

Analyzing SMS offers for domain specific entities using Watson Knowledge Studio and Watson's Natural Language Understanding
<https://developer.ibm.com/code/patter...>

#natural-language-understanding #watson #watson-knowledge-studio #watson-natural-language #artificial-intelligence #machine-learning #ibmcode

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Apache-2.0

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ljbennett62 and markstur updating licensing text (#58) ...			Latest commit 7c95a36 27 days ago
data	update curl example and add a short video	10 months ago	
doc/source/images	Add files via upload	9 months ago	
lib	Updated for web UI	a year ago	
src	formatting	4 months ago	
.classpath	Revert "Memory option changed from 512M to 256M"	a year ago	
.gitignore	use proper arch image	10 months ago	
.travis.yml	Updated for deployment tracker and Travis build	a year ago	
ACKNOWLEDGEMENTS.md	add acknowledgements (#41)	10 months ago	
CONTRIBUTING.md	update MD files	11 months ago	
LICENSE	Update and rename LICENSE.md to LICENSE	11 months ago	
MAINTAINERS.md	update MD files	11 months ago	
README.md	updating licensing text (#58)	27 days ago	
manifest.yml	fixed vcap errors (#55)	4 months ago	
pom.xml	changes for IAM_APIKEY credentials (#53)	5 months ago	

README.md

Analyzing SMS messages with Watson Knowledge Studio

build passing

This code pattern describes how to analyze SMS messages with Watson Knowledge Studio (WKS) and Watson's Natural Language Understanding (NLU) capability to extract entities in the data. Current natural language processing techniques cannot extract or interpret data that is domain or industry specific because entities have different meanings in different domains. The best answer to such a problem is IBM's Watson Knowledge Studio. Consider a case where we need to extract entities present in a commercial SMS. For example:

PIZZA! Don't Cook Wednesdays are here! Get 50% off a Medium Pizza.
Offer available for single Pizza in-store and two for Home Delivery.
Walk-In/Call @ 555-555-5555

The example above has a few interesting entities which could not be extracted with conventional NLP techniques, but by using Watson services we can find out the following:

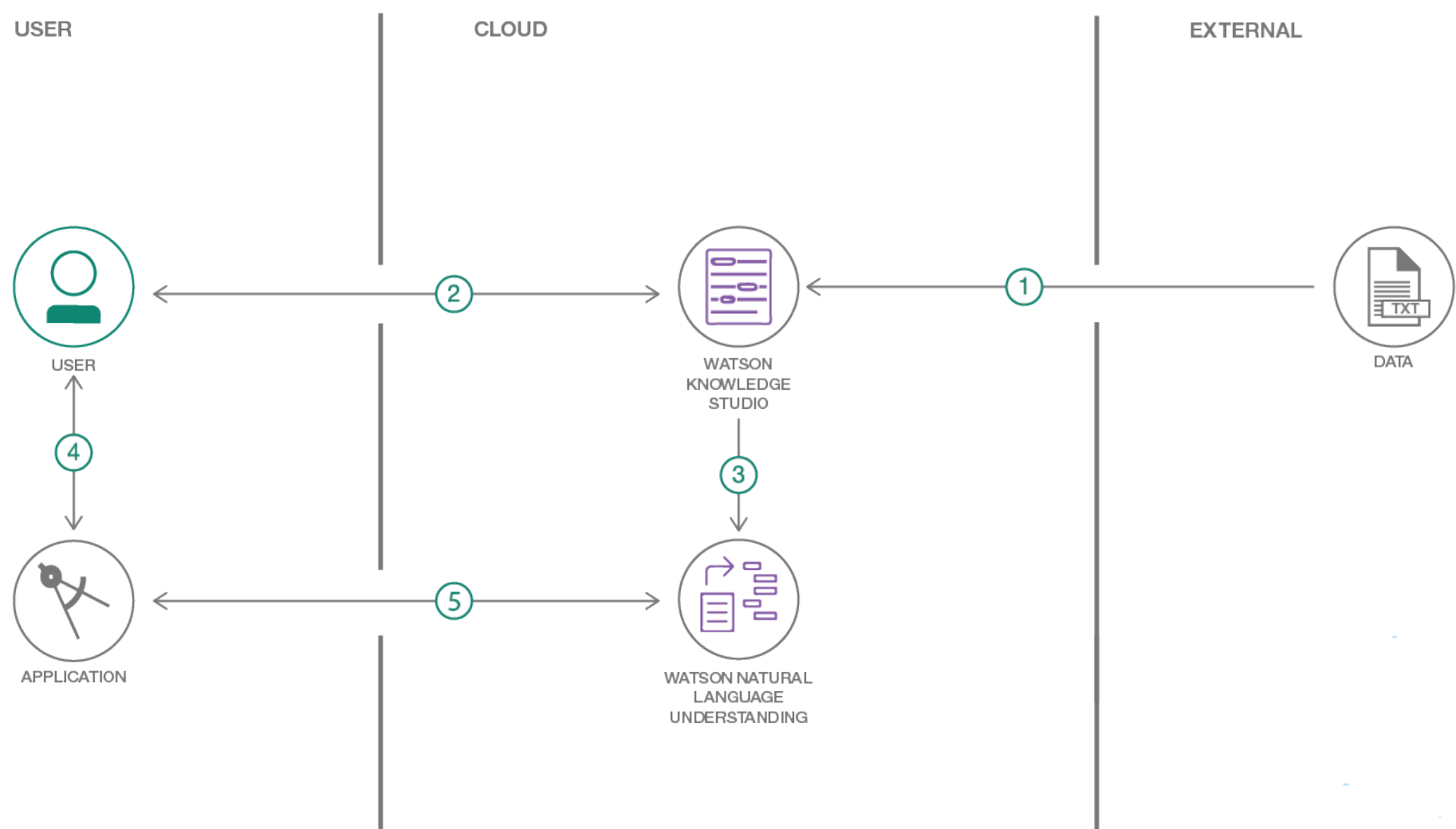
1. What is the offer?
2. Who is the merchant?
3. What is the offer name?
4. What is the offer's validity period?
5. What is the merchant's phone number?

6. What is the merchant's website?

After completing this code pattern, the user will learn how to:

- Upload a corpus with WKS
- Import types to WKS
- Use WKS to create a model
- Deploy a WKS model to NLU
- Call NLU APIs with a WKS model specified

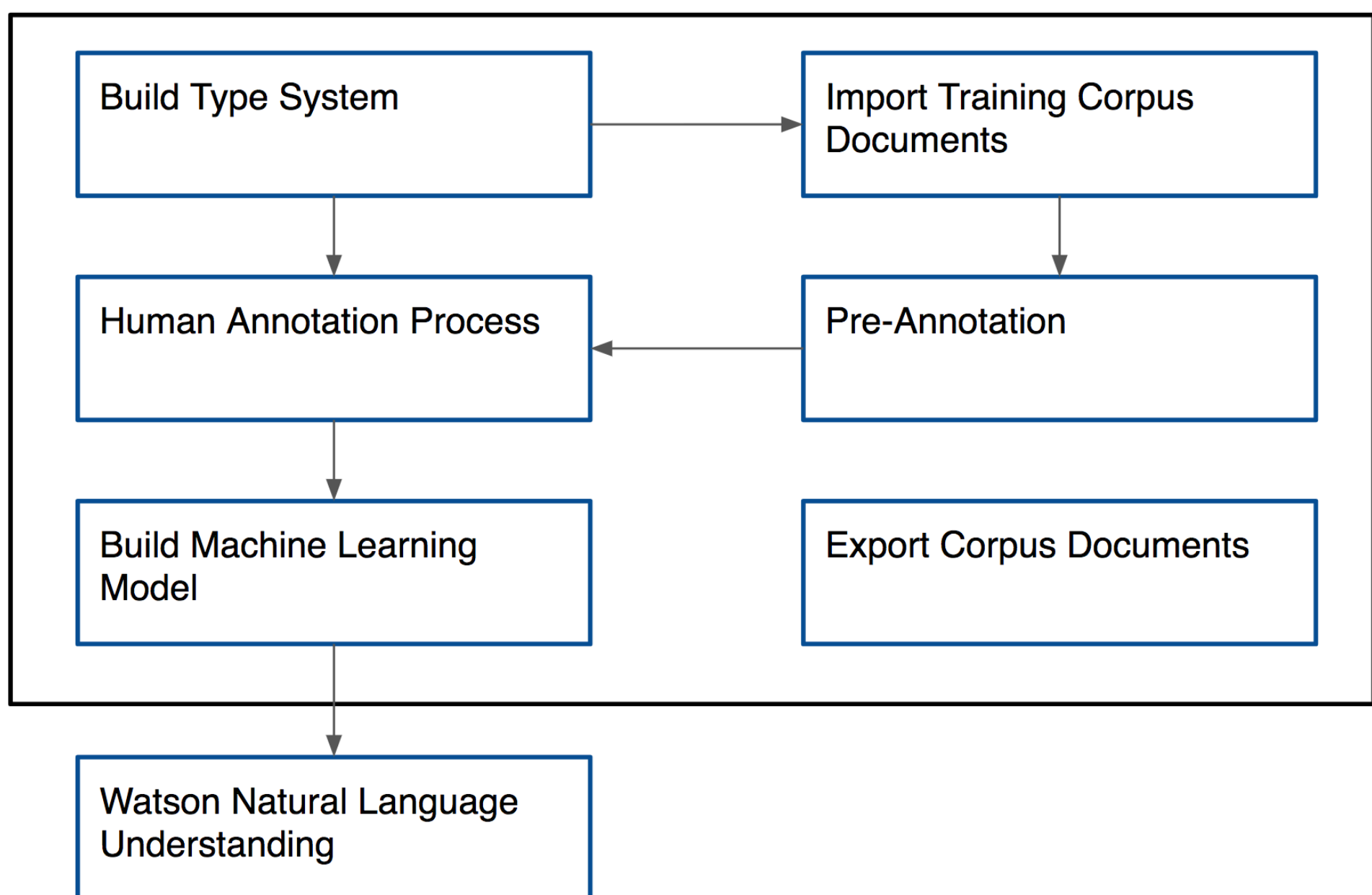
Flow



1. Load type system and corpus files into Watson Knowledge Studio.
2. A user generates a model by training and evaluating data.
3. The WKS model is deployed to Watson NLU.
4. A user provides an SMS message to the app for analysis.
5. The SMS message is analyzed by Watson NLS for processing and returns extracted domain specific entities based on the WKS model are returned.

How does Watson Knowledge Studio work?

The image below explains the process of how Watson Knowledge Studio works in light detail. For greater detail see [Steps 4. Upload Type System](#) through [9. Deploy the machine learning model to NLU](#).



In short, a type system is built and supporting documents are uploaded that have domain specific wording. From here a model must be built to properly understand the documents, this is where the annotations come in. Once the corpus and annotations are set you are free to create a model and deploy it to a Watson Natural Language Understanding instance.

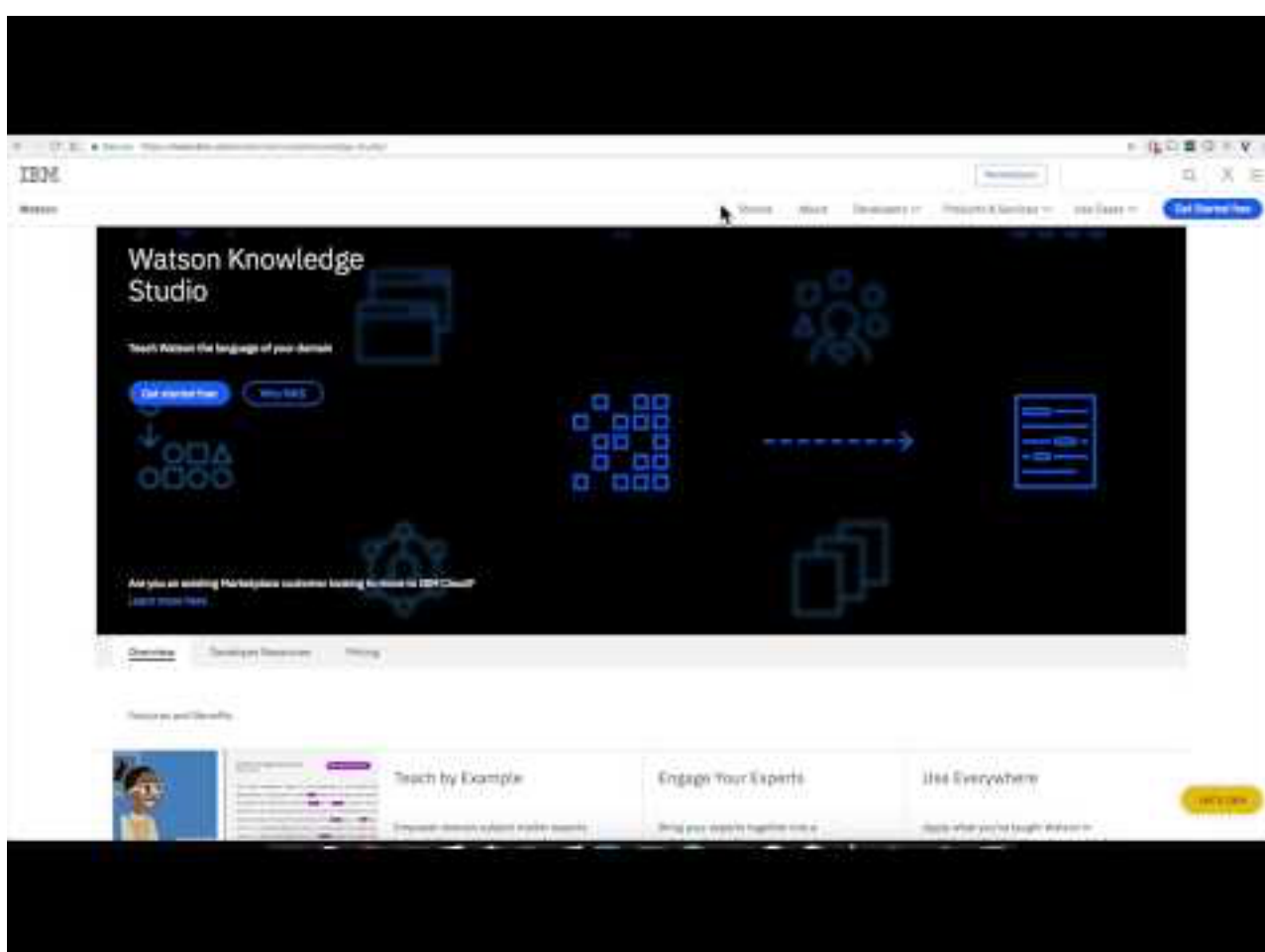
Included components

- [Watson Natural Language Understanding](#): An IBM Cloud service that can analyze text to extract meta-data from content such as concepts, entities, keywords, categories, sentiment, emotion, relations, semantic roles, using natural language understanding.
- [Watson Knowledge Studio](#): Teach Watson the language of your domain with custom models that identify entities and relationships unique to your industry, in unstructured text. Use the models in Watson Discovery, Watson Natural Language Understanding, and Watson Explorer.

Featured Technologies

- [Artificial Intelligence](#): Artificial intelligence can be applied to disparate solution spaces to deliver disruptive technologies.
- [Java](#): A secure, object-oriented programming language for creating applications.

Watch the Video



Steps

- 1. [Clone the repo](#)
- 2. [Create IBM Cloud services](#)
- 3. [Create a Watson Knowledge Studio workspace](#)
- 4. [Upload Type System](#)
- 5. [Import Corpus Documents](#)
- 6. [Create an Annotation Set](#)
- 7. [Create a Task for Human Annotation](#)
- 8. [Create the model](#)
- 9. [Deploy the machine learning model to NLU](#)
- 10. [Test the model with cURL](#)
- 11. [Run the application](#)

1. Clone the repo

```
$ git clone https://github.com/IBM/sms-analysis-with-wks
```

2. Create IBM Cloud services

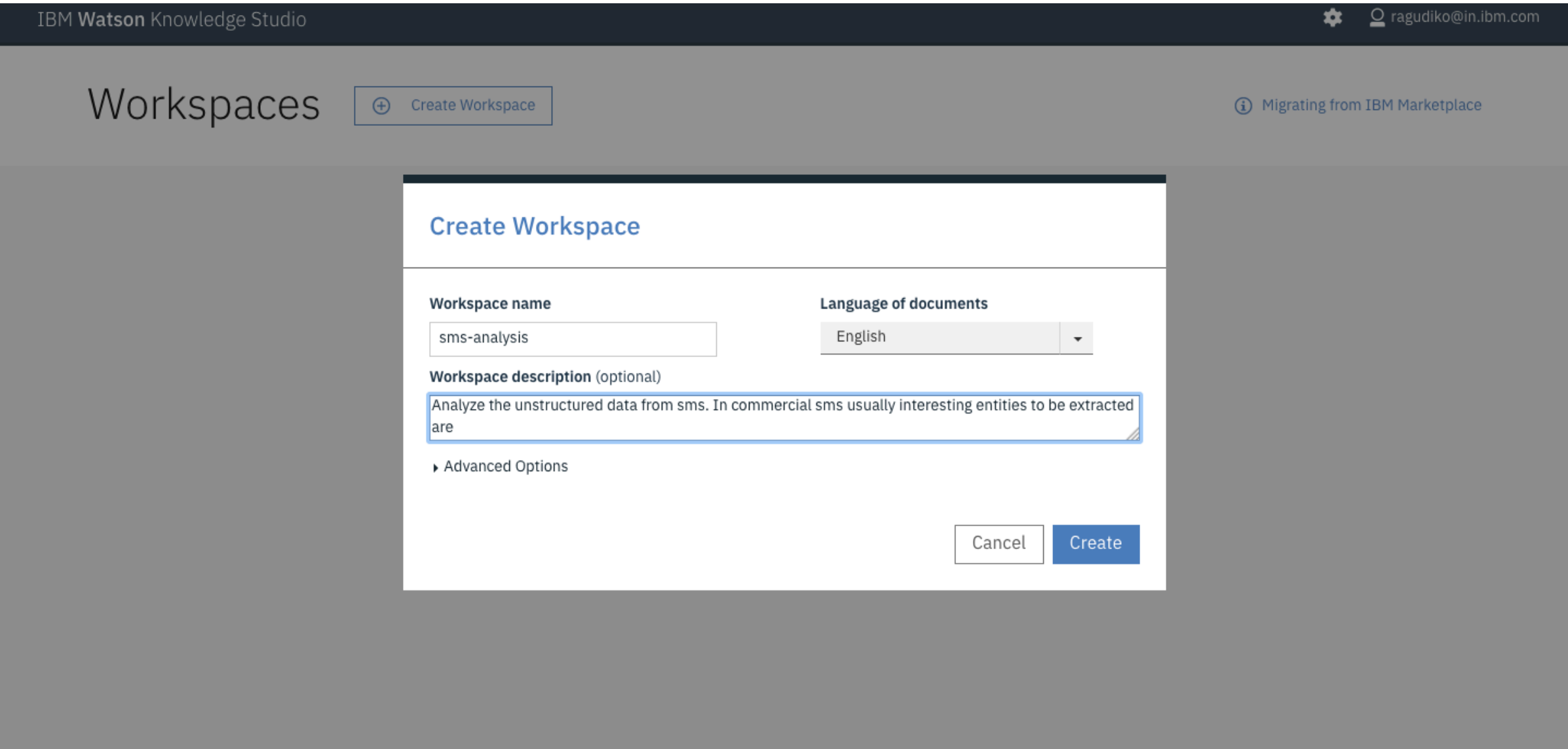
Create the following services:

- [Watson Natural Language Understanding](#)
- [Watson Knowledge Studio](#)

NOTE: It is recommended that you name your NLU service `sms-nlu-service` . This will eliminate some steps if you eventually decide to deploy your app to the IBM Cloud.

3. Create a Watson Knowledge Studio workspace

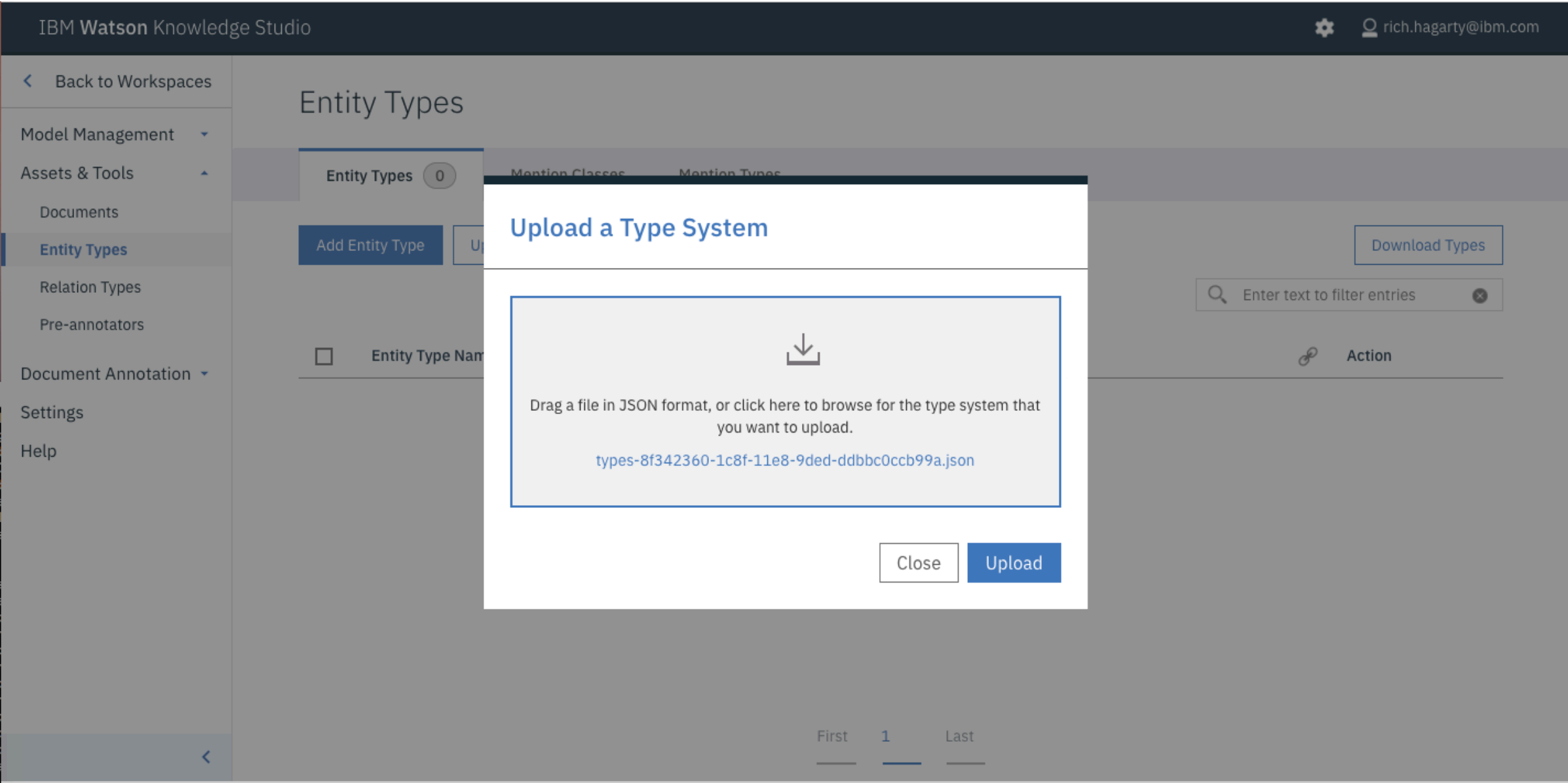
Launch the **WKS** tool and create a new **workspace**.



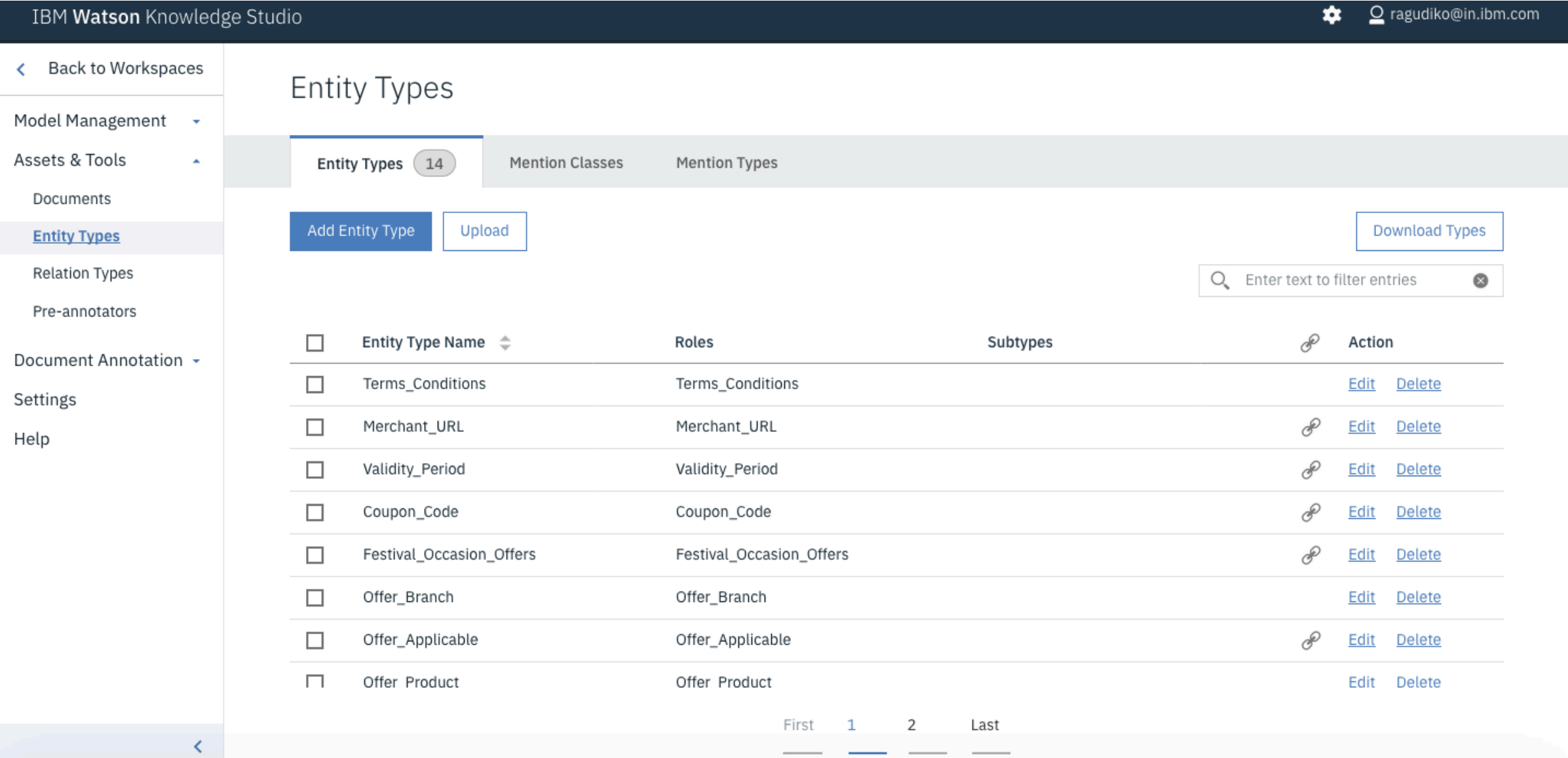
4. Upload Type System

A type system allows us to define things that are specific to our SMS messages. The type system controls how content can be annotated by defining the types of entities that can be labeled and how relationships among different entities can be labeled.

To upload our pre-defined type system, from the **Access & Tools -> Entity Types** panel, press the **Upload** button to import the **Type System** file [data/types-8f342360-1c8f-11e8-9ded-ddbbc0ccb99a.json](#) found in the local repository.



This will upload a set of **Entity Types** and **Relation Types**.



IBM Watson Knowledge Studio

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Relation Types

Add Relation Type

Enter text to filter entries

Relation Type	First Entity Type / Role	Second Entity Type / Role	Action
MerchanthasWebsite	Merchant	Merchant_URL	Cancel Save
OfferisApplicable	Offer	Offer_Applicable	Edit Delete
MerchantgivesOffer	Merchant	Cashback , Points , Offer	Edit Delete
OfferhasValidityPeriod	Offer	Validity_Period	Edit Delete
MerchanthasPhone	Merchant	Merchant_Phone	Edit Delete
OfferhasCouponCode	Offer	Coupon_Code	Edit Delete
OfferhasName	Offer	Festival_Occasion_Offers	Edit Delete

First 1 Last

5. Import Corpus Documents

Corpus documents are required to train our machine-learning annotator component. For this Code Pattern, the corpus documents will contain example SMS messages.

NOTE: Individual SMS sample text messages are located in the [data](#) directory of the local respoitory.

From the **Access & Tools -> Documents** panel, press the **Upload Document Sets** button to import a **Document Set** file. Use the corpus documents file [data/corpus-8f342360-1c8f-11e8-9ded-ddbbc0ccb99a.zip](#) found in the local repository.

NOTE: Uploading the corpus documents provided in this Code Pattern is not required, but recommended to simplify the annotation process (all provided documents will come pre-annotated). An alternative approach would be to is to upload standard text files and perform the annotations manually.

NOTE: Select the option to "upload the original workspace's type system first".

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Documents

Document Sets (1)

Create Annotation S

Name

All

Download Document Sets

Last Modified	Action
-	

First 1 Last

Add a Document Set

Drag files here, or click to browse for the files that you want to add.

For best performance, individual documents should not contain more than 2000 words. [Show details about the file formats](#)

corpus-8f342360-1c8f-11e8-9ded-ddbbc0ccb99a.zip

☒ Upload corpus documents and include ground truth (upload the original workspace's type system first)

☐ Upload documents in UIMA CAS XMI format

Close Upload

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Documents

Document Sets (9)Annotation Sets (0)Documents (FiftSmsSet.txt_set, 40)Tasks

Create Annotation SetsUpload Document SetsDownload Document Sets



Name	Total Docs	Last Modified	Action
All	120	-	
SecondSmsSet.txt_set	20	02/27/2018	Rename Delete
FirstSmsSet.txt_set	20	02/28/2018	Rename Delete
ThirdSmsSet.txt_set	20	02/27/2018	Rename Delete
FourthSmsSet.txt_set	20	02/28/2018	Rename Delete
FiftSmsSet.txt_set	40	02/28/2018	Rename Delete
Training	84	02/28/2018	Delete
Test	27	02/28/2018	Delete

6. Create an Annotation Set

Once the corpus documents are loaded, we can start the human annotation process. This begins by dividing the corpus into multiple document sets and assigning the document sets to human annotators (for this Code Pattern, we will just be using using one document set and one annotator).

From the **Access & Tools -> Documents** panel, press the **Create Annotation Sets** button. Select a valid **Annotator** user, and provide a unique name for **Set name**.

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Document Sets (9)

Create Annotation Sets

Download Document Sets

Name	Total Docs	Last Modified	Action
All	120	-	
SecondSmsSet.txt_set	20	02/27/2018	Rename Delete
FirstSmsSet.txt_set	20	02/28/2018	Rename Delete
ThirdSmsSet.txt_set	20	02/27/2018	Rename Delete
FourthSmsSet.txt_set	20	02/28/2018	Rename Delete
FiftSmsSet.txt_set	20	02/28/2018	Rename Delete
Training	84	02/28/2018	Delete
Test	27	02/28/2018	Delete

Create Annotation Sets

Base set

All

Overlap

100

% of 120 documents

New Sets

+ Add another set and human annotator

To view inter-annotator agreement scores, assign at least two human annotators and ensure that a percentage of documents overlap between the sets.

Annotator

Rajesh Gudikoti



Set name

FirstSmsAnnotationSet

Cancel

Generate

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Annotation Sets (1)

Documents (FirstSmsAnnotationSet, 120)

Tasks

Create Annotation Sets

Name	Total Docs	Annotator	Last Modified	Action
FirstSmsAnnotationSet	120	Rajesh Gudikoti	02/28/2018	Rename

First

1

Last



7. Create a Task for Human Annotation

Note: With the latest release of Watson Knowledge Studio, most of the remainig steps below reference menu actions that have been moved. There is a new **Machine Learning Model** menu item that has been added to the left side of the UI panel. It contains actions associated with **Tasks** (now referred to as **Annotation Tasks**), **Performance**, and **Versions**. Please keep this in mind as you navigate the following steps.

Add a task for human annotation by creating a task and assigning it annotation sets.

From the **Access & Tools -> Documents** panel, select the **Task** tab and press the **Add Task** button.

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Annotation Sets (1)

Documents (All, 120)

Tasks

Add Task

Refresh

Show active tasks

Task name

Task1

Deadline

02/28/2018

Cancel

Create

Enter a unique **Task name** and press the **Create** button.

A panel will then be displayed of the available annotation sets that can be assigned to this task. Select the **Annotation Set** you created in the previous step, and press the **Create Task** button.

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Add Annotation Sets to the Task

Cancel

Create Task

Annotation Set Name	Annotator Name	Task Name
<input checked="" type="checkbox"/> FirstSmsAnnotationSet	Rajesh Gudikoti	

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Add Task

Refresh

Task1

Deadline: 02/28/2018

Progress

0%

Show active tasks

7.1 Start the Human Annotation task

Click on the task card to view the task details panel.

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Document Sets (6)

Annotation Sets (1)

Documents (All, 120)

Tasks

Go Back to Task List

Task1

Deadline: 02/28/2018

Annotations added to annotation sets are not considered ground truth until the annotation sets are submitted and accepted. When an annotation set is accepted, documents that are annotated in only one annotation set immediately become ground truth. Documents that are annotated in two or more annotation sets become overlapping documents that will become ground truth after conflicts are resolved.

Edit Annotation Sets

Refresh

Calculate Inter-Annotator Agreement

Check Overlapping Documents for Conflicts

Apply Type System Updates

Annotation Set Name	Annotator Name	Status	Action
FirstSmsAnnotationSet	Rajesh Gudikoti	IN PROGRESS	Annotate

Click the **Annotate** button to start the **Human Annotation** task.

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Change Task

Task1

Annotation Set

FirstSmsAnnotationSet

Showing 1-50 of 120

Document Name

Status

Last Modified

uber.txt	Ready	2018-02-27 15:34:50 +0530
amprtl.txt	Ready	2018-02-27 15:37:25 +0530
arcee.txt	Ready	2018-02-27 15:40:05 +0530
bpitch.txt	Ready	2018-02-27 15:42:04 +0530
dailyobjects.txt	Ready	2018-02-27 15:43:36 +0530
eve_store.txt	Ready	2018-02-27 15:48:09 +0530
igp.txt	Ready	2018-02-27 15:49:49 +0530
lazypay3.txt	Ready	2018-02-27 15:56:04 +0530
lazvnav2.txt	Ready	2018-02-27 15:56:42 +0530

First

1

2

3

Last

Submit All Documents

If you select any of the documents in the list, the **Document Annotation** panel will be displayed. Since we previously imported the corpus documents, the entity and relationship annotations are already completed (as shown in the following examples). You can annotate mentions (occurrences of words/phrases which can be annotated as an entity) to play around, or you can modify one by annotating mentions with a different entity.

IBM Watson Knowledge Studio

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Hide Details

Replace

Concordance

Attribute View

In Progress

Save

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bigbazaar.txt

1

Bonus Weekend @BigBazaar/fbb Bangalore Rs300 INSTANT OFF on Rs3000 bill+ PAYBACK Pts from 20-22 Oct Code 913363319560 To optout, sms OPTOUT to 9773597735 TnC

Entity

Mention

Type

Subtype

Role

Cashback

Coupon_Code

Festival_Occasion_Offers

Merchant

Merchant_Phone

Merchant_URL

Offer

Offer_Applicable

Offer_Branch

Offer_Product

Phone_Code

Points

Terms_Conditions

Validity_Period

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In Progress

Save

Alphab...

14pt

1

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bigbazaar.txt

1

MerchantgivesOffer

MerchanthasPhone

MerchantgivesOffer

OfferhasValidityPeriod

OfferhasCouponCode

OfferisApplicable

Merchant

Offer_Bra...

Offer

Offer_Applicable

Points

Validity_Pe...

Coupon_Code

Merchant_Pho...

Te...

Bonus Weekend @BigBazaar/fbb Bangalore Rs300 INSTANT OFF on Rs3000 bill+ PAYBACK Pts from 20-22 Oct Code 913363319560 To optout, sms OPTOUT to 9773597735 TnC

Relation Type

MerchantgivesOffer

MerchanthasPhone

MerchanthasWebsite

OfferhasCouponCode

OfferhasName

OfferhasValidityPeriod

OfferisApplicable

7.2 Submit Annotation Set

From the Task details panel, press the Submit All Documents button.

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Document Annotation

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Coreferences

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Help

Change Task

Task1

Annotation Set

FirstSmsAnnotationSet

Showing 1-50 of 120

Submit All Documents

Document Name	Status	Last Modified
dailyobjects.txt	In Progress	2018-02-27 15:43:36 +0530
mobikwik.txt	In Progress	2018-02-27 16:01:07 +0530
olacabs.txt	In Progress	2018-02-27 16:03:45 +0530
msg_24.txt	In Progress	2018-02-27 17:51:48 +0530
msg_26.txt	In Progress	2018-02-27 17:52:57 +0530
msg_34.txt	In Progress	2018-02-27 18:01:17 +0530
msg_38.txt	In Progress	2018-02-27 18:04:39 +0530
otto.txt	In Progress	2018-02-27 22:09:15 +0530
swiðpv1.txt	In Progress	2018-02-27 22:11:40 +0530

First 1 2 3 Last

Confirmation

Do you really want to submit all assigned documents?

CancelOK

All documents should change status to **Completed**.

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FirstSmsAnnotationSet

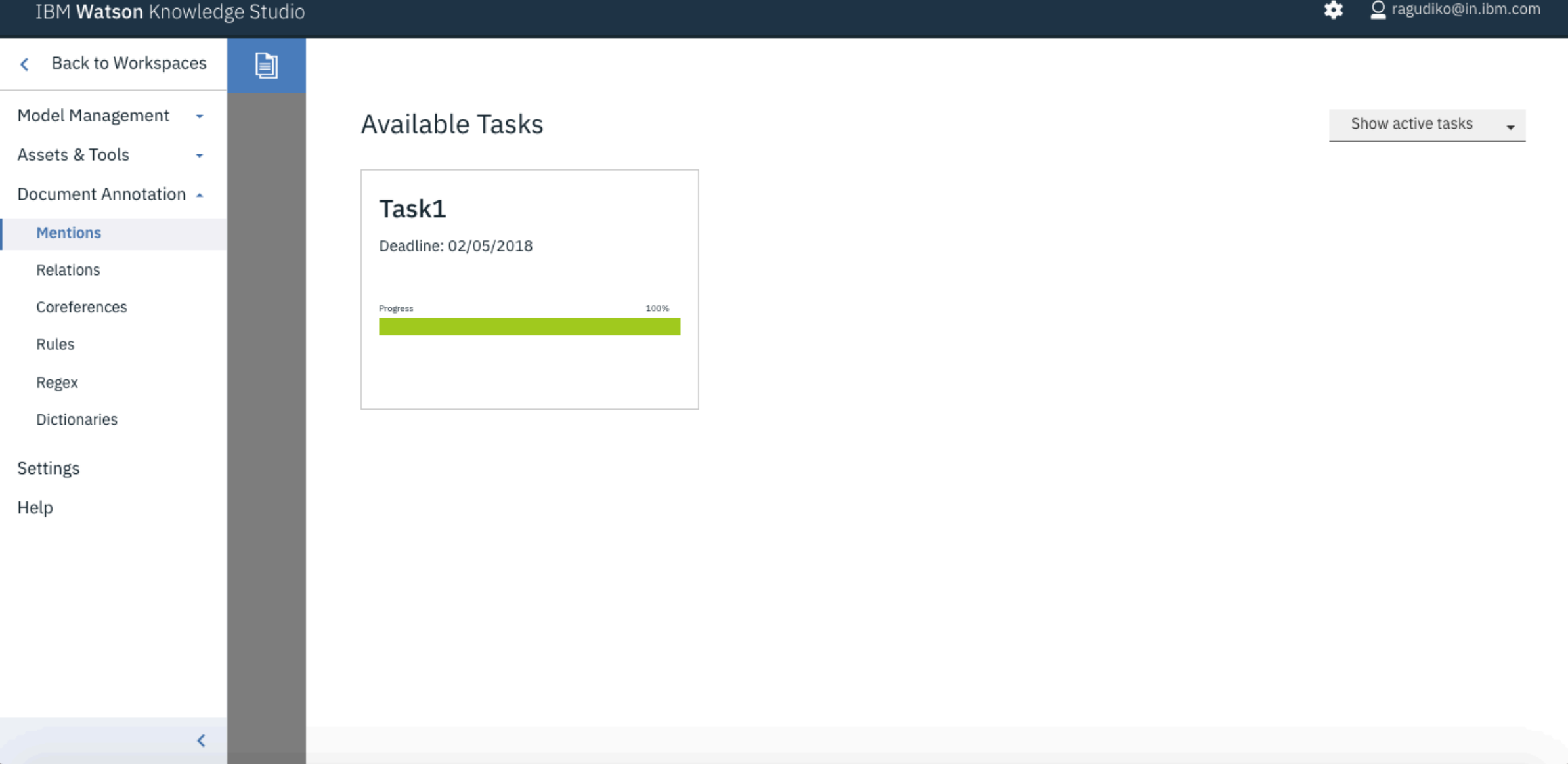
Showing 1-50 of 120

Submit All Documents

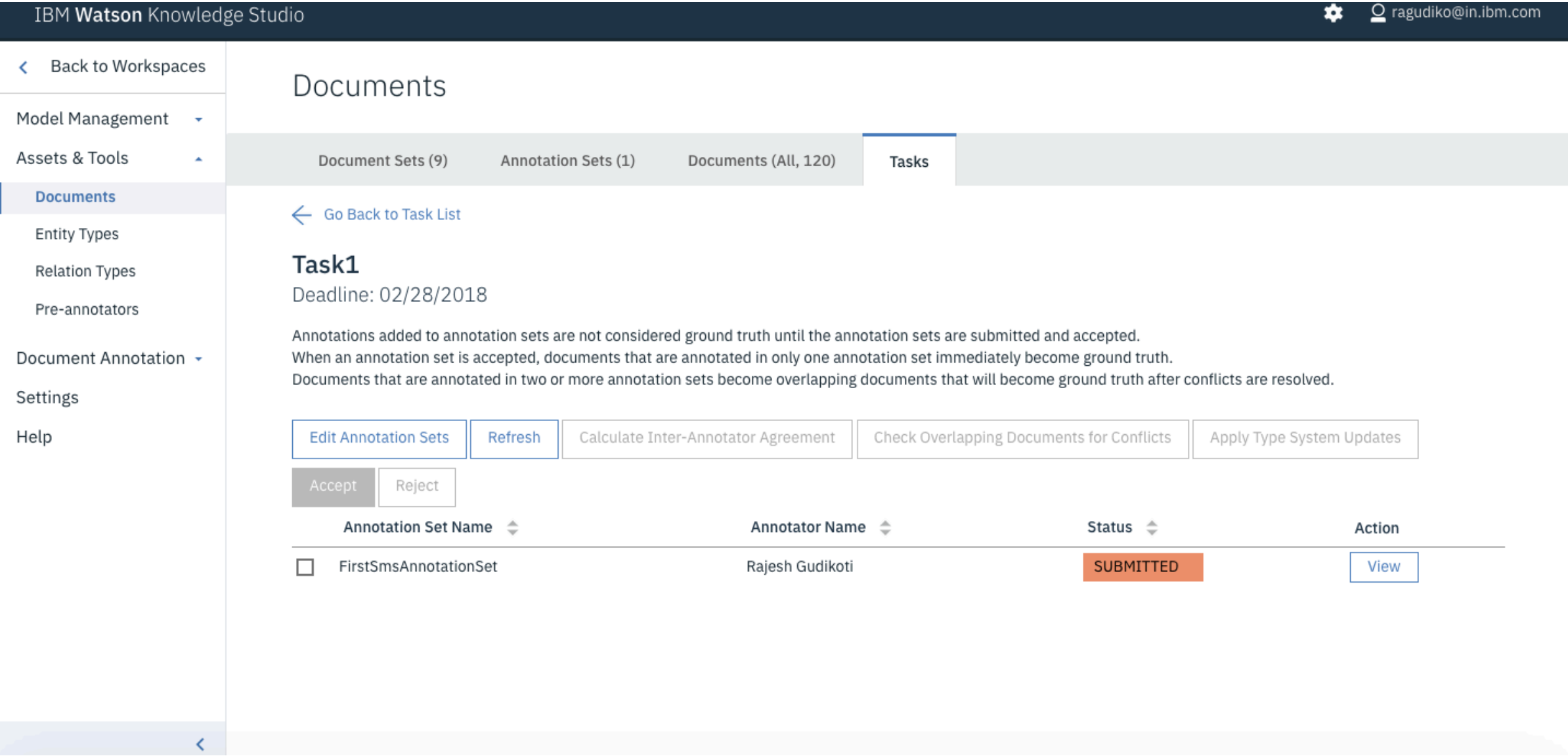
Document Name	Status	Last Modified
dailyobjects.txt	Completed	2018-02-27 15:43:36 +0530
mobikwik.txt	Completed	2018-02-27 16:01:07 +0530
olacabs.txt	Completed	2018-02-27 16:03:45 +0530
msg_24.txt	Completed	2018-02-27 17:51:48 +0530
msg_26.txt	Completed	2018-02-27 17:52:57 +0530
msg_34.txt	Completed	2018-02-27 18:01:17 +0530
msg_38.txt	Completed	2018-02-27 18:04:39 +0530
otto.txt	Completed	2018-02-27 22:09:15 +0530
swiðpv1.txt	Completed	2018-02-27 22:11:40 +0530

First 1 2 3 Last

Press the blue "File" icon to toggle back to the **Task** panel, which will show the completion percentage for each task.



From the **Access & Tools -> Documents** panel, select the **Task** tab and select the task to view the details panel.



Select your **Annotation Set Name** and then press the **Accept** button. This step is required to ensure that the annotation set is considered **ground truth**.

NOTE: The objective of the annotation project is to obtain ground truth, the collection of vetted data that is used to adapt WKS to a particular domain.

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Document Sets (9)

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Tasks

Go Back to Task List

Task1

Deadline: 02/28/2018

Annotations added to annotation sets are not considered ground truth until the annotation sets are submitted and accepted. When an annotation set is accepted, documents that are annotated in only one annotation set immediately become ground truth. Documents that are annotated in two or more annotation sets become overlapping documents that will become ground truth after conflicts are resolved.

Edit Annotation Sets

Refresh

Calculate Inter-Annotator Agreement

Check Overlapping Documents for Conflicts

Apply Type System Updates

Accept

Reject

Annotation Set Name	Annotator Name	Status	Action
<input checked="" type="checkbox"/> FirstSmsAnnotationSet	Rajesh Gudikoti	SUBMITTED	<div>View</div>

Status should now be set to **COMPLETED**.

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Tasks

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Task1

Deadline: 02/28/2018

Annotations added to annotation sets are not considered ground truth until the annotation sets are submitted and accepted. When an annotation set is accepted, documents that are annotated in only one annotation set immediately become ground truth. Documents that are annotated in two or more annotation sets become overlapping documents that will become ground truth after conflicts are resolved.

Edit Annotation Sets

Refresh

Calculate Inter-Annotator Agreement

Check Overlapping Documents for Conflicts



Apply Type System Updates

Annotation Set Name	Annotator Name	Status	Action
FirstSmsAnnotationSet	Rajesh Gudikoti	COMPLETED	<div>View</div>

8. Create the model

Go to the **Model Management -> Performance** panel, and press the **Train and evaluate** button.

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sms-analysis

Language of documents

English



0 Training Set

0 Test Set

0 Blind Set

Training Set

[View Ground Truth](#)

Test Set

[View Ground Truth](#)

[View Decoding Results](#)

Last trained on:

Last evaluated on:

Train and evaluate

You have not trained the machine learning model. Click here to train and evaluate it.

Document set evaluation

Model over time

View Log

1

.80

.60

.40

There is no evaluation result.

Mention

--

Precision: --

Recall: --

Relation

--

Precision: --

Recall: --

Coreference



--

Precision: --

Recall: --

From the **Document Set** name list, select the **Annotation Set Name** you created previously and press the **Train & Evaluate** button.

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Training / Test / Blind Sets

Last trained on: Feb 28, 2018 10:48 PM

Last evaluated on: Feb 28, 2018 10:51 PM

Train

Evaluate

Train & Evaluate

Go Back to View Mode

Document Set

Task Status

☐

All

☐

SecondSmsSet.txt_set

☐

FirstSmsSet.txt_set

☐

ThirdSmsSet.txt_set

☐

FourthSmsSet.txt_set

☐

FiftSmsSet.txt_set

☒

FirstSmsAnnotationSet

COMPLETED

☒ Create new sets by splitting the selected document sets

Ratio

Enter the percentage of documents to include in each set.

70

Training Set (70% Recommended)

23

Test Set (23% Recommended)

7

Blind Set (7% Recommended)

☐ Add documents in the selected sets to:

Set Name

Number of Documents

☒ Training Set

84

☐ Test Set

27

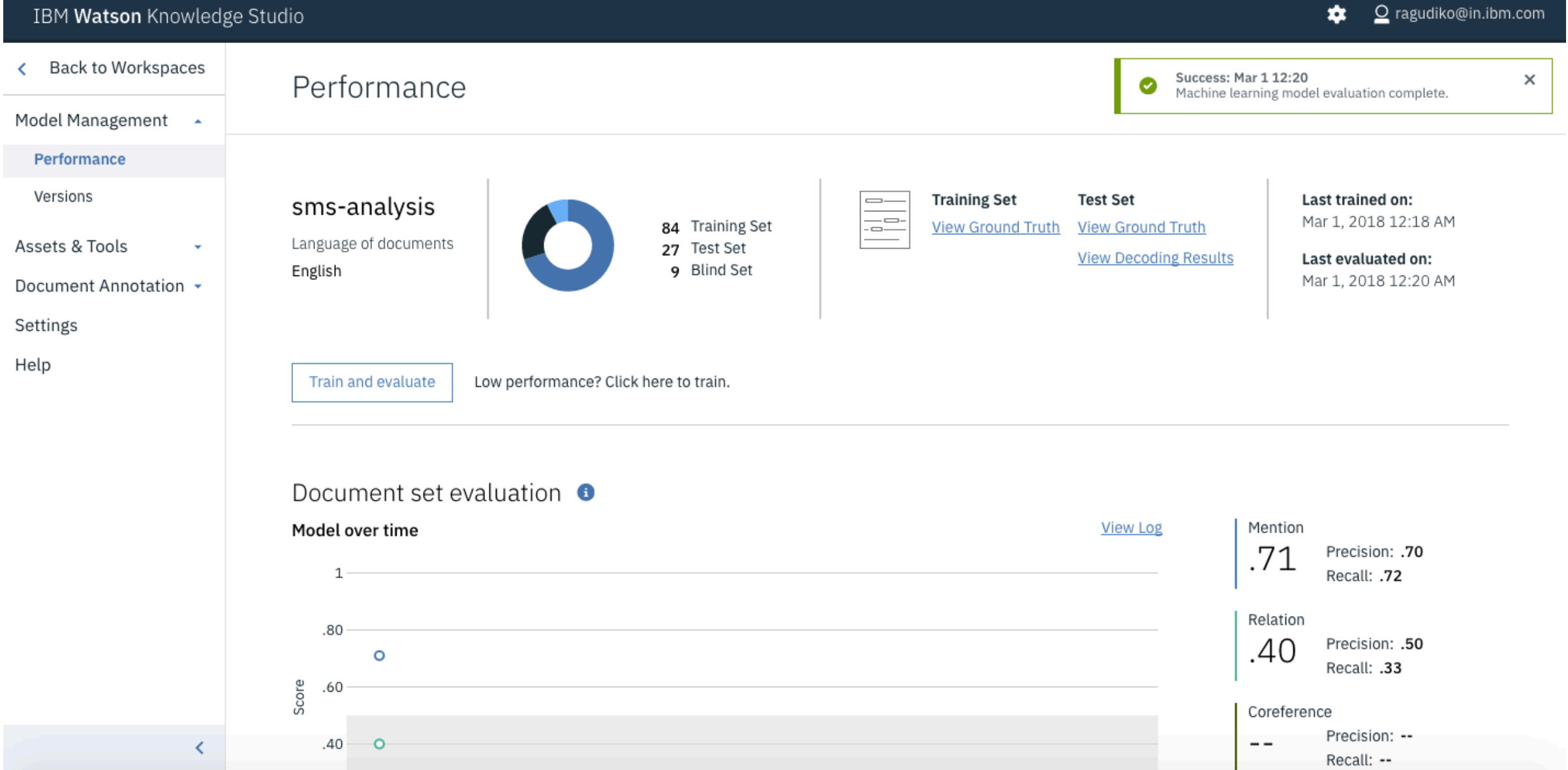
☐ Blind Set

9

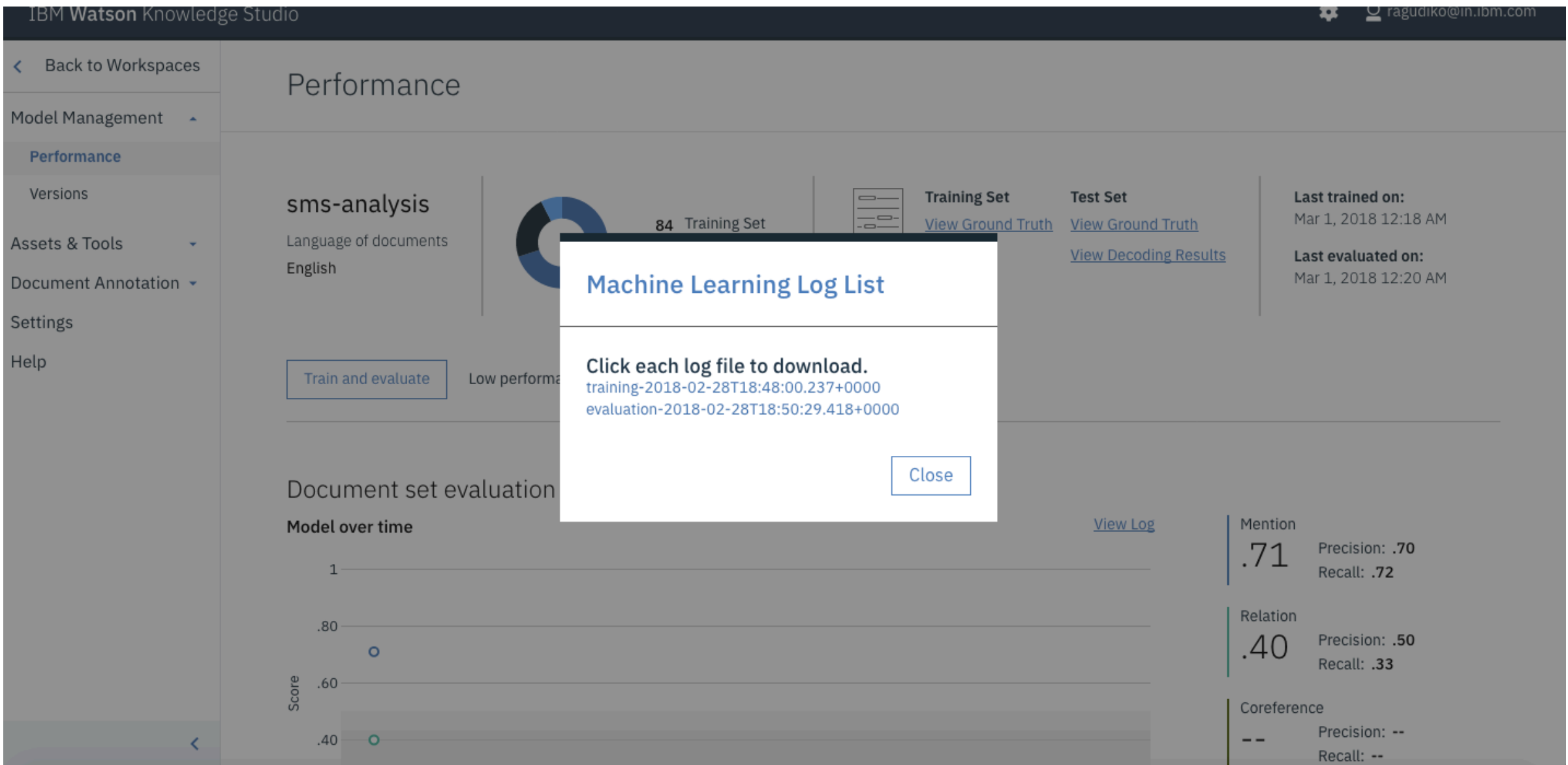
This process may take several minutes to complete. Progress will be shown in the upper right corner of the panel.

Note: In practice, you would create separate annotation sets (each containing thousands of messages) for training and evaluation.

Once complete, you will see the results of the train and evaluate process.





You can view the log files of the process by clicking the **View Log** button.



9. Deploy the machine learning model to NLU

Now we can deploy our new model to the already created **NLU** service. Navigate to the **Version** menu on the left and press **Take Snapshot**.

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Versions

Machine Learning

Rule-based

Rule-based model type mapping

Machine learning models, once trained, can be used to annotate new documents prior to human annotation.

Run this model

Export the current version of your model to use in other Watson applications such as Watson Explorer.



Export current model

Version History and Deployment

Version	Base	Creation Date	F1 score (Precision / Recall)		Description	Action	Status
			Entity Types	Relation Types			
1.0		Current Version	0.71 (0.7 / 0.72)	0.4 (0.5 / 0.33)		Take Snapshot	N/A

The snapshot version will now be available for deployment to NLU.

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Rule-based

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Run this model

Export the current version of your model to use in other Watson applications such as Watson Explorer.

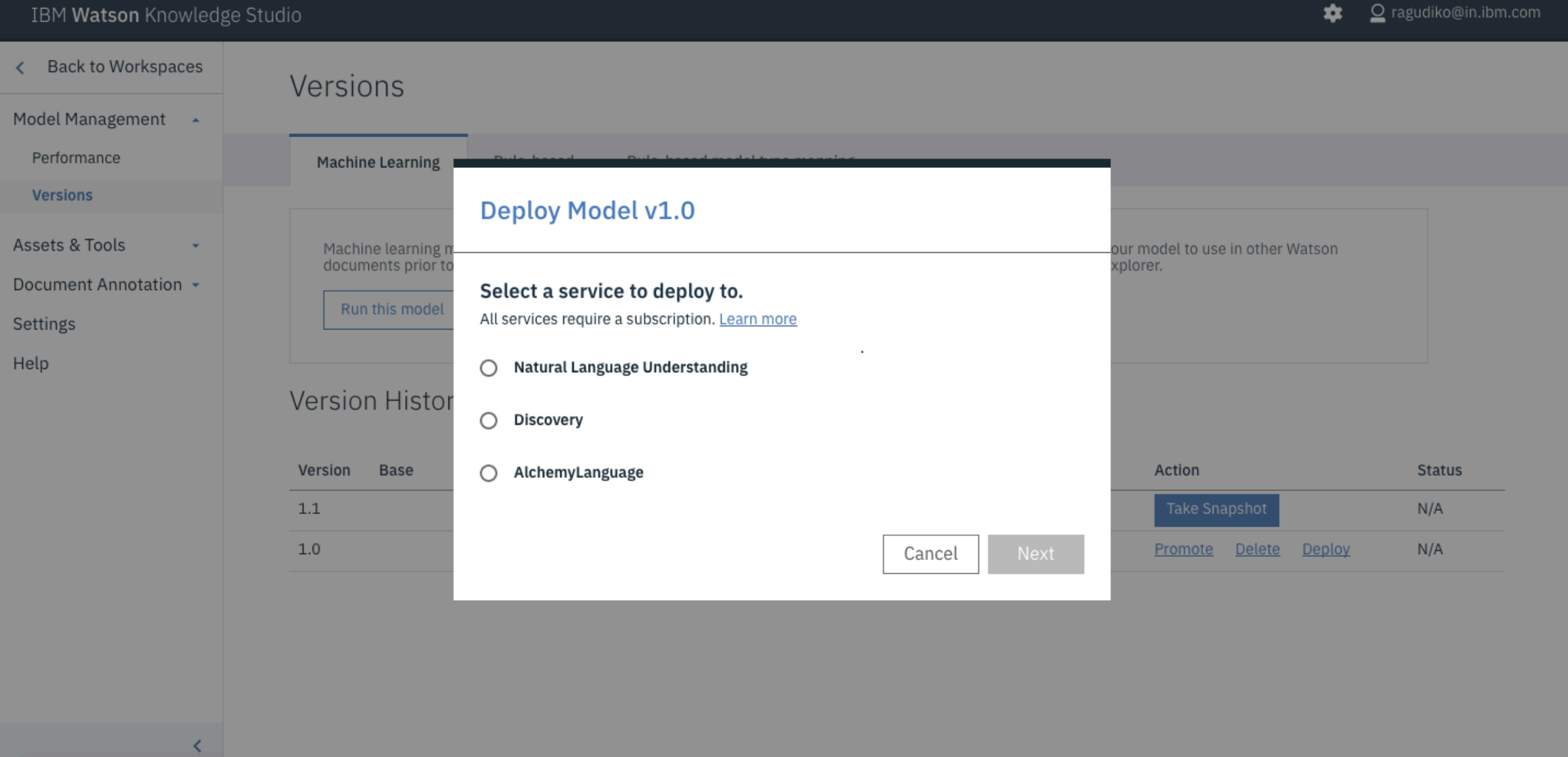
Export current model

Version History and Deployment

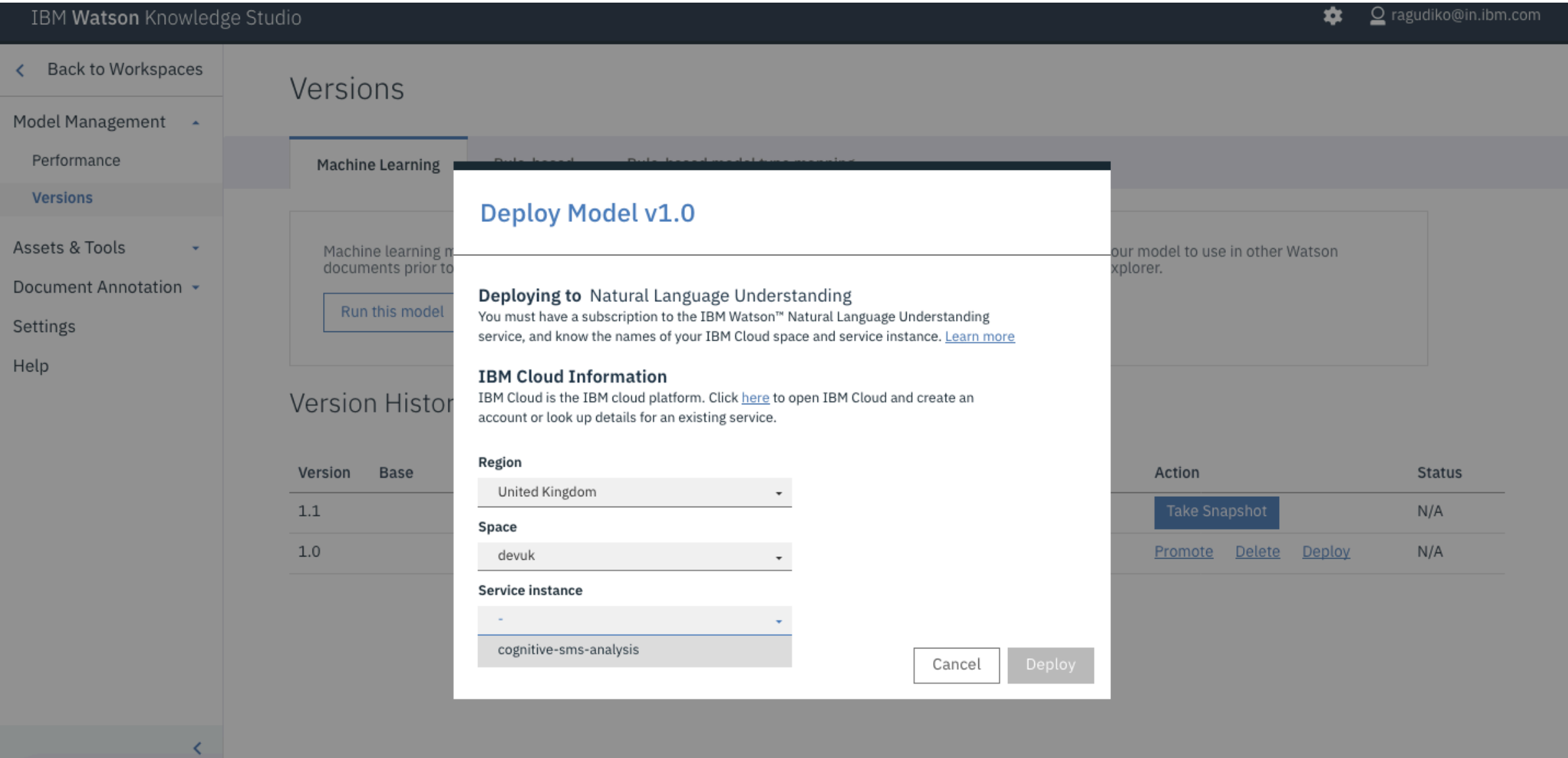
Version	Base	Creation Date	F1 score (Precision / Recall)		Description	Action	Status
			Entity Types	Relation Types			
1.1		Current Version	0.71 (0.7 / 0.72)	0.4 (0.5 / 0.33)		Take Snapshot	N/A
1.0		03/01/2018	0.71 (0.7 / 0.72)	0.4 (0.5 / 0.33)	Trained and Evaluated 120 sms	Promote Delete Deploy	N/A

To start the process, click the **Deploy** button associated with your snapshot version.

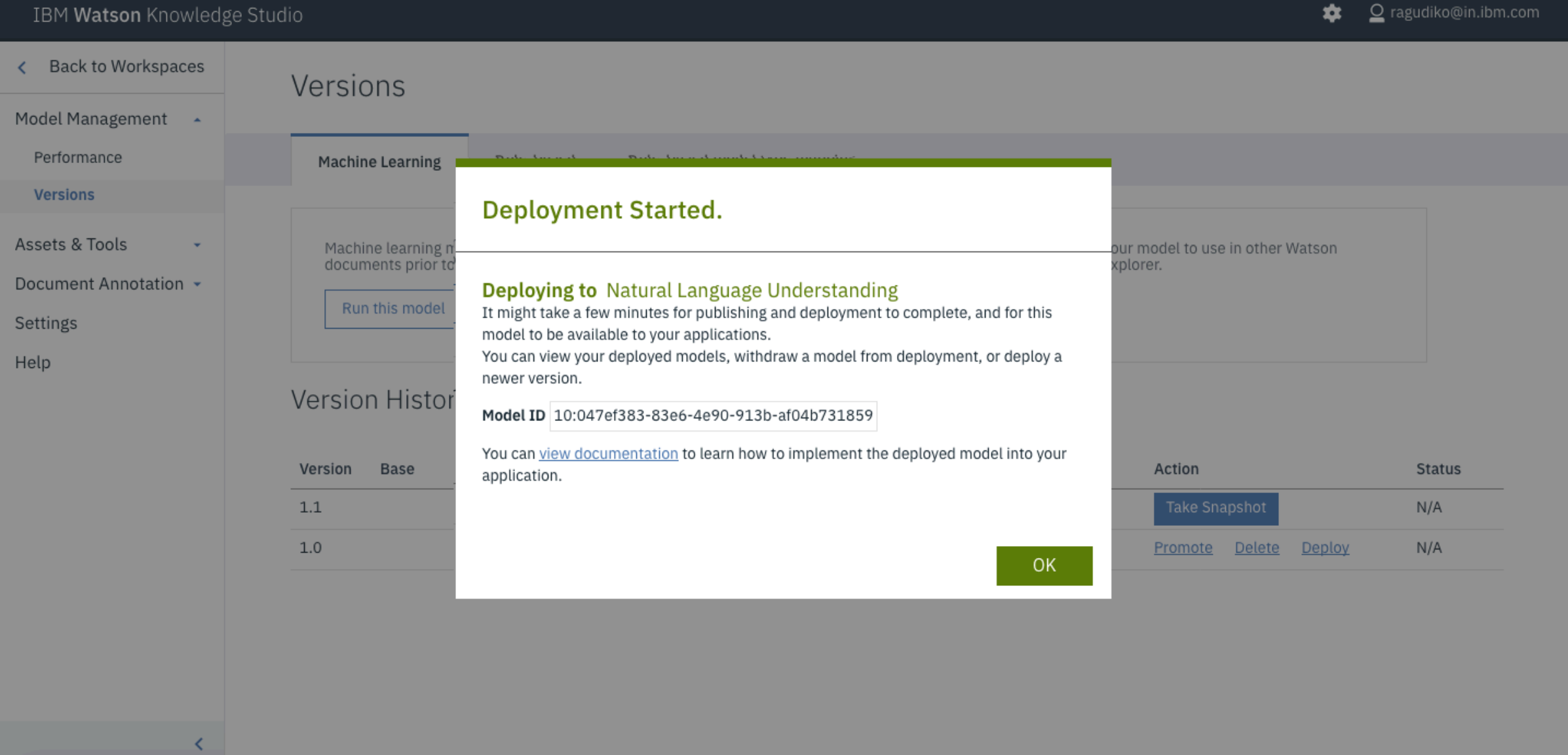
Select the option to deploy to **Natural Language Understanding**.



Then enter your IBM Cloud account information to locate your **NLU** service to deploy to.



Once deployed, a **Model ID** will be created. Keep note of this value as it will be required later in this Code Pattern.



NOTE: You can also view this **Model ID** by pressing the **NLU** button listed with your snapshot version.

10. Test the model with cURL

Using cURL is the quickest way to show the advantages of WKS. Let's see the result of using NLU with and without a WKS model.

NLU with a WKS model

In the following examples, replace `$USERNAME` and `$PASSWORD` (or `$APIKEY`) with your own **NLU** credentials. In this first example, we will also be adding an `entites.model` argument to the query string. Replace `$MODEL_ID` with your own **WKS** model ID.

The SMS text is URL encoded as it is passed as a query argument. Note that the model used to train and evaluate entities is based on a few sample SMS offers, which are located in the [data](#) directory of the local repository.

After issuing this cURL command, it is clear in the server response that we can see domain specific entities like `Offer`, `Offer_Period`, and `Merchant`.

Note: If using an IAM API key for authentication, replace the first line in the curl command with:

```
curl -u "apikey":"$APIKEY" \
```

```
curl -u "$USERNAME":"$PASSWORD" \
"https://gateway.watsonplatform.net/natural-language-understanding/api/v1/analyze?version=2018-03-16&text=Valentines%20Day%20offer%2c%20get%20Rs.10000%20cashback%20%2b%20No%20Cost%20EMI%20on%20all%20mode

{
  "usage": {
    "text_units": 1,
    "text_characters": 145,
    "features": 1
  },
  "language": "en",
  "entities": [
    {
      "type": "Festival_Occasion_Offers",
      "text": "Valentines Day",
      "disambiguation": {
        "subtype": [
          "NONE"
        ]
      }
    }
  ]
}
```

```

    },
    "count": 1
  },
  {
    "type": "Offer",
    "text": "get Rs.10000 cashback + No Cost EMI",
    "disambiguation": {
      "subtype": [
        "NONE"
      ]
    },
    "count": 1
  },
  {
    "type": "Offer_Applicable",
    "text": "on all models of iPad",
    "disambiguation": {
      "subtype": [
        "NONE"
      ]
    },
    "count": 1
  },
  {
    "type": "Validity_Period",
    "text": "Valid till Feb 14",
    "disambiguation": {
      "subtype": [
        "NONE"
      ]
    },
    "count": 1
  },
  {
    "type": "Merchant",
    "text": "Imagine",
    "disambiguation": {
      "subtype": [
        "NONE"
      ]
    },
    "count": 1
  },
  {
    "type": "Merchant_URL",
    "text": "https://goo.gl/hFJcfk",
    "disambiguation": {
      "subtype": [
        "NONE"
      ]
    },
    "count": 1
  }
]
}

```

NLU without a WKS model

Using **NLU** without a **WKS** model ID is less ideal, as the server does not extract the entities we are looking for. It extracts generic data such as company name and some location details, but it does not extract the domain specific offer details we desire.

```

curl -u "$USERNAME":"$PASSWORD" \
  "https://gateway.watsonplatform.net/natural-language-understanding/api/v1/analyze?version=2018-03-16&text=Valentines%20Day%20offer%2c%20get%20Rs.10000%20cashback%20%2b%20No%20Cost%20EMI%20on%20all%20mode

```

```

{

```

```

"usage": {
  "text_units": 1,
  "text_characters": 145,
  "features": 1
},
"language": "en",
"entities": [
  {
    "type": "Location",
    "text": "Imagine. https://goo.gl/hFJcfk",
    "relevance": 0.249854,
    "disambiguation": {
      "subtype": [
        "City"
      ]
    },
    "count": 1
  }
]
}

```

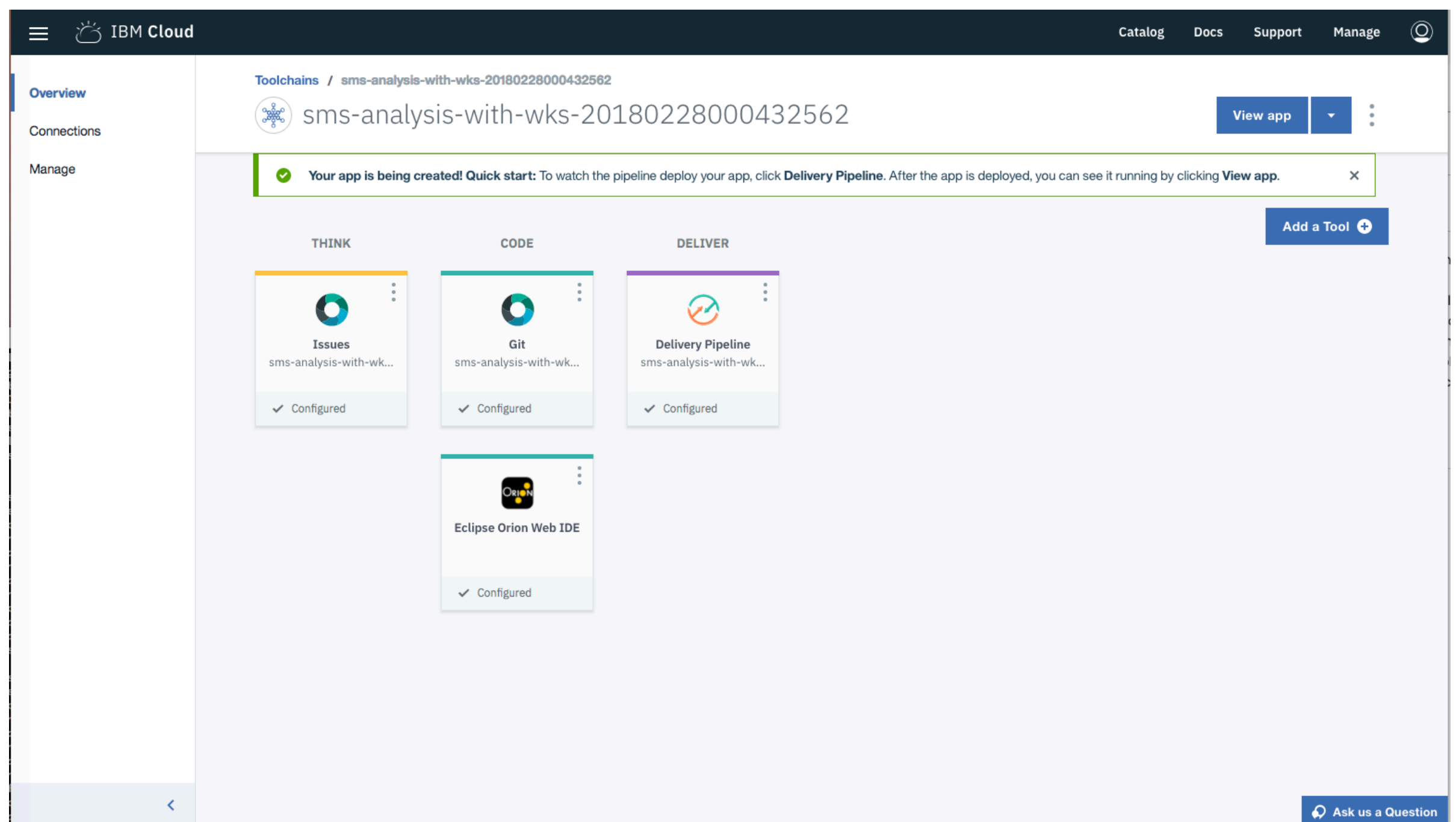
11. Run the application

Use the `Deploy to IBM Cloud` button **OR** run locally.

Deploy to IBM Cloud




1. Press the above `Deploy to IBM Cloud` button and then click on `Deploy`.
2. In Toolchains, click on Delivery Pipeline to watch while the app is deployed. Once deployed, the app can be viewed by clicking 'View app'.



3. To see the app and services created and configured for this journey, use the IBM Cloud dashboard. The app is named `sms-analysis-with-wks` with a unique suffix. The following service is created:
 - sms-nlu-service
4. One last step is required to configure the app to run with your WKS model.

In the IBM Cloud dashboard, find the app that was created and click on it to access the details panel. Click on `Runtime` on the menu and navigate to the `Environment variables` tab.

NAME	VALUE	ACTION
MODEL_ID	placeholder	

Set the `MODEL_ID` to the value you saved in Step 9.

Save the new values and restart the application (re-start should occur automatically), and watch the log for errors.

Run locally

Pre-requisite

Maven `>= 3.5` is used to build, test, and run. Check your maven version using the following command:

```
mvn -v
```

To download and install maven, refer to [maven](#).

Add NLU Credentials and WKS Model ID to config.properties file

The config.properties file is located in the `src/main/resources` directory. Replace the default values with the appropriate credentials (either API key, or username/password) and model ID values (quotes are not required).

```
# Watson Natural Language Understanding
NATURAL_LANGUAGE_UNDERSTANDING_URL=https://gateway.watsonplatform.net/natural-language-
understanding/api
## Un-comment and use either username+password or IAM apikey.
NATURAL_LANGUAGE_UNDERSTANDING_IAM_APIKEY=<add_nlu_iam_apikey>
#NATURAL_LANGUAGE_UNDERSTANDING_USERNAME=<add_nlu_username>
#NATURAL_LANGUAGE_UNDERSTANDING_PASSWORD=<add_nlu_password>

# Watson Knowledge Studio Model ID
WATSON_KNOWLEDGE_STUDIO_MODEL_ID=<add_model_id>
```

Build and Run

In your project root directory, use maven to build and deploy the WAR file and start the app.

```
mvn clean install
mvn liberty:run-server
```

Browse to <http://localhost:9080> to see the app.

Testing

To run the unit tests:

```
mvn test
```

Sample UI layout

Input your offer messages

Hi! Get Rs.25 cashback on mobile recharge of min. Rs.100 with Pockets. Use Code RECHARGE25. Valid up to 3 recharges till 31-Mar-17. Dtls at goo.gl/zn0vu3 .T&C.

26 words

Clear

Analyze

Offer Details*

Merchant:Hi!

Offer:Get Rs.25 cashback

Offer:Rs.100 with Pockets

Troubleshooting

Errors associated with running the app:

Error:com.ibm.watson.developer_cloud.service.exception.UnauthorizedException: Unauthorized: Access is denied due to invalid credentials

This should only occur if running locally. Check to ensure the credentials listed in `/src/main/resources/config.properties` matches the credentials assigned to your NLU service.

Error:com.ibm.watson.developer_cloud.service.exception.NotFoundException: model not found

If running locally, check to ensure the `WATSON_KNOWLEDGE_STUDIO_MODEL_ID` listed in `/src/main/resources/config.properties` matches the the model ID you deployed to your NLU instance, as described in [Step #9](#) above.

If you have deployed your app on the IBM Cloud, check to ensure the `MODEL_ID` environment variable in your runtime instance is set correctly, as described in the [Deploy to IBM Cloud](#) section of [Step #11](#) above.

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- **Procurement Analysis with WKS:** Another code pattern that is focused on a procurement use case where WKS is used with Discovery and IBM Graph.

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