IJARSCT
ISSN (Online) 2581-9429
International Journal of Advanced Research in Science, Communication and Technology (IJARSCT)
Volume 5, Issue 1, May 2021
Impact Factor: 4.819

Restaurant Chatbot Using IBM Watson

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Abstract: *Restaurant chatbot is an automated system for carrying out day to day works in a restaurant such as ordering, reservations, FAQs at reception, and many more tasks which are not that much important but take much time of receptionist while working. Chatbot is a system backed by an Artificial Intelligence technology to learn, adapt and work according to surrounding environment. In this particular system, development of a chatbot is done with the help of API provided by IBM named as WATSON to create, train, and deploy AI and ML models for various purposes to cut down the too much efforts done while developing an AI/ML model. System helps out staff at restaurant to carry out above stated tasks with less to no efforts. Then, staff can give attention to other important tasks related to their routine. Many restaurants and similar organizations offer services like webpages for reservations, helplines with the help of call centers. But these systems are not much efficient and doesn't answer much of the questions of customer. Chat bots form a solid surface for this situation, answers much of the questions of customers, carry out some operations available online like collecting online payments, reserving rooms, answering different questions like address of an organization, facilities provided by them, vacant rooms available or not and many more. For the development of a restaurant chatbot as a last year university project on experimental basis, adding large facilities is avoided. Data sets for training chatbot model is collected from a leading website KAGGLE, which provides various data sets for models. A chatbot is a conversation agent where a computer program is made to simulate an intelligent conversation. It can use user inputs in several formats such as text, voice. For such different open-source platforms can be found. A Chatbot plays an important role in human-machine interaction. A Chatbot has three modules: the user interface, an interpreter, and a knowledge base. It is a program that tries to simulate the typed text in such a manner that human feels like it's talking to another human, not a machine. There are many chatbots that are on the internet for different purposelike education, customer service, entertainment.*

Keywords: AI – Artificial Intelligence, ML – Machine Learning, NLP – Natural Language Processing, NLU – Natural Language Understanding, HCI – Human computer Interaction

I. INTRODUCTION

A Chabot is called intelligent when it is aware of the requirements of the user. Its intelligence is what provides the Chabot the ability to handle any scenario of a conversation. For example, a Chatbot is helping a user book a room in a hotel. The user is then asked to provide a date for which the room is to be booked. It is all good until the question 'Is there any premium rooms available?' is asked by the user. An intelligent chatbot will then understand this and give a convincing answer.

A chatbot is created to attend to the user requests. A chatbot is recognized by its ability to understand and process natural language. When using natural language processing, the answer is found by deconstructing content provided into intents, entities, agents, actions, and contexts. With NLP platforms like WIT, API, and LUIS can be leveraged to make an intelligent chatbot. A model is to be decided before building an intelligent chatbot when one chooses to use machine learning to build their own NLP.

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1.1. Motivation

Motivation for development comes from real time scenarios. In this project, we can see many restaurants providing boking, conference and various other services. But automation in this field is very necessary. Chatbots provide one way of automation of restaurants which can help receptionists, accountants and various other stakeholders.

Customer satisfaction is the key driver for any representation to sustain in current competitive. Service providers need to know their customers and design their services in such a way that more possible satisfaction is attained by the customer. The objective of the present study is to measure customer satisfaction in the hotels of the Kashmir valley. The study will also provide different suggestions to the users so as to make their services more efficient and effective.

The sample size for the research is 150 Sample variance and confidence methods are used for Determining sample size. Simple random sampling procedure has been adopted by the researcher to collect the data. On the basis of results, 40 % of the respondents are better satisfied with the safety and security of the hotel while 20 % are not satisfied with the location of the hotel. With every attribute the level of satisfaction changes, therefore making it clear that users rate their satisfaction differently with every single attribute:

- Users Loyalty
- Customer Loyalty Scale
- Service attribute
- Service Quality Scale

1.2 Problem Definition

Creating a conversation-based chatting bot or chatbot for carrying out day to day operations in restaurants and similar organizations with ease. It can be deployed on various platforms, such as social media platforms like Facebook Messenger, Telegram. Also, it can be deployed on public website of service seeking restaurant so customers can easily access it, get help from it and make working easy at reception as well as a kitchen of that restaurant.

II. Literature Survey

List of references used for research & implementation:

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   Survey on Intelligent Chatbots State-of-the-Art and Future Research Directions.
2. https://www.ijert.org
   Chatbots to replace work helpdesks.
3. Maruti tech labscase study:
   BookMyTable case study on chatbots.
4. http://ijsrcseit.com/
   Smart hotel using intelligent chatbot
5. Kaggle.com
   Dataset in CSV format (Intents & Entities)
6. https://chatbotslife.com
   Text classification (Naïve bayes algorithm)
   https://monkeylearn.com/blog : What is text analysis (NLP, NLU & NLG)

III. Software Requirement Specification

3.1 Project Scope

Currently this project is under development as a submission of BE final year project. Hence scope of this project is somewhat limited. This project is being developed with the vision of small-scale implementation of a chatbot system under the Artificial Intelligence domain.

With the readymade dataset based on survey of many organizations, helps to train an experimental model of chatbot system, which may be upgraded to a large platform solution of restaurants and can be deployed publicly.

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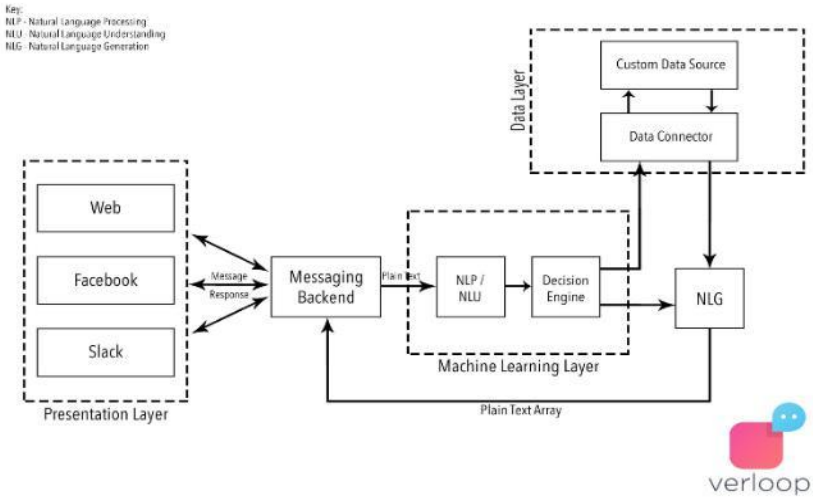
This model is an example which states, in future, how we can make best use of an AI system, when such systems are developed for large businesses of restaurants, which reduce load of reception of answering calls for negligible reasons. And help businesses to reach out to more customers when such systems are deployed on widely used social media platforms like Facebook Messenger and Public websites of that restaurant. Also, this can generate more no. of jobs in future.



It is presented that a web-based application will be used for booking tables, ordering and pre-ordering foods in a restaurant making the overall process easier and less error-prone. we are using smartphones or tablet to give necessary interfaces for the customer to view and order menu. With private login machine, guests can view and make an order and receive updates in real-time and collect receipts right from the smartphone itself. This machine is convenient, effective and easy so that it improves the performance of the restaurant's staff. Thus, making the restaurant business more effective and dinning more immersive.

3.2 User Characteristics

1. User should be able to ask questions related to booking tables.
2. User should be able to ask about available accommodations.
3. User should be able to ask various about locations of restaurants.
4. Users should be able ask various queries related to cuisine.
5. Prompt response to questions.
6. Detailed answers to queries.
7. Resolution for a problem or a complaint.
8. Finding a human customer service agent.
9. User should be able to connect to reception if unsatisfied.
10. User should be able to specify his/her requirement of booking and cuisine.

3.3 Assumptions and Dependencies

- You'll have access to all the resources you need to complete the project, both human and material.
- Project team members will have the resources they need to complete their individual tasks on time, from specialized equipment and software.
- Project development depends upon a framework provided by IBM; on IBM cloud.
- It is assumed that when product is deployed, user will be able to communicate with it with ease on platforms like Facebook messenger and restaurant website.

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- This project depends upon dataset which is provided by Kaggle, used to train and test chatbot for good working.
- Facebook messenger is considered as widely used social media platform and hence used here to deploy this project and hence users don't have to download another application.
- It is assumed that if chatbot is unable to answer, then it should transfer control of system to human helper which will be able to answer an solve queries.
- When using system, it is considered as user is connected to an internet so he/ she can use system seamlessly.
- System should be able to display different locations, images if required and asked by user.

3.3 Functional Requirements

3.3.1 System Feature 1

- Chatbot can process input given by user by NLP and give accurate output within less time using multinomial naïve bayes algorithm.
- Chatbot have a feature of NLU by which it understands input given by user and gives correct output based on it.
- Chatbot is able to solve various queries related to restaurant including booking, cuisine, type of booking required etc. and also able to transfer the control to human if its unable to answer the query given by user.
- Chatbot is able to display images of menu, if asked by user.
- Chatbot is able to display phone number if query is not resolved so human will be able to help user.

3.3.2 System Feature 2

- Chatbot will be deployed on popular social platform Facebook messenger so user can access it easily without needing external application.
- User can chat with chatbot from anywhere, and get answer to their query with ease.
- Chatbot will answer in text format for asked query.
- Chatbot can also be deployed on individual websites of restaurants, hence they can be used by people who don't have Facebook messenger.

3.4 External Interfaces Required

3.4.1 IBM Cloud

- Platform provided by IBM to train and deploy AI models such as chatbots.
- IBM cloud provides framework called as "Watson" which is used to create AI models and integrate them with dataset to train based on them.
- From IBM cloud, we can easily deploy our AI model on various platforms such as Facebook messenger, Slack etc.
- Also, it has database integrated called as IBM DB2 database. By use of this, it stores data related to model to implement it on cloud during development.

3.4.2 Dataset

- Taken from Kaggle.com which provides various datasets for AI models.
- Dataset is the divided into half and then first part is used for training and other half is used to test model on IBM cloud.
- Dataset features intents and entities, intent is recognized by chatbot which is of human and entity, most likely probability is found based on this, stored in context variable.

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3.4.3 Naïve Bayes Algorithm

- Used to find most correct answer of query by finding probability of intent.
- Formula: $P(A|B) = \frac{P(B|A)\ P(A)}{P(B)}$

3.5 Non-Functional Requirements

3.5.1 Performance Requirements

1. System Should be able to answer quickly.
2. System should have user friendly user interface.
3. System should be able work when some users are simultaneously using it.
4. If query is not resolved, system should take help of humans.
5. System must give accurate information.
6. System must remain updated for changes in restaurants.
7. 7) System should be able provide addresses & phone numbers to user when asked.
8. System should learn from various inputs given by user.
9. System should recognize various intents & entities.

3.5.2 Safety Requirements

1. System should not System should be able to keep information related to restaurants safe.
2. System should seek human help if any out of the scope question is asked.

3.5.3 Security Requirements:

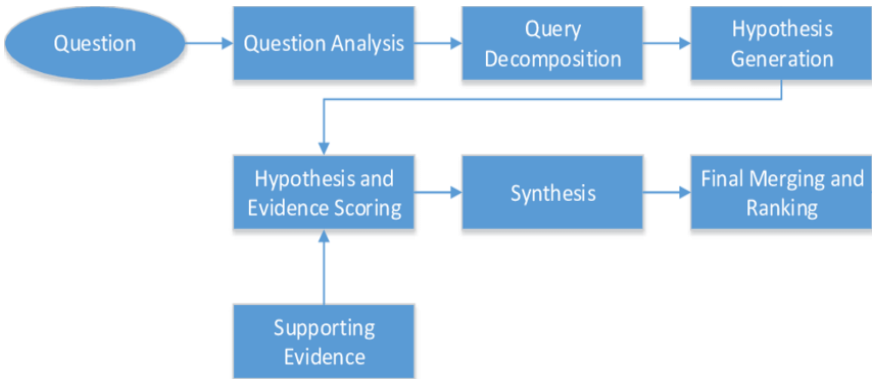
1. System should not save data of session with user and disclose their information.
2. System should not disclose any sensitive information of restaurants to users.

3.6 System Requirements

3.6.1 Database Requirements

A. IBM DB2 Database

- Integrated with IBM Watson framework.
- work seamlessly with IBM services, stores instantiation data in the form of context variables to respond queries quickly.



3.6.2 Software Requirements:

A. IBM Cloud:

- Platform provided by IBM to train and deploy AI models such as chatbots.

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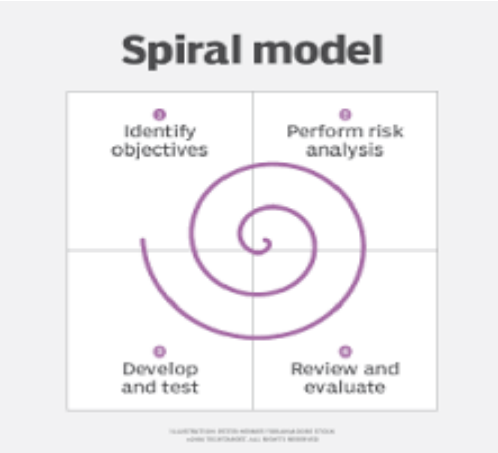
3.6.3 Development Model

A. Spiral Model



- In spiral model, we can develop application in the form of sprints. Each sprint consists of

1. Identifying objectives
2. Risk analysis
3. Review
4. Develop
5. Test & Deploy

- Due to this we can develop application rapidly & at the end of every sprint, we can have working module of project.
- Spiral model offers rapid development and hence for submission, we can utilize model.

3.7 System Implementation Plan

- Creating account on IBM cloud with appropriate plan.
- Selecting required services & frameworks:
  - Conversation service: Watson
  - Natural Language Processing
  - Natural Language Understanding
  - Natural Language Generation
- Creation of AI model with appropriate language.
- Uploading training dataset including intents and entities to train the model.
- Creating context variables to hold the data of conversation with user
- Creating examples for the understanding of model & training purpose.
- Testing for given intent & entities with dummy conversation.
- Deploying model on platform such as Facebook messenger.

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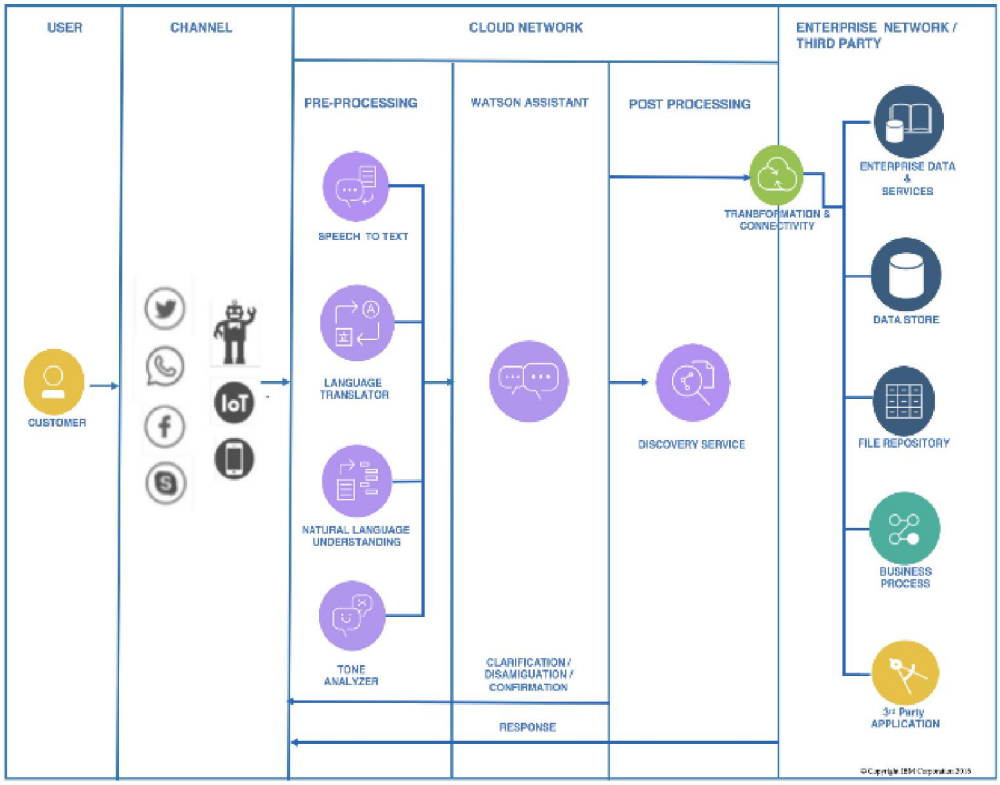
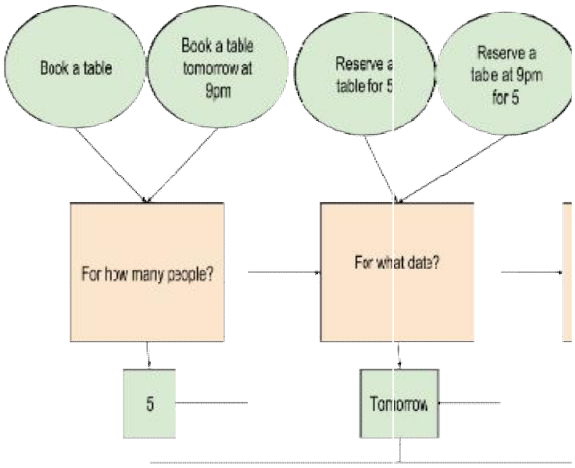
IV. DATA FLOW DIAGRAM



4.1 Entity Relationship Diagram



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V. ADVANTAGES

- **Marketing via Facebook Messenger**: You can place promotions or special events of your restaurant for your clients.
- **Show your Menu**: Display your menu with a visually impressive interface for your customers to check.
- **Quick Reservations**: Allow your diners to book in less than a minute.
- **Immediate feedback**: It allows users to receive feedback immediately by chatting with the bot, which improves customer experience.
- **No downloads**: Your clients do not need to download a special app to use the bot, since it is integrated with Facebook messenger or other messaging applications.

VI. LIMITATIONS

- **Lack Emotions**
  - Unlike humans, a chatbot has no emotions. However, they are pretty essential to keep a conversation going the right way. Your customer service executives can understand your customers' emotions and respond accordingly, but a chatbot may not be able to do so.
- **Difficult to Create**
  - It is very challenging to create a chatbot from scratch. It requires that you invest significant time and effort into creating it. You may also need to have some coding knowledge to create a better-functioning chatbot.
- **Made to Attend First Level Questions**
  - One of the greatest disadvantages of chatbots is that they have been designed to handle first-level questions only. They may not be able to solve complex queries. You need to train them to converse with your customers in the right way.
- **Require Maintenance**
  - Chatbots require ongoing review, maintenance, and optimization in terms of their knowledge base and the way they are supposed to communicate with your customers.
  - You need to feed them with new, insightful data (content) that they can use to respond to customer requests and questions.

VII. APPLICATIONS

- **Manage Reservations and Take Order**
  - How much time do your employees spend on managing reservations & taking orders? With several online food ordering apps, you may have partnered with, it takes a lot of time to take, process and complete an order.
  - A chatbot, deployed on your website, app, social media - Facebook, Twitter, and even your phone system, can interact with your customers and can perform these monotonous tasks with 100% accuracy.
  - As restaurants are primarily service based businesses, minimizing errors help you reduce loss of customers & business and avoid mismanagement issues.
- **Promote Deals & Offers**
  - A chatbot can tap into your email list and entice your existing customers with new deals and offers. They can work on social media and even, on your website and bring in a lot of repeat business.
- **Connect with Customers**
- Whether the customer is online or sitting already in your diner, chatbots for restaurants are able to engage better, reducing the need for additional manpower and improving customer experience.
- Recommendations, taking orders, offering deals and answering FAQs can all be done through a fun, DIY, and conversational interface.

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VII. CONCLUSION

1. Proposed chatbot system increases speed of service.
2. System is easy to use and needs no special knowledge to use.
3. Chatbot system decreases load on receptions and helplines by solving queries instantly.
4. If user is not satisfied with the answers of his/ her query, he/ she can contact reception further.

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