PROJECT REPORT

Topic: Intelligent Customer Help Desk with Smart Document Understanding

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Category: *Artificial Intelligence*

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Introduction

Overview

We will make a simple chatbot by using multiple Watson AI services on IBM cloud like Watson assistant, Discovery, Cloud Function, Node red and Smart Document Understanding (SDU) feature of the Watson discovery service. We will combine this Watson discovery and Watson assistant using Cloud function as webhook in Watson Assistant.

- Poject Requirements: Python, IBM Cloud, IBM Watson
- Functional Requirements: IBM Cloud
- Technical Requirements: Python, Watson, AI, ML
- Software Requirements: Watson Assistant, Watson Discovery
- Project Deliverables: Smartinternz Internship
- Project Duration: 1 Month

Purpose

The typical customer care chatbot can answer simple questions, such as store locations and hours, directions, and maybe even making appointments. When a question falls outside of the scope of the pre-determined question set, the option is typically to tell the customer the question isn't valid or offer to speak to a real person.

In this project, there will be another option. If the customer question is about the operation of a device, the application shall pass the question onto Watson Discovery Service, which has been pre-loaded with the

device’s owners manual. So now, instead of “Would you like to speak to a customer representative?” we can return relevant sections of the owners manual to help solve our customers’ problems.

To take it a step further, the project shall use the Smart Document Understanding feature of Watson Discovery to train it on what text in the owners manual is important and what is not. This will improve the answers returned from the queries.

Literature Survey

Existing Problem

Generally chatbot are loaded with certain set of questions that is more like if and else flow, the question or input which lies out of the predefined set of questions chatbots are not able to answer the question and they ask either to change the input or transferring to an agent or representative option.

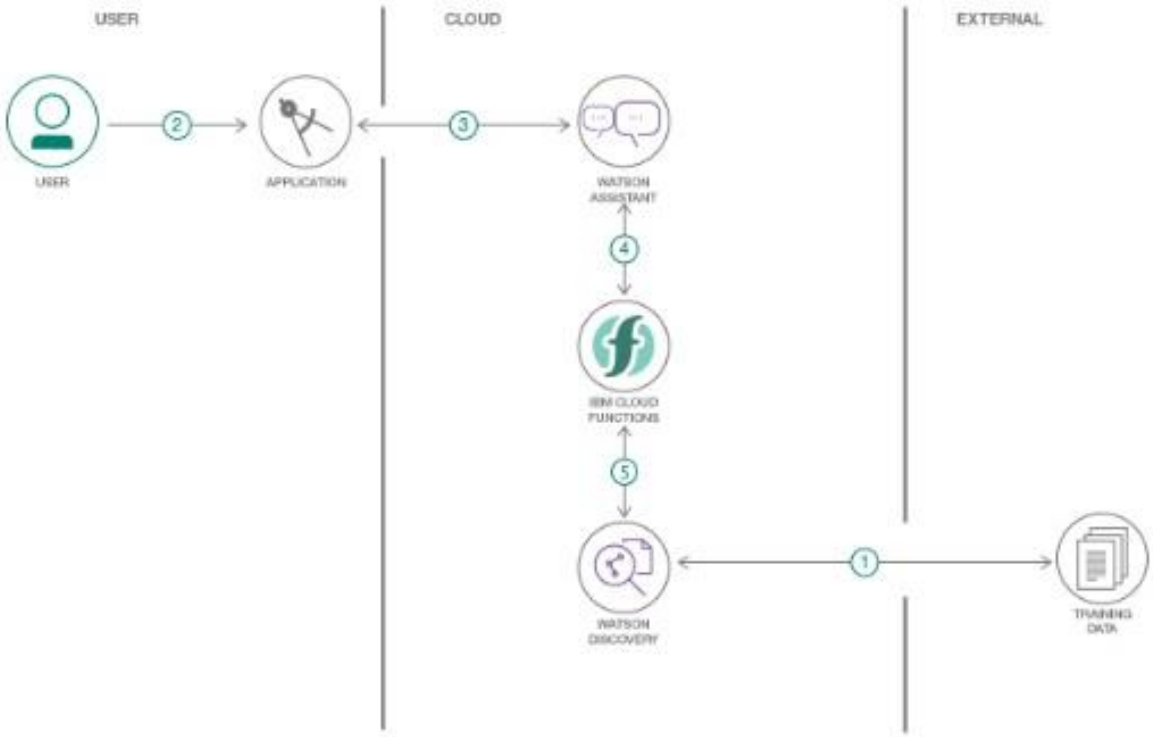
The efficient bot should reduce the waiting traffic to representatives, to achieve just that we will include one more feature to our chatbot which is smart document understanding feature of Watson Discovery service on IBM cloud.

Proposed Solution

For the above mentioned problem, We have made our chatbot able to handle the queries related to functioning, installation and set up of product of company. For that we have used SDU(Smart Document Understanding) of the Watson discovery services. We will train SDU for user manual of the products sold by company. Bot will return the related part of manual as an answer to queries related to handling of product or warranty information.

Theoretical Analysis

Block/Flow Diagram



1. The document is annotated using Watson Discovery SDU.

2. The user interacts with the backend server via the app UI. The frontend app UI is a chatbot that engages the user in a conversation. It made with the help of node red dashboard service of IBM cloud.

3. Dialog between the user and backend server is coordinated using a Watson Assistant dialog skill.

4. If the user asks the product operation question, a search query is passed to a predefined IBM Cloud Function action via a webhook.

5. Cloud function action will query the Watson Discovery service and return the result to assistant.

6. With the help of *javascript* function will extract the useful information in human readable form from returned json object.

Hardware/Software Designing

- Create IBM Cloud services.
- Configure Watson Discovery.
- Create IBM Cloud Function action.
- Configure Watson Assistant.
- Create flow and Configure node in node red.
- Deploy and run node red app.

Experimental Investigation

Create necessary IBM Cloud Services

a. Watson Discovery
b. Watson Assistant
c. Node red with Continuous Delivery service.

Configure Watson Discovery

First you need to create discovery service instance

a. Sign up for free IBM cloud account or login if you already have one.
b. Go to catolog search for discovery
c. Click create.

Step1: Launch the tooling

1. Click the Discovery instance you created to go to the service dashboard.
2. On the Manage page, click *Launch Watson Discovery*. If you're prompted to log in to the tooling, provide your IBM Cloud credentials.

Step2: Upload the document(Manual)

1. Upload the document to your collection. Either drag and drop it into your collection, or click *browse from computer* to upload documents. After the upload is complete, the following information displays:
2. The number of documents (1).

3. The fields identified from your document. You should see one field identified, text. We identify additional fields in a bit.
4. Enrichments applied to your document. The Entity Extraction, Sentiment Analysis, Category Classification, and Concept Tagging enrichments are automatically applied to the text field by Discovery. For more information about enrichments, see Adding enrichments.
5. Pre-built queries you can run immediately.
6. Let's try a quick Natural Language Query to level set. Click *Build your own query* on the lower right.
7. On the *Build queries* screen, click on *Search for documents*, then *Use natural language*. Enter *What are the minimum hardware requirements* and click the Run query button. Click the JSON tab on the right. The result is not as precise as it could be, so let's improve it with Smart Document Understanding.
8. Click on the name of the collection on the upper left to return to the *Overview* screen.

Step3: Annotate the document uploaded

1. Click *Configure data* on the upper right.
2. On the Configure data screen, there are three tabs: *Identify fields*, *Manage fields*, and *Enrich fields*.
3. The *Watson Explorer Installation Guide* is displayed and ready for annotation on the *Identify fields* tab. All available fields *(answer, author, footer, header, question, subtitle, table_of_contents, text, and title*) are displayed in the *Field labels* list on the right. If you purchase an Advanced or Premium plan you can create your own custom labels.

4. Click *on title,* then select the marker next to Installation and Integration Guide. Click *Submit page*.
5. In the page preview on the left, click on page 3. Note that the title is already predicted for this page. Click *Submit page*.
6. On page 4, select the *footer* label and select the marker next to the footer. Click the *Submit page* button.
7. On pages 5 and 6, annotate the footers with the footer label. Submit each page. Click through a few more pages; note that the footer was predicted properly by Discovery. Annotate the titles (flush left) and subtitles (indented) on pages 7, 9, and 10 and submit each page individually.
8. Click through a few more pages and check the predicted titles and subtitles. If any need to be changed, annotate those pages, and click *Submit page.*
9. Now click on the *Manage fields* tab and under *Improve query results by splitting your documents* split the document, based on *subtitle.*
10. Click the *Apply changes to collection* button on the top right. An *Upload your documents* dialog box appears. Browse to the original manual file, and upload it. All of the annotations are applied to your index. After it finishes indexing, the *Overview* screen opens. Expect to now see more than 30 documents and 4 fields identified from your data: footer, subtitle, text, and title. If the changes do not display within a few minutes, refresh the browser window.

Step4: Let’s query

1. Click *Build your own query* on the bottom right.
2. On the *Build queries* screen, click on *Search for documents*, then *Use natural language*. Enter What are the minimum hardware requirements and click the *Run query* button.
3. Click the **JSON** tab on the right. Look at the text under results. The answers returned for the query are much more precise.
4. Store the credentials for discovery by clicking on upper right corner at the *api* tab. Store the collection ID, Environment ID.

Now Create and Configure the IBM Cloud Function Action:

It is used to link the discovery with assistant, so that our queries can be answered by the discovery. After selecting the action from the IBM catalog, we have to click on the action tab as shown on the left menu. Here we made the Information function. Then we can post the code which will help us to link the discovery.

In the code section of the cloud function action paste the code given in appendix. Add the parameter by clicking on *Parameters* at the left option and then *add parameters* such as iam_apikey, collection_id, url, environment_id for the values use the discoveries api credential for collection_id and environment_id. Use the discoveries service credential for url and iam_apikey.

Click on *endpoint* -> enable the *web action* it will generate url note the **public url** we will use it in the webhooks while configuring the Watson Assistant.

Create and configure Watson Assistant

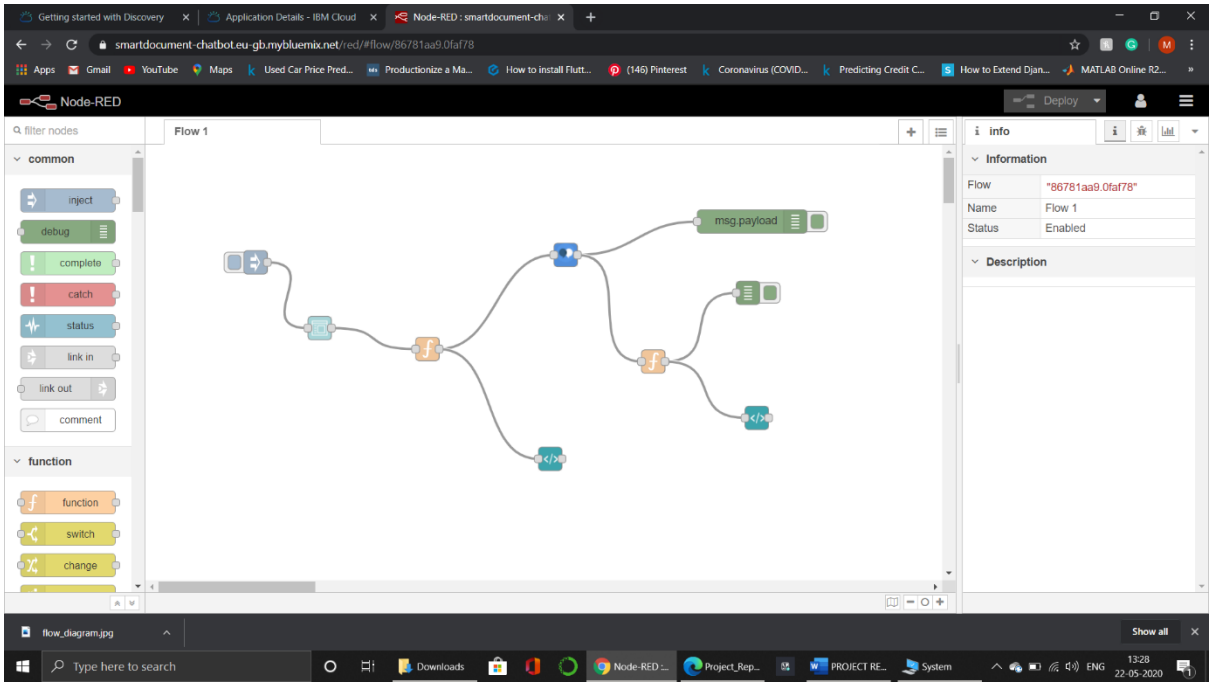
use the sample customer care skill for convenience. We can add intent related to product information and the related entities and dialog flow. Intents- These are the categories which we mention or we expect the user input to be, for example: Greetings can be an intent and in it we can have examples as Good Morning, Good Evening and all. Entities- These are used to mention the usual typos of the user and the synonyms like some people write the good morning as gm, good morning, gud morning, so we can cover all these also instead of returning a message to rephrase. Dialog- Here we mention the outputs to be given, these can be static as well as dynamic.

Next in the *options* -> *webhook* section url which we got at the end of cloud function as **public url**.

Now go to *dialog skill* of the assistant click on the skill created for *product information* and then click on the *customize* tab at the upper right corner and *enable the webhook* click on the *apply*.

Make the node red flow and link everything

We will get a UI from the node. The roles of different nodes can be understood by the references mentioned in in the end. The final flow will look like as shown below. The UI we have is the basic one but can be improved by writing the HTML code in the template node. We can vary the background colour also from the node-red. This is how the initial flow looked like .


Node-RED
Flow 1
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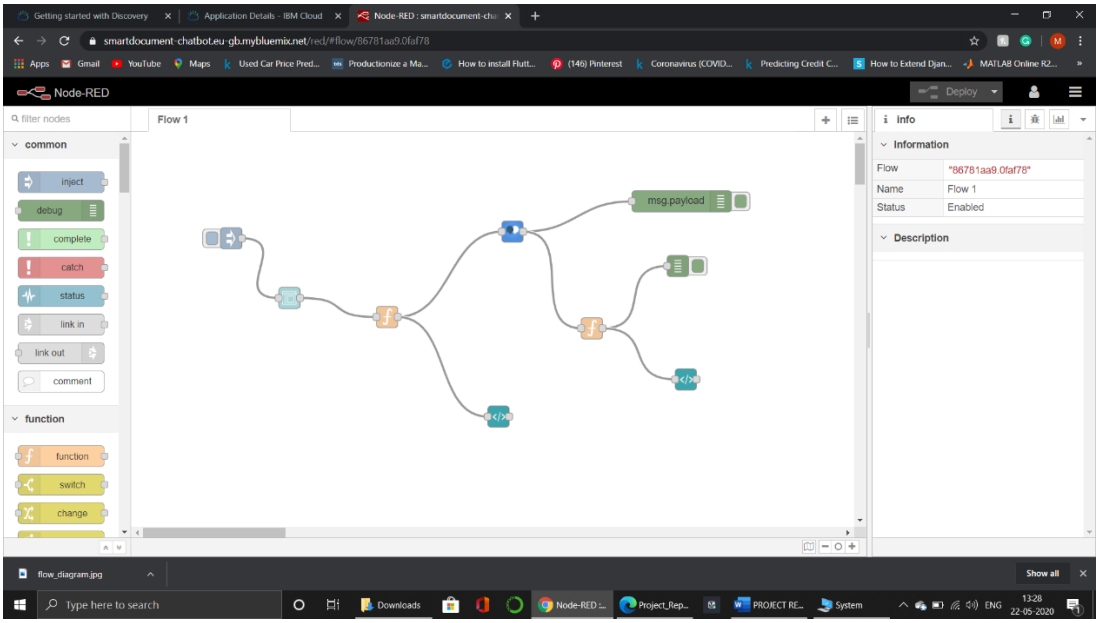
complete
catch
status
link in
link out
comment
function
function
switch
change
msg.payload
info
Information
Flow
"86781aa9.0faf78"
Name
Flow 1
Status
Enabled
Description
flow_diagram.jpg
Show all

Flow chart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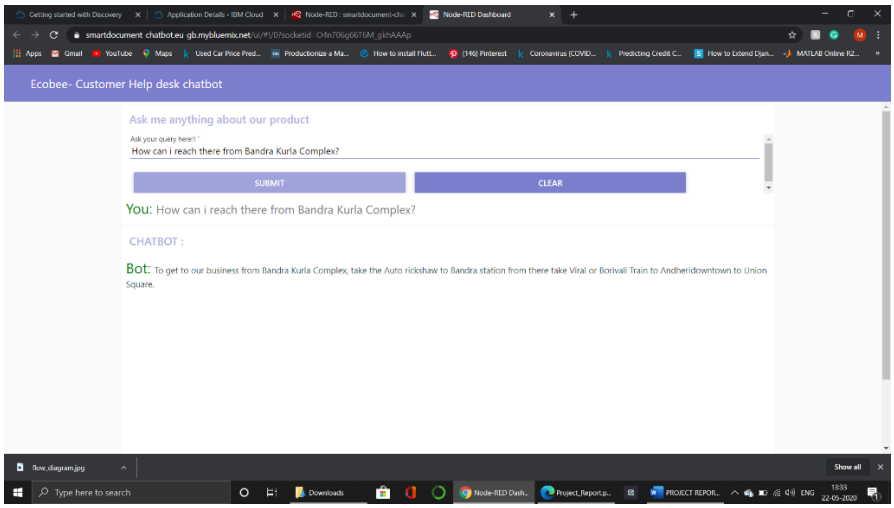
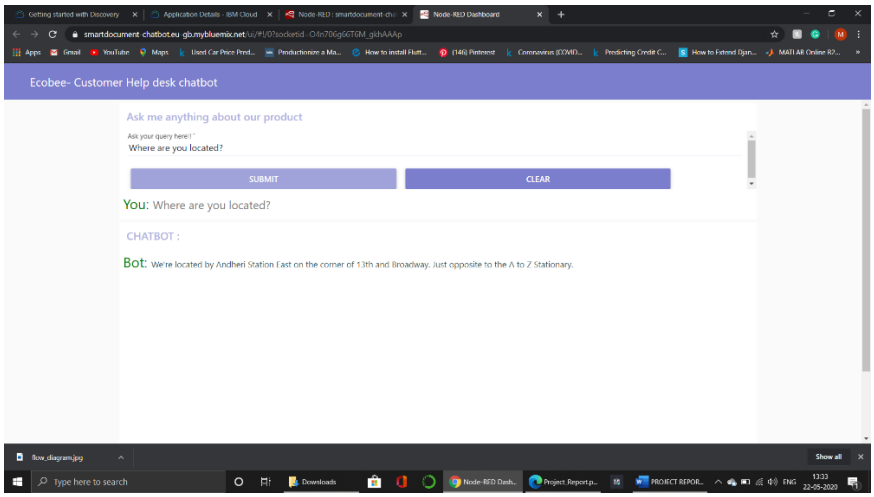
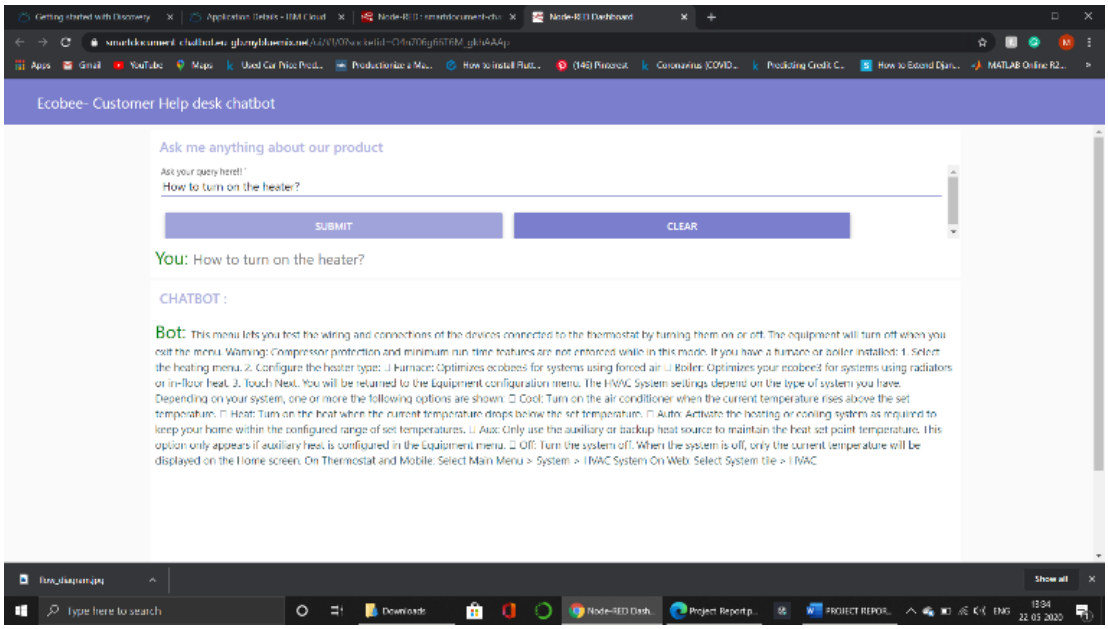
RESULT


Ecobee- Customer Help desk chatbot
Ask me anything about our product
Ask your query here!!
How can i reach there from Bandra Kurla Complex?
SUBMIT
CLEAR
You: How can i reach there from Bandra Kurla Complex?
CHATBOT :
Bot: To get to our business from Bandra Kurla Complex, take the Auto rickshaw to Bandra station from there take Viral or Borivali Train to Andheridowntown to Union Square.


Ecobee- Customer Help desk chatbot
Ask me anything about our product
Ask your query here!!
Where are you located?
SUBMIT
CLEAR
You: Where are you located?
CHATBOT :
Bot: We're located by Andheri Station East on the corner of 13th and Broadway. Just opposite to the A to Z Stationary.


Ecobee- Customer Help desk chatbot
Ask me anything about our product
Ask your query here!!
How to turn on the heater?
SUBMIT
CLEAR
You: How to turn on the heater?
CHATBOT :
Bot: This menu lets you test the wiring and connections of the devices connected to the thermostat by turning them on or off. The equipment will turn off when you exit the menu. Warning: Compressor protection and minimum run time features are not enforced while in this mode. If you have a furnace or boiler installed: 1. Select the heating menu. 2. Configure the heater type: ☐ Furnace: Optimizes ecobee5 for systems using forced air ☐ Boiler: Optimizes your ecobee5 for systems using radiators or in-floor heat. 3. Touch Next. You will be returned to the Equipment configuration menu. The HVAC System settings depend on the type of system you have. Depending on your system, one or more the following options are shown: ☐ Cool: Turn on the air conditioner when the current temperature rises above the set temperature. ☐ Heat: Turn on the heat when the current temperature drops below the set temperature. ☐ Auto: Activate the heating or cooling system as required to keep your home within the configured range of set temperatures. ☐ Aux: Only use the auxiliary or backup heat source to maintain the heat set point temperature. This option only appears if auxiliary heat is configured in the Equipment menu. ☐ Off: Turn the system off. When the system is off, only the current temperature will be displayed on the Home screen. On Thermostat and Mobile: Select Main Menu > System > HVAC System On Web: Select System tile > HVAC

Advantages:

- Companies can use these to decrease the work flow to the representatives.
- Reduce the number of reps.
- Cost Efficient.
- Decrease in the number of calls diverted to representatives.
- Less work load on employees.

Disadvantages:

- Sometimes the chatbot misleads the customers.
- The discovery returns wrong results when not properly configured.
- Giving same answer for different sentiments.
- Sometimes is unable to connect the customer sentiments and intents.

Application:

- It can be deployed in popular social media applications like Facebook, Slack and Telegram.

- Chatbot can be deployed at any website to clear the basic doubts of the customer.

Conclusion:

By following the above-mentioned steps, we can create a basic chatbot which can help us to answer the basic questions of the customer or user related to location of the office, working hours and the information about the product. We successfully create the intelligent helpdesk smart chatbot using Watson Assistant, Watson Cloud Function, Watson Discovery and Node-Red.

Future Scope:

We can improbe UI in node-red flow. Make more dialog skills and intents in Watson Assistant. Upload more manuals related different products companies sell. Annotate the manuals more accurately to improve results. Embed an online machine learning model to make answers more accurate over time by asking for feedback from customers.

We can also include Watson Text to audio and speech to text service, Language translator service.

Appendix

Code:

```
/**
*
* @param {object} params
* @param {string} params.iam_apikey
* @param {string} params.url
* @param{string}params.username
* @param{string}params.password
* @param {string} params.environment_id
* @param {string} params.collection_id
* @param {string} params.configuration_id
* @param {string} params.input
*
* @return {object}
*
*/
const assert = require('assert');
const DiscoveryV1 = require('watson-developer-cloud/discovery/v1');
/**
*
* main() will be run when you invoke this action
*
* @paramCloud Functions actions accept a single parameter, whichmust be a JSONobject.
*
```

```
* @return The output of this action, which must be a JSON object.
*
*/
function main(params) {
return new Promise(function (resolve, reject) {
let discovery;
if (params.iam_apikey){
discovery = new DiscoveryV1({
'iam_apikey': params.iam_apikey,
'url': params.url,
'version': '2020-05-09'
});
}
else {
discovery = new DiscoveryV1({
'username': params.username,
'password': params.password,
'url': params.url,
'version': '2020-05-11'
});
}
discovery.query({
'environment_id': params.environment_id,
'collection_id': params.collection_id,
'natural_language_query': params.input,
'passages': true,
```

```
'count': 3,
'passages_count': 3
},function(err,
data){ if (err)
{
return reject(err);
}
return resolve(data);
});
});
}
```

References:

https://cloud.ibm.com/docs/discovery?topic=discovery-getting-started

https://developer.ibm.com/tutorials/how-to-create-a-node-red-starter-application/

https://www.youtube.com/watch?v=hitUOFNne14

https://www.youtube.com/embed/5z3i5IsBVnk

https://www.youtube.com/embed/G3bqRndQtQg

https://smartdocument-chatbot.eu-gb.mybluemix.net/ui/#!/0?socketid=O4n706g66T6M_gkhAAAp