

# ML Enabled WhatsApp Chatbot using IBM Watson

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## Abstract

A chatbot mimics human interaction through voice or text interactions. Chatbots are used by businesses to interact with consumers in addition to the traditional client care channels like via phones, mails or social media. The most basic type of chatbot system handles jobs by interpreting user input and then searching its directory for content related to particular words or phrases. In a nutshell, it works as a keyword-based content retrieval system. Watson Studio provides a collaborative environment and resources to work on data in order to solve business challenges. Users may select tools for analyzing and displaying their data, cleaning and shaping it and using it for constructing and training machine learning models. Watson Assistant is a business-oriented AI chatbot. This enterprise AI technology can be used to create conversational AI applications. Since, loan application process can be extremely cumbersome, so we have developed a chatbot using IBM Watson that could help in easing this process. The chatbot has been integrated with WhatsApp using Twilio. By answering a series of standard questions related one's application, one can see the risk percentage involved in taking the loan. This has been enabled using Machine Learning models. *Keywords*: chatbot; machine learning; IBM Watson; loan risk prediction

# Introduction

The main aim of the work was to build a chatbot that could be used easily by people for assistance [1] regarding loan applications. If done traditionally, this procedure can be really time-consuming that clients frequently migrate to other rivals, leading to the loss for the bank. However, we have employed machine learning technologies [10] to minimize the time it takes to make these judgments and raise the accuracy of the decisions made, resulting in a growth in our client base. Machine learning [8], when used correctly, may also help to reduce prejudice. Furthermore, chatbots may be used to boost productivity and deliver a better customer experience. Chatbots may improve the customer experience at multiple points by answering quickly and effectively to commonly requested inquiries or by smoothly elevating requests to a human agent with the full context of the enquiry [2]. The complete process for loan application has been automated using:

- Watson Studio to assist in the generation of ML pipelines and the training of the model to improve predictions [5, 7].
- IBM Cloud [9] Functions to allow execution of the application code without servers and automatically scale it.
- The Watson Assistant [12] chatbot's ability to connect to WhatsApp through Twilio. Watson Assistant also aids in the expansion of the user base by making the system more accessible.

In the past, there has been some research in this area. A M Rahman, Abdullah Al Mamun and Alma Islam (2017) studied various chatbot building platforms and explored their capabilities. Sasha Fathima Suhel, Vinod Kumar Shukla, Sonali Vyas and Ved Prakash Mishra (2020) researched about the possibility of Conversion to automation in banking sector through chatbots using Artificial Machine Intelligence [8, 11]. Sewoong Hwang and Jonghyuk Kim (2021) examined an AI chatbot that could improve one's financial stability and

#### ML Enabled WhatsApp Chatbot using IBM Watson

provide policy solutions when required. Although these studies are relevant, but our solution is not just smart as it's build using ML, also it is very convenient to use.

## **Materials and Methods**

Some prerequisites that were required are listed below:

- An IBM Cloud account
- A Twilio account

The step-by-step method followed for making the chatbot has been described below:

### Creating the Watson Studio service

We first started by creating a Watson Studio [12] instance and associated a cloud storage instance with it as shown in Figure 1. Then, we created a new project as shown in Figure 2 and uploaded the dataset that would be required by the Machine Learning model [10] for training like in Figure 3.



Figure 1: Creating Watson Studio and Cloud Object Storage Instance.

new project			
Define details	Storage		
Name WhatsApp Chatbot	Cloud Object	Storage-WC	
Description			
Connecting a chatbot and WhatsApp to a machine learning model.			
Choose project options	A		
Restrict who can be a collaborator ()			
Project includes integration with Cloud Object Storage for storing project assets.			
		_	

Overview	Assets	Jobs Mar	uge					Data in this project	
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> Så Data	1								

## Creating and running an AutoAI experiment

We then moved on to the Machine Learning portion. We created a new experiment as depicted in Figure 4. We then set the target attribute as shown in Figure 5. The prediction type was chosen as shown in Figure. 6. After finalizing the experiment settings, the model was trained on the dataset. Once trained, the metric chart and other model specifications could be viewed as shown in Figure 7. Here, we also visualized the performance of the model that gave us the most accurate results as displayed in Figure 8.

Create an AutoAI exp	periment	
+ New	Define details	Define configuration
OX Gallery sample	Name	Walson Machine Learning Service Instance
	WhatsApp Chatbot	Machine Learning-WC 🗶
	Description (optional)	Environment definition
	What's the purpose of this AutoAI experiment?	8 vCPU and 32 GB RAM
		This environment definition consumes 20 capacity units per hour for training. The consumption rate differs for joining
	Tags (optional) Add tags to make assets easier to find.	multiple data sources, depending on your configuration. For details, see Watson Machine Learning plans.
	Start typing to add tags	

*Figure 4:* Creating a New Experiment.

Projects / WhatsApp Chatbot / WhatsApp Chatbot				
Configure AutoAI experiment				
WhatsApp Chatbot 🖉			Autosaved: 12:34:05	AM
Add data sources	Configu	re details		
Drop or browse for one or more tabular data files. Learn more.	×~	Enable this option to predict future activity over a specified date/time range. Data must be structured and sequential. Learn more	Yes No	1
Browse or Select from project	0	What do you want to predict? Predictor columns ()		L
		Risłį x v		
m final_german_credit_data_2.csv				

Figure 5: Setting Target Attribute.

Prediction	Prediction settings				
Data source Runtime	General Fai	imess Time ser			
	Change the prediction spectron type bar other prediction settings.	Multiclass classification Classification Classification Classification Classification categories. Choose this if your prediction column contains multiple distinct enterprine	Regression Predict values from a continuous set of values. Choose this If your prediction column contains a large number of values.	Time series forecast forecast future willow in a perior. Data must be structured and sequential. Learn more	

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Figure 8: Visualizing most Accurate Results.

## Creating a deployment and testing the model

As our model was ready, we then moved forward to the deployment phase. We create a deployment space first as shown in Figure 9.

The deployment of XGB model [13] was done, as it gave us the most accurate results. A direct online link for the endpoint of our model was generated as shown in Figure 10.

Use a deployment space to organize supporting resources suc models or functions to generate predictions or solutions; and	ch as input data and environments; view or edit deployment details.	: deploy		
Target space		Tags (optional)		
Select or create a space	^	Start typing to add tags		
Create a new deployment space	۲			
Selected assets (1)				
Asset name	Format			
WhatsApp Chatbot - P4 XGB Classifier	Model			
Select version				
Promoting a version of an asset to a space creates a s a new asset 10.	new asset in the space, with			
Current	~			
Description (optional)				
Create a deployment space				
Use a space to collect assets in one place to create, run, and	I manage deployments			
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Figure 9: Creating Deployment Space for Model.

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## Setting up IBM Cloud functions

To use the chatbot service elsewhere, an API key was required. It was generated by hovering to the API keys option as shown in Figure 11. To integrate this with our chatbot, IBM Cloud Functions [6] were used as depicted step by step in Figure 12. The function code was written, and the API was linked as shown in Figure 13.

	AI 1 Reys	
	Create, view, and work with API keys that you have access to manage. IBM Cloud API keys are associated with a user's identity and can be	
Users	used to access cloud platform and classic infrastructure APIs, depending on the access that is assigned to the user. The following table	
Trusted profiles	displays a list of API keys created in this account. Learn more.	
Service IDs	Looking for more options to manage API Keys? Try IBM Cloud* Secrets Manager for creating and leasing API keys dynamically and storing	
API keys	them securely in your own beoutated instance.	
Identity providers	View: My IBM Cloud API keys V	
	APT keys associated with a user's identity have the same access that the user is assigned across all accounts. To update the access for an APT keys associated with a user's identity have the same access that the user is assigned across all accounts.	
Access groups	say, assign or remove access sur une user.	
Authorizations	There are no API keys. Create one and start using it across the cloud platform.	
Roles	Create an IBM Gloud API key+	

Functions		
Getting Started	IBM Cloud Functions	on Apache Openitivak
APIs Activations Dashboard Launch Logging C <sup>4</sup> Launch Henitaring C <sup>4</sup>	Run your application code w automatically, and pay nothi	ithout servers, scale it ng when it's not in use.
Namespace Settings	Download CL1 Start Creating	
() Functions	Create a Nam	espace × ©
Getting Started ^	IBM Clou Friggers) and belong to a re give users access to your P numerspaces. Functions-as-as	is ling, attors and source prox, how a source of the sourc
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IBM Cloud	Search resources and products	Q, Catalog Docs Support Manage - Manasi Childber's Acc 🖾 🖾 🛆 🥂
@ Punctions	Create Action	
Getting Started v	Actions contain your function code and	Action Name
Triggers APIs	are invoked by events or REST API calls.	WC Action
Activations Dashboard	Learn more about Actions	Enclosing Package
Launch Logging C	Learn more about Packages	(prist/tracep)
Namespace Settings		Ratine Python 3.9
		Looking for Java, JNET or Docker? Docker? Docker Actions can be created with the CL1
	Cancel Create	

*Figure 12:* Setting up Cloud Function.

18H Cloud		
Functions / Actions / WC Action		
WC Action Web Action @	Ø Namepad	(e: WC(London) I
Code	Code © Python 3.9 Edit mode - press ESC to exit Reset	Seve D
Parameters	1 # male() will be run when you invoke this action 2 #	
Runtime	3 # ggaram Cloud Functions account a single parameter, which must be a 350% object. 4 # 4 # 5 # # # # # # # # # # # # # # # # # #	
Endpoints	5 8 greater ine output of this action, which make be a jour segret. 5 8 7	
Connected Triggers	B Emport sys 9 Emport sys 14 Emport Sys	
Enclosing Sequences	11 Import requests	
Launch Logging	13 def main(dic): 8 MOTE: you must manually set API_MEY below using information retrieved from your IBM Cloud account. 80 MW and conference in all and content of the set o	
Launch Monitoring	<ol> <li>MT_LTY = did['adi.ky']</li> <li>tiken_response = requests.pest('https://im.cloud.Hm.com/identity/token', data-('adikey': AFL_TEY, 'grant_type': 'arm:Hm.parametsauth.grant-type': 'atkime' = token_response.seath.grant-type': 'arm:Hm.parametsauth.grant-type': 'arm:Hm.parametsauth.grant-type:'arm:H</li></ol>	(ype:aplkey"))
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Code	Parameters   Add Parameter   Reset	Save (3
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Runtime Endpoints		
Runtime Endpoints Connected Triggers		
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Ruttime Endpoints Connected Triggers Enclosing Sequences Launch Logging		

## Integrating the machine learning model with Watson Assistant

A new Watson Assistant was created and a json file consisting of its dialog specifications was uploaded as shown in Figure 14.

Upload		
Dialog-Skill-Demo.jsc	· · · · ·	
Urag and drop file	WHE OF COCK TO WEEKS & NOR	
upload.		
Select the JSON file f	or the dialog skill with the data you want to	
Add existing skill	Area test skill. Use sample skill Uplead skill	
Add dialog sk		
	Create assistant	
		A
	Description (optional) Add a description for this assistant	
	Nume your assistant, for example <b>Banking</b> or <b>Cuntomer Care</b> .	
	Barksy	
	Name	
	Create an assistant to deploy the skill that addresses your customers' goals.	

## Integrating IBM Watson Assistant with WhatsApp

To set up WhatsApp, a series of simple steps like the ones shown in Figure 15 were followed. The specifications of the chatbot were entered and it was good to go.

PI Wate	son Assistant Ute Upgrade	Learning center 😗 🤅
Wh	natsApp with Twilio	Close Back Next
Integral	tion name	
Wha	atsApp with Twilio	
F	Set up WhatsApp	
-/-		
	C Get started Step 1 Step 2 Step 3 Account SED Auth token Wethook	
	Get started	
	Through Twilio, your assistant is ready to join the world's most popular messaging service.	
	Steps to setting up WhatsApp	

## Configuring and using Twilio sandbox

At last, we opened Twilio, entered our chatbot's API key as shown in Figure 16 and the phone numbers where we wanted the chatbot to reply to conversations and finally it was ready to be activated on WhatsApp.

My first Twillo	account : the \$15.48 lowers Account + Billing + @	M ~
Develop Monitor	Reach customers with the WhatsApp Business API and Studio for free. Qualified new accounts get a 90-day trial. <u>Get.statist.html</u> .	
p	Twilio Sandbox for WhatsApp	
No pinned products yet!	Sandbox Configuration	
Explore Products	To send and receive messages from the Sandbox to your Application, configure your endpoint URLs. Learn more (5	
	WHEN A MESSAGE COMES IN https://integrations.eu-gb.as HTTP Post 🗸	
- 💭 Messaging	STATUS CALLBACK URL HTTP Post V	
Overview		
<ul> <li>Try it out</li> </ul>	Sandbox Participants	
Services	Invite your friends to your Sandbox. Ask them to send a WhatsApp message to 🔇 +1 415 523 8886 with code join directly-obtain.	
<ul> <li>Senders</li> </ul>	USERD	
★ Settings		_

## **Results and Discussion**

To use the chatbot, named Banksy, all you need to do is to ping on +1 415 523 8886 with code 'join directly- obtain' and you'll be set. After answer a series of question, you'll be able to see the risk probability of your application. Figure 17, Figure 18 and Figure 19 describe the complete process.

Banksy		
	TODAY	
	This business works with other companies to manage this chat. Click	k to learn more.
		join directly-obtain 10:13 pm 🛷
Twilio Sandbox: messages from what time.	You are all set! The sandbox can now send/receive sapp:+14155238886. Reply stop to leave the sandbox any 10:13 pm	
		Can I take up a loan? 11:14 pm J
What is the amount	of duration you want for the loan? (In days) 11:15 pm	
		90 11:15 pm J/
What is the purpose	of your loan?	
1. other 2. car_new 3. furniture		
5. education 6. car_used 7. appliances		
8. repairs 9. radio_tv Periodic tv		

Figure 17: Connecting to Banksy.

9. radio_tv Reply with the option number.	
nus pm	
	5 11:15 pm 🛷
What is the loan amount you are applying for? 11:15 pm	
	80000 11-15 pm //
what is the installment percent? Please choose a value from 1 to 6. 11:15 pm	
	3 tt:15 pm 🛷
How much savings do you have currently?	
1. less. 100	
2.100_to_500	
4. greater_1000	
5. unknown Reply with the option number. 11:15 nm	
	4 11:15 pm √/
How long have you been employed? (In Years)	
1, less 1	
2.1_to_4	
3.4_to_7 4. greater_7	
5. unemployed Performithe the potion number	
hepty must be option number. 11:15 pm	
	1 11:15 pm 🛷
How long have you stayed at your current residence? (In Years) 11:15 pm	
	5
	11:16 pm 🗸
Any others on loan with you?	
1. None	
2. Co-applicant Reply with the option number. 11:16 pm	
	11:16 pm 🗸
Do you own any property?	
• union income	
2. real_estate	
3. unknown 4. car other	
Reply with the option number. 11:16 pm	
	2
	* 11:16 pm √
What is your age? 11:16 pm	
	20 11:16 pm //
Da unu haun an Installment alan?	- the part of
uo you nave an installment plan?	
1. None 2. Stores	
3. Bank	
Reply with the option number. 11:16 pm	
	1 11:16 pm 🗸

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What is your status on your house 🗸	
1. Own	
2. free	
3. Rent	
Reply with the option number. 11:16 pm	
	1 11:16 pm
Discus enter a volume of some existing coulds count	
Please enter a value or your existing credits count that	
	40000 11:16 pm
Discussion of the base of security	
Please select the type of your job.	
1. Skilled	
2. Unskilled	
3. Management	
Reply with the option number. 11:16 pm	
	1 11:17 pm
Your application is presenting a No Risk application with a risk probability of:	
30% 11:17 pm	

#### Conclusion

With the help of a wide range of IBM Watson services [4, 6], we have built a chatbot for loan application process assistance [3]. The chatbot can smartly deduce the risk probability that could be involved during the process. This has been done with the help of XGB classification model [13] in Machine Learning. The functionality to use the chatbot through WhatsApp was added using Twilio.

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