

# Smart FAQ Assistant

## Overview

In this tutorial, we will be creating a smart assistant that can answer user questions basing on a pdf file that is provided as input and can also can query a machine learning model for prediction.

## Pre-requisites:

1) IBM Cloud Account 2) Watson Studio 3) Watson Machine Learning service 4) Watson Discovery service 5) IBM Cloud Functions 6) Watson Assistant

## Creating IBM Cloud Account:

- Create your account at [cloud.ibm.com/registration](https://cloud.ibm.com/registration)
- You will get a confirmation email to the provided email address

Once we have created our IBM Cloud account and logged into it, we will be creating the next set of services as 4 discrete steps.

### Step 1

Create a Machine learning model on Watson Studio using AutoAI and deploy it to Watson Machine Learning service.

### Step 2

Create a collection on Watson Discovery, load documents and use smart document understanding to better process the documents.

### Step 3

Create a cloud function that can talk to discovery service or watson machine learning service as per requirement.

### Step 4

In this step we create a watson assistance instance and train it to respond to basic user queries. Then we integrate the above configured services into one assistant using Cloud functions.

# AutoAI and WML

Quick links : [Home](#) - [Step 1](#) - [Step 2](#) - [Step 3](#) - [Step 4](#)

## Overview

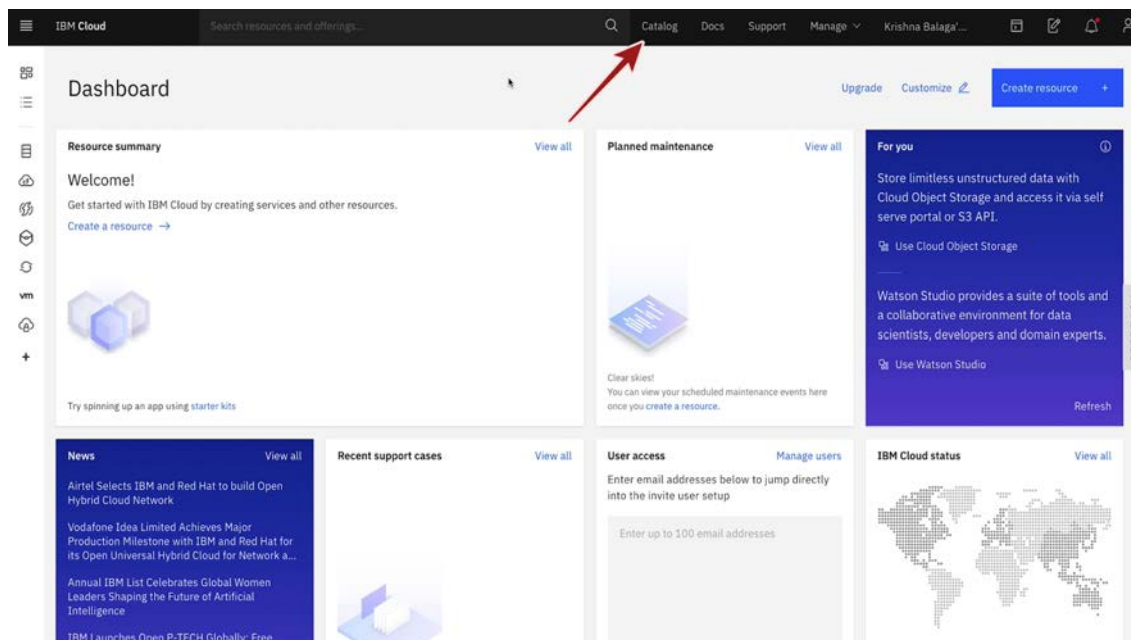
In this step, you will create a simple machine learning model using AutoAI and save the model using WML(Watson Machine Learning)

1.0) Download the project files from [Github repo](#)

```
git clone https://github.com/krishnac7/Smart-FAQ-Assistant.git
```

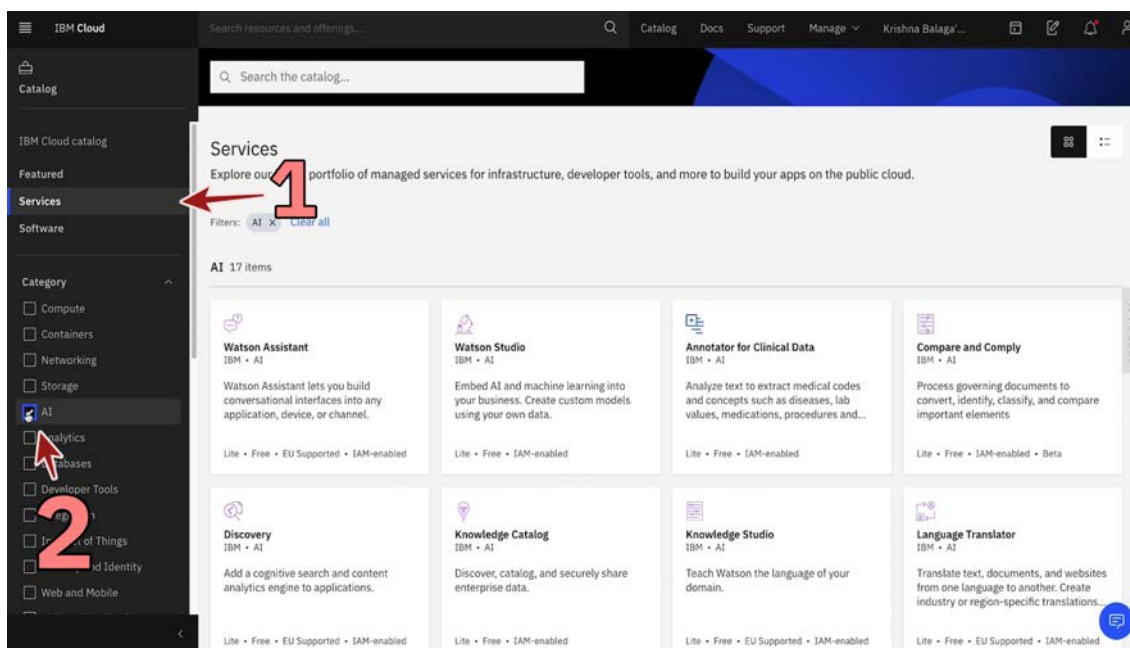
## Setup an instance of Watson Studio

1.1 ) Click on Catalog

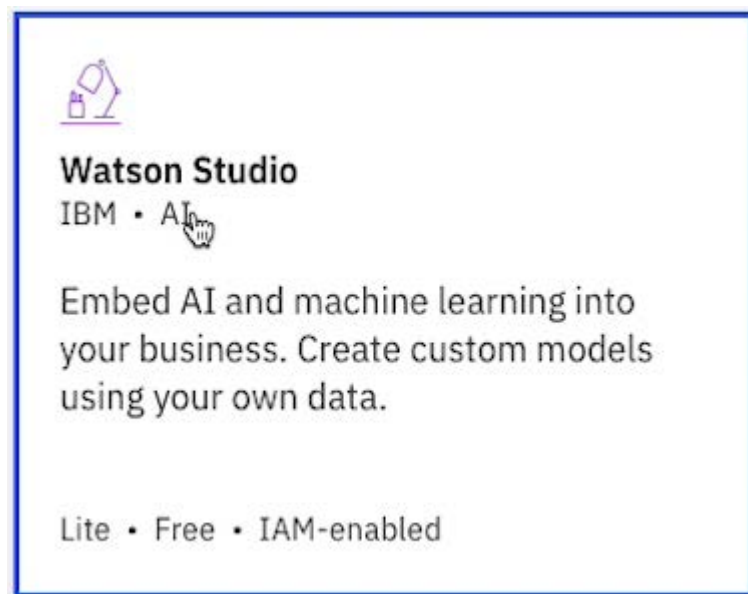


you can look at a whole list of services and offerings from ibm cloud

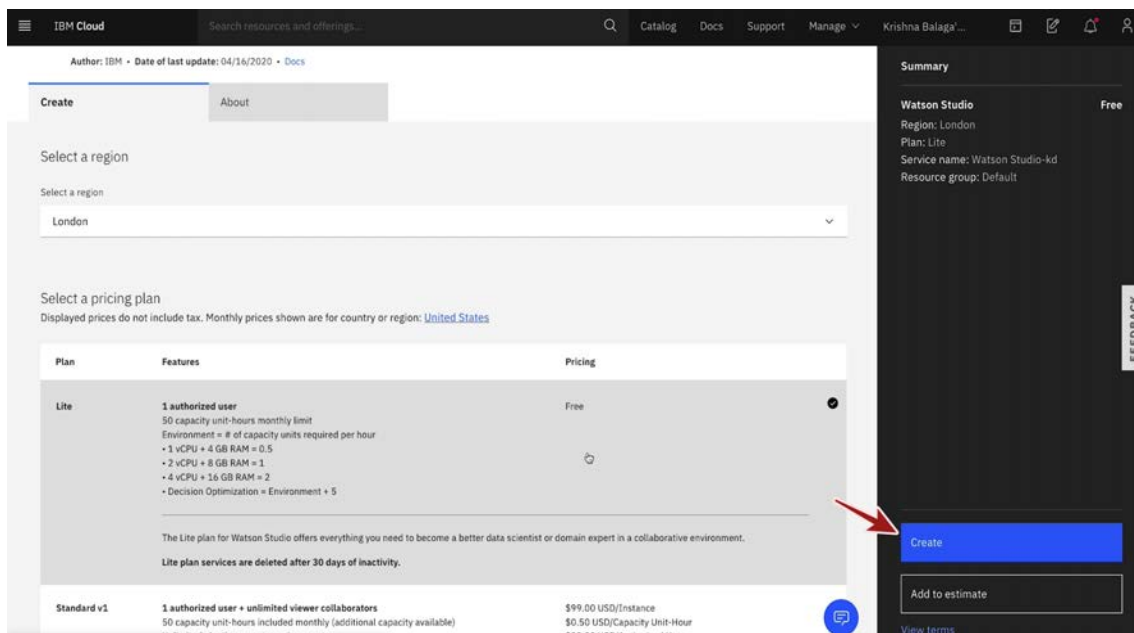
1.2 ) Select services tab and Filter by AI



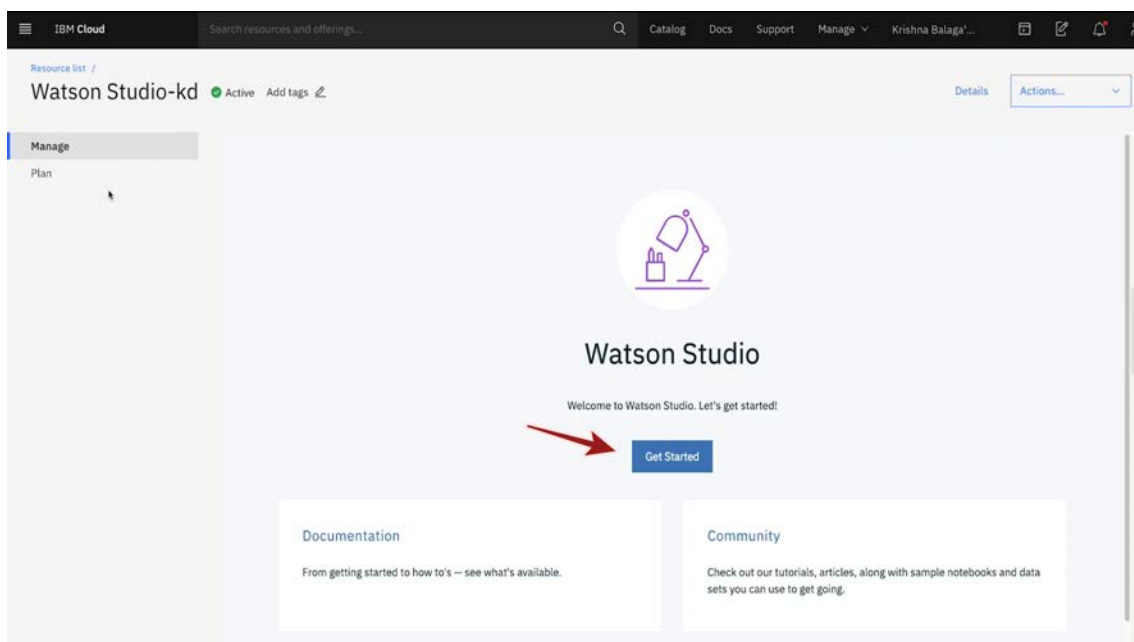
1.3 ) Click on Watson Studio.



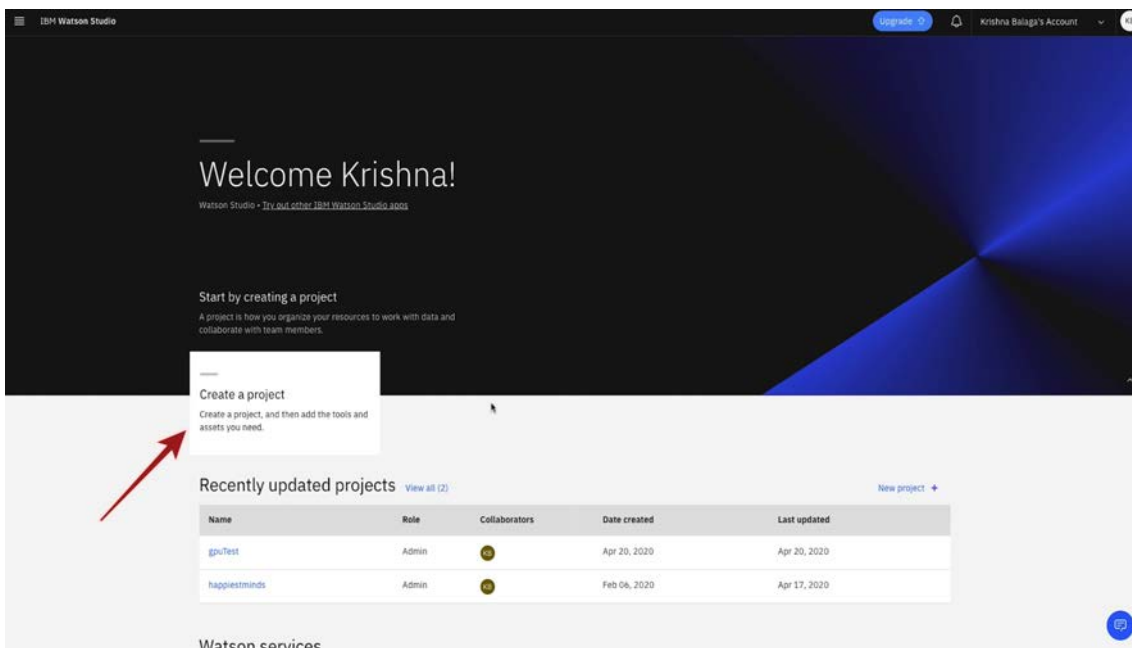
1.4 ) You can leave the defaults and click on Create. Do take a minute to look at features you are getting with lite plan of the service



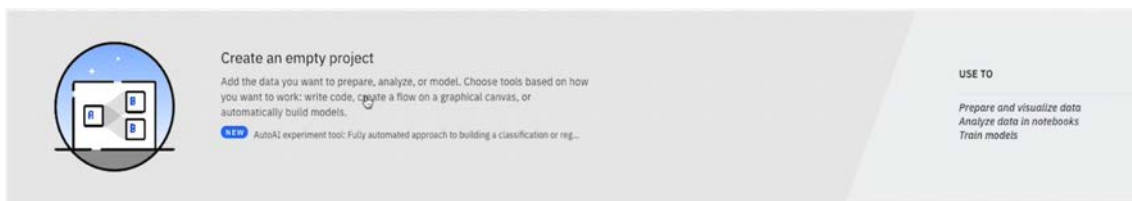
1.5 ) Once you click on Create, the service is provisioned. Click on Get Started. It opens a new tab with your watson studio dashboard



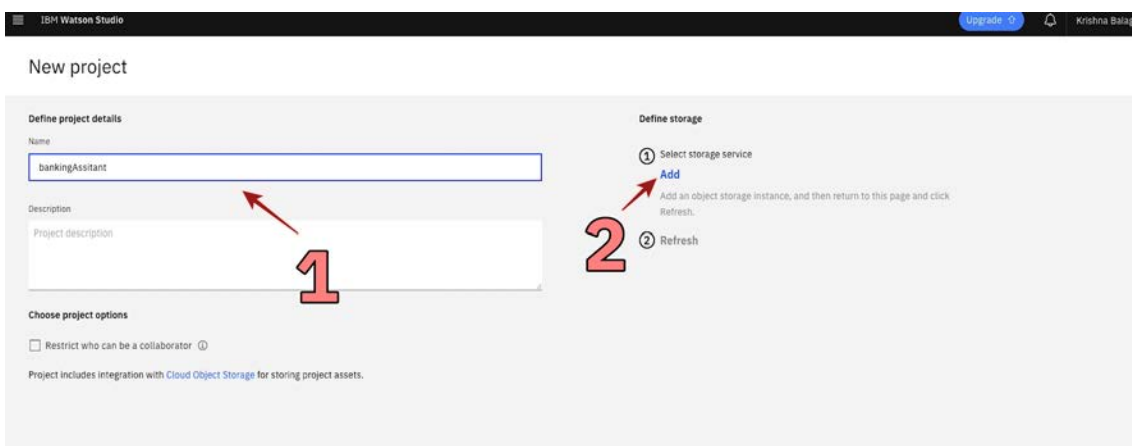
1.6 ) Once you are in watson studio dashboard, the first thing we will do is create a project to work in. click on create a project



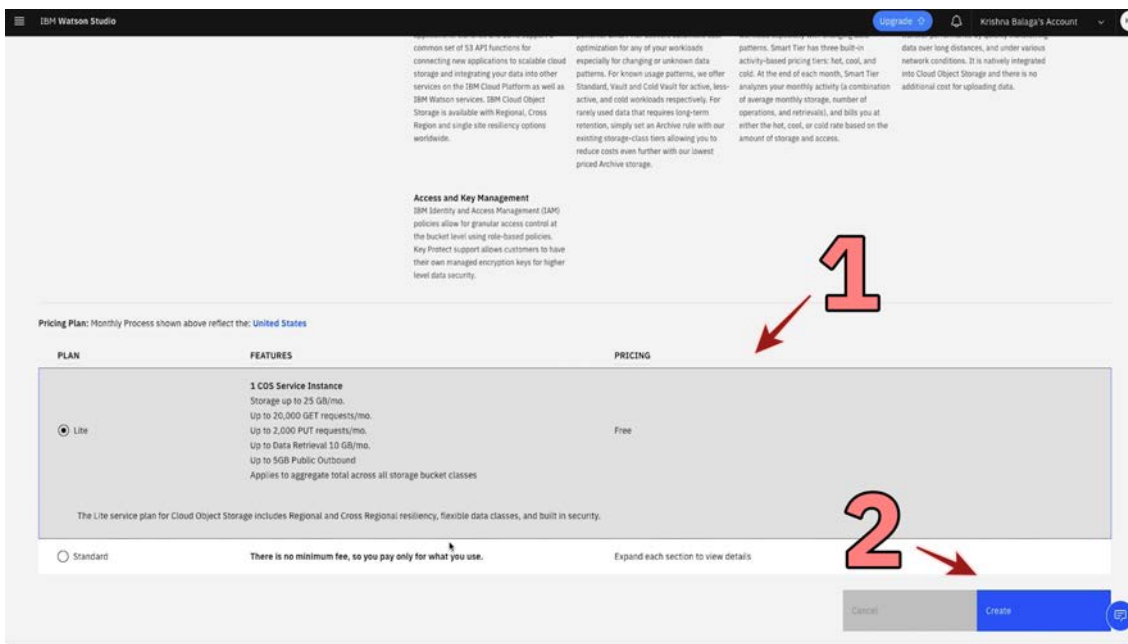
1.7 ) Select Create an empty project.



1.8 ) Give a Unique name to your project. and To add storage to your project, Click on Add. if you see the storage option prefilled, you can skip the next step



1.9 ) It will open a new tab where you can create a new instance of object storage. you can select the lite plan and click on create



1.10 ) You can leave the defaults and click on confirm.the service name generated for you can be different

Confirm Creation

Plan

Lite

▼

Resource group

Default

▼

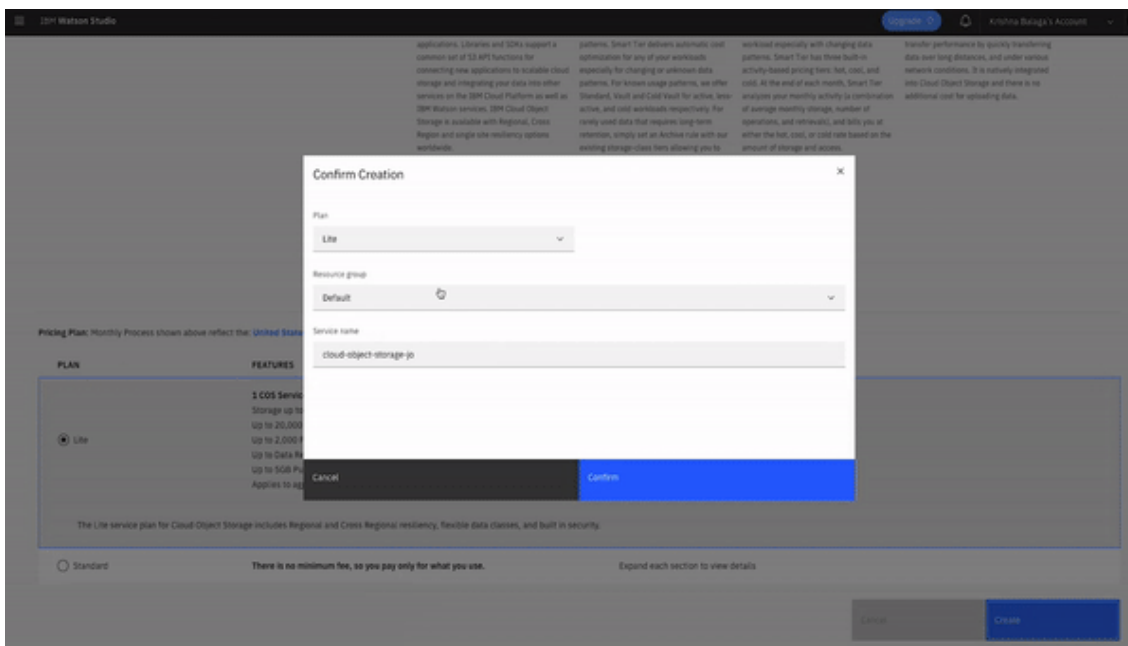
Service name

cloud-object-storage-jo

Cancel

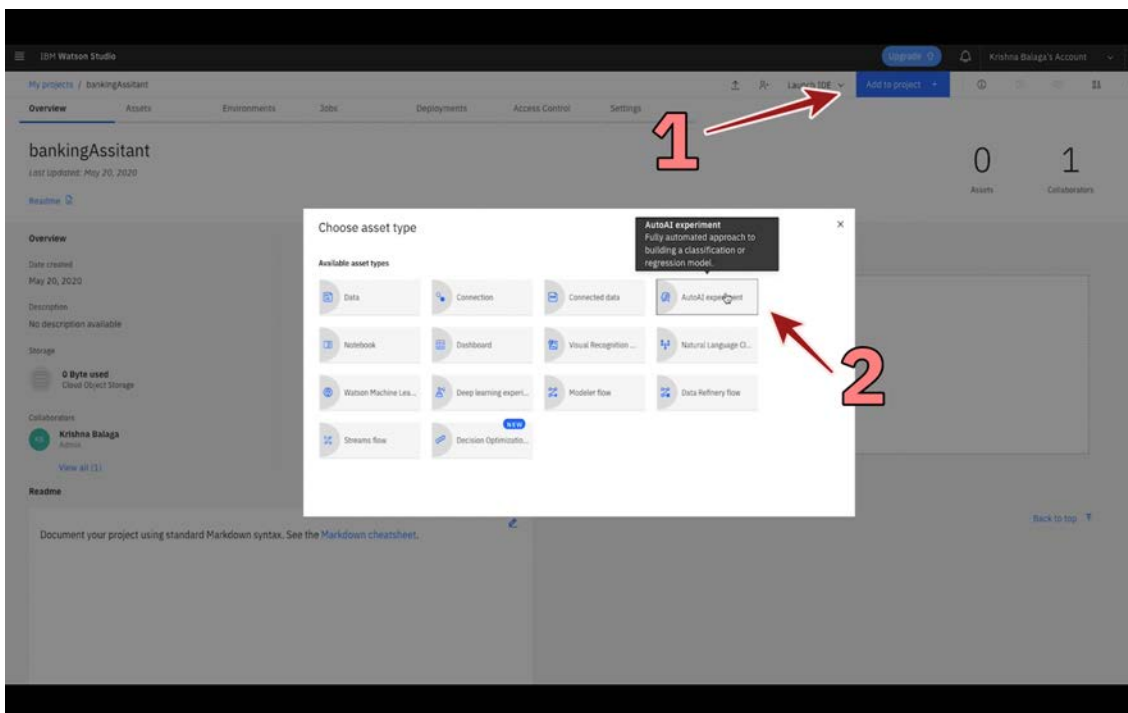
Confirm

1.11 ) Once the Object storage is created, you can close the tab and press refresh to see your attached storage



## Run and Auto-AI Experiment

1.12 ) Within project, click on 'Add to project' and choose AutoAI Experiment.



1.13 ) Choose From blank and Provide a name for your experiment. then click on the 'Associate a machine learning service instance' url

**New AutoAI experiment**

**Define details**

Experiment type  
☒ From blank ☐ From sample

Name \*

Description

**Associate services**

**Watson Machine Learning Service Instance \***  
 No Machine Learning service instances associated with your project.  
[Associate a Machine Learning service Instance](#) with your project on the project settings page, then click the reload button below to refresh the instances available for association with your new model builder instance.

**Reload**

Compute configuration \* ⓘ  
**8 vCPU and 32 GB RAM**  
 This compute configuration consumes 20 capacity units per hour. [Learn more](#) about capacity unit hours and Watson Machine Learning pricing plans.

Cancel Create

1.14 ) Select a lite instance and click confirm then create the service. Once the service is created go back to the Auto AI Tab and click on Reload.

**New AutoAI experiment**

**Define details**

Experiment type  
☒ From blank ☐ From sample

Name \*

Description

**Associate services**

**Watson Machine Learning Service Instance \***  
 No Machine Learning service instances associated with your project.  
[Associate a Machine Learning service Instance](#) with your project on the project settings page, then click the reload button below to refresh the instances available for association with your new model builder instance.

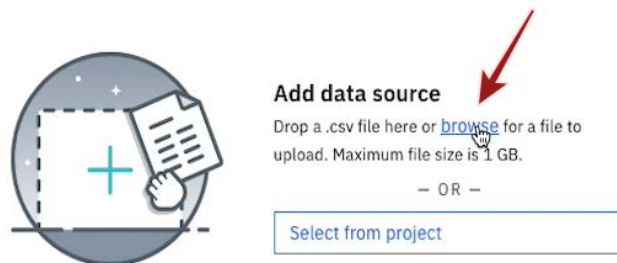
**Reload**

Compute configuration \* ⓘ  
**8 vCPU and 32 GB RAM**  
 This compute configuration consumes 20 capacity units per hour. [Learn more](#) about capacity unit hours and Watson Machine Learning pricing plans.

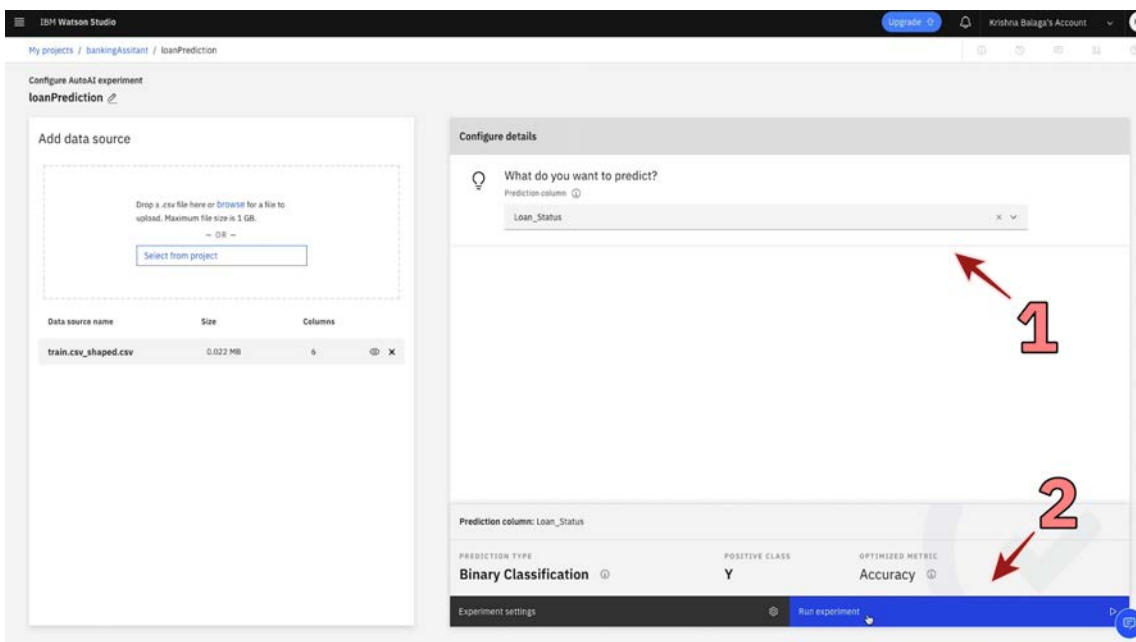
Cancel Create

1.15 ) Click on create and in the next page click on browse and upload 'train.csv\_shaped.csv' or you can also drag and drop the same file on the upload area

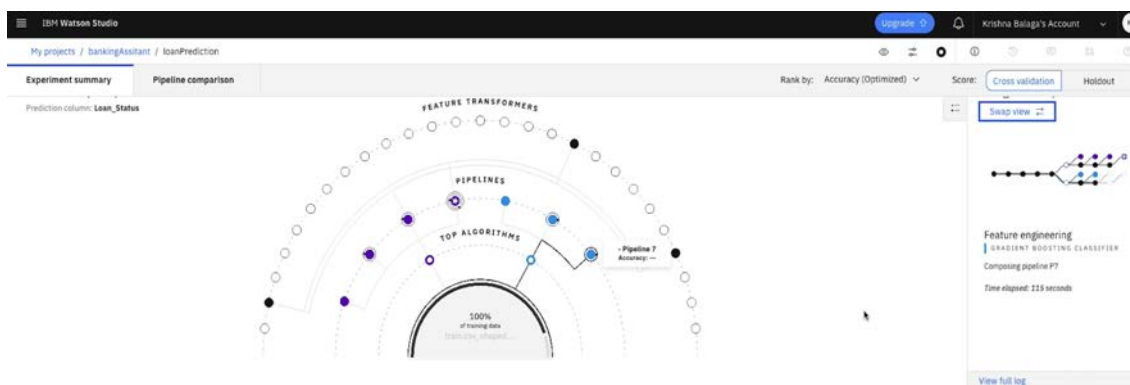




1.16 ) Select the predict column to be 'loan status' and click on 'Run Experiment'



1.17 ) Then the AutoAI experiment starts running. AutoAI will create multiple pipelines.

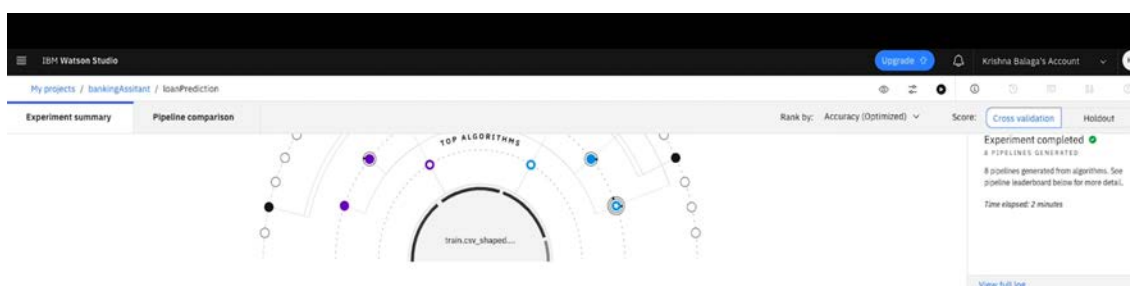


Pipeline leaderboard

Rank	↑	Name	Algorithm	Accuracy (Optimized)	Enhancements	Build time
>	★ 1	Pipeline 4	Logistic Regression	0.815	HPO-1 FE HPO-2	00:00:09
>	2	Pipeline 3	Logistic Regression	0.813	HPO-1 FE	00:00:27
>	3	Pipeline 6	Gradient Boosting Classifier	0.813	HPO-1	00:00:04
>	4	Pipeline 1	Logistic Regression	0.812	None	00:00:01
>	5	Pipeline 2	Logistic Regression	0.812	HPO-1	00:00:04

to further understand how AutoAI works, please refer the [documentation](#)

1.18 ) Once the process is completed, the pipelines are sorted according to the optimization metric and the most efficient pipeline is marked with a star next to it.

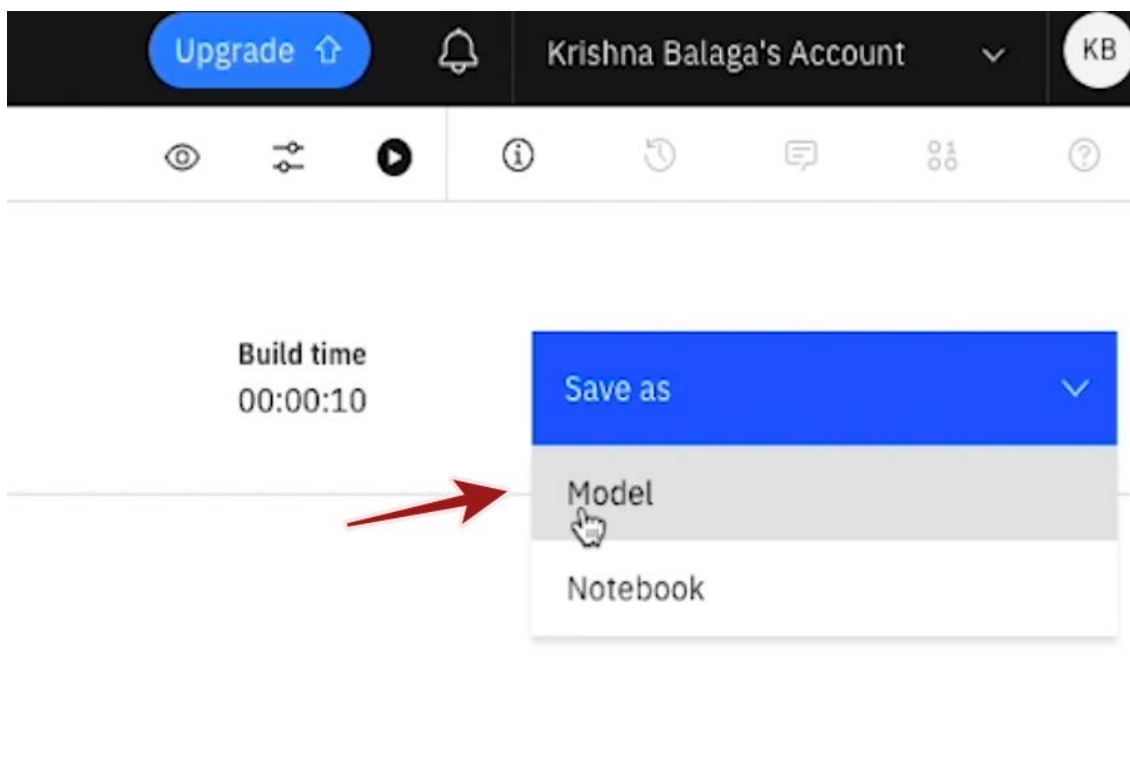


Pipeline leaderboard

Rank	Name	Algorithm	Accuracy (Optimized)	Enhancements	Build time
>	★ 1 Pipeline 8	Gradient Boosting Classifier	0.817	HPO-1 FE HPO-2	00:00:10 <span>Save as</span>
>	2 Pipeline 4	Logistic Regression	0.815	HPO-1 FE HPO-2	00:00:09
>	3 Pipeline 7	Gradient Boosting Classifier	0.815	HPO-1 FE	00:00:33
>	4 Pipeline 3	Logistic Regression	0.813	HPO-1 FE	00:00:27
>	5 Pipeline 6	Gradient Boosting Classifier	0.813	HPO-1	00:00:04
>	6 Pipeline 1	Logistic Regression	0.812	None	00:00:01
>	7 Pipeline 2	Logistic Regression	0.812	HPO-1	00:00:04
>	8 Pipeline 5	Gradient Boosting Classifier	0.784	None	00:00:01

## Save the model and create a deployment

1.19 ) You can explore the pipeline information by clicking on its name. To save this model, from the right top corner click on Save as and choose model.



1.20 ) You can leave the model details as default and click on save

Save as model

×

Save this model as a project asset so you can deploy, train, and test it.

Model name

loanPrediction - P8 GradientBoostingClassifierEstimator

Description (optional)

Description of model

Associated project

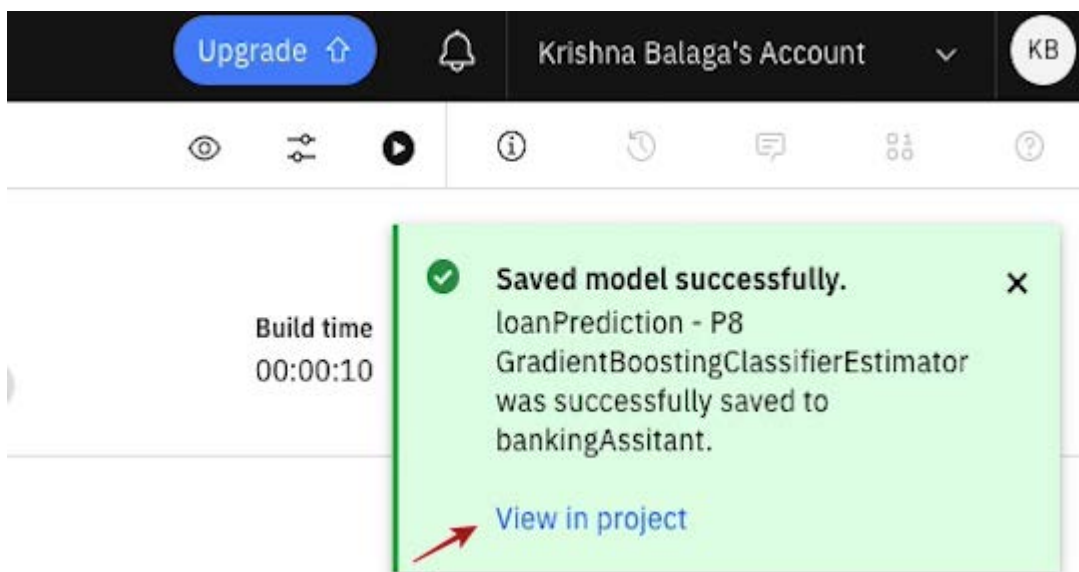
bankingAssitant

Cancel

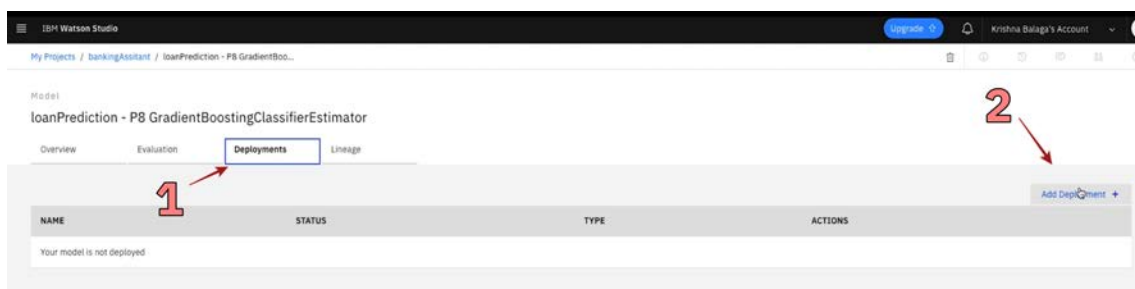
Save

**Note: the name generated depends on the algorithm used, sometimes it can be different from what is showed in the illustrations**

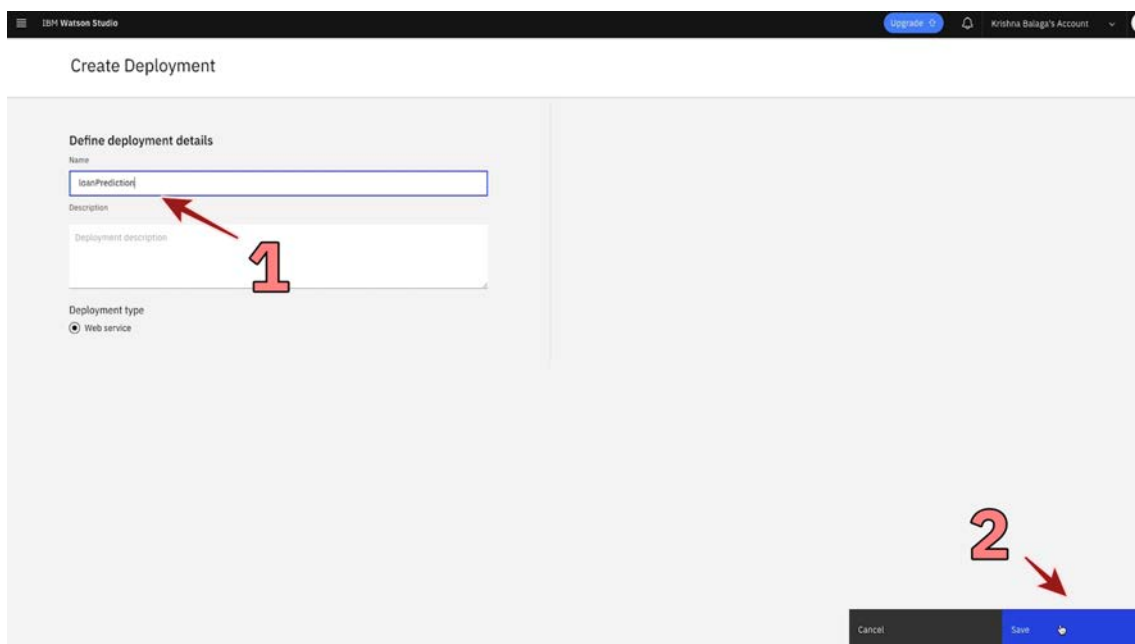
1.21 ) Once the model is saved, click on View in project from the pop-up notification to open the saved model.You can always find it listed in assets tab of your project



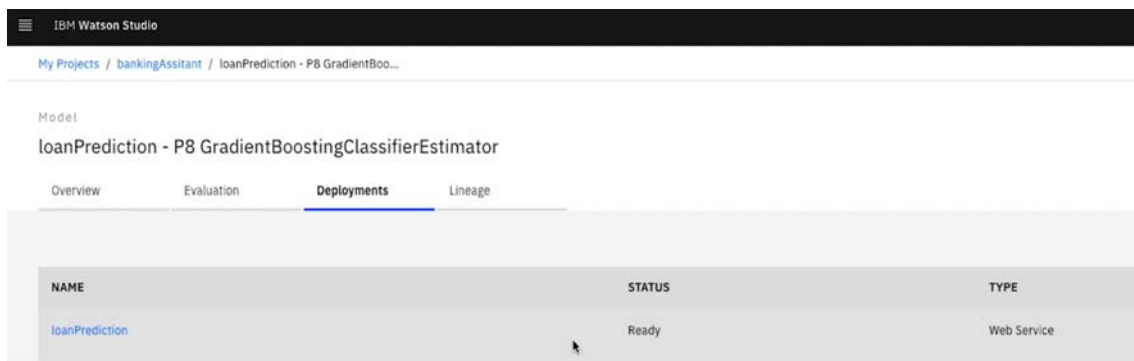
1.22 ) Once the saved model is opened,navigate to deployments tab and click on click on Add Deployment.



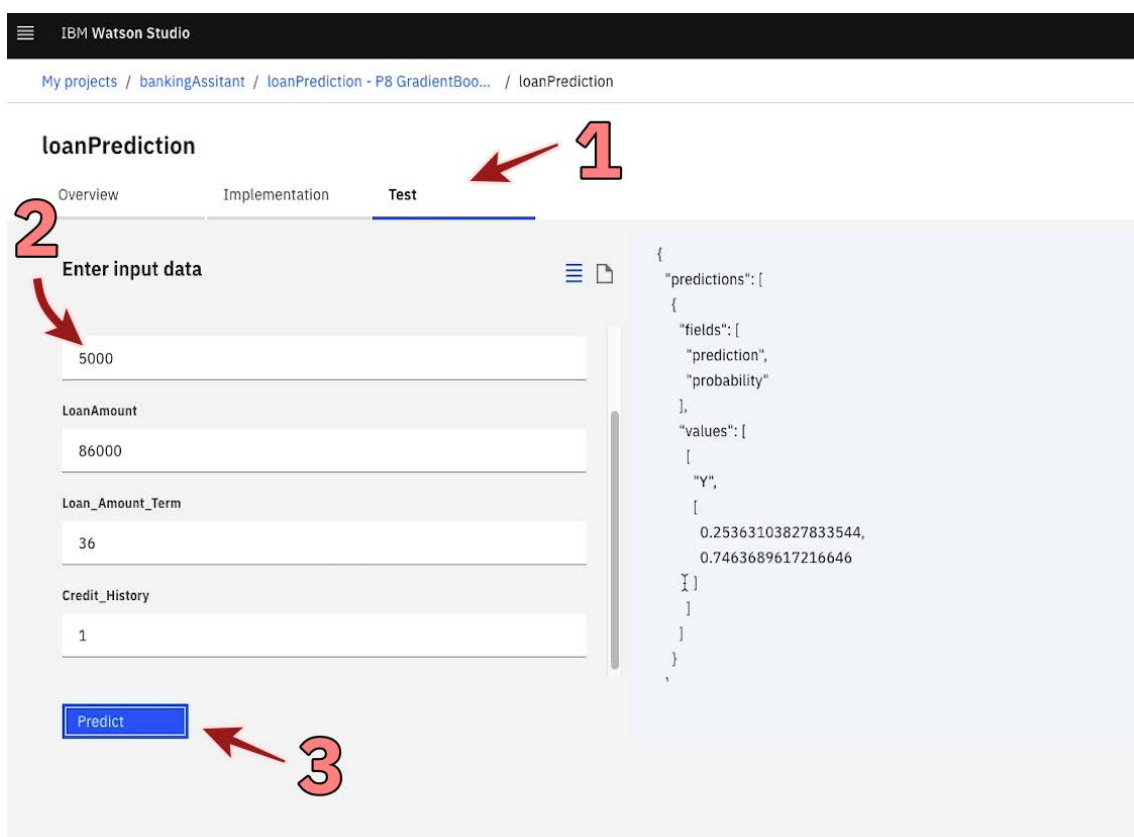
1.23 ) Provide a name and click on Save.



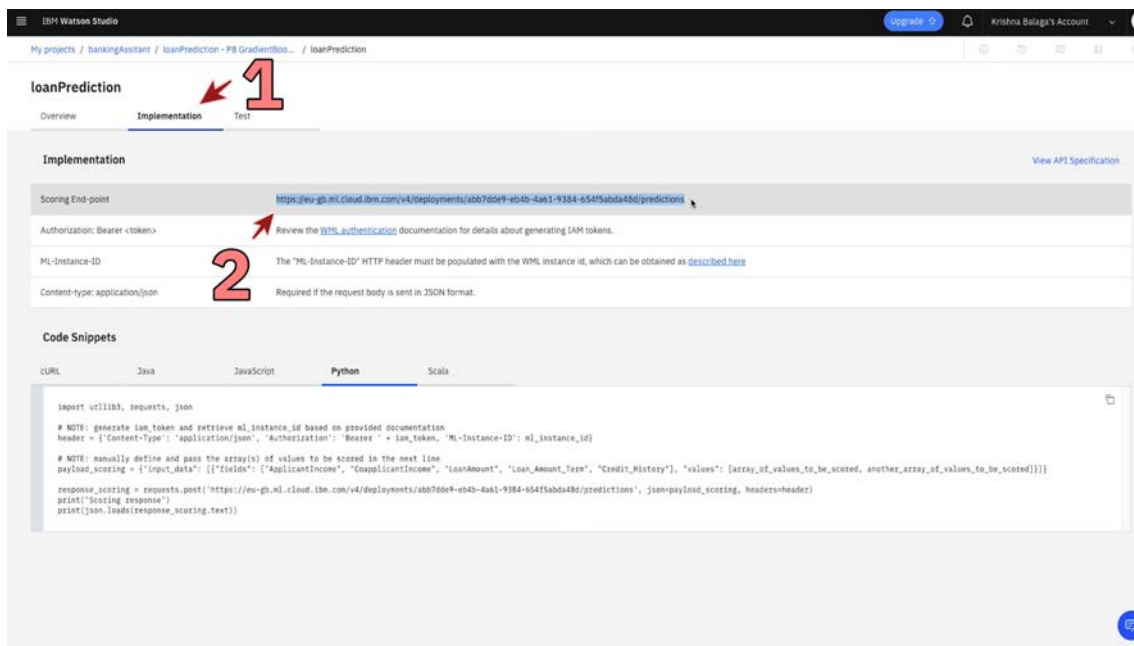
1.24 ) Wait for deployment status to change to Ready and click on the created deployment.



1.25 ) In the deployment, navigate to Test tab and input the details and click on Predict to get the predictions from the saved model

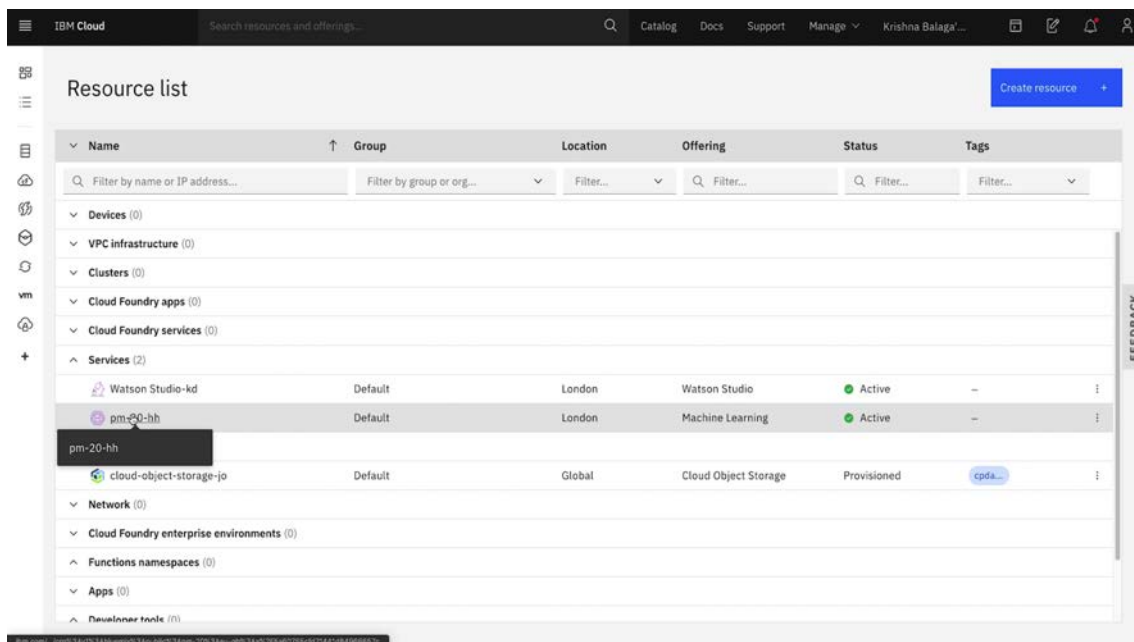


1.26 ) Now that the model is deployed and you have tested it out, you can switch to the implementation tab and copy the scoring End-Point url

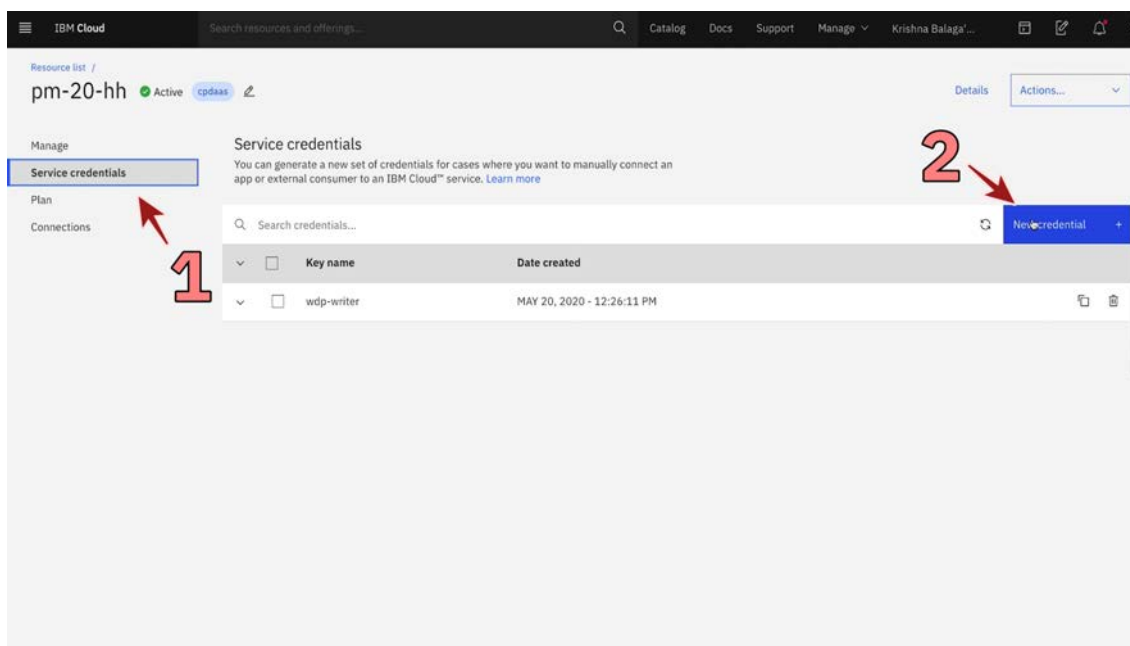


1.27 ) We would need a couple of more credentials to access the model, to get them navigate to your [resources dashboard on IBM Cloud](#)

1.28 ) Under services, choose your Machine learning service

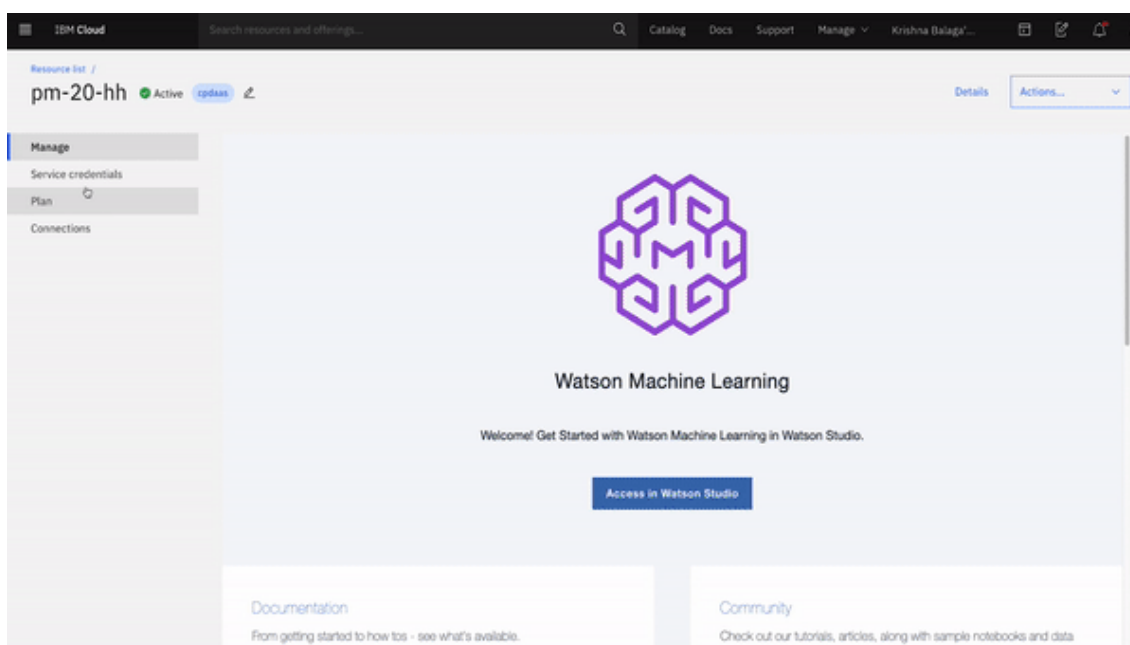


1.29 ) Navigate to the Service Credentials tab and then create a new set of credentials



1.30 ) You can leave the defaults and click on add, once the new set of credentials are added, you will need to copy

```
"apikey": "<Your WML API key>"
"instance_id": "<your WML Instance Id>"
```



we suggest maintaining a single note where you copy all the required credentials as we move forward.

1.31 ) Now proceed to [Step 2](#)

# Watson Discovery

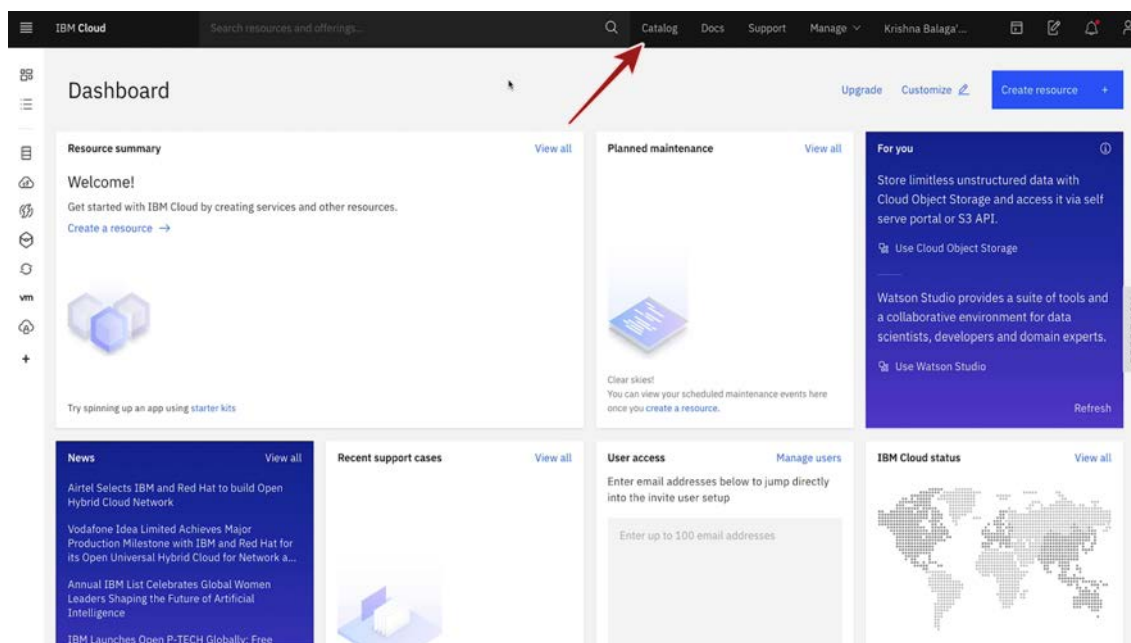
Quick links : [Home](#) - [Step 1](#) - [Step 2](#) - [Step 3](#) - [Step 4](#)

## Overview

In this, you will provision an instance of Watson Discovery and use Smart Document Understanding feature to analyse the contents to create a Query able knowledge base

2.1 ) Navigate to [IBM Cloud Dashboard](#)

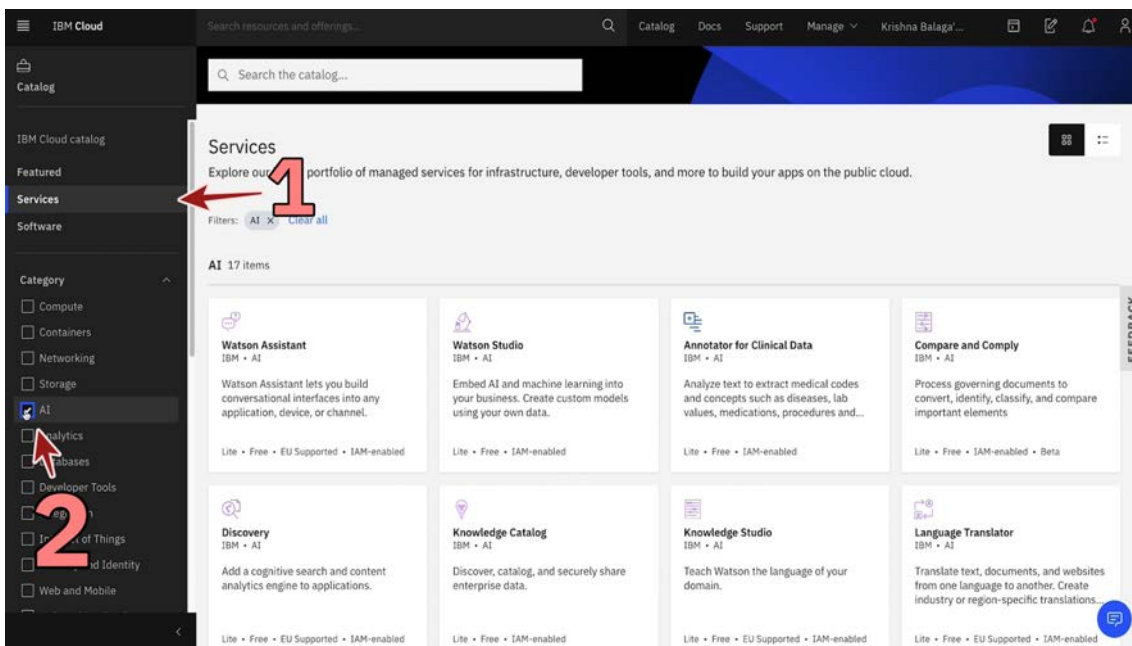
2.2 ) Click on Catalog



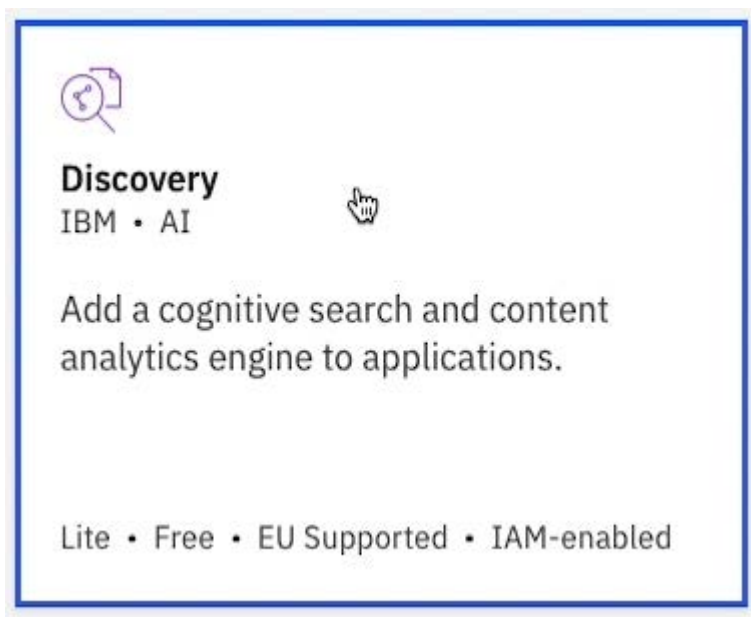
you can look at a whole list of services and offerings from ibm cloud

2.3 ) Select services tab and Filter by AI

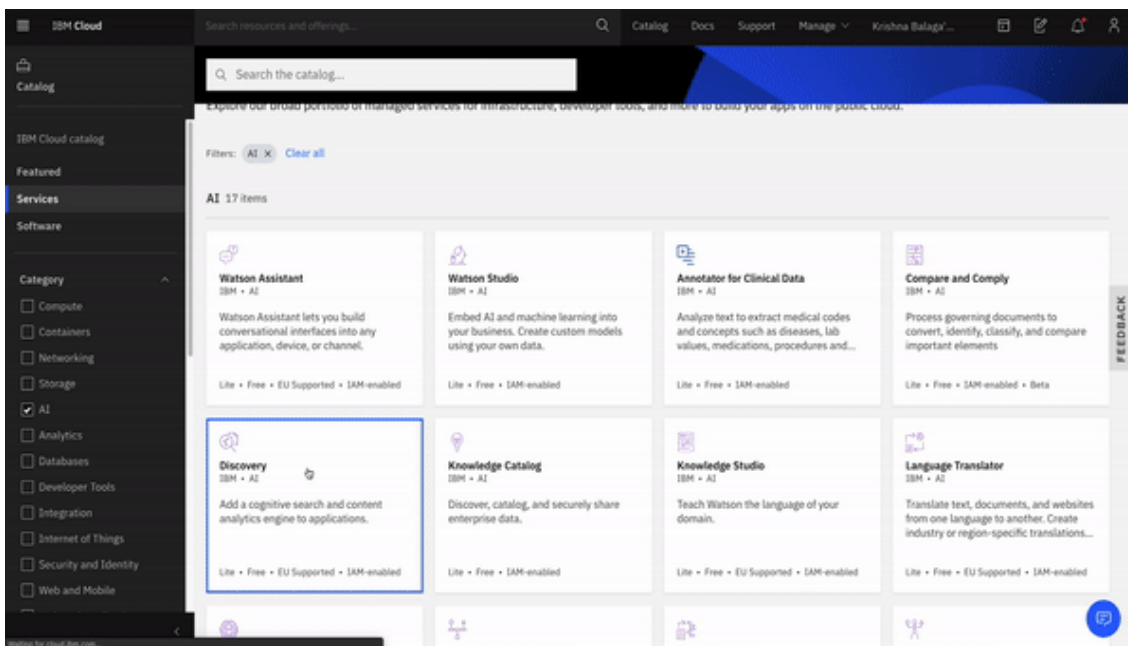




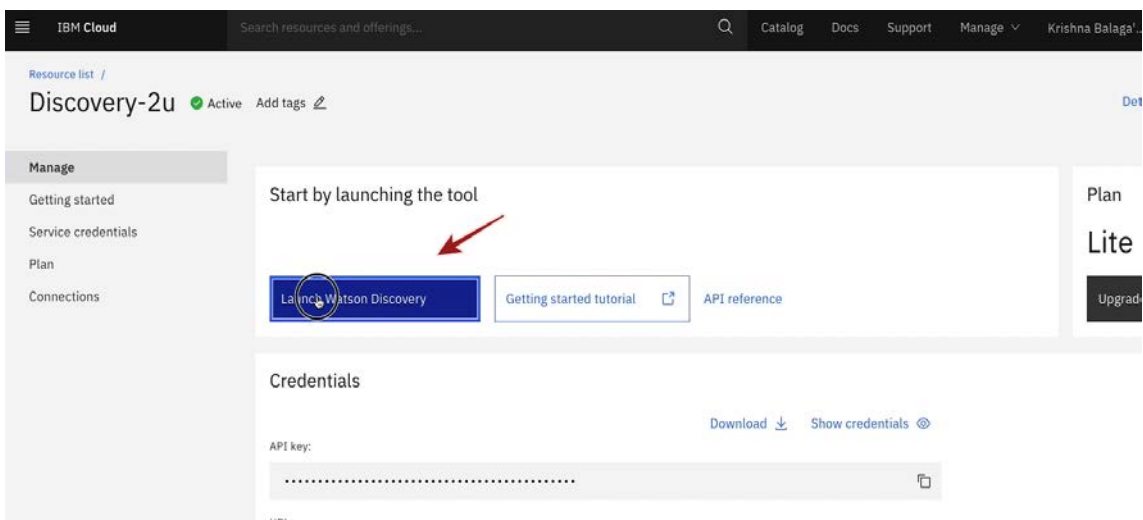
#### 2.4 Click on Discovery service



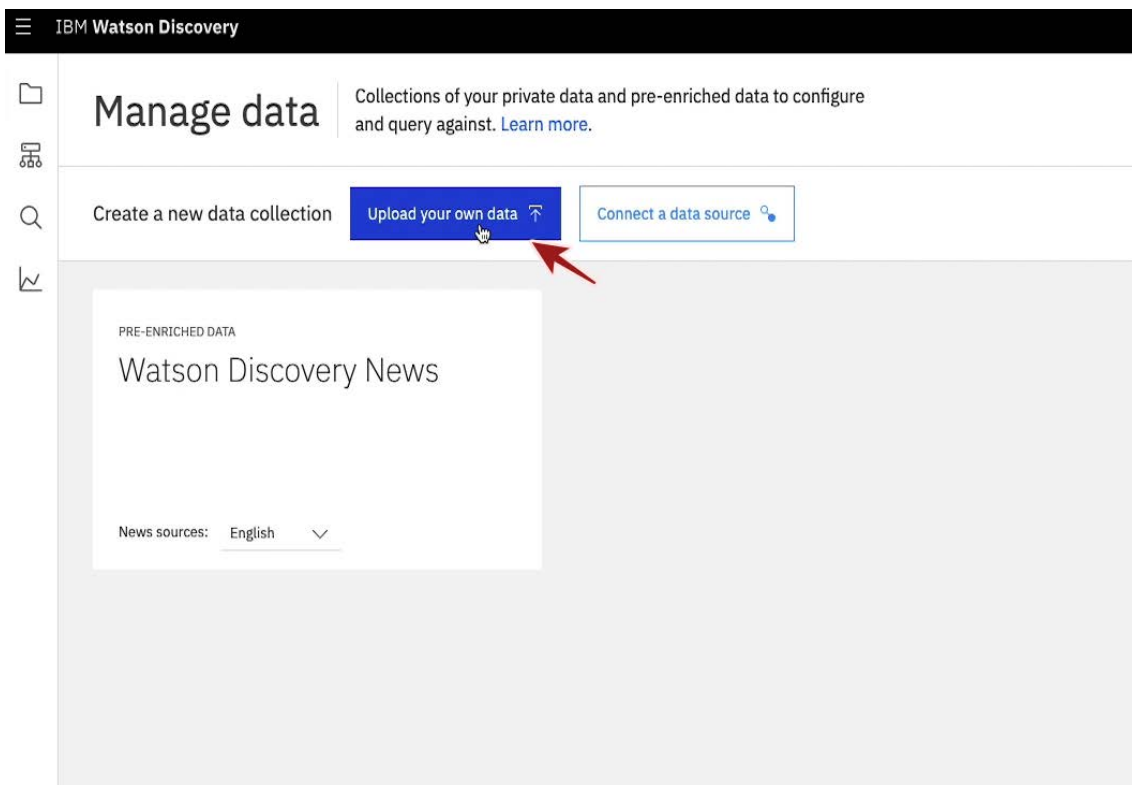
2.5 ) You can leave the defaults and go ahead to 'create'. wait for the provision to complete and then open the service dashboard



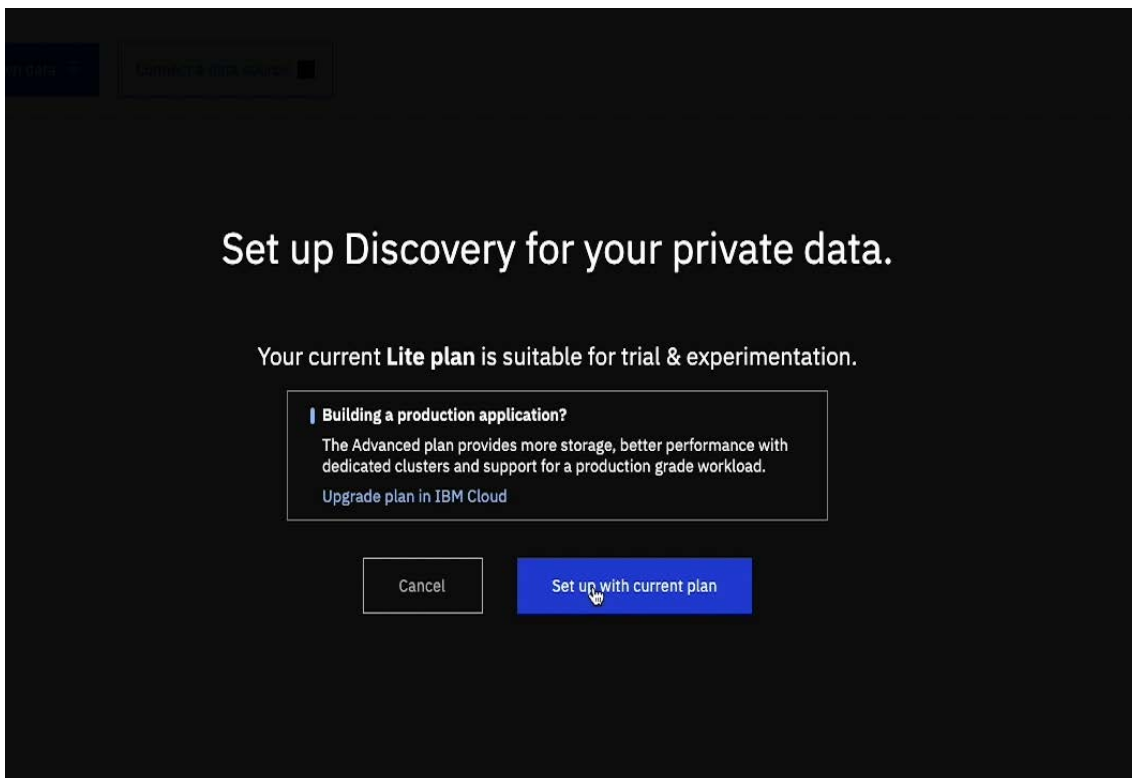
2.6 ) Click on 'Launch Watson Discovery' to get started



2.7 ) Once in Watson Discovery, click on 'Upload your own Data'

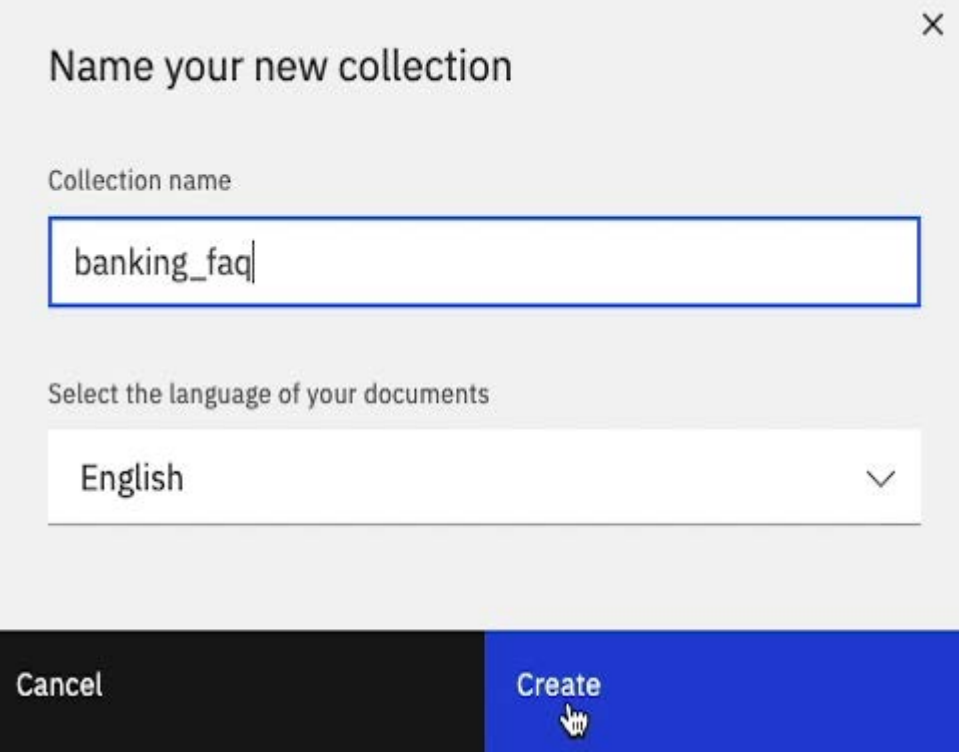


2.8 ) When asked for storage options, choose 'Setup with current plan'



2.9 ) Once the storage setup is complete, click on 'Continue'

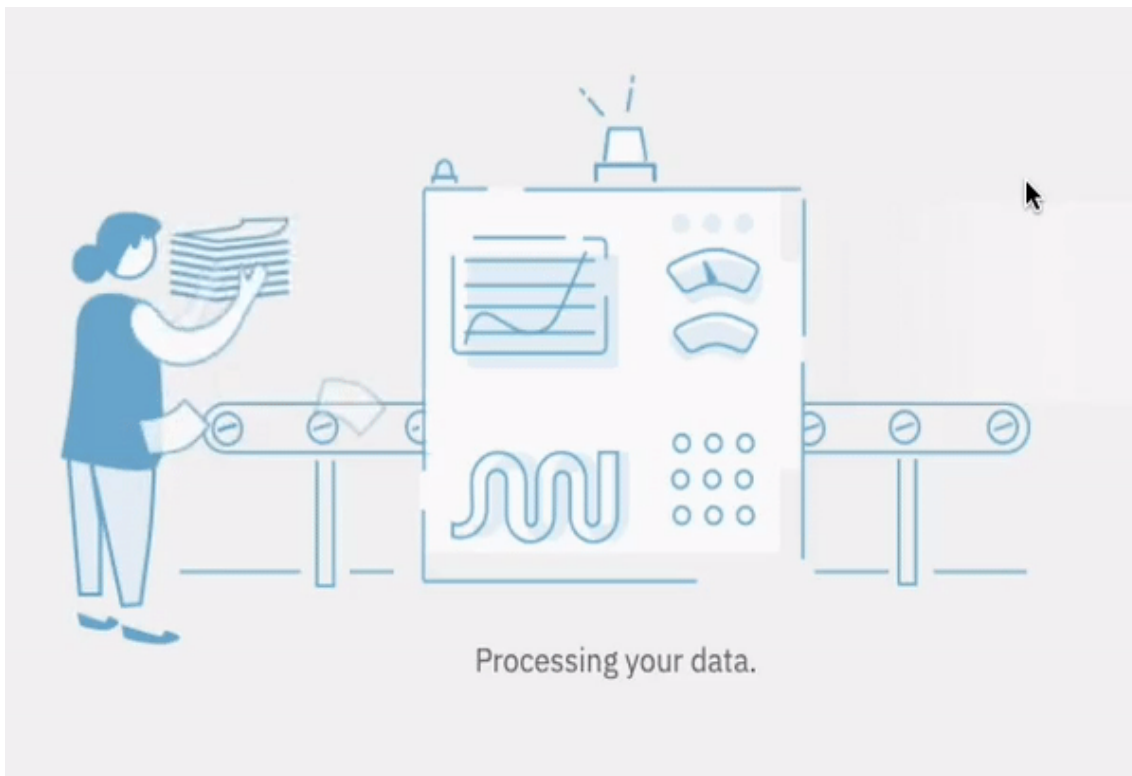
2.10 ) When a prompt for naming your collection comes in, give the collection a name and click on create



The screenshot shows a dialog box titled "Name your new collection" with a close button (X) in the top right corner. Below the title, there is a label "Collection name" followed by a text input field containing the text "banking\_faq". Below this, there is a label "Select the language of your documents" followed by a dropdown menu showing "English" with a downward arrow. At the bottom of the dialog, there are two buttons: "Cancel" on the left and "Create" on the right. A mouse cursor is hovering over the "Create" button.

2.11 ) Once the collection is open, you can click on 'Upload documents' and select the [faq\\_banking.pdf](#) file or Drag and drop it.

2.12 ) It might take a little while for initial processing of the document



2.13 ) Once the processing is done, you would see some basic enrichments generated from the document

IBM Watson Discovery

Cookie Preferences Instance: Discovery-2a

banking\_faq

Overview Errors and warnings (1) Search settings

1 document

0 documents failed View details

Created on 5/20/2020 3:26:56 am EDT

Last updated 5/20/2020 3:26:56 am EDT

Upload documents

Identified 1 field from your data

text

Need to identify more fields? Add fields

Added 4 enrichments to your data

Entity Extraction

Authorised Dealer (1) B2C (1) Bank (1) Bank or Financial Institution (1) Banks (1)

Sentiment Analysis

0% positive 0% neutral 100% negative

Concept Tagging

Bank (1) Banking (1) Debt (1) Financial services (1) Money (1)

Category Classification

finance → accounting and audit... tax preparation and ...

Now you're ready to query!

Top entities with their average, min, max sentiment score Run

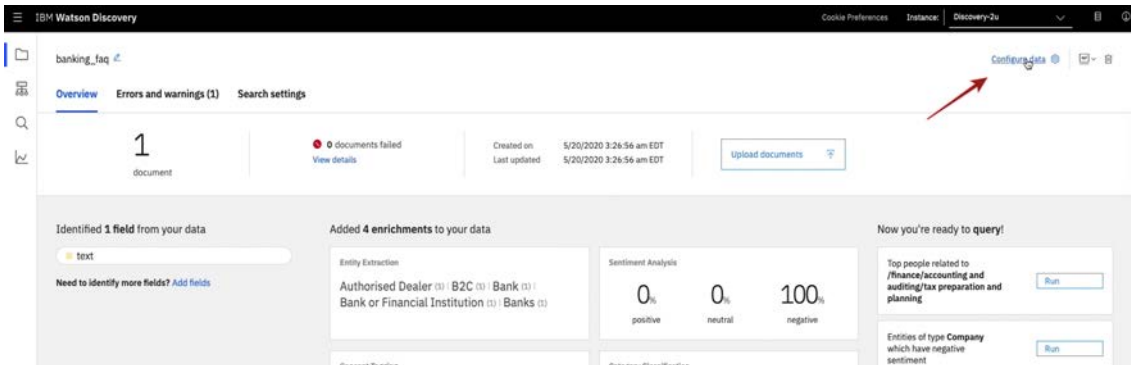
Entities of type Company which have positive sentiment Run

Documents about NRO as a Company with a very negative sentiment Run

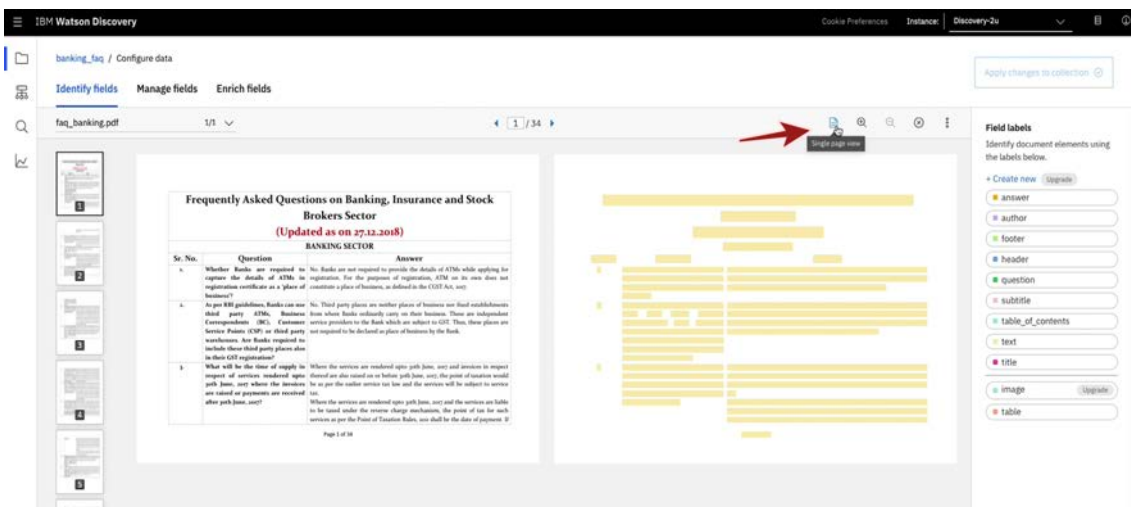
Build your own query →

5 enrichments available. Add enrichments

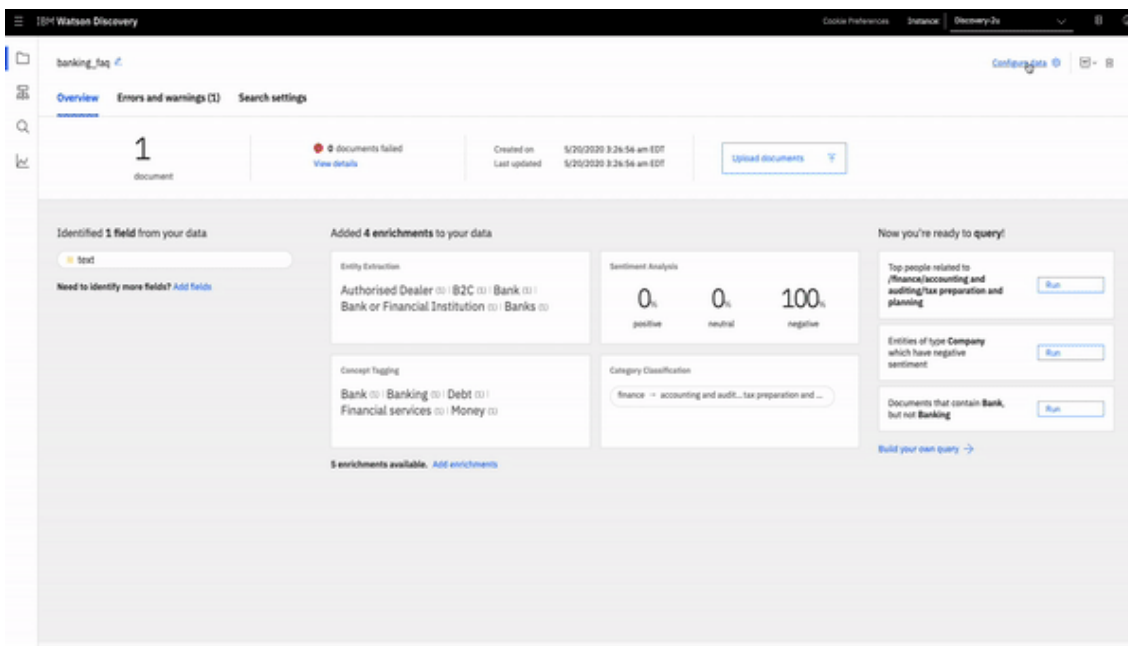
2.14 ) Now click on 'Configure Data' to bring up the Smart Document Understanding tool



2.15 ) Once you are in SDU, you will see an overview of your Document. Switch to single page View

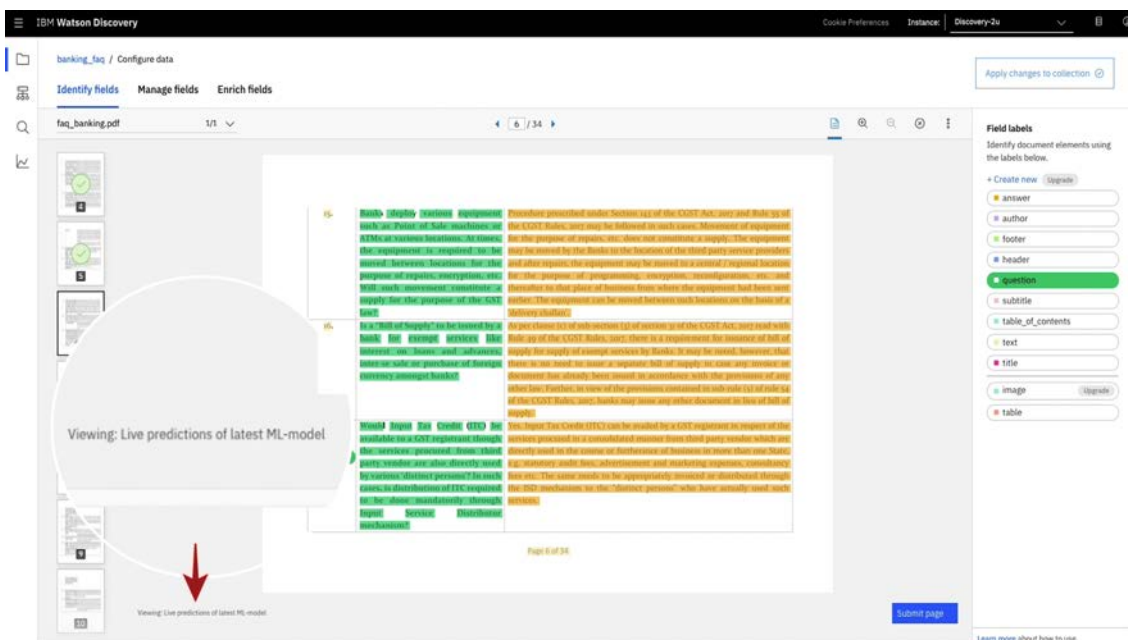


2.16 ) You can click on the 'question' label and start marking the questions column. Do the same for 'answer' label

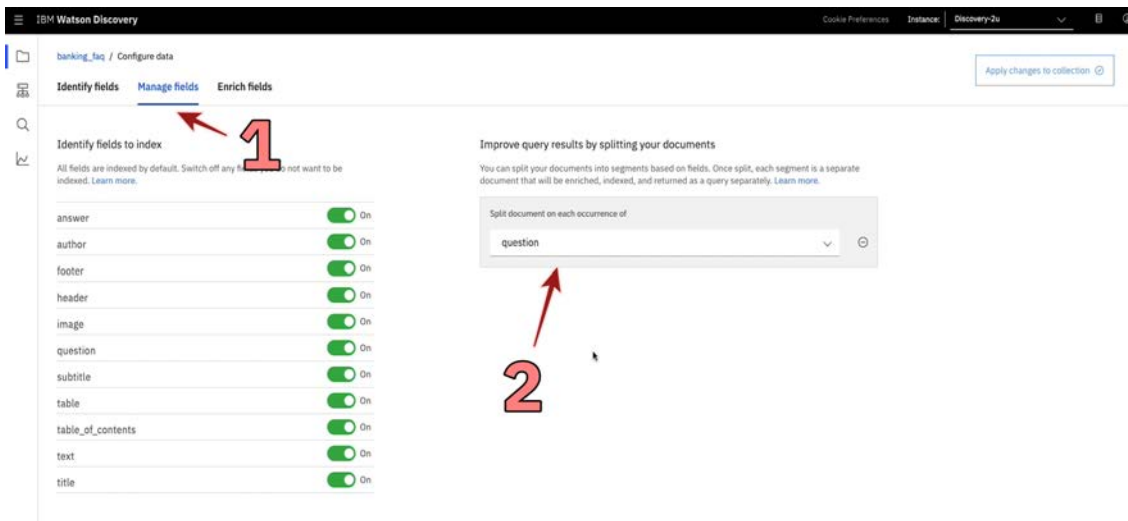


2.17 ) Once you are happy with the marking, click on submit

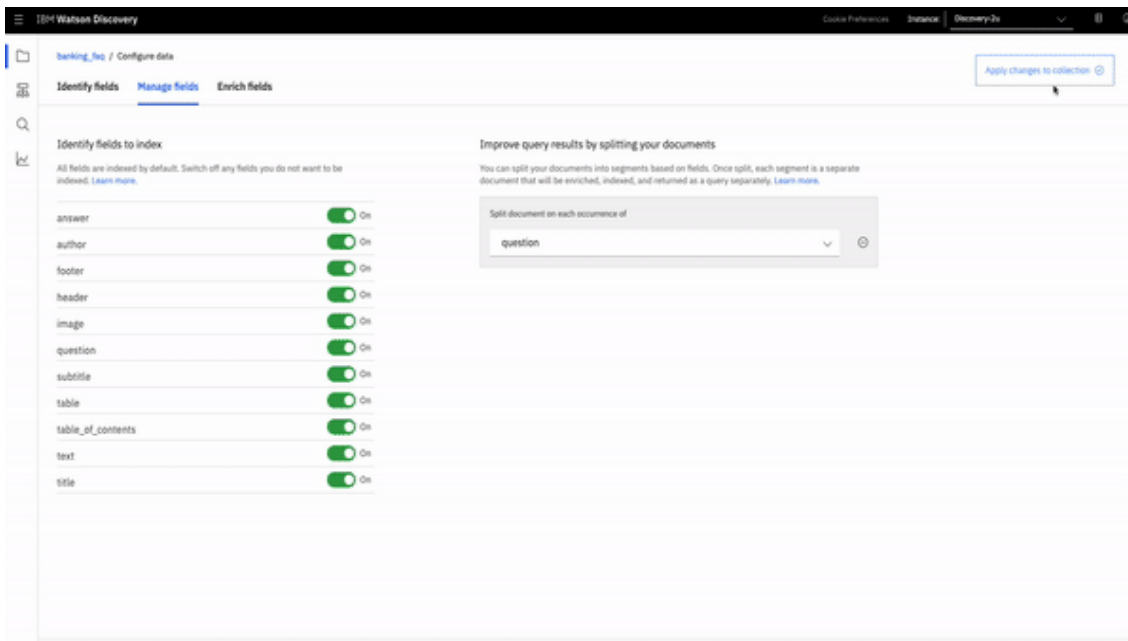
2.18 ) You can repeat the process for the next 5-6 pages, you will notice that suggestions will be made automatically as you proceed, once you are sure that the model has learnt well and the layouts suggested are good, you can jump to the next step



2.19 ) Goto 'Manage fields' tab and in the 'split document by' drop down, select questions

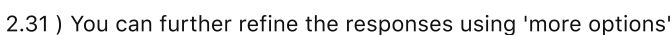


2.20 ) Click on Apply changes to the collection, and when asked for upload the same pdf again



2.21 ) You can see that now the document has been split into sub-documents basing on the questions column





The screenshot shows the IBM Watson Discovery web interface. On the left, a sidebar contains icons for documents, queries, and a search icon. The main area is titled 'banking\_faq / Build queries' and includes a search bar with the query 'is tax payable on interest charged by banks on outstanding gold loan?'. Below the search bar are options to 'Include analysis of your results' and 'Filter which documents you query'. A 'Run query' button is at the bottom right of the search area. On the right, a 'Summary' panel shows 'JSON' results. It includes a 'Passages' section with several text snippets and a 'Results' section showing 'Showing 10 of 96 matching documents'. The results are organized into a table with columns for 'Sentiment' (neutral) and 'Answer'. The answer text is: 'The Gold (Metal) Loan Scheme is a means of financing. The jewellers can purchase gold (metal) from the Banks on outright basis on payment of the price. The gold (metal) loan only provides an option to the jeweller to avail a loan and pay for gold (metal) at a future date. For this facility, the jeweller pays interest to the Bank. The grant of loan and levy of interest is dependent on the purchase of gold, and therefore, part of the same transaction or facility; therefore the interest, which is the consideration, will not be exempt as per provisions of section 19C(1)(d) of the CGST Act, 2017.' The question text is: 'Whether tax is payable on interest charged by the Banks on the outstanding amount of gold (metal) loan?'.

2.32 ) Now that we have properly configured our Watson Discovery instance to answer queries from the pdf, lets go ahead and get the credentials to be used

2.33 ) Click on the api icon on top right and copy

```
Collection ID:
Configuration ID:
Environment ID:
```

Cookie Preferences Instance: Discovery-2u

Configure data

Collection ID

53e4ae 6c9a5

Configuration ID

cb2bea1 9f13

Environment ID

bab01f7 2fc8

Upload documents

99% neutral 1% negative

Documents about **Sr.** as a **Person** with a very negative sentiment Run

Entities of type **Company** which have negative sentiment Run

Top entities with their average, min, max sentiment score Run

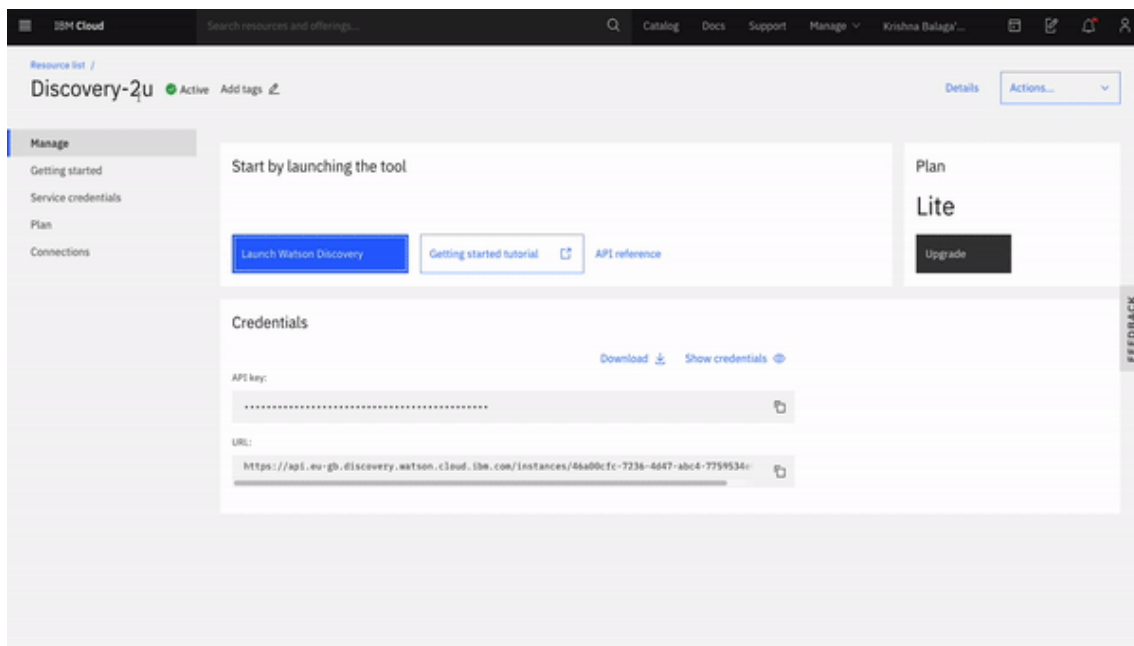
Build your own query →

2.34 ) Navigate to [IBM Cloud services Dashboard](#)

2.35 ) Select your Discovery Instance and navigate to the 'service credentials' tab

2.36 ) Create a new set of credentials and copy the following parameters.

```
"apikey":  
"url":
```



Now we can proceed to [Step 3](#)

# Functions

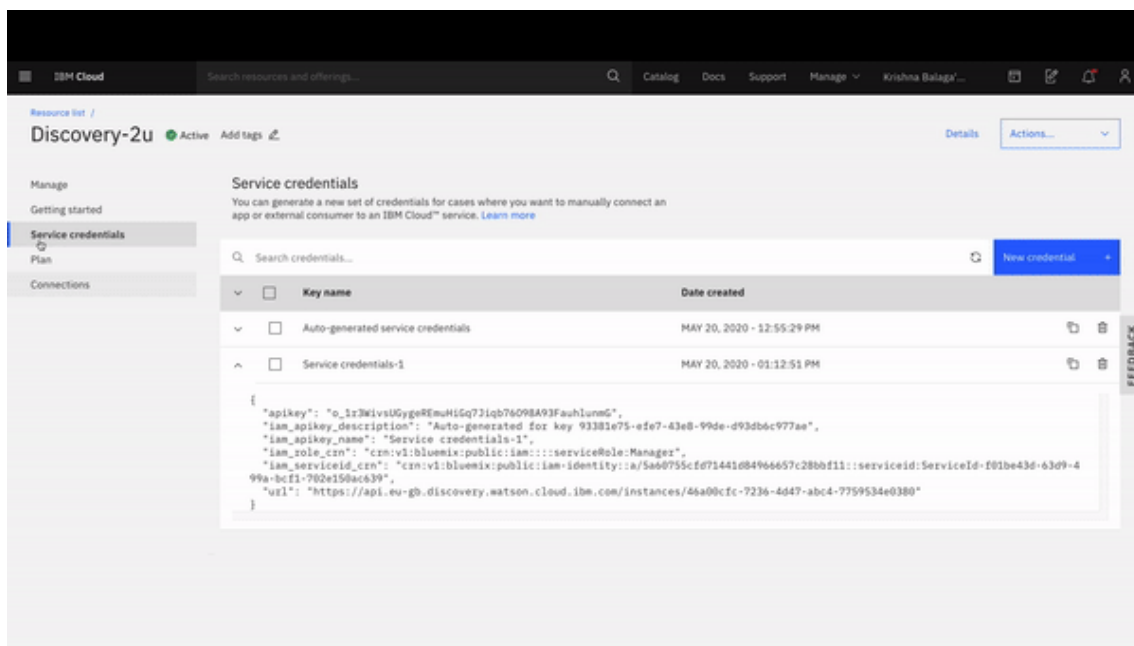
Quick links : [Home](#) - [Step 1](#) - [Step 2](#) - [Step 3](#) - [Step 4](#)

## Overview

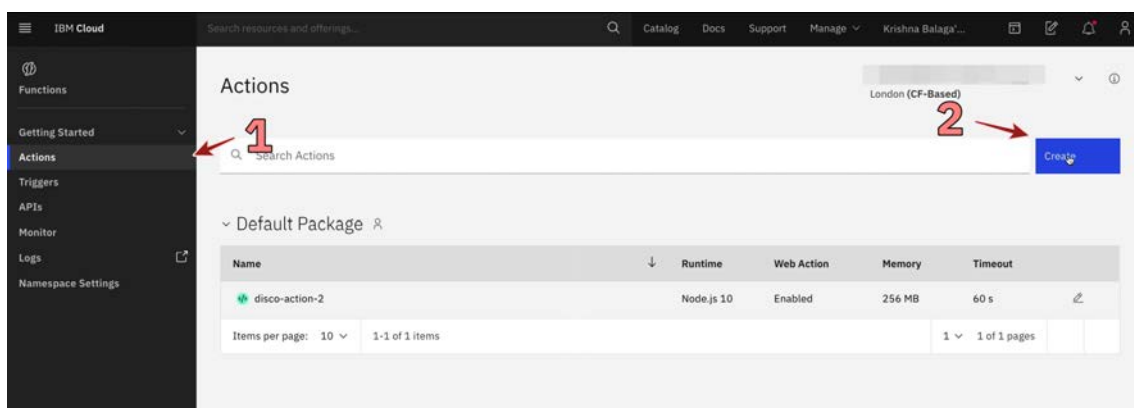
In this, you will create an action using cloud functions that will parse the data fetched from Watson Discovery and Watson Machine Learning.

## Create an action in Functions

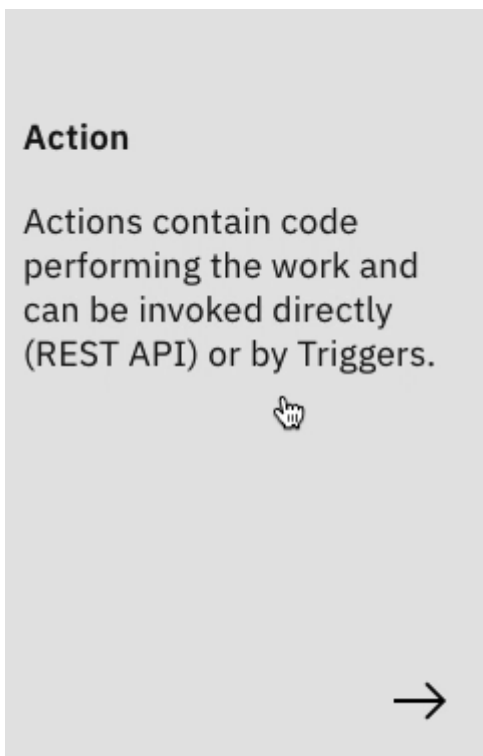
3.1 ) From the navigation menu, click on [Functions](#).



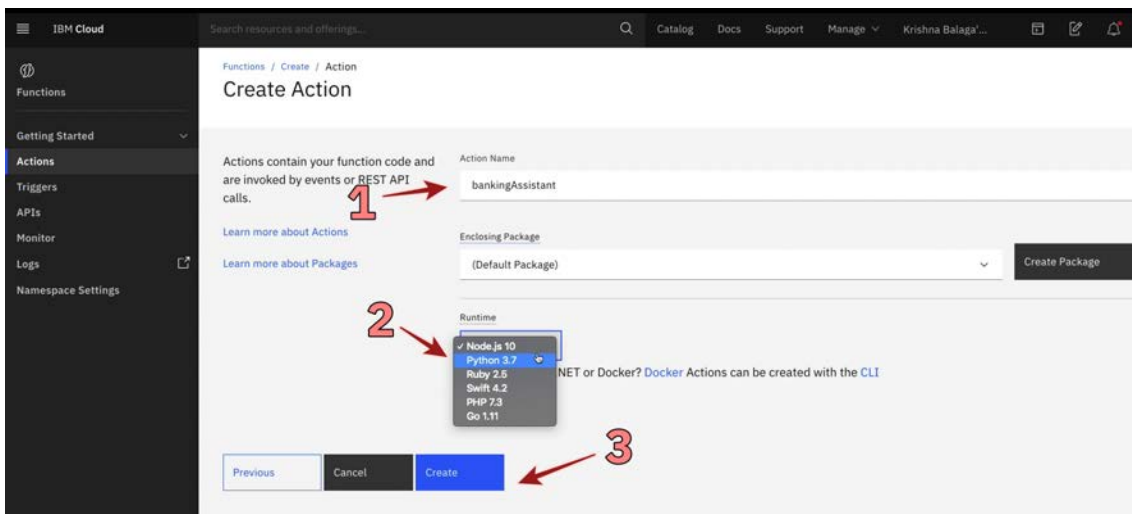
3.2 ) Navigate to 'Actions' tab and click on 'create'



3.3 ) Choose 'Action'



3.4 ) Provide a name to your action and change the runtime to python 3.7 and click 'Create'.



3.5 ) Paste the code from [main.py](#) and then save the function

IBM Cloud

Search resources and offerings...

Functions / Actions / bankingAssistant

bankingAssistant Web Action

Code Python 3.7 Edit mode - press ESC to exit

Reset Save

```

37
38 # setting parameters, please check if the version matches with your instance
39 params = {
40     ('version', '2018-12-03'),
41     ('count', '1'),
42     ('deduplicate', 'false'),
43     ('highlight', 'true'),
44     ('return', 'answer'),
45     ('passages', 'false'),
46     ('passages.count', '1'),
47     ('passages.fields', 'answer'),
48     ('natural_language_query', dict['query']),
49 }
50
51 # forming the query url
52 url = dict['discovery_url'] + '/v1/environments/' + dict['discovery_environment_id'] +
53     '/collections/' + dict['discovery_collection_id'] + '/query'
54
55 response = (requests.get(url,
56     params=params, auth=('apikey', dict['discovery_apikey'])))
57
58 return {'result': response['results'][0]['answer'][0]} if len(response['results'])
59
60
61 def main(dict):
62     # determine what kind of query we have
63     if dict['kind'] == 'wml':
64         return wmlResult(dict)
65     elif dict['kind'] == 'discovery':
66         return discoveryResult(dict)
67
68

```

Activations Collapse Clear

bankingAssistant 197 ms 5/20/2020, 13:17:51

Activation ID: c34e8b1ec0411ca34e8b1ec0411c2f

Results:

```

{
  "message": "Hello world"
}

```

Logs:

```

[]

```

3.6 ) Go to parameters, click on Add parameter and provide the following parameters that are copied from discovery and watson machine learning services

```

"wml_apikey": "<watson_machine_learning_service_api_key",
"wml_scoring_url": "<watson_machine_learning_deployment_url>",
"wml_instance_id": "<watson_machine_learning_service_instance_id",
"discovery_url": "<watson_discovery_url>",
"discovery_apikey": "<watson_discovery_apikey>",
"discovery_environment_id": "<watson_discovery_env_id>",
"discovery_collection_id": "<watson_discovery_collection_id>"

```

3.7 ) Once the credentials are entered click on 'save'

IBM Cloud

Search resources and offerings...

Functions / Actions / bankingAssistant

bankingAssistant Web Action

Code Parameters Runtime Endpoints Connected Triggers Enclosing Sequences Logs

Parameters

Parameter Name Parameter Value

discovery_environment_id	Default Value
wml_apikey	Default Value
discovery_url	Default Value
discovery_collection_id	Default Value
wml_instance_id	Default Value
discovery_apikey	Default Value
wml_scoring_url	Default Value

Add Parameter Reset Save

3.8 ) Go to endpoints, click on "Enable as web Action" and click on save. Then copy the url that is generated in this step.

IBM Cloud

Search resources and offerings...

Functions / Actions / bankingAssistant

bankingAssistant Web Action

Namespace:

Code

Parameters

Runtime

Endpoints

Configure Triggers

Enabling Sequences

Log

Web Action

☒ Enable as Web Action

Allow your Cloud Functions actions to handle HTTP events. Web Actions allow you to control the response data and type by using a set of URL extensions, such as .json or .html. Learn more about [Web Actions](#).

Note: The Web Action URL below requires to return a dict object that contains a body property.

☐ Raw HTTP handling

When enabled your Action receives requests in plain text instead of a JSON body

HTTP Method	Auth	URL
ANY	Public	<a href="https://eu-gb.functions.cloud.ibm.com/api/v1/web/tatahiab5%40xhimatedm.com_dev/default/bankingAssistant">https://eu-gb.functions.cloud.ibm.com/api/v1/web/tatahiab5%40xhimatedm.com_dev/default/bankingAssistant</a>

REST API

HTTP Method	Auth	URL
-------------	------	-----

Reset Save

Once you have the public endpoint copied, now we can proceed to The [Final Step](#)



# Watson Assistant

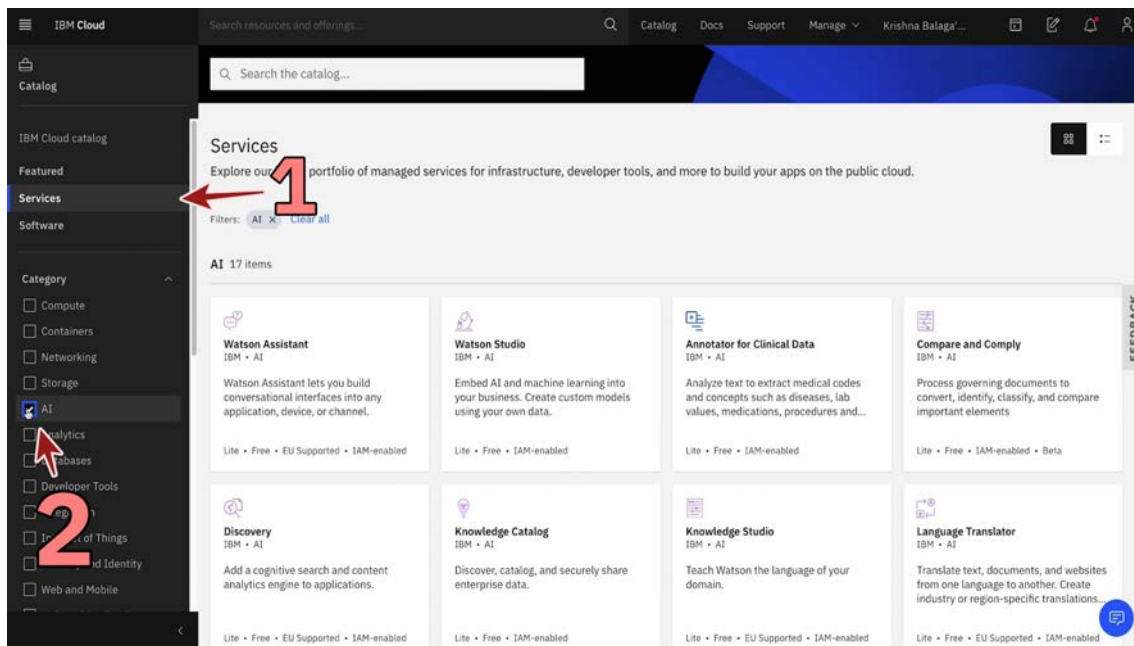
Quick links : [Home](#) - [Step 1](#) - [Step 2](#) - [Step 3](#) - [Step 4](#)

## Overview

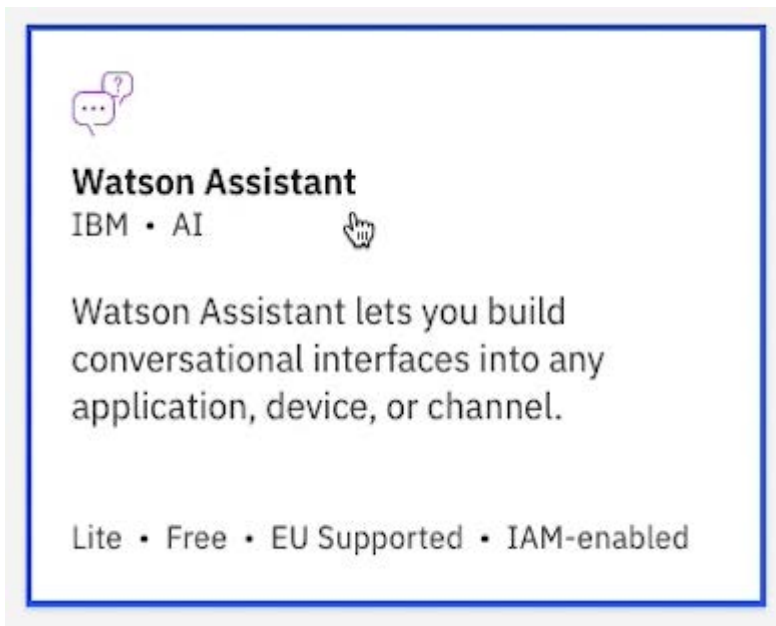
In this, you will create a simple watson assistant flow and enable webhooks which will fetch details from cloud functions.

## Setup an instance of Watson Assistant

4.1 ) Navigate to [IBM Cloud catalog](#). From Catalog, filter the services by AI

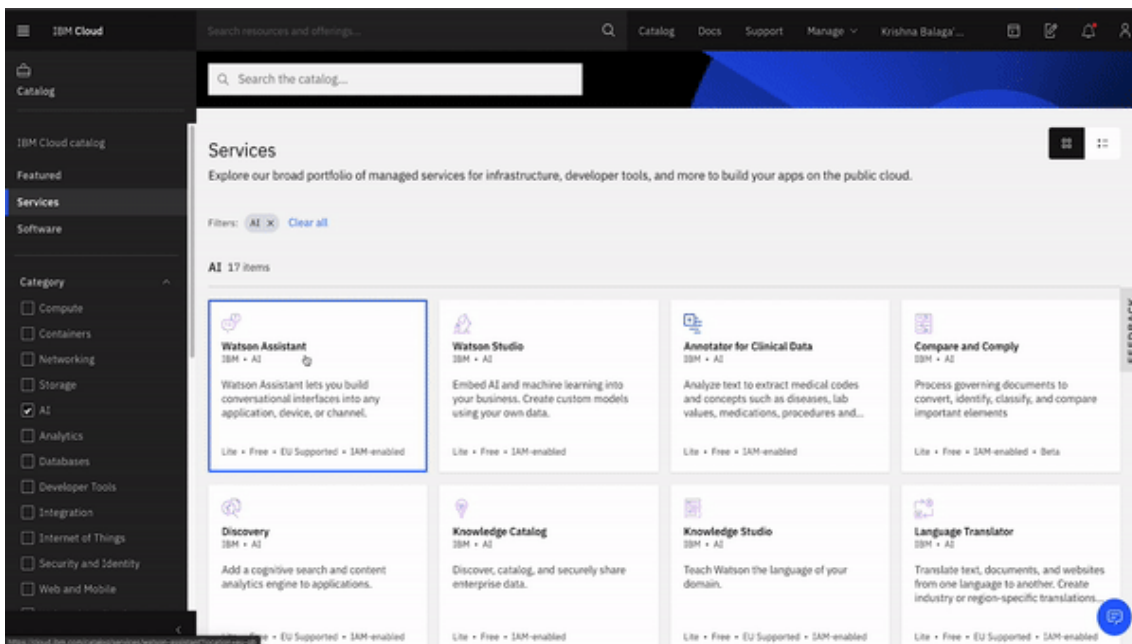


4.2 ) Click on Watson Assistant.

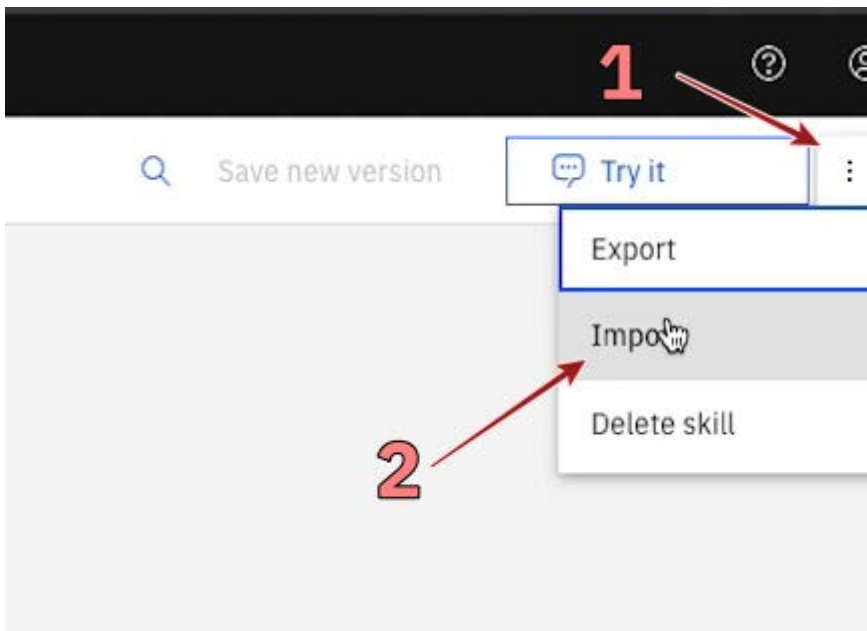


4.3 ) Leave the default values and 'create' a lite service.

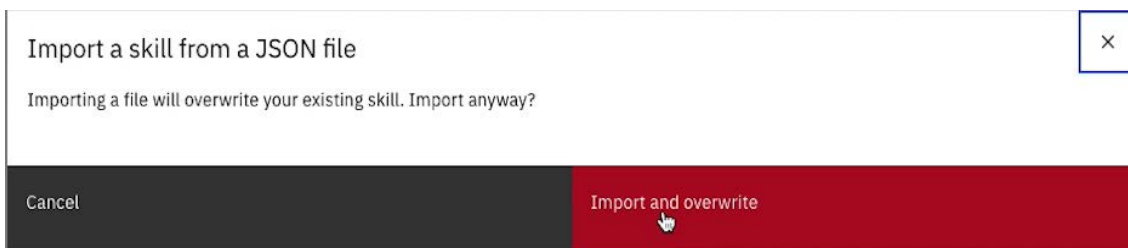
4.4 ) One the service is provisioned, click on 'Launch Watson Assistant'



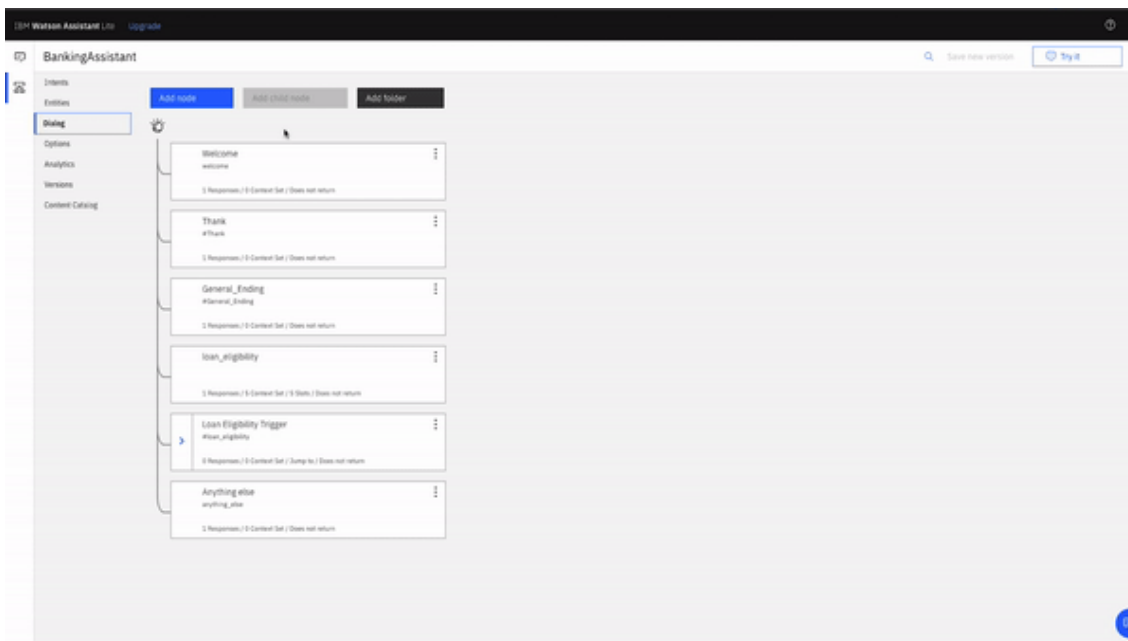
4.5 ) To create a new skill, click on import flow from the top right hand menu. Import the [skill-BankingAssistant.json](#) file



4.6 ) Select 'Import and Overwrite' when prompted



4.7 ) Once you import the flow, you will be able to see intents, entities and dialogs related to the flow.



4.8 ) Goto webhooks and paste the url that we copied from the functions and add .json at the end of the url.

**Note: DO NOT FORGET TO ADD .json TO THE END OF WEBHOOK URL**

IBM Watson Assistant Lite Upgrade

BankingAssistant Save new

Intents  
Entities  
Dialog  
Options  
Webhooks  
Disambiguation  
Autocorrection  
Irrelevance Detection  
System Entities  
Analytics  
Versions  
Content Catalog

### Webhooks

A webhook is a mechanism that allows you to call out to an external program based on events in your dialog.

**Webhook setup**

Specify the request URL for an external API you want to be able to invoke from dialog nodes. Watson will call this URL when configured to do so from a dialog node. [Learn more](#)

URL

https://eu-gb.functions.cloud.ibm.com/api/v1/web/latashia65%40xhanimat

**Headers**

Add HTTP headers for authorization or any other parameters required for invoking the webhook.

Header name	Header value
<a href="#">Add header</a> <a href="#">Add authorization</a>	

**Next step**

To trigger this webhook from an individual dialog node, enable webhooks from the Customize page of the node. [Go to dialog](#)

**1**

**2**

add .json to the end of url

4.9 ) Now click on the assistant icon on the left menu and select your Assistant.

4.10 ) Click on Add integration

IBM Watson Assistant Lite Upgrade

Assistants

**My first assistant**  
Built for you to create and learn.

**Skill**  
A dialog skill provides specific responses you've created. Choose one for your assistant. [Learn more](#)

**Dialog**

**BankingAssistant**

LANGUAGE: English (US) TRAINED DATA: 5 Intents | 2 Entities | 23 Dialog nodes VERSION: DESCRIPTION: VERSION CREATED:

LINKED ASSISTANTS (1): My first assistant

**Search** [Plus](#)

Expand your assistant's knowledge  
For customer questions or requests that require lengthy or complex responses, add a search skill. A search skill can access your existing self-service content to find relevant information and share it with your customers. [Learn more](#) [Try Plus plan](#)

**Integrations**  
Choose a channel to deploy your assistant.

[Add integration](#)

Deploy with Web Chat [Plus](#)  
Add your assistant to your company website.  
[Integrate Web Chat](#)

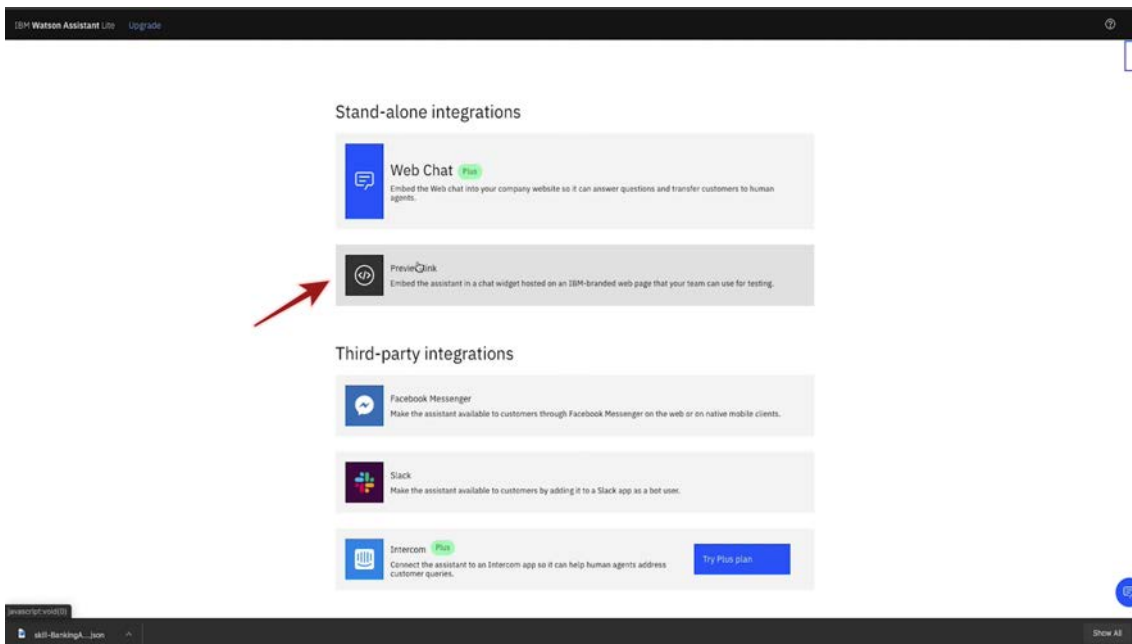
**Saved integrations**

Saved integrations like the Preview Link will be available here.

**1**

**2**

4.11 ) Add a stand-alone 'preview' integration



4.12 ) Click on 'Create'



## Preview link integration

Integration name

Preview Link

## Try it out and share the link

Use of the assistant embedded in this web page incurs billing charges. ⓘ



4.13 ) Click on the generated link to open up a preview of your Smart Assistant.

4.14 ) You can query it with any questions related to the document

Example:

1. Is interest in debt exempted from gst?
2. Would assignment or sale of unsecured debts be liable to gst?

## Assistant preview

Hello. I'm Dave, your Banking Assistant. How can I help you today?

is interest in debt exempted from gst?

| Yes. As debt instruments such as debentures, bonds etc. are in the nature

Type something... →

4.15 ) You can check the prediction made by your assistant using Watson machine learning service

1. Am i eligible for loan?

Income: 4500

Co-applicant income: 5000

Loan amount: 86000

Term :36

Credit history available: yes

## Assistant preview

Please enter the co applicant Income

5000

Please enter the Loan amount you are looking for

86000

Please enter the loan term in months

36

Is your credit history Available?

Yes

No

Yes

| Congratulations you are eligible for the loan

|Type something...



Congratulations! you've deployed a multi functional smart assistant :)