Hands-On Lab: Watson Discovery

In this lab you will learn how to build a demo application using Watson Discovery service (and Watson Assistant) that can be used to help demonstrate the value of Discovery for conversational applications.

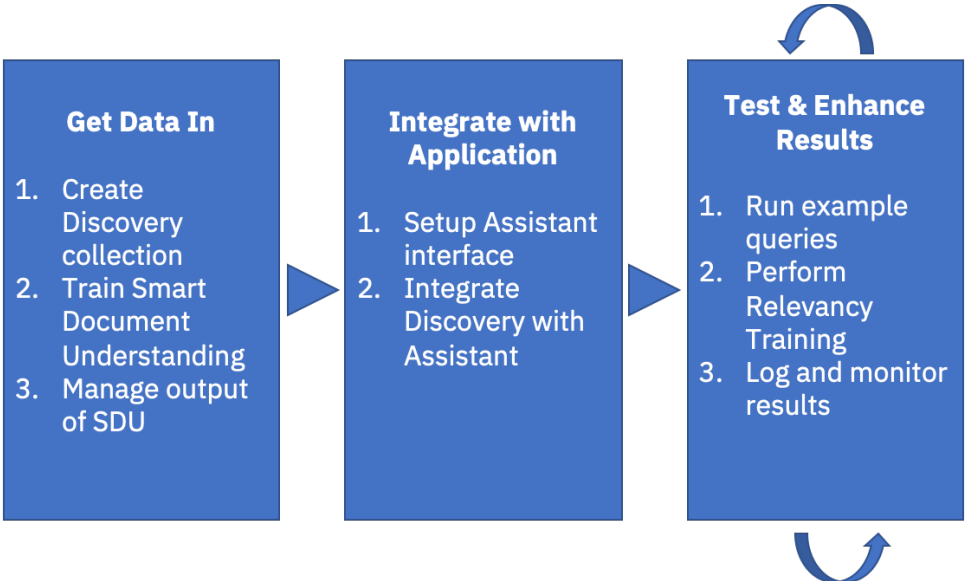
The core use case represented is user support. In many industries, support is essential to providing great experiences, achieving customer satisfaction, and building brand loyalty. Conversational AI solutions using Watson Discovery can help achieve two goals for support organizations:

1. Deflect support cases away from human agents by providing customers the answer to their question
2. Assist support agents in finding responses quickly to reduce case handling times and improve overall customer satisfaction

This lab presents an example of support in a retail banking setting to help with case deflection. For this use case there are few key benefits to highlight with Discovery:

1. The ability to answer natural language questions that may come directly from customers that are unfamiliar with an organization's products
2. The ability to answer these questions directly from existing content instead of having to spend time and resources creating new content
3. The ability to train the service to improve how it both reads the content and finds answers to provide better results to the user

Lab Outline



Prerequisites:

- NodeJS (https://nodejs.org/en/)
- Python 3 (https://www.python.org/downloads/)
- IBM Cloud Account with space to create at least 2 service instances

If you do not have an IBM cloud account

1. Create a new IBM cloud account:
    - Go to the IBM cloud login page https://cloud.ibm.com/login
    - Click on Create an IBM Cloud account
    - Fill up the form
    - Click Create Account to create an account
2. Check your registered email, for confirmation email from IBM cloud.
3. In the confirmation email, click on Confirm account
4. Login to the newly created IBM cloud account with:
    - https://cloud.ibm.com/login

Step 0: Create Watson Services

1. Create an instance of the Assistant service and get your credentials:

    - Go to the Assistant page in the IBM Cloud Catalog.
        - Or copy the below link: https://console.bluemix.net/catalog/services/conversation
    - Log in to your IBM Cloud account.
    - Ensure that the region is **Dallas**
    - Select **Plus Trail** plan if it is not selected.
    - [Optional] scroll to the **Service name** field and change to **Assistant-Lab**
    - Click **Create**.
    - Click **Show** to view the service credentials.

2. Create an instance of the Discovery service and get your credentials:

    - Go to the Discovery page in the IBM Cloud Catalog.
        - Or copy the below link: https://console.bluemix.net/catalog/services/discovery
    - Log in to your IBM Cloud account.
    - Ensure that the region is **Dallas**
    - Select the **Lite plan** if it is not selected
    - [Optional] scroll to the **Service name** field and change to **Discovery-Lab**
    - Click **Create**.
    - Click **Show** to view the service credentials.

Step 1: Setting up Watson Discovery

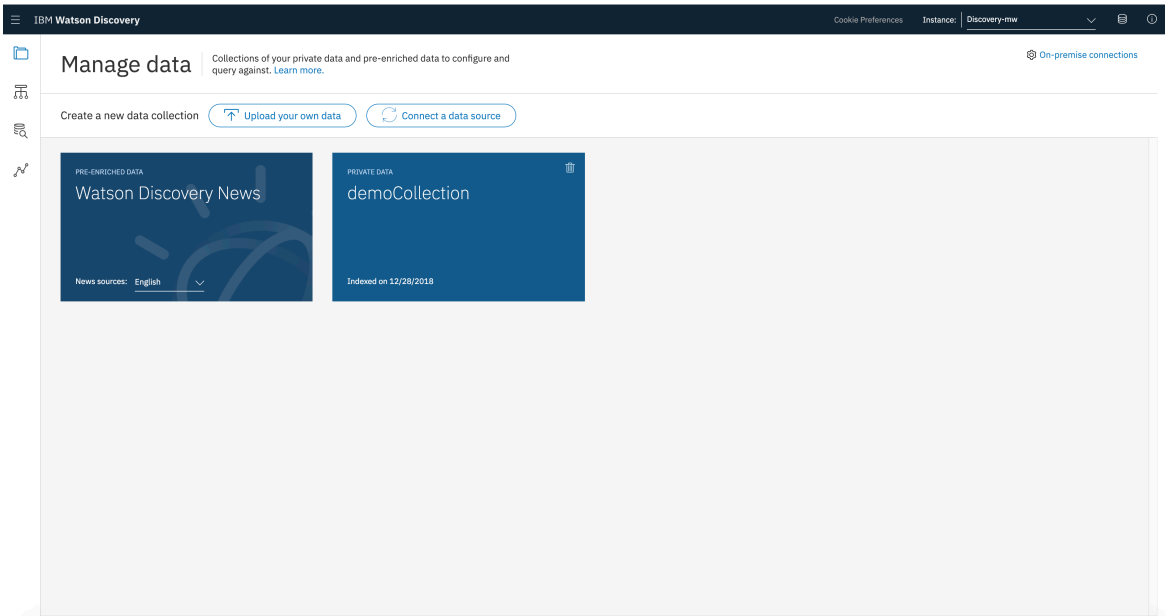
The majority of this lab will focus on getting Watson Discovery setup and using core features of Discovery to improve results.

Setup Discovery Collection

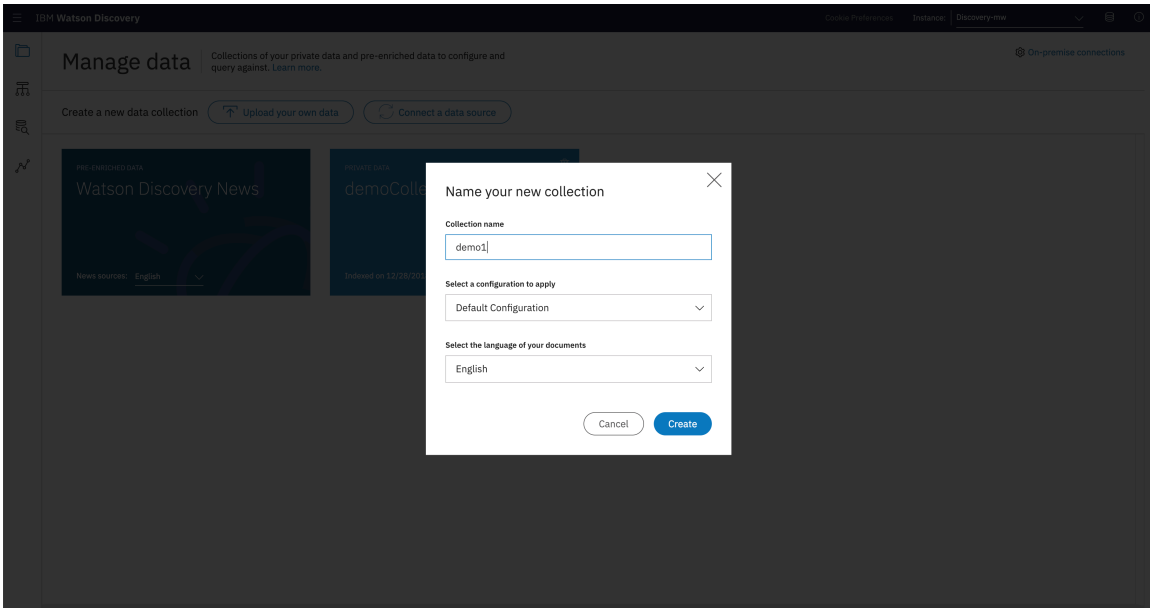
1. Open and login to the IBM cloud dashboard: https://cloud.ibm.com

2. Click on Services in the **Resource summary** pane to expand on the Resource list view.
3. Click on Discovery-th under the **Services** section
4. Click on **Launch Watson Discovery** to open the Discovery tooling

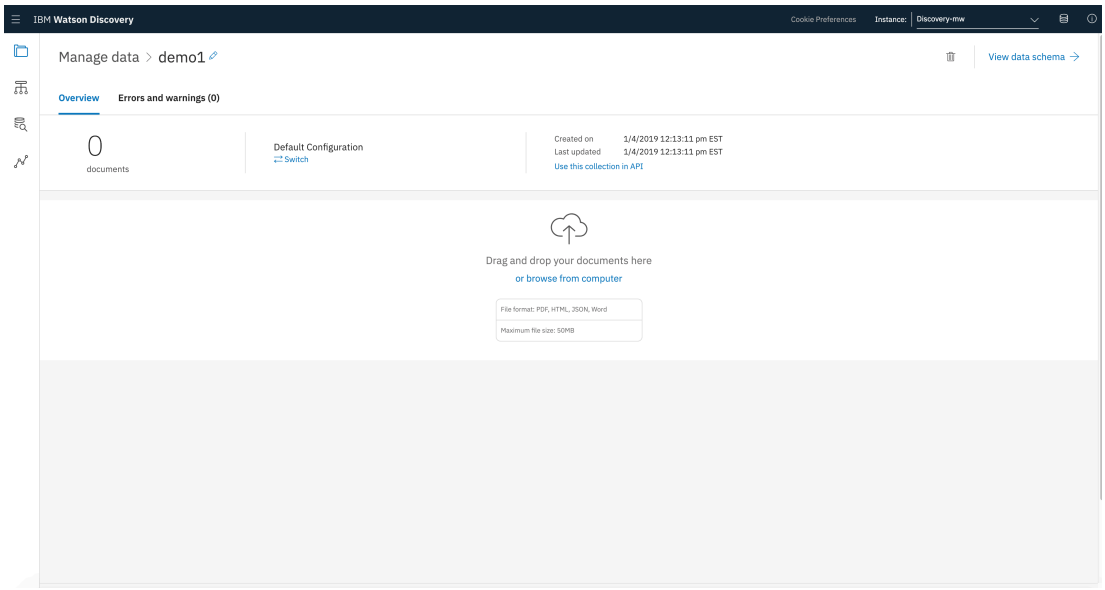
5. Select “Upload your own data” under “Create a new Data Collection”



6. Name your collection “demo1” and keep the Default Configuration, and English language settings as is



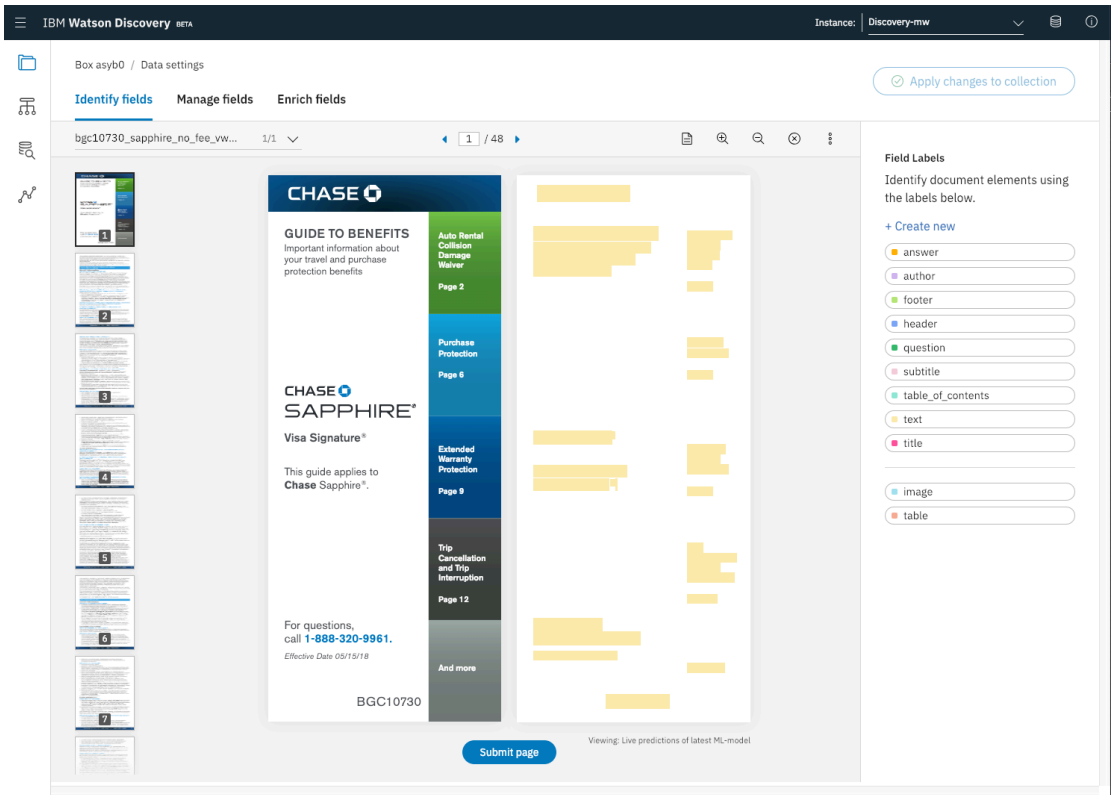
7. Download the sample document located at the box folder here: https://app.box.com/s/4jpkidz8pwed5di0rcygcc2p1hmhqt4s and then drag and drop from the download location into the Discovery tooling:
    a. It may take a minute or two to finish uploading and for the count to become 1.



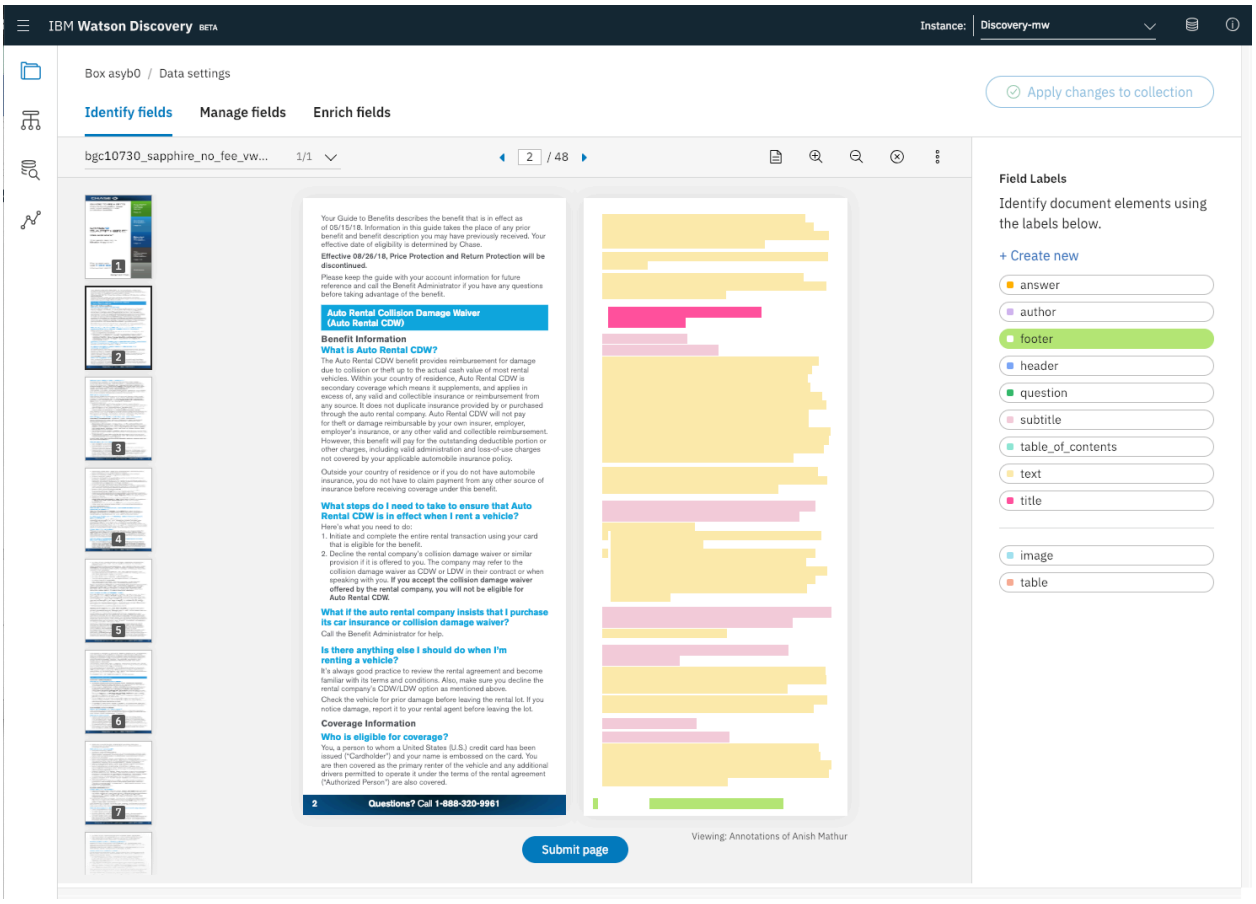
Step 2: Train Smart Document Understanding

Smart document understanding (SDU) is a new feature in Watson Discovery for learning the structure of documents. It allows you to train on examples of the document structure, and then apply the model to more data, to take something like a pdf and extract structure and meaning. This becomes extremely valuable when trying to create well-formatted, metadata-rich answers within a conversational interface.

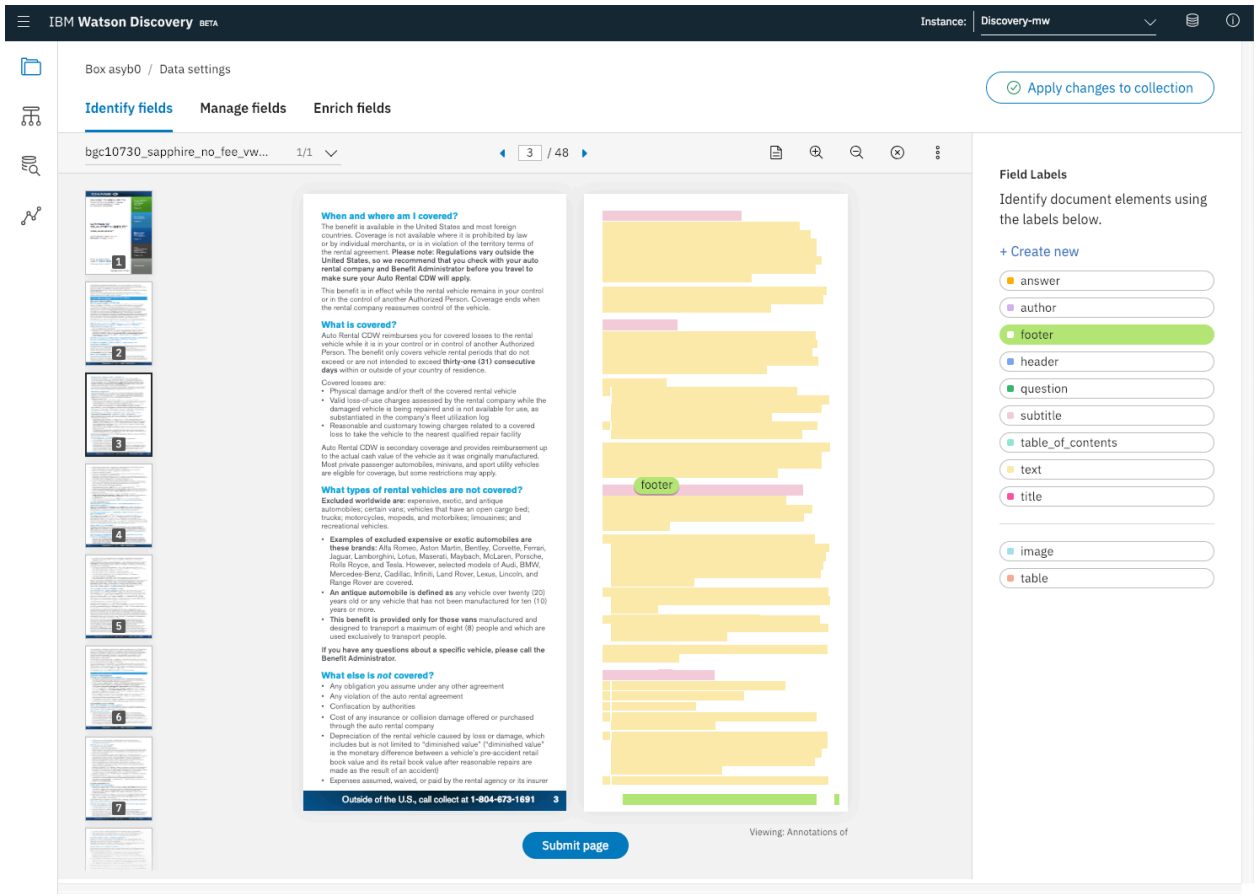
1. Select 🗀 on the left panel and click on the newly created collection to get to the **Overview** page of the collection.
2. Select Configure data ⚙ from the **Overview** page.
3. You will come to the Smart Document understanding labeling screen. This is where you train SDU on your text.
    a. On the right are “Labels” these are the tags that you can assign to different parts of the document. (Note this is training on the structure, so it ignores the words on the page).
    b. In the center you see a view of the original PDF and a view with each section block highlighted, this is where you can make annotations by selecting a label and then a block
    c. On the left are all the pages of the document.
    d. For each page, SDU will show a preview of what the model thinks the content should contain, as you add annotations, you will see these predictions update for future pages.



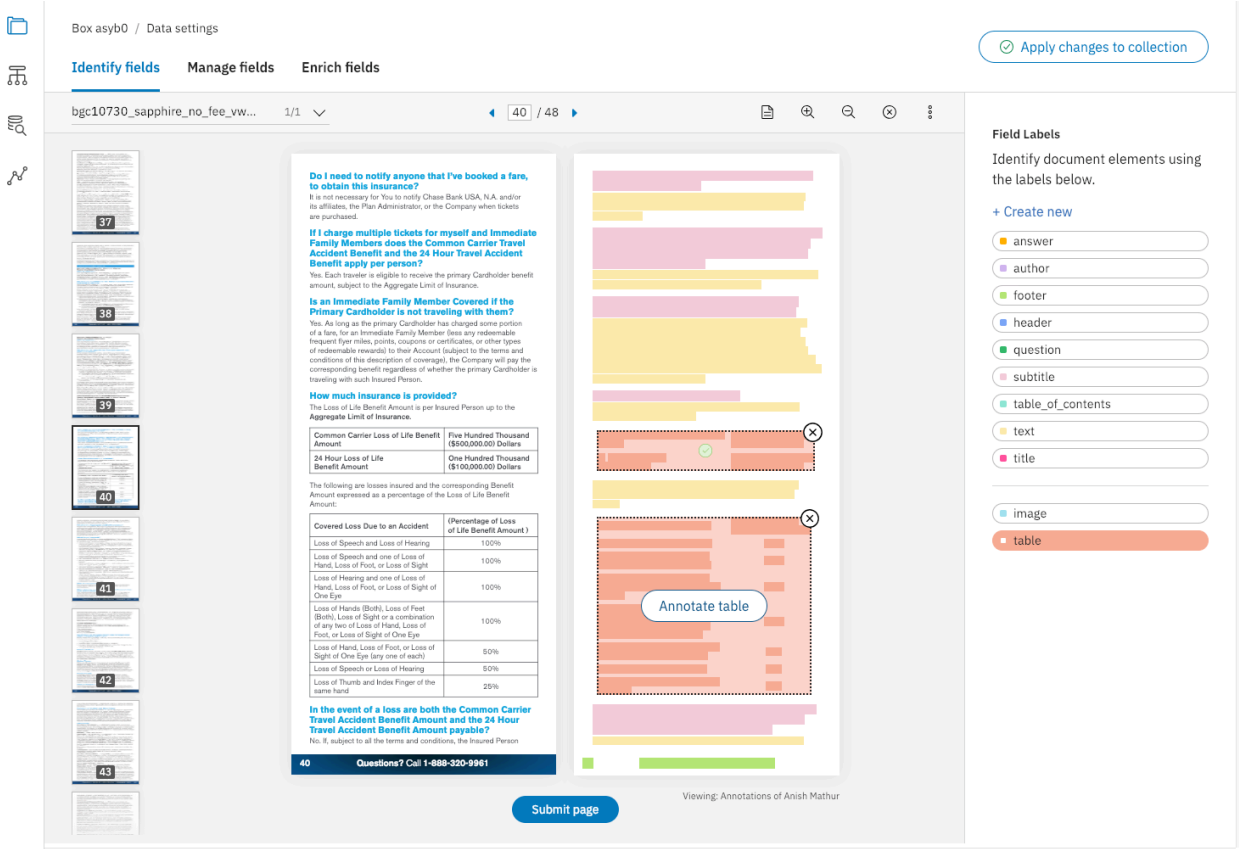
4. For now let's skip the title page since it's a bit unique. Starting on page two, you can see the structure of the document. It has a Title section in blue and then a number of FAQs as subtitles. So we can use the labels to mark the document as such.
5. There is also a consistent footer on every page, we want to identify that footer so we can potentially remove it.



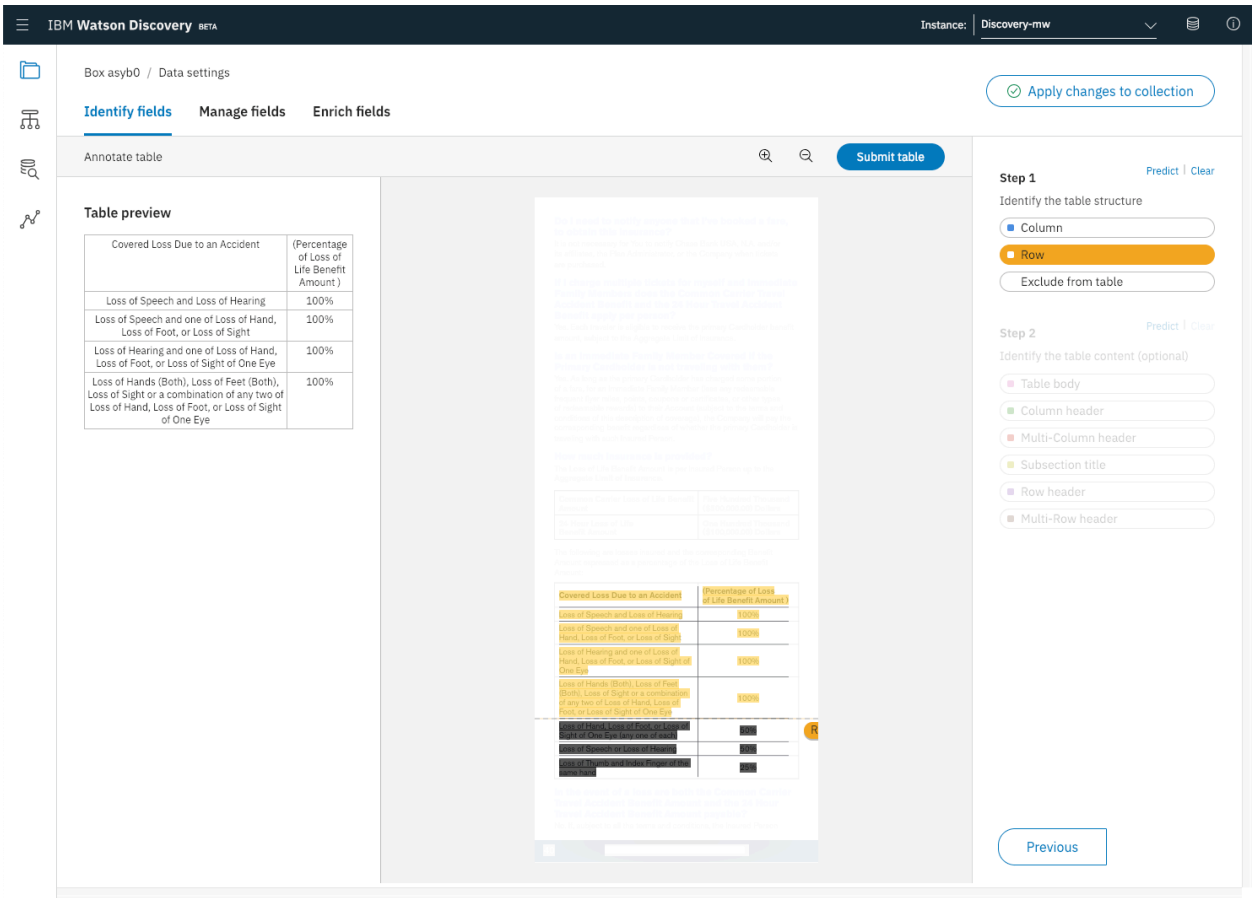
6. When done hit submit page, and you'll advance to the next page in the document.
7. Let's mark up one more page and then see how the model is doing.
    a. **Customer Value:** With a small amount of training you can get a very accurate and scalable model that can be applied to a larger set of documents. Reduces the need for costly preprocessing and curation.



8. Now when we go to the next page we can start to see that the model understands the structure. Without annotating, it has found the subtitles, and footer on the page.
9. One of the other major benefits of SDU is the ability to extract data from Tables. Page 40 has an example of table that can be annotated. Use the table label to mark where the table appears in the document. You should see a button appear to “Annotate Table”



10. When annotating the table you mark where the columns and rows appear, then mark the column and row headers. You'll see a preview of the table appear on the left as you annotate.



11. When done with annotation we can hit Submit Table in the top right
    a. **Customer Value**: The ability to extract structure from tables in unstructured content is a unique differentiator in Discovery and provides the ability to perform complex analysis over docs in more Expert Assist focused solutions (where the end user is a knowledge worker rather than a customer or support agent)
12. Once we've gone through and annotated enough pages to feel confident the model is picking up what we need, we can select "Apply Changes to Collection" and it will sync our document again using the SDU model we just produced.

Using the Output of SDU

The most common use of SDU is for managing fields within your documents. Each label will appear as a separate field for the doc in Discovery. You can create structured queries to run against these fields.

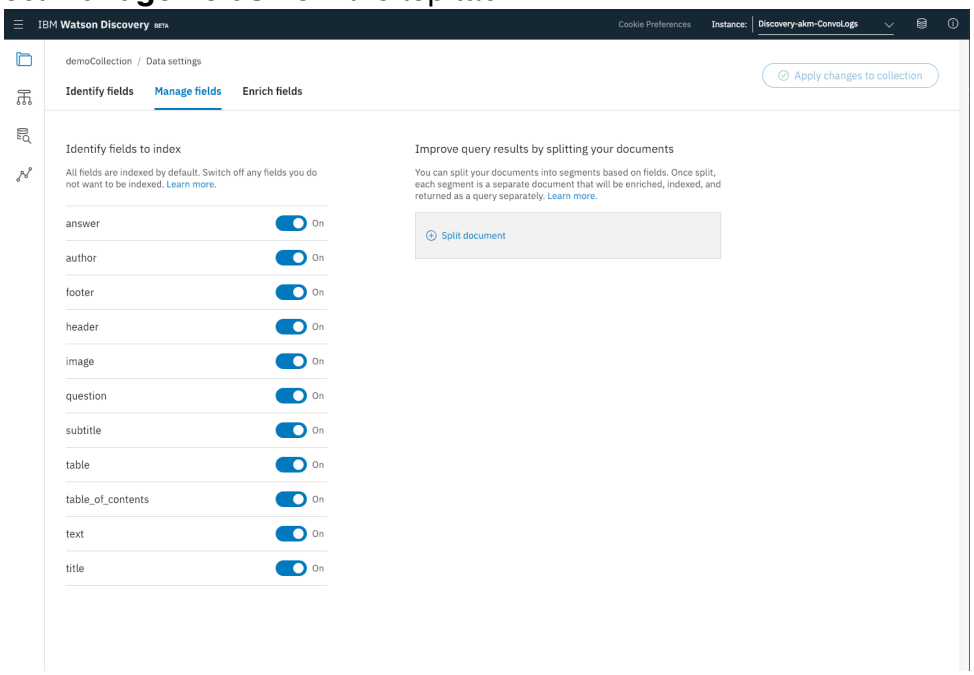
1. Let's look at how to query what we got from SDU. To start we'll run an empty query to see the JSON structure of our document
2. From the results you can see the document has a subtitle, text, and source.
    a. **Customer Value**: We can already see that SDU has helped identify the structure of the doc that we can use to create something like FAQs. This reduces the need to produce this structured data separately.

3. You can split a large pdf like this on these structural elements like subtitles even if they don't have a consistent font or style. This is very valuable for creating good answers for a chatbot interface.

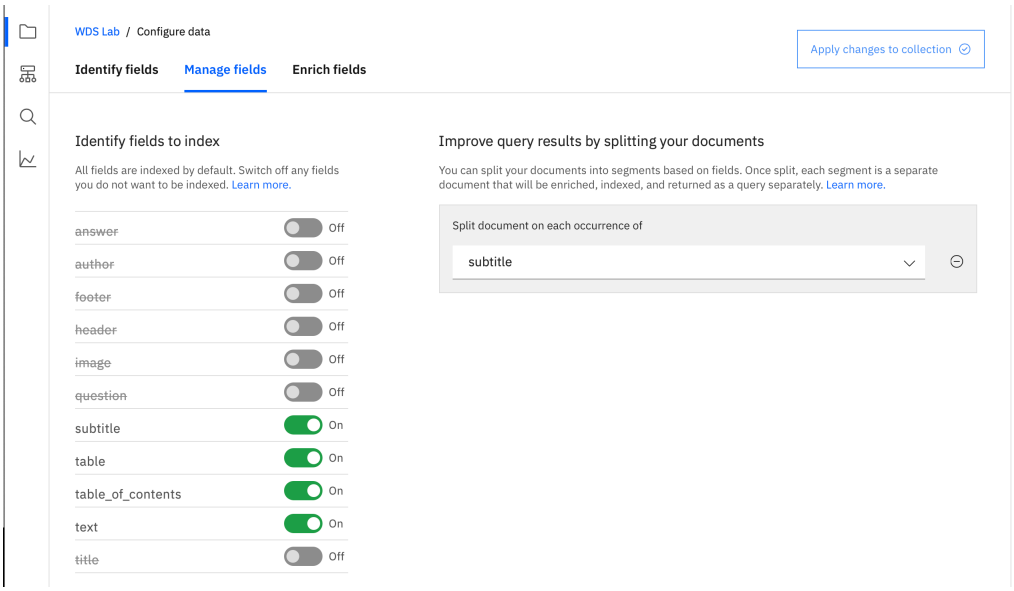
Automatic Splitting Document by SDU

The sample pdf is quite a large pdf with total 48 pages. To get good query result with simplify Discovery NLQ, it is best split into smaller documents. To use the SDU to split the document:

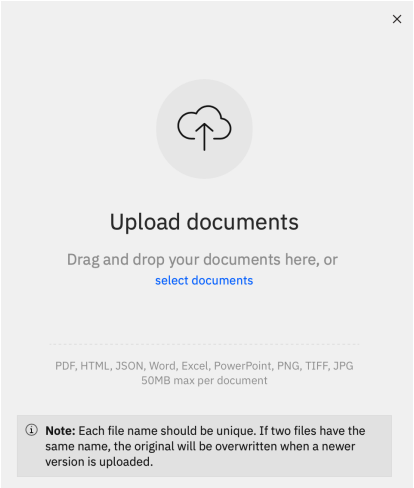
1. Select 🗀 on the left panel and click on the newly created collection to get to the **Overview** page of the collection.
2. Select Configure data ⚙ from the **Overview** page.
3. Select **Manage fields** from the top tab.



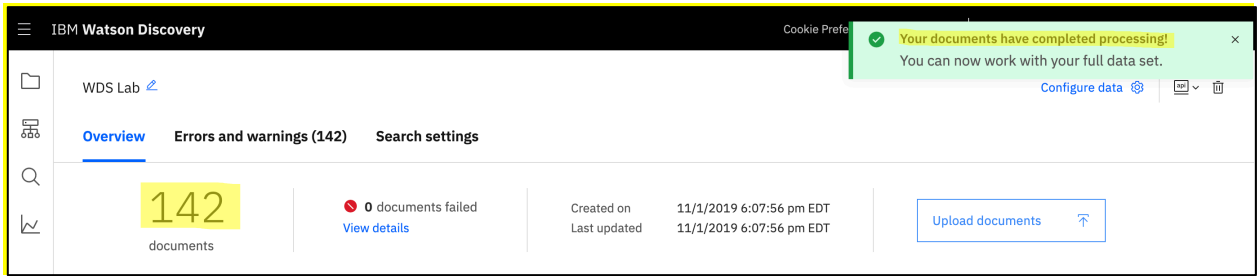
4. Select and turnoff those fields that do not want to be indexed by Discovery.
5. Select + Split document to enter split field select option
6. Select subtitle as the field to split the document



7. Select **Apply Changes to Collection**
8. Drag the sample document into the Upload documents window, to start the document splitting process.



9. Check on the split documents process, refresh the collection page if needed. You should see a message "**Your documents have completed processing!**" and documents count should increase.



Now you can try using the output of SDU to get better NLQ results

Step 3: Exploring the collection

Next you can try to explore how the data is indexed and enriched in Discovery:

1. Select the on the left pane to view the **data schema** page.
2. Select the **Collection view** on the top tab of the left pane in the main window.
3. Click on the **text** to view the top values.
4. Click on each of the **enriched_text** field to view the top values of each field category.
5. Click on **subtitle** to view the top subtitle
6. Select the **Document view** on the top tab of the left pane in the main window.
7. Browse through the top split documents and the fields and enriched fields.

Query Discovery Collection

Next you can test out how is the performance of the Discovery collection or try out how to build query on the fields.

1. Select the on the left pane to view the **build queries** page.
2. You can try any or all of the following queries and click Run query on the bottom of the left pane of the main window:
    a. Click on the **Search for documents** to try out using:
        i. **Use natural language**
        ii. **Use the Discovery Query Language**
            - Refer to Discovery Concept for details about the Discovery Query Language
            - Refer to Discovery Query Operator for details about the operators
            - Refer to Aggregations for details about the aggregation
            - Example of Query Language
                - Return the enriched_text.concepts.text contain the term “cloud computing”

                - Return top enriched_text.concepts.text

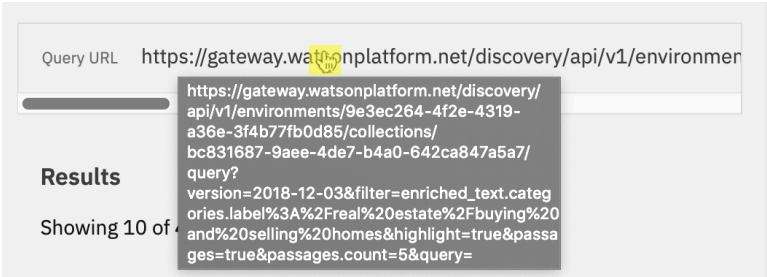
    b. Click on the **Include analysis of your results** to try out using:
        i. Build in visual mode to build query in visually assist mode
        ii. Edit in query language to build query in Discovery Query Language
    c. Click on the **Filter which documents you query** to try out using:
        i. Build in visual mode to build query in visually assist mode

ii. Edit in query language to build query in Discovery Query Language

d. Click on the Use a sample query to try out some of the sample queries.

3. All the above queries you can try out:
4. Click on > More options in bottom of the search option to customize the result
   a. Include Passages
   b. Specify fields return
   c. Number of passages / documents to return
   d. Max character count for each passage *
   e. Number of query results to skip at the beginning, for pagination

   * Only available if passages result is included
5. Click on the JSON tab on the right result pane to view the result in JSON format
6. Mouse over Query URL to view the URL for the query



Application for Discovery

Watson discovery does not come with any application for end user to search or discover insight from the collection. In order enable end user to search collection, one of the use case is to connect Watson Assistant to the Discovery collection, so that the end user can use the chat bot interface to query the Discovery collection.

Connect Discovery to Watson Assistant for Simple Chatbot query

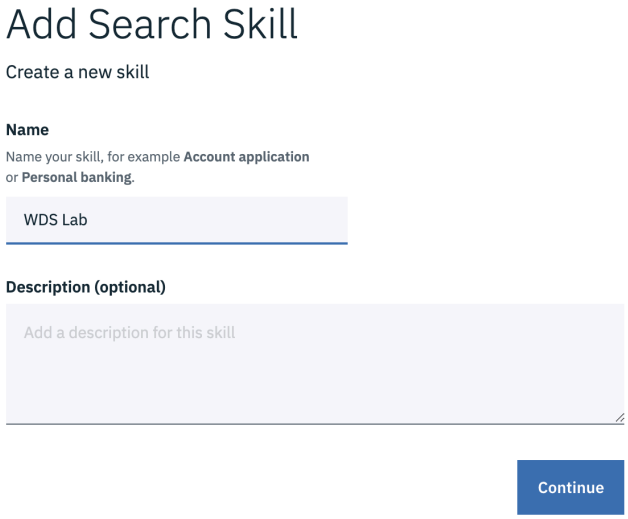
Follow the below steps to setup Watson Assistant, and configure Watson Assistant search skill to search Discovery Collection.

Step 4: Setting up Watson Assistant

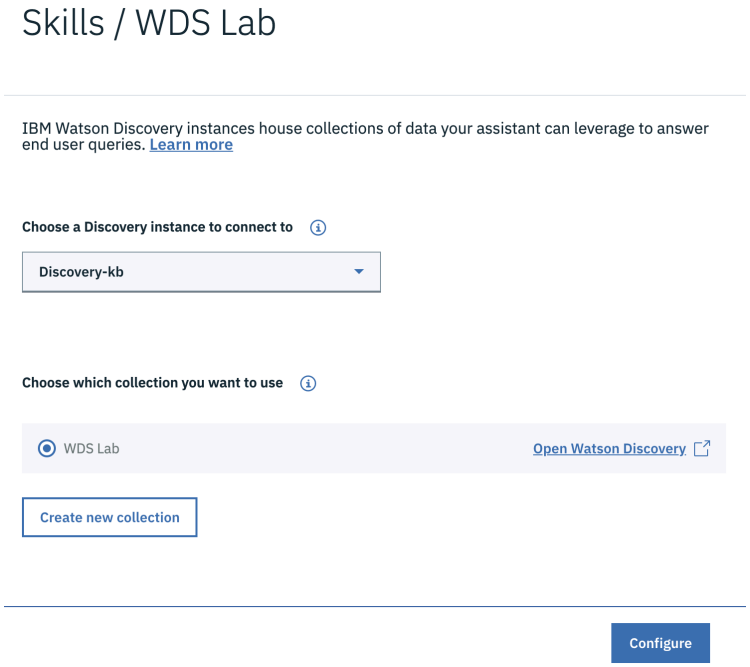
Follow the below steps to setup Watson Assistant.

1. Open the Watson Assistant tooling with the url: https://watson-assistant.ng.bluemix.net
2. An new assistant name **My first assistant** and new dialog skill name **My first skill** are created.
3. Click on **My first assistant** to open the assistant.
4. Click on the Add search skill to create a new search skill.

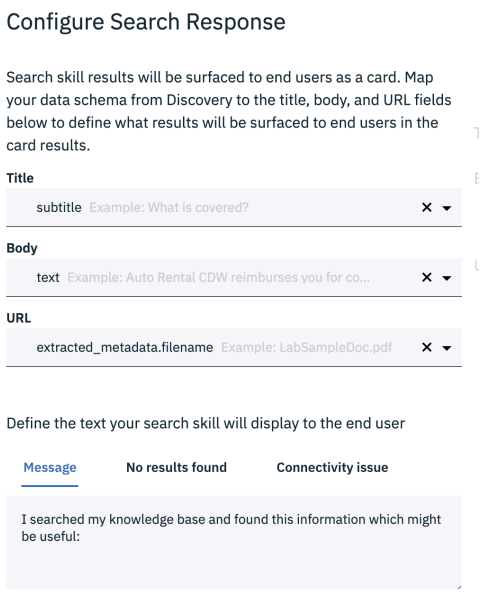
5. Enter a Name for the search skill and click **Continue** to continue to next step.



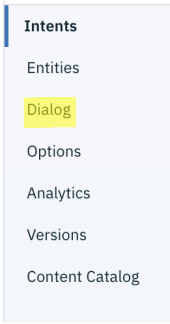
6. Choose the discovery instance and collection to be connected and click on **Configure** to configure the search skill.



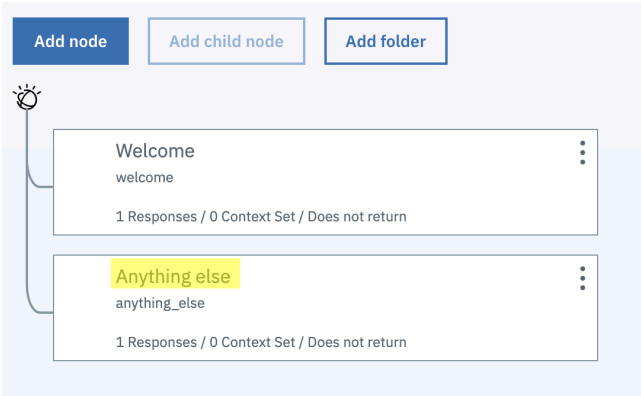
7. Select the Title, Body and URL with subtitle, text and extracted_metadata.filename
8. Optionally, you can customize the responses for search skill for **Message**, **No results found** & **Connectivity issue** conditions.
9. Click **Create** to create the new skill.



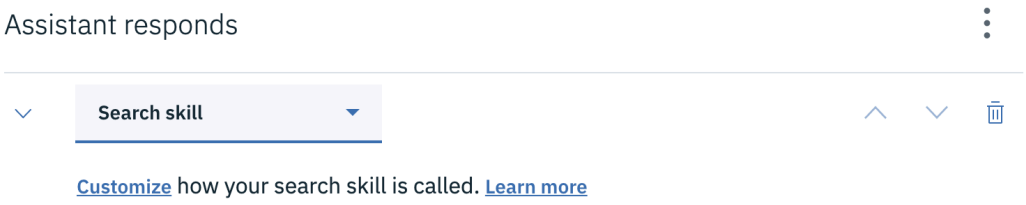
10. Select the Dialog skill **My first skill** the **My first assistant** page.
11. Click on the Dialog on left pane.



12. Click on the Anything else dialog node



13. Change the **Assistant responds** to **Search skill**



14. Optionally, can customize the Query and Filter by click on the

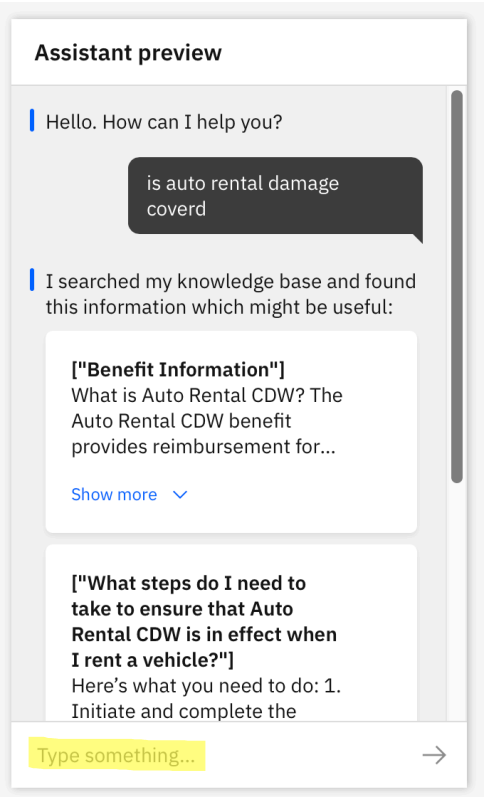
Step 5: Testing Discovery with Preview Link

We had setup our Watson Assistant to search for answer in discovery, now is time to setup the preview link and test the search.

1. Click on the on the extreme left pane to switch to the Assistants view.
2. Select **My first assistant** from the Assistants view.
3. Click on the Add integration to access the Assistant integration page
4. Click on the Preview link to go to the **Preview link integration** page

   Preview link
   Embed the assistant in a chat widget hosted on an IBM-branded web page that your team can use for testing.

5. Click on the Create button to create the preview link.
6. Click on the generated preview link to open the preview link. The link should something like below:
   https://assistant-chat-us-south.watsonplatform.net/web/public/xxxxxx
7. Type your natural language query in the Type something... text box and see the response from search.



Step 6: Enhancing Results

Now that we have setup our application, we can run some test queries and see how we can potentially improve the results.

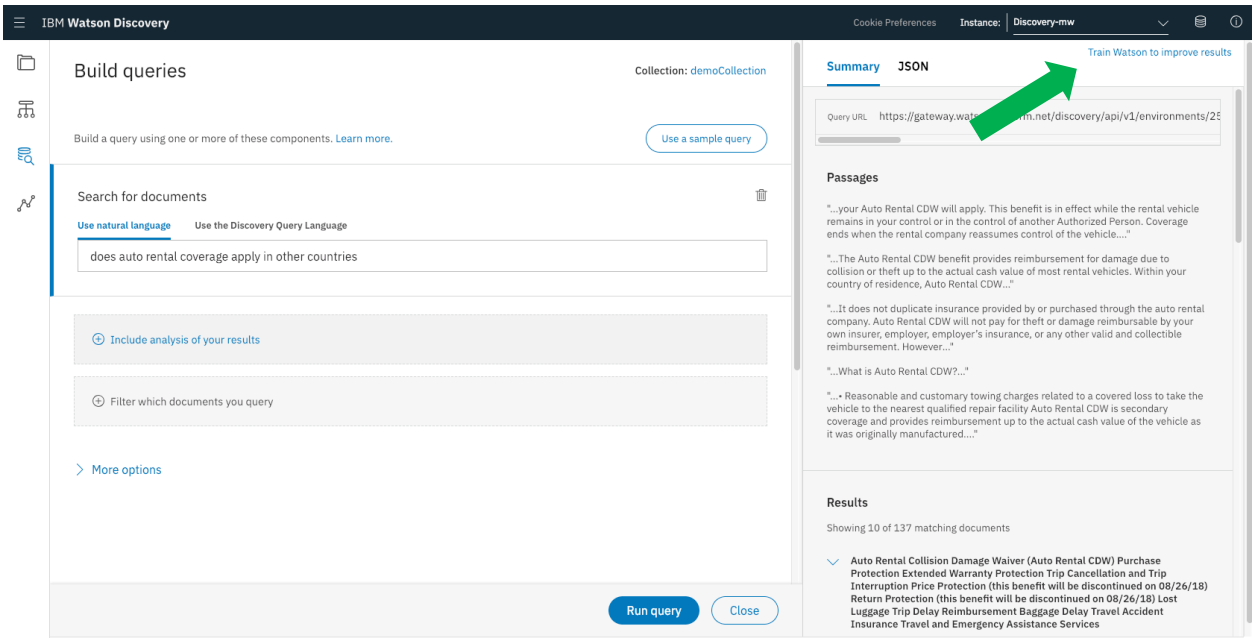
Start by running a few sample queries like, “does auto rental coverage apply in other countries” or “is lost luggage covered”

Running these queries will give an initial sense for how well the service is doing

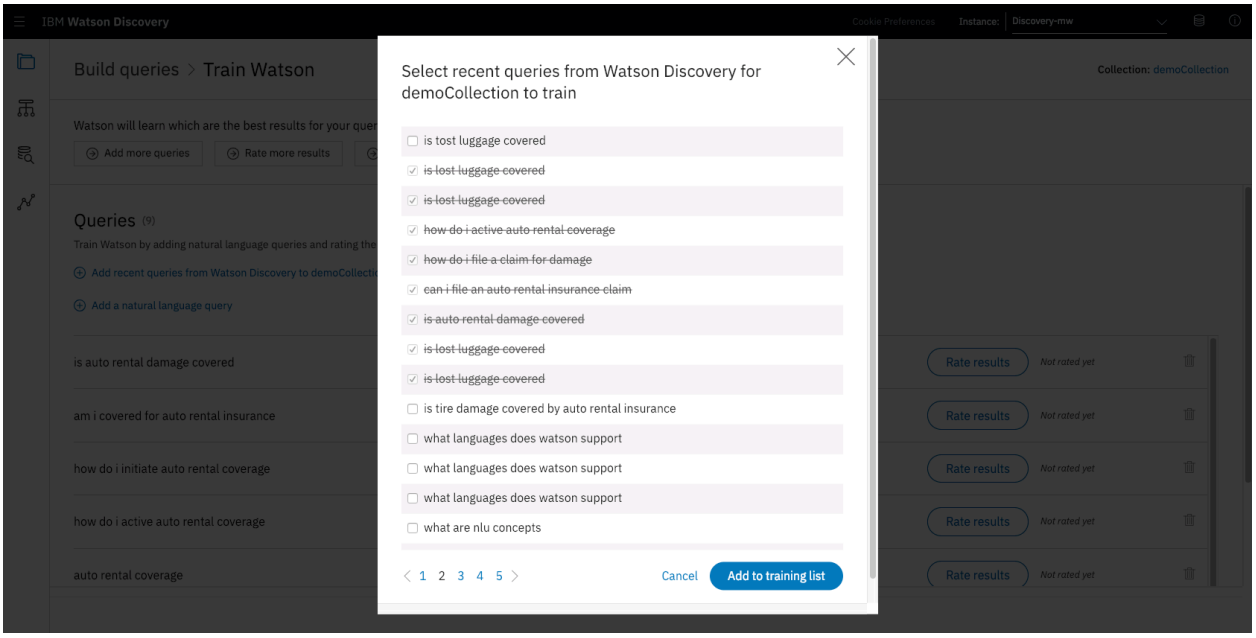
Ideally, you want to create a test set of queries (at least 50) that you can measure the accuracy against. There are several metrics that can be used for measuring accuracy of results from Discovery see here for some suggestions. This set can then be used to determine when you see improvement and help quantify the effort/benefit for customers.

Performing Relevancy Training

1. One method for improving the order of results is performing Relevancy Training.
    a. Relevancy training provides a supervised machine learning approach for helping Discovery learn which results to pull to the top
    b. For more detail on Relevancy Training, see
        i. Documentation here: https://console.bluemix.net/docs/services/discovery/train-tips.html#relevancy-tips
        ii. Blog post here: https://developer.ibm.com/dwblog/2017/get-relevancy-training/
        iii. Internal FAQ here: https://apps.na.collabserv.com/wikis/home?lang=en-us#!/wiki/W19ab95afacb0_412d_b762_2e874c0f2a9e/page/FAQ%20-%20Relevancy%20Training?section=Relevancy%20Training
    c. Relevancy training can be especially valuable when used in combination with SDU. SDU creates new metadata fields that Relevancy training can then learn over to improve results.
2. In order to perform relevancy training you need a set of training questions and results. One way to collect examples for training is to use the logging and metrics features in the application
    a. Discovery logs queries run against private data collections and makes them accessible for analytics
    b. To use logged queries for training, select “Train Watson to improve results” from the query results page in the Discovery tooling

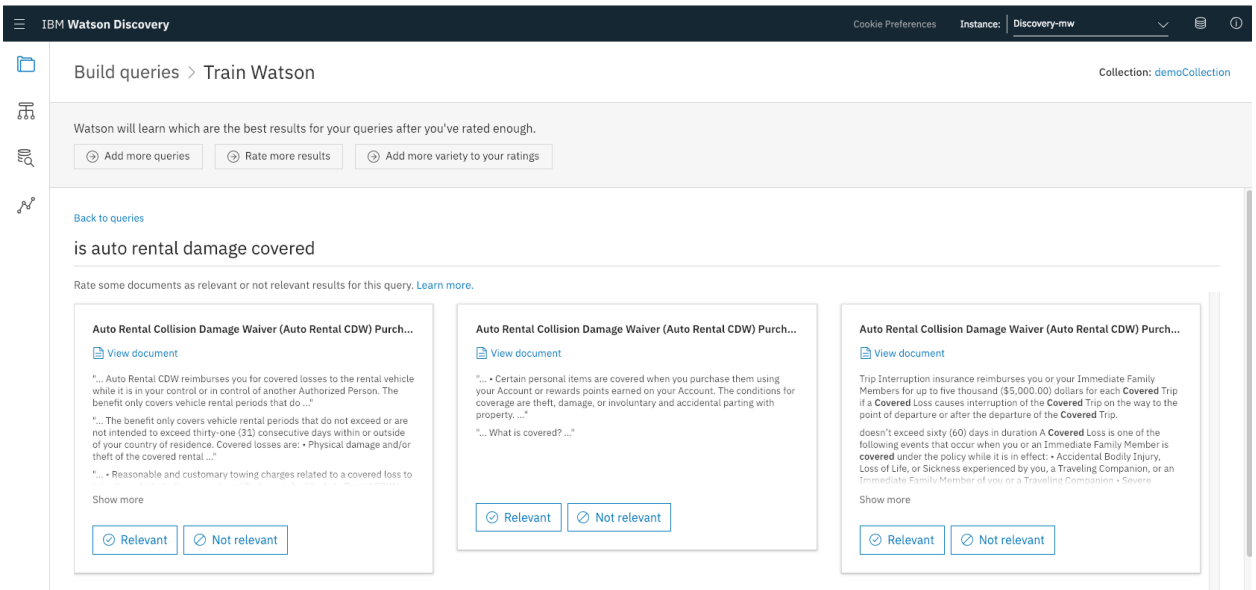


c. From the Training screen, select “Add recent queries” You should see a list of the queries that were run against the collection.
d. Select queries that are most representative of real customer queries for this use case and then chose “Add to training list”



3. We can now start rating results, for each question go to “Rate Results”
   a. From the rating screen you will see the top three results for the training query. You can choose whether a result is relevant or not relevant.

i. Note: It is helpful to provide some examples of Not Relevant results, but it is not necessary to mark all Not Relevant documents, the service treats empty and not relevant similarly.



b. Relevancy Training needs a minimum of 50 training queries with at least one Relevant rating to start.
c. **Customer Value**: Relevancy Training enables improvement of results by a business user or content expert, as opposed to many other search systems that require knowledge of search optimization techniques and continuous tuning.

Other Approaches to Improving Relevancy

There are a few other approaches that can provide significant value but are only available in the Advanced plan of Discovery in Public environments:

1. Custom stopword lists: Stopwords are common terms that contribute little to the overall relevance of a result. Discovery comes with a small list of pre-defined stopwords, but especially in cases where you only have a small number of documents (<1000) it may help to add a broader list of custom stopwords. Thse stopword lists can be added using the Discovery API: https://console.bluemix.net/docs/services/discovery/using.html#stopwords
    a. For English a common list that can be used is here https://gist.github.com/sebleier/554280

2. Continuous Relevancy Training: When building an application, often the best training data can come from real user behavior. Continuous Relevancy Training allows Discovery to use data that comes from logging embedded within your app

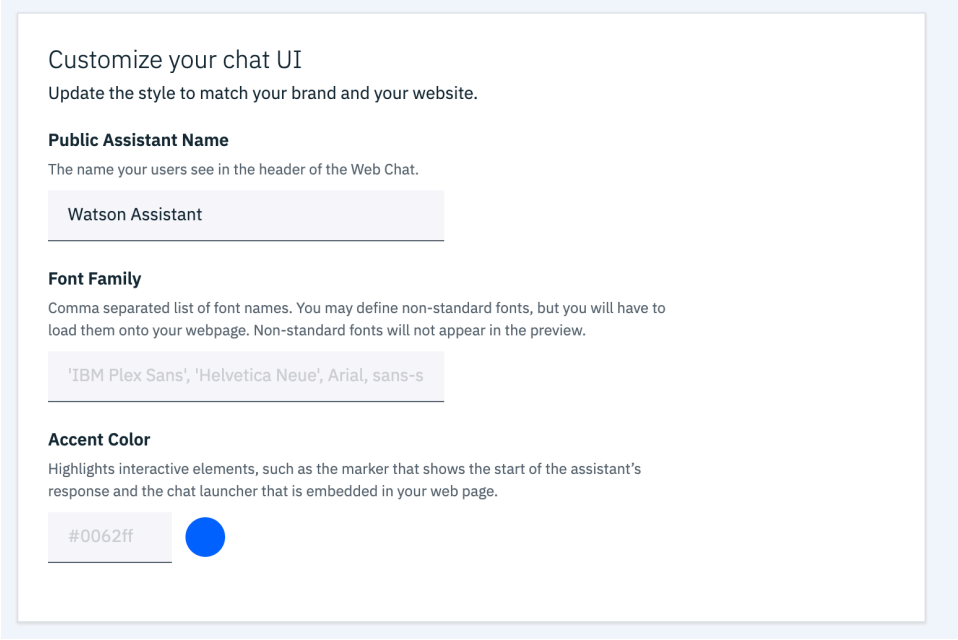
to improve results automatically as users interact with the service. https://console.bluemix.net/docs/services/discovery/continuous-training.html#crt

a. **Customer Value**: Allows a customer to scale relevance without manual intervention. Also helps produce measurable results from the interactions, e.g. average clickthrough rate and the change over time.

Step 7: Deploy chat to company web site [Optional]

After the enhancing the result to acceptable level, it is time to deploy the chat bot to company web site. Watson Assistant has a Beta Integration web chat, it is aim to provide a simple way for you to deploy the Assistant to your web site. Refer to URL: https://cloud.ibm.com/docs/services/assistant?topic=assistant-deploy-web-chat for more details. Step to deploy the beta web chat:

1. Open the Watson Assistant tooling with the url: https://watson-assistant.ng.bluemix.net
2. Click on **My first assistant** to open the assistant.
3. Click on the Add integration to access the Assistant integration page
4. Click on Web Chat BETA to add the web chat integration to the Watson Assistant.
5. Provide **Integration name** in the **Web Chat integration BETA** page
6. Click Create to create the Web Chat BETA integration.
7. Optionally, you can customize your chat UI.



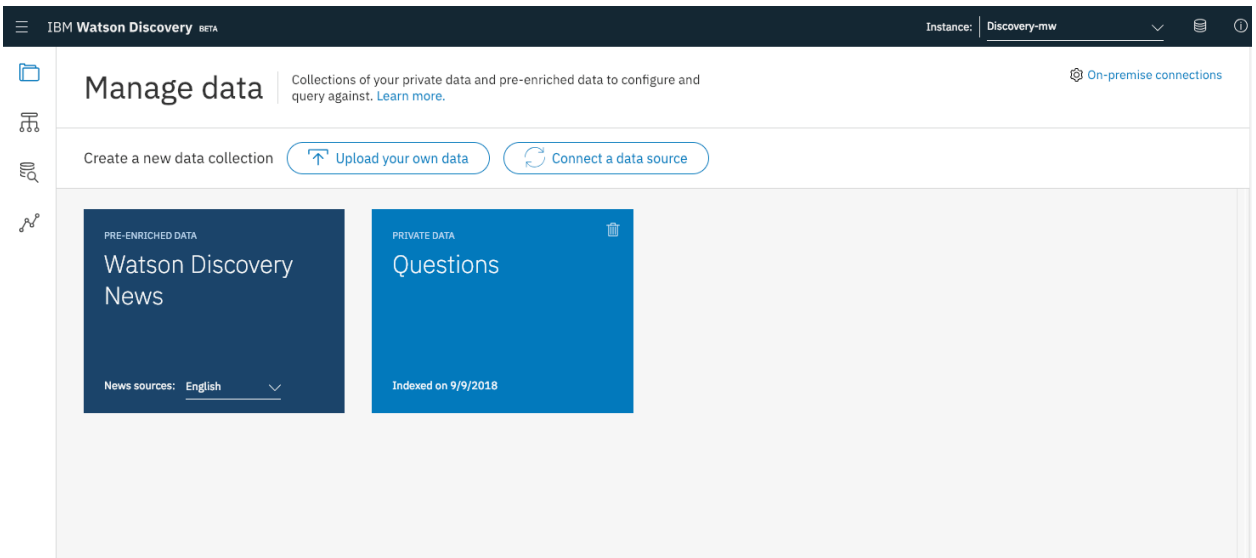
8. Copy the provided javascript code snippet from the code window and paste it in your company web page.

Optional Lab: Connect Discovery with external content source

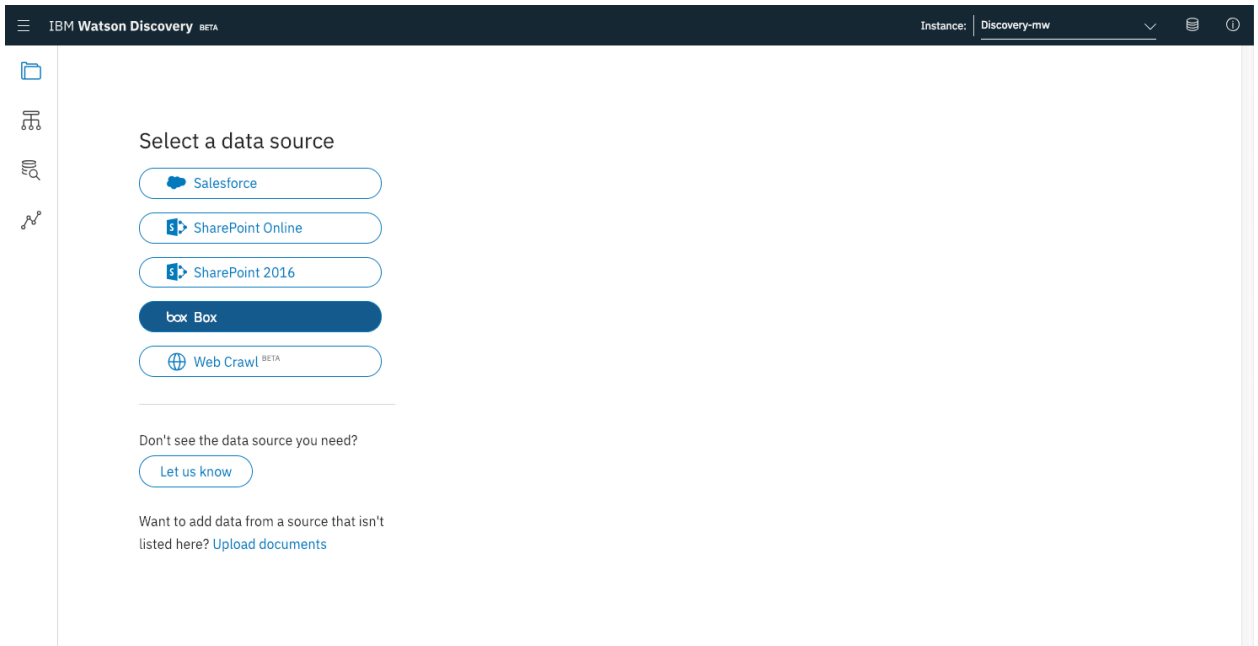
Connect to Box

We want to take a set of documents that were split using SDU and load them into Discovery (as noted above, this can be done automatically within Discovery using the Advanced Plan).
To do this we will use the built in Box data connector. The data connector provides a no-code, configuration-based way to pull data directly from Box.

1. Start by selecting “Connect a Data Source”



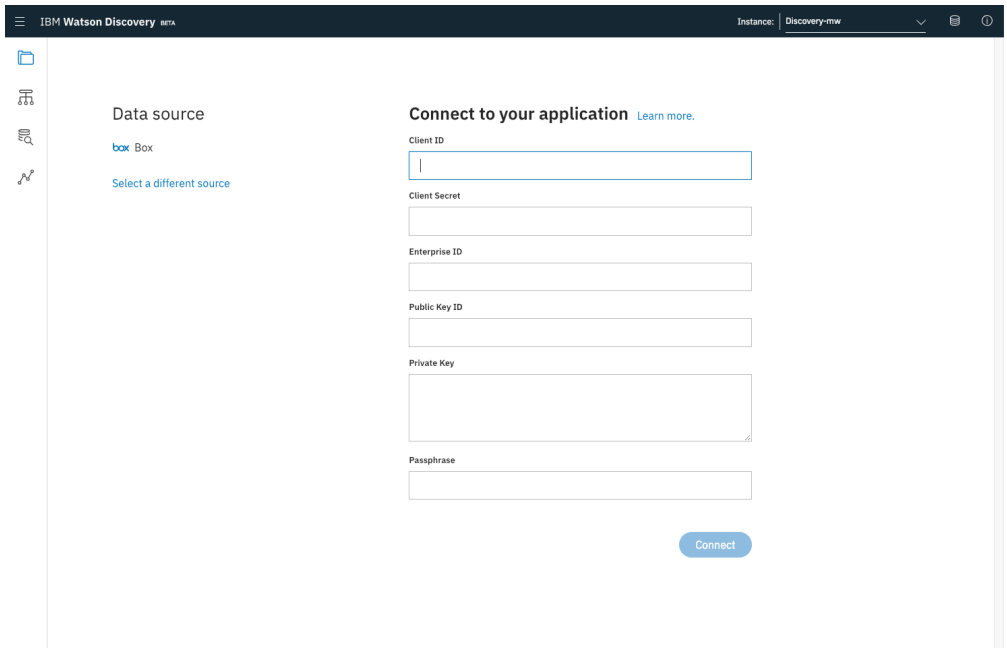
2. Next, choose the Box connector:



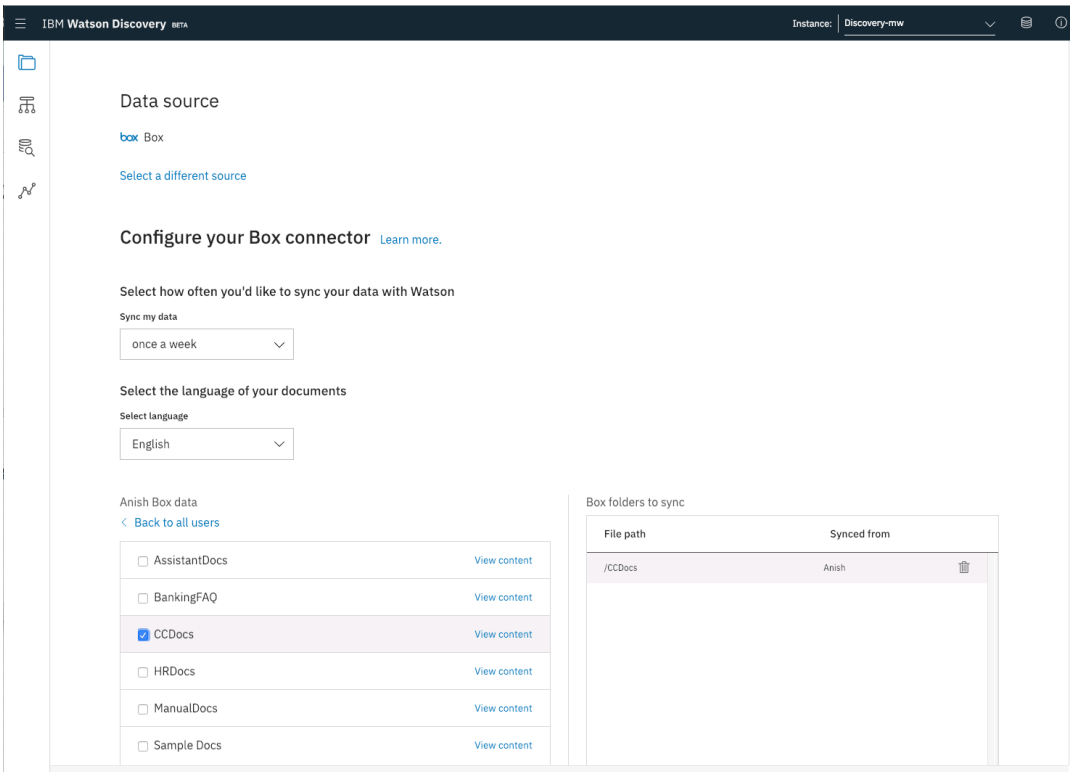
3. To connect to Box you need a set of credentials that can be acquired based on the steps here: https://console.bluemix.net/docs/services/discovery/connect.html#connectbox
    a. For this lab, we have provided a config file with the credentials to a box instance where the data is stored, these credentials will be deleted immediately after the lab is complete.

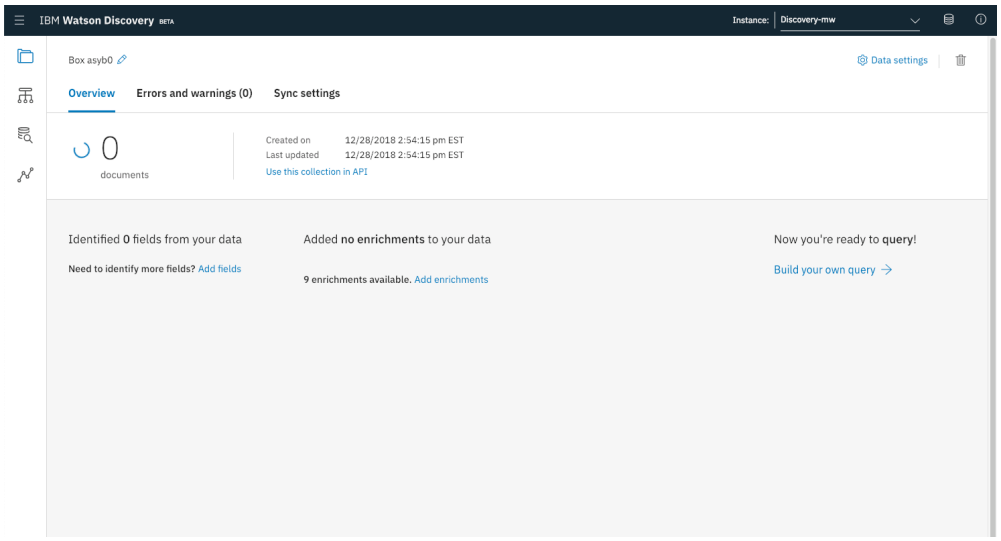
Client ID	upbup7ct8a7wwnc5ck280qp0ag08phij
Client Secret	jc5CF9ruEFynhatSZYBjkqHfWjozqShr
Enterprise ID	270378541
Public Key ID	qylxpx24
Private Key	-----BEGIN ENCRYPTED PRIVATE KEY----- MIIFDjBABgkqhkiG9w0BBQ0wMzAbBgkqhkiG9w0BBQwwDgQIn76DEHI3UEQCAggA MBQGCCqGSIb3DQMHBAg6LneRKC1xlQSCBMjZFZh+nA4FQwfjoQ3024i1Ql4ukVlq GlFFNpVNaAazWKtP70lMq8GFaqQ2Nl9fR/Q3218uq3ImksFH4q1KDkRjBcWFRfba rZEdvynS4xw7Y9+PDlSrw+EEpbrkovbi5+HVfGLwbtWfDD2D7Q0eIKu7zBYqU2Fn OAf8c3NTciB/SJD76QbC5E/KiSA/45MZGCAzSkBe5nxesjeFNDCABtxwYBcYAu+B EXGhaVTvxVrQPf9pxeIUcZnZzXHhmyw60RlyQJUz7D9Zcm9HJsU/OoUYs/4RBJeZ tlllTwFO+efrxvHM9hDX8aYHDNgR7NmQc55ucvuyk2/6I6gf7rgWTPfFv5cBEnhK lkMDj3FJX45LSeTKhHGW8cX8OlpJzCRNy0ZJ+BQpa471jMCM9pdi+zbHpN46PDOc GEBVI2AbBzYWKWgGY8T7zoyoqborCXYJYuxg3BXvAMcFH8Yl+L4bCQV0Xj2FtXCu mF398alYioT63y/Yyl7EHBNFWrj2CEuVQVr6Nw7nUUtatBKlgcj9fa9YklPuFOYj LdLnOJKDl6Gb+C/S9VCaeY6UgQWl4LTGbHAs+mvTUOKhOKKz5bcbjcnVRclzsN+M 9S9PKxSHZuxw9k32LOcS45KwueaPC65bz5/DjcNapwW5grJEeYLkFxD9VTS3rQsQ jcgYB0Jb2EtMDotM2RCKkEZWIyzNuzJzN5Kmk0vr99AyI7cV25C+vPMGVnWgFgjy HI7y/MkutodHXOI2gp8+ydU29j9MRuCgT7T4MIt61I20jPnXLLVuiGlmWNQUR2+T s1/2QixVHNsRgGz5rk3BLnc4fKlupT0GU6NZTlF0jYXGEcC0Etp0KxbDuwA+syij tnHRQn+3nsBRz19jB3AHfPfys0D673rmnEedDcMqLRpB+8iVCKPDf29IGvZrJbsa i5MgwkoVjVKa0tis75jBvK2rgDQFVdS52fkv8d7MJuap99lGvtOTDy7QeewkU9Jy te8cDiubmoWEomAqmRl3BhJB9FP3/B/CW2zBJ67SBmWkvTk65UA68XDyRraHqy3e 4encdXyIr47KraSiW7rAxMpuxZvKOMXgcyJZvXHbqG+naOil78qHU1JK1I0p6Rwd lm/dxbpY9uAERjw9KbcC1oKNPCQk6O7ZgpAXm414zDGSCrErUnqTJh0emkmDQleT dJzAVV0+N/qcL1PDc7wjHcWGoD8DrPpQL9Y4+2A7bzM/wpPEK1TFFuCNCVO0pDbe bWF6KvUNrCU37S1iS+CprNIcE0PLduf7/ZlG7VM+INT63+05Wo4V4F16aL4eV3O7 9re44b3kEc33SLCUHaSuyQcLjSjVxlSBQTXNTS99qNwC5VjmIElKWlNa6T4wmboo pKk3SzCIHLezNHEAizf+9ly46I4IRcZCJ2alDrwVDTWULqDnCIfTwBMJHjBSs7Yu t8TBpSXfO0Edd7T2flEs/Q2lDi+v9oLMlSDQsow8+8GunXkckEhRHYnJH63Hp/7d DExRYUVlFfT75gZPZck74VAmTptlAobcZebVk6W2bHLfy81CO9mrHNCxUcpAlSyp 6BJ3D7JZP9HUTlvS3u8nelLp4tXgGIgWyz0DrhUxEvXjTFGdtC+AnhzD4aE3N5Uy bE0= -----END ENCRYPTED PRIVATE KEY-----
Passphrase	1d8aeaf3f46d19ca75b786ce812465b1

4. Once you have the information, enter it into the Box connector setup and click “Connect”



5. Once the connection is setup you should see the folder structure for the your Box folder. Select the folder or document to check next to it.



6. Select Save and Sync Objects to pull the documents in from Box
7. You should start to see the document count start to increase as the documents are being sync'd (it may take a few seconds for the sync to start)

a. **Customer Value**: Content can be pulled from existing sources. A system like Box can remain the source of truth Content Management System where content is created/edited, and Discovery can simply keep in sync. This allows for the rapid integration of Discovery solutions with existing business workflows.