communities by combining digital solutions and professional advising. Watson provides the following three types of assistance in the field of healthcare:
- 1. Diagnostics / Treatment Assistant:* A diagnostic assistance is designed to provide information on a specific system to a human, such as a medical patient, a home's electrical system, or a vehicle. The diagnostic assistance should provide information about any underlying facts or disorders, as well as test and therapeutic suggestions. In order to provide such assistance, the

assistant will require a system model that includes knowledge of potential causes, available tests and treatments, and system observation, which is commonly referred to as Symptoms. There are mainly four types of inputs in the diagnostic assistant and they are as follows:

- i. prior knowledge, tells us that how diseases manifest themselves, providing the test information, the treatment effect, and how to find out information. Past experience, previous medical records or diagnosed data that are previously achieved by the patient and their current diagnosis data also that have been done recently.
 - ii. goals of a patient's choice whether to live longer or reducing pain.
 - iii. stimuli which is examination of symptom of a patient.
2. *Evidence based insights*: According to evidence-based guidelines, 'multidisciplinary teams produce rules and standards that meet the needs of groups of people and that indirectly influence individual patients by influencing the behaviour of healthcare decision-makers.' In evidence-based personal decision, personal clinicians make decisions about patients or concept fully their care.
 3. *Collaborative Medicines*: Every five years, the amount of unstructured medical data doubles. According to 81 percent of physicians, they read medical publications for fewer than 5 hours each month. One out of every five diagnosis is incorrect or incomplete. Medical blunders cause 5.2 million mishaps in India each year, according to Harvard research. In India, a lack of AI expertise and appropriate deployment might avert roughly 5 million fatalities each year. "Medicine has gotten far too tough," said Steven Shapiro, UPMC's Chief Medical and Scientific Officer. "Only around 20 percent of the material utilised by clinicals is evidence-based," says the author. IBM Watson is ideal for healthcare because it interprets the medical condition, analyses the data, qualifies the result, support iterative ideas and adapts new technology.

IBM Watson is going to improve healthcare by the following ways:

- i. *Managing Care*: Eighty percent of healthcare expenses are accounted for by twenty percent of patients. These patients with high costs and high needs must be continuously monitored. IBM Watson Care was intended to boost health-care efficiency. The system supports healthcare terminology by moving between organised and unstructured patient data, as well as the latest evidence-based medicine, quality standards, and regulatory requirements. The IBM Watson care manager then works with the teams to generate individualised care plans and provide treatment recommendations. The importance of AI in healthcare management is likely to be underestimated. About 147,000 patients' care plans are currently being tracked with the aid of IBM Watson care manager. The technology has shown to be very useful in the management of mental health and social care [3].
- ii. *Interpreting Medical Images*: IBM purchased merge healthcare for a billion dollars. Merge specializes in handling all kinds of medical images, and its service is used by more than 7500 hospitals and clinics in the US, as well as clinical research organizations and pharmaceutical companies. The acquisition is part of an effort to draw on many different data sources including anonymized, text based medical records, to help physicians make treatment decisions. Merge's data set contains some of 30 billion images which is crucial to IBM 30 because it plans for Watson rely on a technology, called deep learning, that trains a computer by feeding at large amounts of data. These images can help to study "Melanoma" a form of skin cancer [4].
- iii. *Accelerating drug recovery*: It takes very long time to introduce new drug to market and most experimental drug do not make it to market. IBM Watson drug recovery is

accelerating the process. Collaboration with Burrow Neurological Institute, who used IBM Watson's AI to rank 1500 proteins for their predicate association with Amyotrophic Lateral Sclerosis (ALS) also known as Lou Gehring disease. Out of top 10 proteins ranked by IBM Watson eight of them were proved to be linked to ALS. One interesting fact here is that five of them had never before been associated with the disease. It makes the invisible data visible [6].

- iv. Treating rare forms of childhood diseases: IBM Watson helps in treating rare paediatric diseases. 1 in 10 Americans, 30 million in US, 400 million globally are affected by a rare disease. 7000 distinct rare disease exist today. 80 percentage of rare disease have identified genetic origins. IBM has collaborated with Boston Children's Hospitals to diagnose rare paediatric disease.
- v. Identifying appropriate cancer treatment: IBM has collaborated with Manipal Hospital in India for implementation of Watson. Number of healthcare organizations using IBM Watson is growing very fast. The AI technology is 99 percentage accurate in identifying the treatment recommended by the human tumour board. It can also extract information of diagnosis which humans denies where doctor scares. Manipal treats 200,000 patients annually with the help of IBM Watson. IBM Watson uses deep learning to update its database to improve its knowledge.
- vi. Matching patients with clinical trials: There are a long wait for the trials of medicine. Watson CTM has reduced pre-screening wait time by over 75 percentage during a typical 16-week trial period. It also eliminates the majority of patients who do not meet clinical trials requirements. It translates to faster enrolment to clinical studies, which ties into accelerating the speed of drug being introduced into the market.
- vii. Powering application that gives nutritional advice: Nu-trino and IBM announced the launch of Nutrino app powered by Watson, which provides expectant moms with real time, science based nutritional insights. The app gives personalized meal recommendations and round the clock nutritional support by combining Nu-trino's nutrition database with Watson's natural language capabilities.
- viii. Healthcare transformation and value-based care: Healthcare organizations require more precise and accurate information and better database management to change value-based care successfully. There are more opportunities to use to use healthcare technology and data to support decision making. Owing to a large amount of medical, population health, genomic and performance data. AI and analytics solution will collect and analyze information from its massive source of information to assist hospitals, healthcare providers and care givers learn and apply innovative models [7].

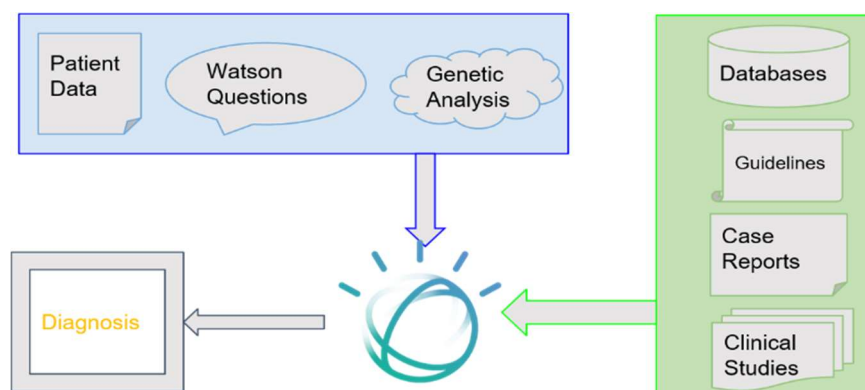


Figure 2. Working of IBM Watson in Health Care

In the above figure it is showing the working of IBM Watson where it takes two different kinds of inputs. One is data about the patient like patient data, some basic Watson questions to know

the patient better and the genetic analysis. Another type of input is already available to the Watson like the databases that store the previous data, the guidelines to be followed, the case reports and clinical studies.

4.2 IBM Watson Visual Recognition - AutoGlass BodyRepair

4.2.1. IBM Watson Visual Recognition: Visual recognition with IBM Watson is a unique process for analyzing various kinds of images. It analyzes the content of uploaded images for scenes, faces, food, objects, colours and other subjects using deep learning algorithms.

4.2.2. Built - In Models of IBM:

1. The IBM Watson Visual Recognition service comes with three certain built-in models. They are,
2. General Model - This is the default model among all the built-in models. It classifies the input image into thousands of classes.
3. Faces Model - This is one of the pre-built models that are available and it is used to detect human faces and to output the age, gender.... related to the input image.
4. Food Model - It classifies different food items from the input image.
5. Text Model - This model is used to recognize the text and also for its classification.
6. Custom Model - This model will be employed for particular specific purpose. We can create our own custom model based

4.2.3. Areas of Application:

1. Visual auditing - As a defect detector, we use this service to check out visual deteriorations in planes, windmills and trucks and many more objects.
2. Education - To design various kinds of image - based applications and also used to teach image classifications.
3. Manufacturing - In Manufacturing environment, the images from different stages are picked and these are used to train the model to ensure proper development of product.
4. Social commerce - If we want to know about any company or any food item or about any other object, we will capture that particular image for uploading it in social websites to track the reviews/comments from different people.
5. Retail - This can be used to retrieve the information about stock of outfits availability in all the retail stores.
6. Insurance - Here, a classifier is used for processing and classifying the policies into different categories such as Claims, Pensions, Retirements etc.,.

4.2.4. Building a Visual Recognition Classifier: Using Visual Recognition model for training the model to classify the input images for different scenes, objects, or any other custom content.

- Required service - Visual Recognition service. There can only be one instance per project.
- Data format - Images should be either in JPEG or PNG files that are grouped in a .zip file, separated by class
- Applicable Data size - Small to medium data sets

- Building a classifier:

- Each image class must contain at least 10 images, collected in a zip file
- Supported image file formats: JPEG (.jpg) and PNG (.png)
- Minimum image size: 32×32 pixels
- Collaborate to classify images
- Use one of four built-in models or build your own
- Test the model with sample images

4.2.5. Case Study on AutoGlass BodyRepair: -

Belron is the world's leading automotive glass repair and replacement company founded in 1987, headquartered in Egham, England. AutoGlass BodyRepair is a part of Belron that is popular in UK. Auto Glass BodyRepair is a mobile accident damage repair company that uses IBM Watson Visual Recognition for quotation process that is launched in September 2017.

The IBM Watson Visual Recognition tool was integrated into the Belron brand Autoglass BodyRepair's website, minimizing the need to manually analyse customers' vehicle damage and to provide quotes. The system analyses and arranges clients' uploaded photos using custom classifiers, then uses the results to calculate repair costs.

Business challenge faced by AutoGlass BodyRepair - Manually assessing the damage On a daily basis, 260 consumers use the Autoglass BodyRepair website to get quotes, and photographs are submitted via the online portal or email. Three damage advisors will analyze the car damage and provide repair quotations based on what they saw and read from the photographs and notes that were sent. Customers used to fill out a simple form on the website and upload a few photos of the damage. These would land a damage advisor in trouble that where he would examine the images and either calculate the price or he has to get back in touch with the customer to request more images or more detail. As this is a complex and time-consuming process, they are looking for an efficient and hassle-free Service. There comes, Visual side of IBM Watson into picture that would fit their needs in the best possible way[8].

4.2.6. Transformation story - After using Watson Visual Recognition to analyze damage and costs:

Using the IBM Watson Visual Recognition service, Autoglass BodyRepair now analyses car damage and prepares customer quotes. Customers simply upload photographs of their vehicle damage and basic information about themselves to the website. for generating quote. The IBM Watson service uses a library of 2,000 images to analyze and organize customer photos into four classifiers. First it identifies whether the image is a 2 or 4 - wheeler and then validates it is mobile repairable or not. Then it recommends a price based on the selections of skill level person and type of damage[9]

4.2.7. Role of IBM Watson in Auto Glass Body Repair Website:

The customer/user of Auto Glass Body Repair interacts them with either the mobile application/website. The users will enter the basic details about them and their vehicle and also, they need to upload the pictures of vehicle damage along with the notes containing information about the damage. These images are passed to the application server and server sends these images to Database which is deployed in cloud from where these are provided to IBM Visual Recognition service as input for classification and analysis. The IBM Visual Recognition service analyses the input based on different criteria such as 2 or 4 - wheeler and whether it is mobile repairable or not, what type of damage it is and about the skilled person. By analyzing all of the server from where it is sent to mobile client and will be displayed to the user.

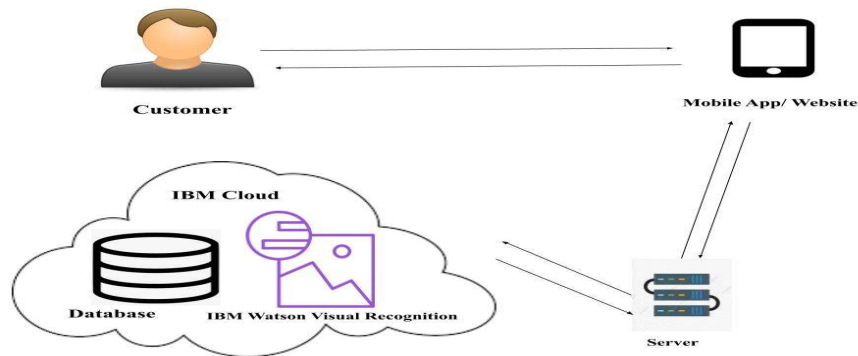


Figure 3. Role Of IBM Watson Visual Recognition Services

4.2.8. Results with IBM Watson Visual Recognition Service: Auto glass Body Repair is the first company in its field to employ IBM Watson's Visual side to deliver auto repair quotations to customers. When Watson effectively quotes a vehicle damage repair without the assistance of a human, the processing time is reduced by 70

4.3. Case study on the Software Company: BOX

4.3.1. IBM Watson - Natural language understanding: Natural language understanding (NLU) is subtopic of Natural language processing (NLP) in Artificial intelligence that deal with Machine reading Comprehension [10]. It has collection of API that use that offer text analyse through NLP. Watson natural language understanding service is use to extract the specific information from piece of data. It offers to analyze semantic features from input text and extract meta-data from the content such as keyword, concept, emotion, sentiments, semantic roles, relation.

Benefits of watson natural language understanding:

- **Powerful Insights:** it provides features to associate with a full suite of advanced text analytics features to extract entities, relationships, keywords, semantic roles and more.
- **Domain Customization:** It has features that allow you to Apply the knowledge of unique entities and relations in our organization to our data.
- **Broad Language Coverage:** With the use of NLP, it can translate text into 13 different languages.

Company that used Watson NLU: BOX, GUARDIO, AUDIENSE, MAX KELSEN, INFLUENTIAL, ACCRETE.AI

4.3.2. The cloud company BOX: The BOX is a public cloud company based in Redwood City California. The idea for Box cloud service started in 2003 with Aaron Levie, he was a business student at the University of Southern California. Initially he writes a paper for storing the digital file in online storage then He start developing the Box service in 2004. And in 2005 the box service is released [11]. initially, it had only 4 million users because Box was initially focused on consumers, but many of those consumers used the service at work.to focus on business customers The company developed features to embed Box services in business applications [12]. In 2011 new version of BOX was released with some major improvements, an interactive interface, it can handle a large number of users and manage its cloud content.

It develops a cloud-based content management, collaboration, and file sharing tools for business [13]. Its software allow users to store and manage files in an online folder system accessible from anywhere and any device.Box.com use Box Skill To enhancing the metadata of file and for custom processing of file uploaded in box cloud.

4.3.3. BOX Service with Custom/BOX skill: BOX skill is powered by Watson AI and Watson NLU service. It enables us to extract AI insights from an a.docx file submitted to a Box in order to make it more searchable and consumable and to improve and automate business processes. The main purpose of designing box skill is to allow Custom processing of file uploaded in BOX cloud[14]. And make it straight forward to use third-party Machine Learning services to automatically extract information from files uploaded to Box and apply the resulting data as metadata on the file. Custom Skills need to be enabled on a folder by a Box Admin. With Box Custom Skills, documents that are saved in Box folders can be enriched by using Watson artificial intelligence (AI).The major benefit of using the BOX skill is that it permit the storage of rich information about any file. Custom skill is best used when :

- When application want to add only metadata to file uploaded to BOX. - When application want to perform any API calls.
- When application want to way to pass file to ML services without having to handle authentication.

4.3.4. Transformation of BOX After using Watson-NLU:

By using IBM Watson NLU and Box skill there are various transformation are happening in the working of Box Services like Content Management, Watson Analytics, Social Collaboration Solutions. IBM and box are partnering together to bring intelligence to our content by apply machine learning algorithm to our content in box. By using Watson NLU, it able to deliver custom solution for our business.

4.3.5. Workflow diagram: In this section we will see the Document enrichment using Watson Natural Language Understanding with Box Custom Skills [15].

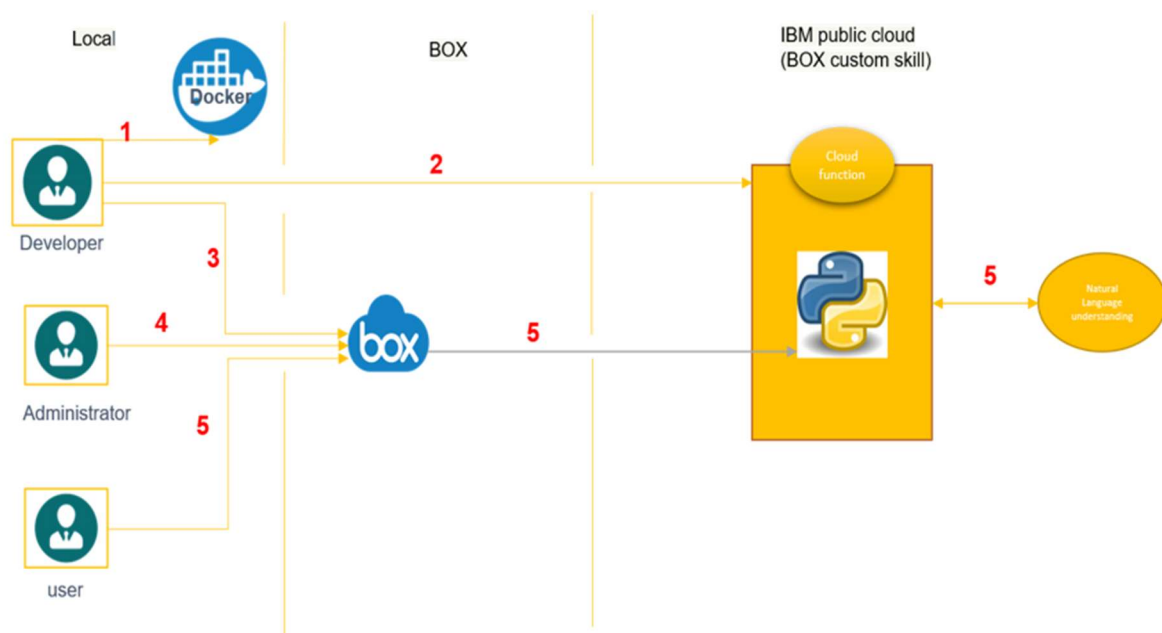


Figure 4. Flow Diagram of BOX custom skill

- In the first step Developer Use Docker Desktop software to create a Python action zip file.
- In the second step Developer Upload the python action zip file to IBM Cloud Functions.
- After that Developer Create a Box Skill application which uses your function's endpoint.
- After that admin Enable your Box Skill application for .docx files in an allow list of folders
- In this step Box users will see a card describing concepts and keywords in documents and user will connected to the IBM public cloud function.

4.3.6. *organization that used BOX*: There are various organizations that selected BOX for different purposes for their business [16].

- a. U.S. General Services Administration for E-signature.
- b. U.S. Air Force Reserve Command for Cloud Content Management.
- c. NASA, Johnson Space Center for Cloud Content Management.
- d. Washington State Department of Health for Cloud Content Management
- e. Police Service of Northern Ireland Chooses for Cloud Content Management

4.4. Implementation of chatbot using Watson Assistant:

4.4.1. 1 *Watson Assistant*: IBM Watson Assistant is intelligent virtual agent or conversational AI that provides customers with fast, consistent, and accurate answers across any messaging platform, application, device, or channel. Watson Assistant using Natural Language or AI to learn from customer conversation in order improve their ability to resolve customer issues and query[17]. With the help of IBM Watson Assistant We can build a chatbot with different type of conversational interface into any application or channel. Most virtual assistants try to mimic human interactions, but Watson Assistant knows when to search for an answer from a knowledge base, when to ask for clarity, and when to refer someone for direct interaction to a human. Like a human personal assistant, the assistant you build helps your customers perform tasks and answer questions[18]. To accomplish this, you define actions for the assistant.

4.4.2. *Chatbot*: A chat chatbot is an AI computer program that simulates and processes human conversation (either written or spoken) and can imitate a real-world conversation with humans using their natural language. It allows humans to interact with digital devices as if they were communicating with a real person. It uses machine learning to identify the pattern of communication and according to the pattern, it learns to mimic real-life conversation. A chatbot is a program that answers a simple query with a single-line response, or as sophisticated as digital assistants that learn and evolve to deliver increasing levels of personalization as they gather and process information[19]. Here we are using Watson Assistant to create a chatbot named "PALAK".

4.4.3. *Stages to building Chatbot*: the stages of building chatbot are shown in figure below.

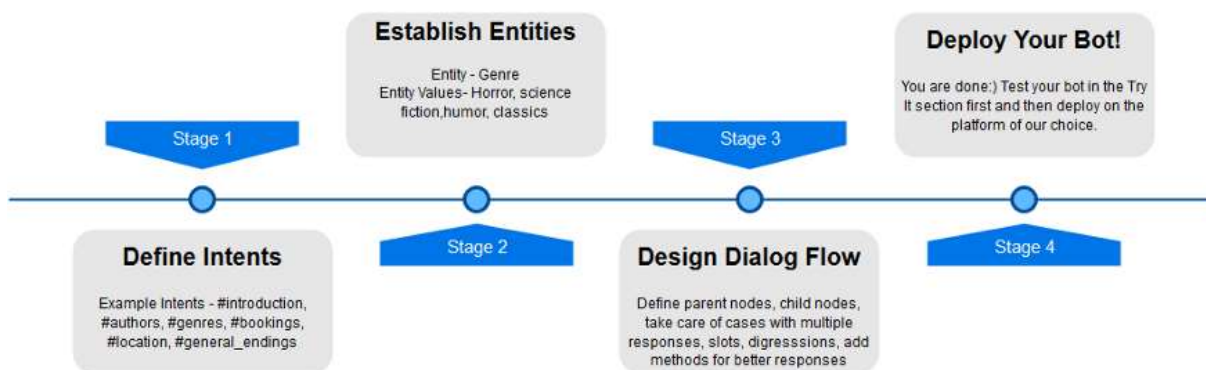


Figure 5. Stages to building chatbot

- 1) Define your Intents: Intents, are used to establish the purpose behind the statement that the user makes so that the bot can take action likewise. It is used to define a dictionary of the different statements a user might use in order to achieve a particular goal[1]. Here are the different intents that we used to design our chatbot are shown in figure 6.

	Description	Modified T1	Examples T1
<input type="checkbox"/> Intents (10) ↑			
<input type="checkbox"/> #Disease_enquiry	For disease enquiry	14 hours ago	3
<input type="checkbox"/> #General_Connect_to_Agent	Request a human agent.	3 days ago	47
<input type="checkbox"/> #General_Greetings	Greetings	14 hours ago	28
<input type="checkbox"/> #Goodbye	Good byes	17 hours ago	8
<input type="checkbox"/> #Help	Ask for help	3 days ago	8
<input type="checkbox"/> #Hospital_Location	Locate a physical Hospital location or an address.	17 hours ago	14
<input type="checkbox"/> #Hospitals		13 hours ago	2
<input type="checkbox"/> #Patient_Appointments		17 hours ago	0
<input type="checkbox"/> #Patient_Appointments	Schedule or manage hospital appointment.	17 hours ago	15
<input type="checkbox"/> #Thanks	Thanks	3 days ago	8

Figure 6. Intents in PALAK chatbot

- 2) Establish your Entities: Entities are defined to classify the purpose of the users behind every statement into well-defined categories. Books is a fairly broad category[20]. Entities that we used to design our chatbot are shown in figure 7.

Entity (11) ↑
<input type="checkbox"/> @covid
<input type="checkbox"/> @holiday
<input type="checkbox"/> @hospitals
<input type="checkbox"/> @landmark
<input type="checkbox"/> @phone
<input type="checkbox"/> @reply
<input type="checkbox"/> @specialist
<input type="checkbox"/> @zip_code

Figure 7. Entities in PALAK chatbot

- 3) Construct your Dialog Flow: Dialog flow is like the bone marrow that provides structure to your chatbot by mapping responses to the intents defined by you. Designing an efficient dialog flow aids in simple, smooth dialog and eliminates unnecessary ambiguities. Node that we used in our PALAK chatbot are: opening Dialog flow is like the bone marrow that provides structure to your chatbot by mapping responses to the intents defined by you [21]. Designing an efficient dialog flow aids in simple, smooth dialog and eliminates unnecessary ambiguities.[22] Node that we used in our PALAK chatbot are:-

- opening node
- near hospitals
- Disease
- where are you located
- general greetings
- goodbye

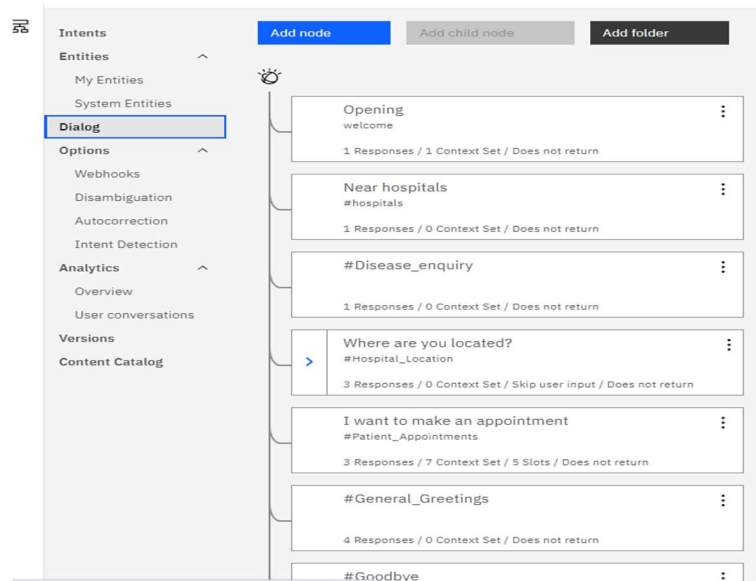


Figure 8. Nodes in PALAK chatbot

- 4) Result: After Defining all intents, establishing all system entities and connecting all node chatbot is ready for communication. it has the feature to make appointments, Disease enquiry, Nearest hospitals information etc and in future, we will add more feature to make this chatbot more advance, So that it can communicate with humans using their natural language. Here is some screenshots of our PALAK chatbot.

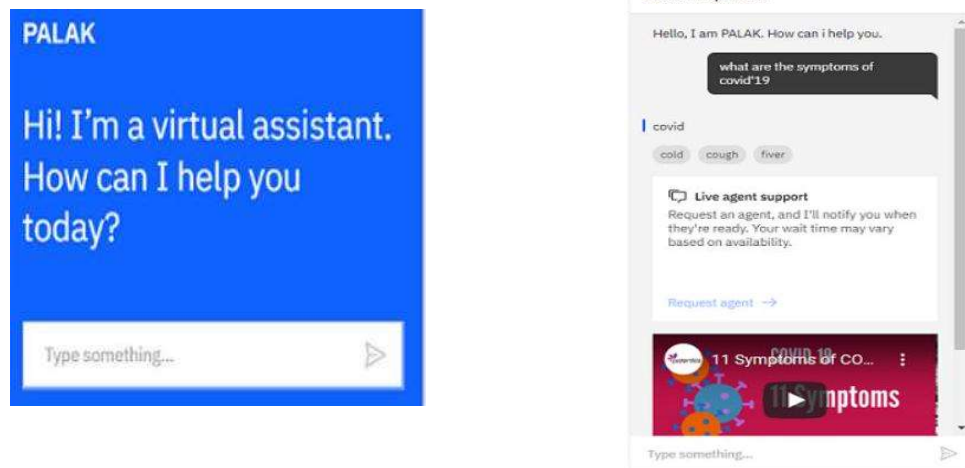


Figure 9. "PALAK" chatbot

5. Conclusion: In this paper, we concentrated mainly on the different services provided by IBM Watson and its role in various fields. We have studied different case studies in this regard. This preliminary study helps us to understand and analyse the different services of IBM Watson AI and the usage of Watson studio in an easy way. With this survey, we developed an IBM Watson AI-assisted chatbot that can help the people in answering their queries and provide the solutions in a faster way. The Bot is

particularly useful for advising users about disease symptoms and the precautions that should be taken, which can be amended regularly based on user feedback. To meet the stated goals, more work on the implementation of the given approach is required. Furthermore, reporting progress to date, together with a reflection of biases, is valid and allows the Bot to be updated in the future.

References:

- [1] Cecil, R. R., Soares, J. (2019). IBM Watson studio: a platform to transform data to intelligence. In *Pharmaceutical Supply Chains Medicines Shortages* (pp. 183-192). Springer, Cham.
- [2] Ferrucci, D. A. (2012). Introduction to "this is watson". *IBM Journal of Research and Development*, 56(3.4), 1-1.
- [3] High, R. (2012). The era of cognitive systems: An inside look at IBM Watson and how it works. IBM Corporation, Redbooks, 1,16 .
- [4] Chotirat, S., Meesad, P. (2021). Part-of-Speech tagging enhancement to natural language processing for Thai wh-question classification with deep learning. *Heliyon*, 7(10), e08216.
- [5] Lally, A., Prager, J. M., McCord, M. C., Boguraev, B. K., Patwardhan, S., Fan, J., ... Chu-Carroll, J. (2012). Question analysis: How Watson reads a clue. *IBM Journal of Research and Development*, 56(3.4), 2-1.
- [6] Lee, K. Y., Kim, J. (2016). Artificial intelligence technology trends and IBM Watson references in the medical field. *Korean medical education review*, 18(2), 51 – 57
- [7] Strickland, E. (2019). IBM Watson, heal thyself: How IBM overpromised and underdelivered on AI health care. *IEEE Spectrum*, 56(4), 24-31.
- [8] Bertacchi, M., Silveira, I., Omar, N. (2017). A Comparative Analysis of the Evolution of the IBM Watson's Visual Recognition API on Android. In *2017 Workshop of Computer Vision (WVC)* (pp. 120-125). IEEE
- [9] Lally, A., Fodor, P. (2011). Natural language processing with prolog in the ibm watson system. *The Association for Logic Programming (ALP) Newsletter*, 9
- [10] <https://sendpulse.com/support/glossary/chatbot>
- [11] <https://books.google.co.in/booksid=C20mDwAAQBAJlpg=PR5ots=VTpxLfzuJ7dq=watson20naturallanguageunderstanding>.
- [12] <https://www.techrepublic.com/article/how-aaron-levie-and-his-childhood-friends-built-box-into-a-2-billion-business-without-stabbing-each-other-in-the-back/>
- [13] Rao, Leena (April 7, 2010) <https://techcrunch.com/2010/04/07/box-netraises-15-million-to-take-on-microsoft-sharepoint-in-the-cloud/>
- [14] High, R. (2012). The era of cognitive systems: An inside look at IBM Watson and how it
- [15] <https://github.com/IBM/watson-box-skills-with-nlu>
- [16] <https://blog.box.com/category/customer-stories>
- [17] Ferrucci, D. A. (2012). Introduction to "this is watson". *IBM Journal of Research and Development*, 56(3.4), 1-1.
- [18] Petiwala, F. F., Shukla, V. K., Vyas, S. (2021). IBM Watson: Redefining Artificial Intelligence Through Cognitive Computing. In *Proceedings of International Conference on Machine Intelligence and Data Science Applications* (pp. 173-185). Springer, Singapore.
- [19] Khalil, K., Asgher, U., Ayaz, Y., Ahmad, R., Ruiz, J. A., Oka, N., . Sajid, M. (2020, July). Cognitive Computing for Human-Machine Interaction: An IBM Watson Implementation. In *International Conference on Applied Human Factors and Ergonomics* (pp. 400-406). Springer, Cham.
- [20] Lee, K. Y., Kim, J. (2016). Artificial intelligence technology trends and IBM Watson references in the medical field. *Korean medical education review*, 18(2), 51-57
- [21] Ahmed, M. N. Toor, A. S., O'Neil, K., Friedland, D. (2017) Cognitive computing and the future of health care cognitive computing and the future of healthcare: the cognitive power of IBM

- watson has the potential to transform global personalized medicine. IEEE pulse, 8(3), 4-9.
- [22] 6 Lee, K. Y., Kim, J. (2016). Artificial intelligence technology trends and IBM Watson references in the medical field. Korean medical education review, 18(2), 51-57.