

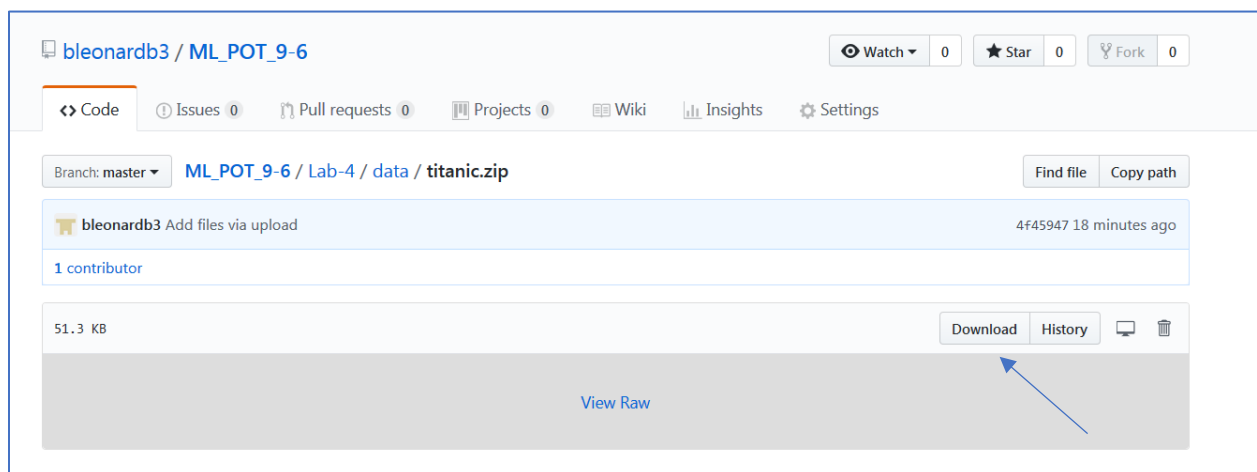
Watson Machine Learning Overview

This lab will introduce the Watson Machine Learning capability using the Titanic dataset. The lab will consist of the following steps:

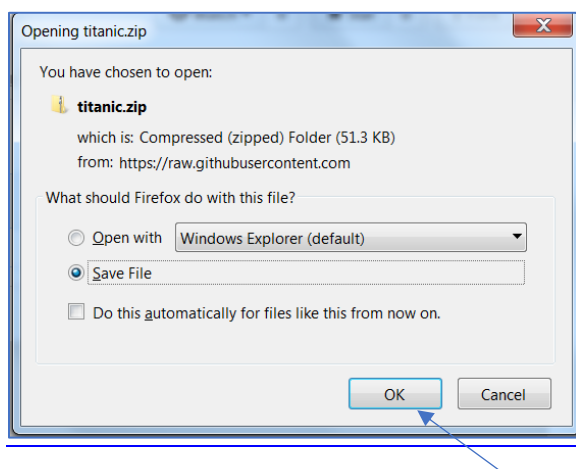
1. Adding a data asset to the Watson Studio Labs project
2. Creating a Model to predict whether a passenger would survive
3. Deploying and Testing the Model
4. Deploying a simple web front-end and connecting it to the Titanic deployed model.


Step 1: Adding a Data Asset to the project

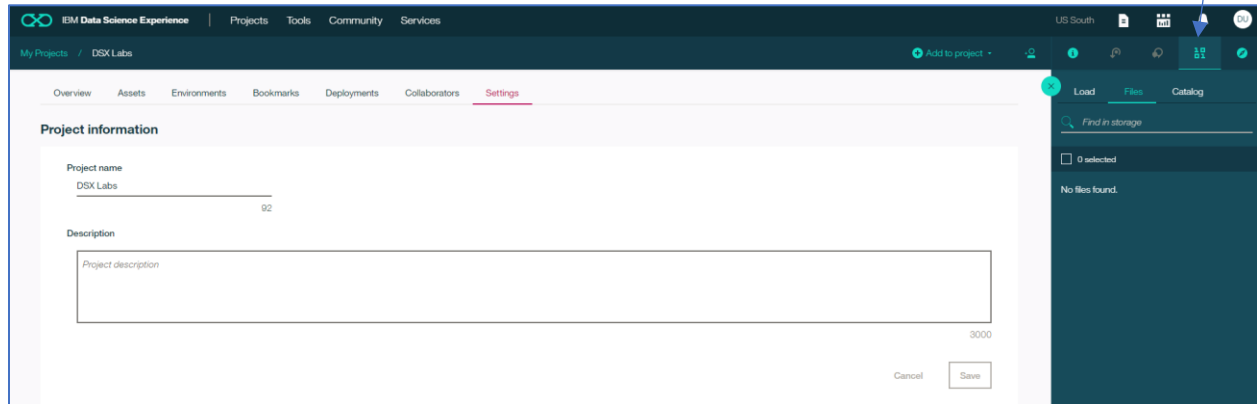
1. Download the Titanic data file from the following location by clicking on the link [Titanic Data](#) and then clicking on the **Download** button.



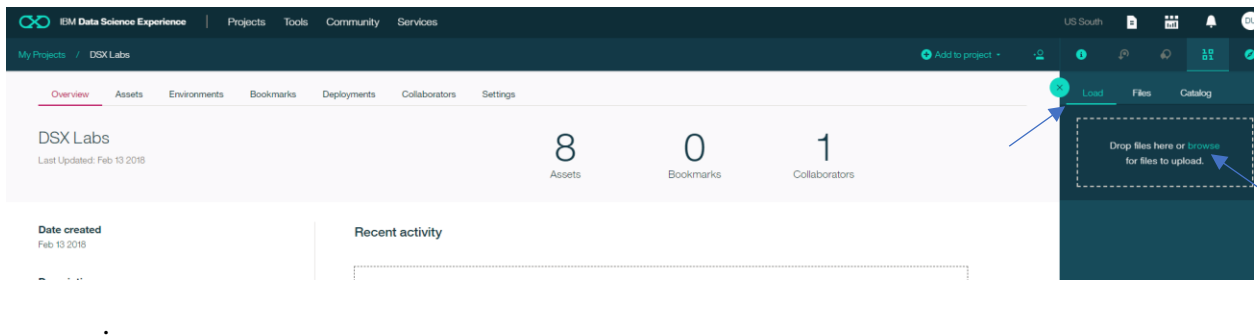
2. Click on the **OK** button in the pop-up dialog.



3. Navigate to the directory where the file has been downloaded. Unzip the titanic.zip file. There should be two files (1) titanic_cleansed.csv and (2) titanic.csv. You will use the **titanic_cleansed.csv** for this lab.
4. Go back to your Watson Studio Labs project. Click on the  icon.

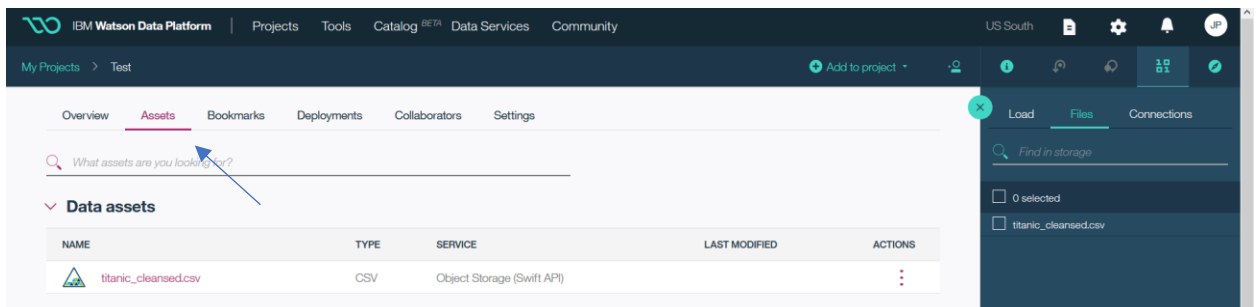


3. Click on **Load** and then **browse** and then go to the folder where the titanic_cleansed.csv is stored. Select titanic_cleansed.csv and then click Open.

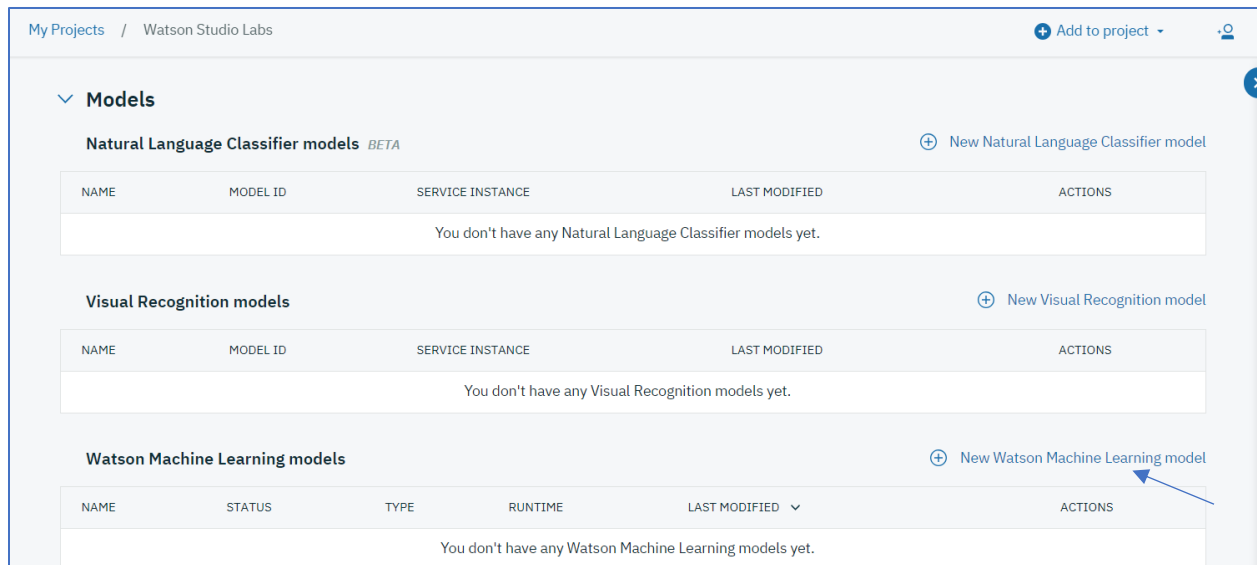


Step 2: Create a Model to predict survival

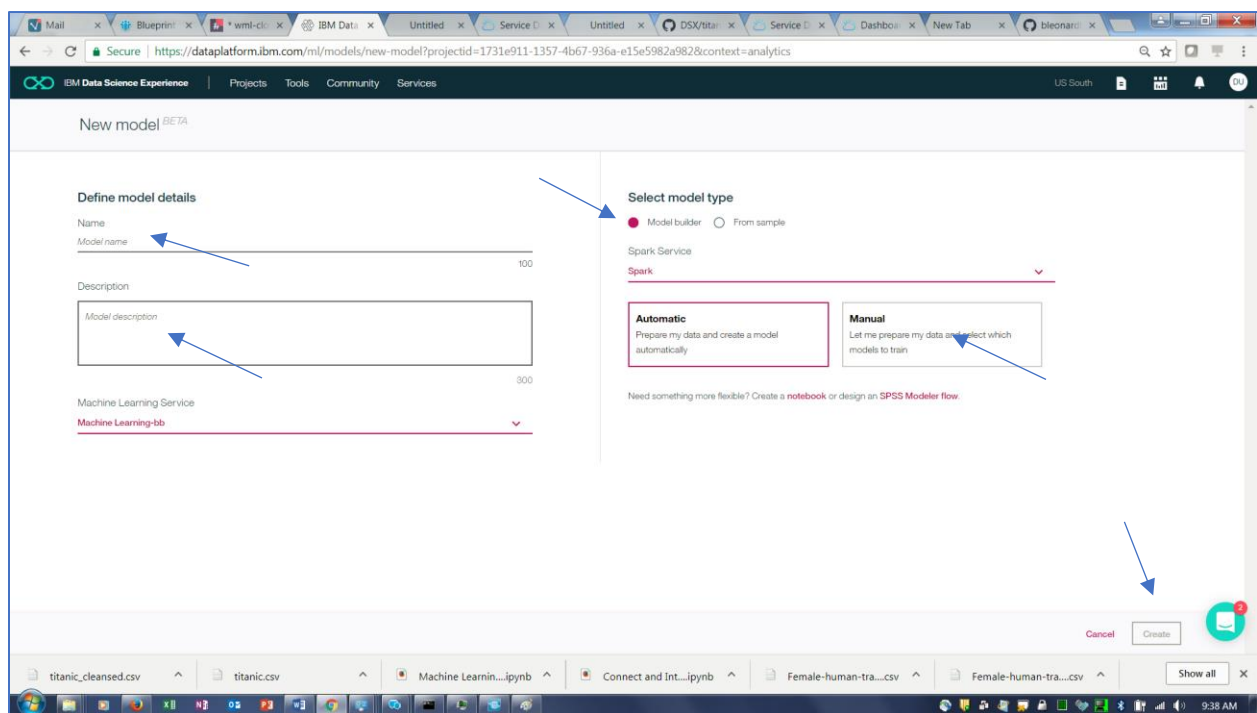
1. Click on the **Assets** Tab



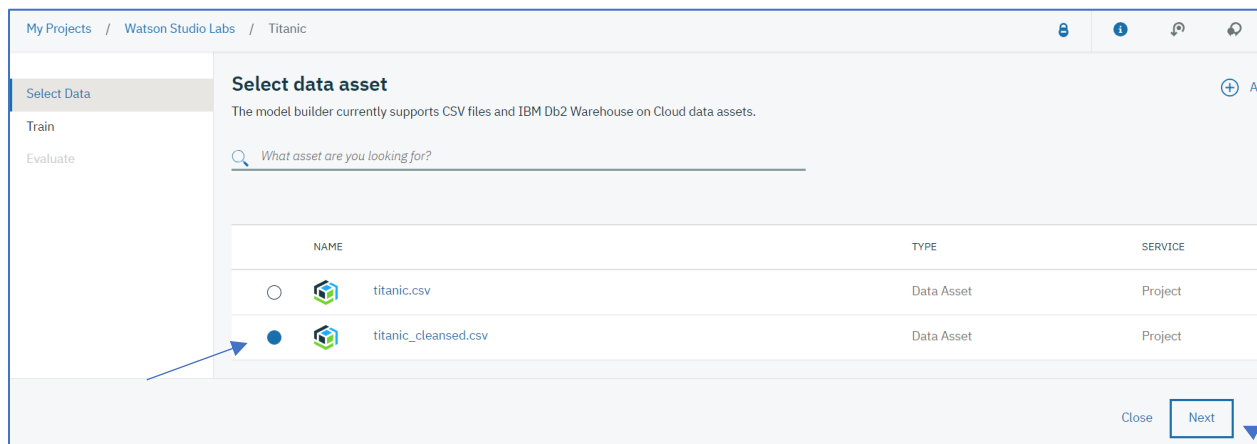
2. Click on **New Watson Machine Learning model**.



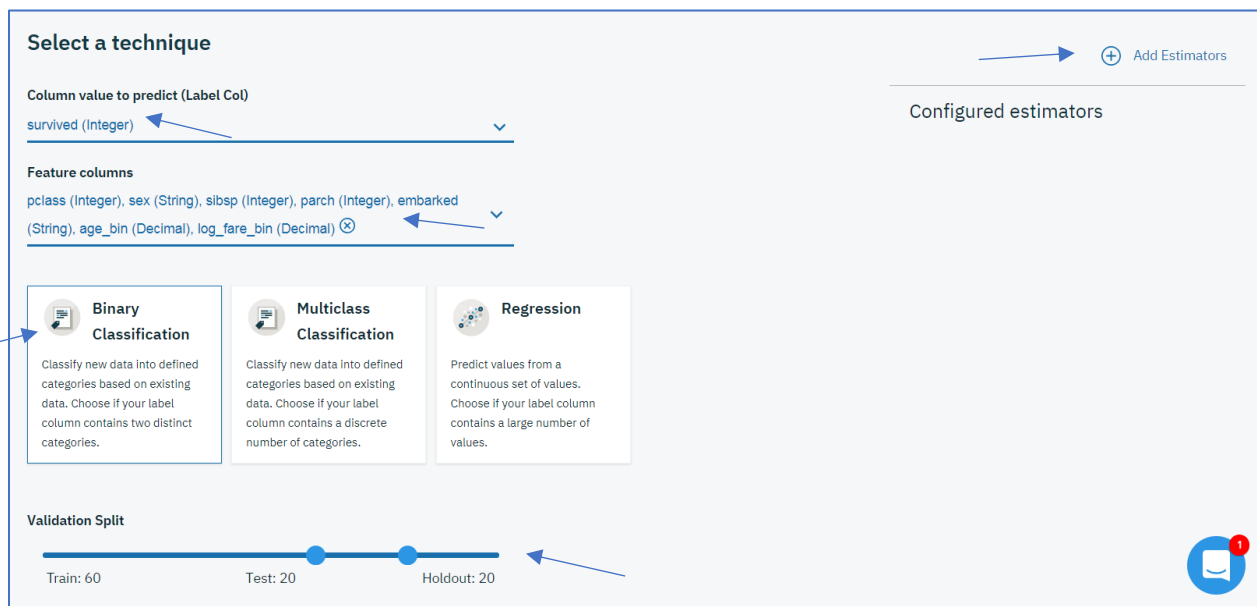
- Enter a **Model Name** (eg Titanic), optionally a **Description**, leave **Model Builder** selected, select **Manual**, and click on **Create**.



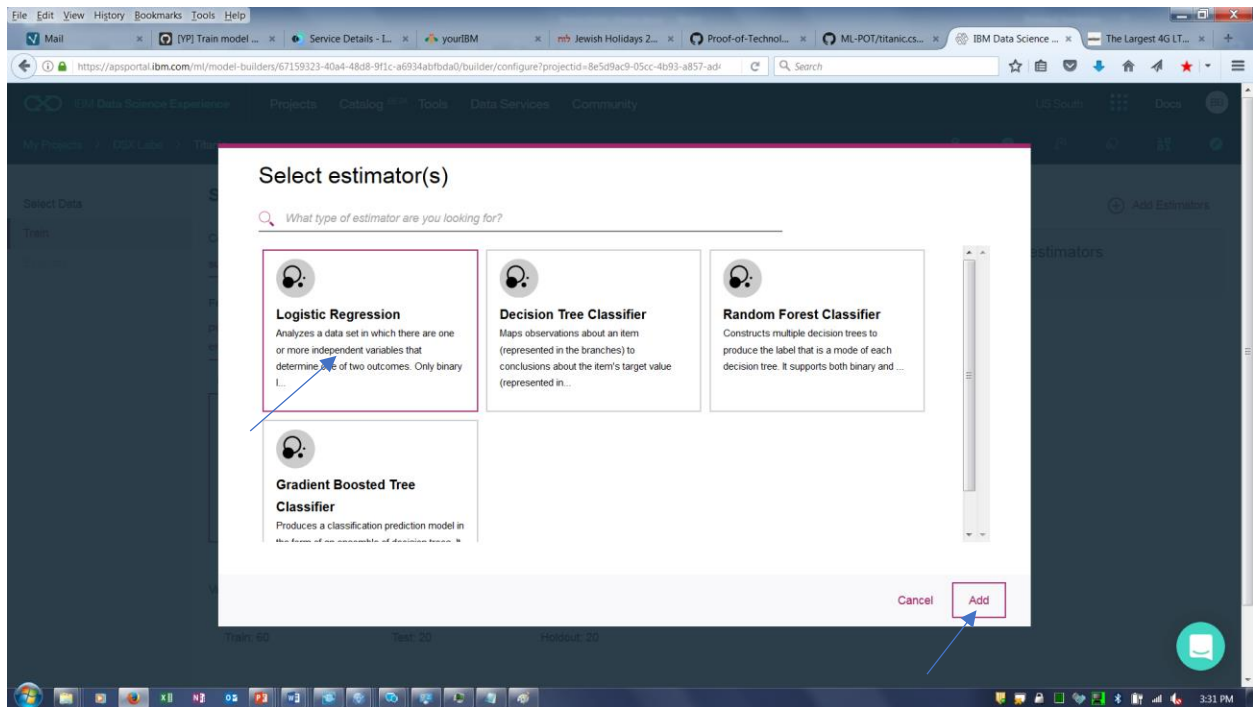
- Click on the **titanic_cleansed.csv** and click on **Next**



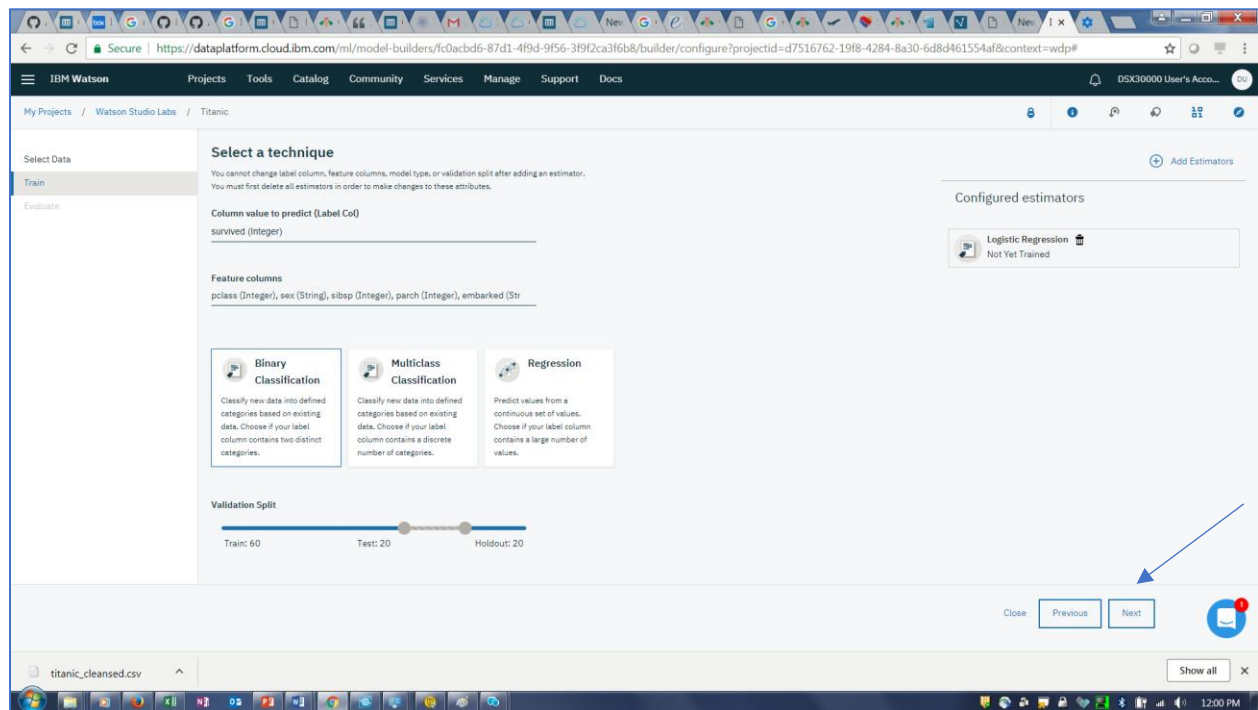
- For **Column value to predict (Label Col)** select **survived**. For **Feature columns** select the following features (**pclass**, **sex**, **sibsp**, **parch**, **embarked**, and **Age_Bucket**) . Click on the **Binary Classification** Box (which is suggested by the service). Adjust the **Validation Split** as desired. Click on **Add Estimators** to add the specific models to use.



- Select **Logistic Regression**. You can select more if you wish to see the results of multiple models. Select **Add**.



7. Select the **Next** button.



8. The system trains and evaluates each model. If more than one model was selected, the models would be listed in descending order of quality with the best result at the top. Note: if a model fails to run (rare, but happens), select Previous, delete the estimator, and re-add it. Then run again. Click on **Logistic Regression** (if it is the best) and then click **Save**.

	ESTIMATOR TYPE	STATUS	PERFORMANCE	AREA UNDER ROC CURVE	AREA UNDER PR CURVE	LAST EVALUATION
	LogisticRegression	Trained & Evaluated	Good	0.88379	0.87048	22 Jul 2018, 12:08 PM

Close Previous Save

9. Click **Save** again on the next screen.

Save model?

Are you sure that you want to save this model?

Cancel
Save

10. The system displays the model training summary. Click on Evaluation.

IBM Watson Data Platform
Projects
Tools
Catalog ^{BETA}
Data Services
Community
US South

My Projects > Test > Titanic

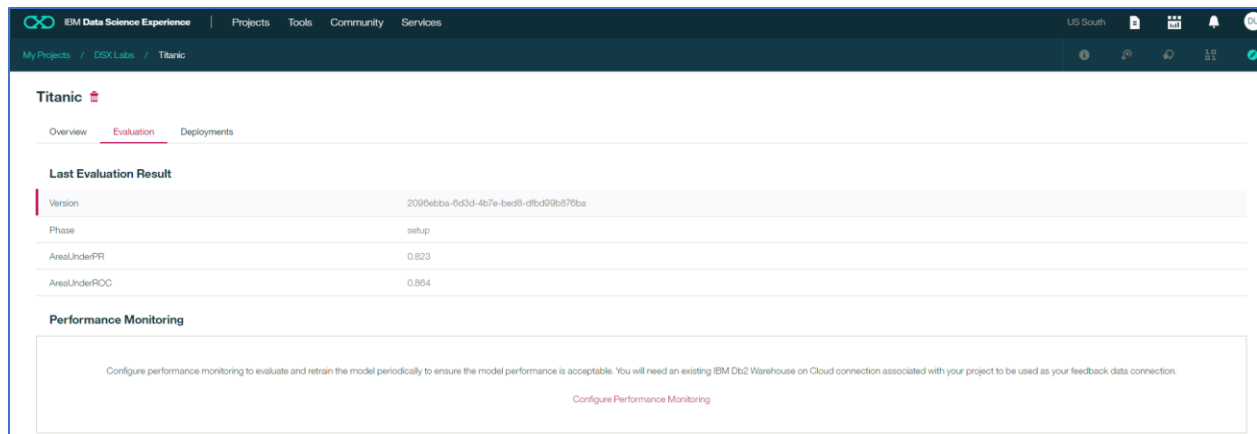
Titanic

Overview
Evaluation
Deployments

Summary

Machine learning service	ML-113017
Runtime environment	spark-2.0
Training date	30 Nov 2017, 4:39 PM
Label column	survived
Latest version	e00e9080-442c-4e68-b45f-3430c7b86a90
Model builder details	View

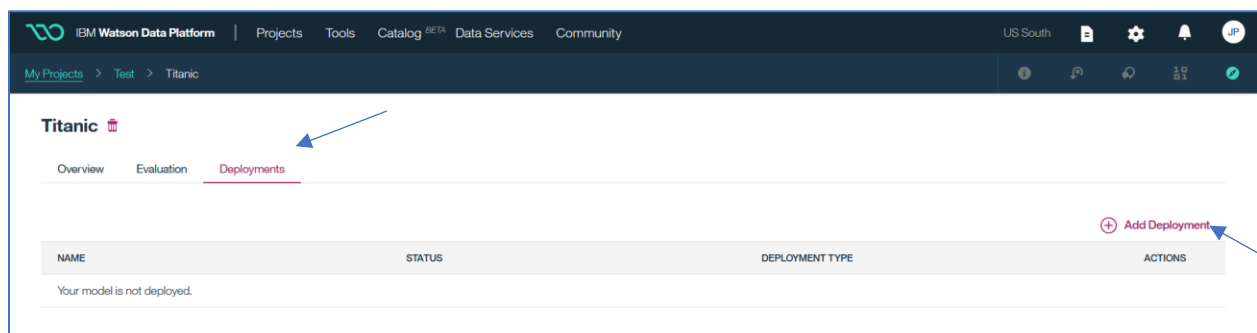
11. The system displays the recorded evaluation statistics for the run. You can also set up Continuous Learning (Performance Monitoring) on this screen. We will not do this now.



Step 3: Deploying a Model

We can deploy the model to enable applications to invoke it via an API call. This is called a Web Service deployment or Online deployment.

1. Select the **Deployments** Tab
2. Click on **Add Deployment**



3. Three options for deployment are available. For this lab, we are going to embed the predictive model scoring in a web application. Therefore, select the **Web Service** tab, enter Titanic_Deployment for **Name**, and click on **Save**.

Create Deployment

Define deployment details

Name
Titanic_Deployment

Description
Deployment description

Deployment type

- ☒ Web service
- ☐ Batch prediction
- ☐ Realtime streaming prediction

Cancel Save

4. The system responds with an acknowledgement that the model was successfully deployed. Click on **Titanic_Deployment** to test the deployed API.

Titanic

Overview Evaluation **Deployments** Lineage

+ Add Deployment

NAME	STATUS	DEPLOYMENT TYPE	ACTIONS
Titanic_Deployment	DEPLOY_SUCCESS	Web Service	

5. The system displays information about the deployed service. Click on **Test** to test out the API.

IBM Data Science Experience | Projects Tools Community Services

My Projects / DSX Labs / Titanic / Titanic_Deployment

Titanic_Deployment

Overview **Implementation** Test

Deployment

Name	Titanic_Deployment
Type	Web Service
Deployment ID	2e4ee472-49db-4a21-8158-d068110d278b
Status	ACTIVE
Machine learning service	Machine Learning-bb
Created	14 Feb 2018 10:22am
Last modified	14 Feb 2018 02:00pm

6. Enter values for the following fields:
- pclass - 1
 - sex – female
 - sibsp (number of siblings or spouses) – 0

Scroll down continue entering values for:

parch (number of parents or children) – 0

fare - 25

embarked – S

Age_Bucket - 1

and then click on **Predict**. Note that any values inputted for any of the fields not included in the model parameters (e.g. name) will not affect the prediction.

Titanic_Deployment

Overview Implementation **Test**

Enter input data

pclass
1

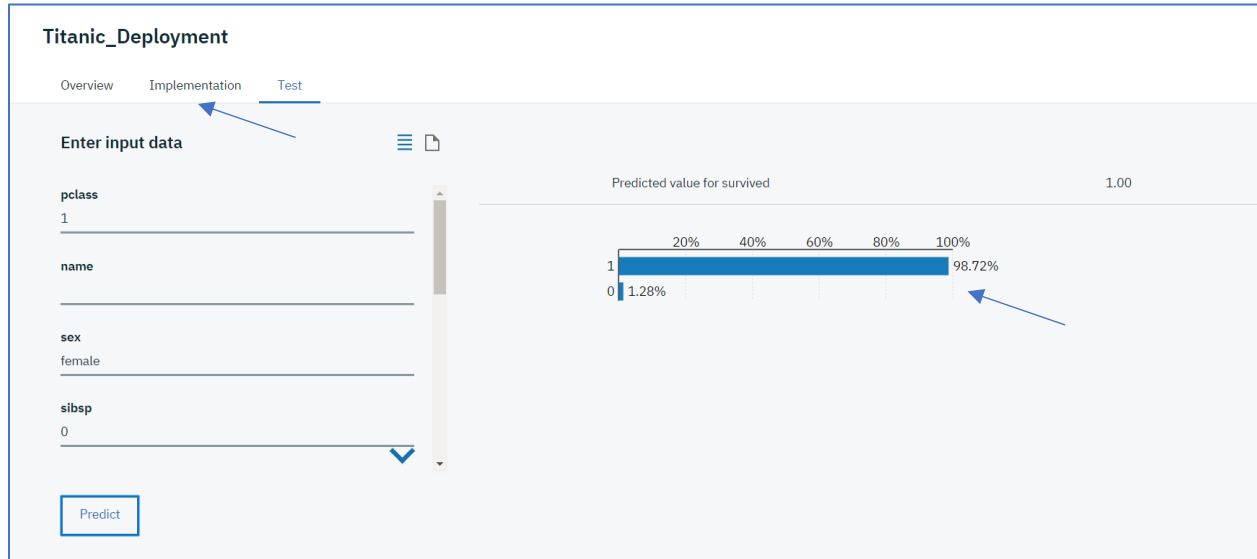
name

sex
female

sibsp
0

Predict

- The predicted result should be returned which indicates that the model has been successfully deployed. Now click on the **Implementation** tab.



- The Implementation panel provides information for the application developers to invoke the deployed model. It includes sample code in various programming languages and the scoring endpoint to be used when invoking the web service. Open Windows Notepad to copy and paste the scoring endpoint. We will be using this endpoint in Step 4.

The screenshot shows the 'Titanic_Deployment' interface with the 'Implementation' tab selected. It displays the 'Implementation' section with a 'View API Specification' link. Below this is a table with the following information:

Scoring End-point	https://bm-watson-ml.mybluemix.net/v3/wml_instances/c4882b9a-5cb3-4d8e-9884-5255e55404e5/published_models/f1405ef1-810a-4239-8db5-37312d0d32a7/deployments/2e4ee472-49db-4a21-8150-d006116d278b/online
Authorization: Bearer <token>	See code snippets below for information on how to retrieve the WML Authorization Token to be passed with scoring requests.
Content-type: application/json	Required if the request body is sent in JSON format.

Below the table is the 'Code Snippets' section with tabs for 'cURL', 'Java', 'JavaScript', 'Python', and 'Scala'. The 'cURL' tab is selected, showing the following code:

```
# retrieve your $WML_SERVICE_CREDENTIALS_USERNAME, $WML_SERVICE_CREDENTIALS_PASSWORD, and $WML_SERVICE_CREDENTIALS_URL from the
# Service credentials associated with your IBM Cloud Watson Machine Learning Service Instance

curl --basic --user $WML_SERVICE_CREDENTIALS_USERNAME:$WML_SERVICE_CREDENTIALS_PASSWORD $WML_SERVICE_CREDENTIALS_URL/v3/identity/token

# the above CURL request will return an auth token that you will use as $WML_AUTH_TOKEN in the scoring request below
# TODO: manually define and pass values to be scored below
curl -X POST --header 'Content-type: application/json' --header 'Accept: application/json' --header 'Authorization: Bearer $WML_AUTH_TOKEN' -d '{"fields": ["pclass", "name", "sex", "sibsp", "parch", "ticket", "fare", "embarked", "Age"]
```

Step 4: Deploy a simple web front-end to invoke the Watson Machine Learning service

This section will provide an example of a simple Python Flask web front-end application that invokes the Titanic scoring API demonstrating embedding machine learning in a web app. You will click on a link below that will deploy the sample Python web application into your IBM Cloud account. A toolchain will be set up for continuous delivery of the application. The application code will be cloned from a public Git repository into a private Git repo in your account that will be set up as part of the toolchain. Each time you commit changes to the repo, the app will be built and deployed.

The toolchain uses tools that are part of the Continuous Delivery service. If an instance of that service isn't already in your organization, when you click **Deploy**, it is automatically added with the free [Lite](#) plan selected.

You will need to customize the application to provide the credentials for your Watson Machine Learning service, and to provide the scoring endpoint.

1. Click on the **Deploy to Bluemix** link below to deploy a sample Python Flask web application into your IBM Cloud account. Note you may get this message – “*An IBM Cloud account is required. To get started, click Log In or Sign Up at the top of this page*”. If you get this message, click on **Log In**.

[Deploy to Bluemix](#)

2. Scroll down to the bottom. Click on the **Create+** button to create an IBM Cloud API key.

The Delivery Pipeline automates continuous deployment.

App name: ⓘ

IBM Cloud API Key: ⓘ

*The value is required.

Region: ⓘ

Organization: ⓘ

Space: ⓘ

*The value is required. *The value is required. *The value is required.

Create+

3. Click on the **Create** button.

×

Create API key

The following API key will be created to deploy your application from the Delivery Pipeline.

API Key for Titanic-20180722183628794

API keys can be managed from **Manage > Security > Platform API keys**.

Cancel

Create

- Please wait until the Region, Organization, and Space are filled in. **Note that these must match the corresponding Region, Organization, and Space where the Titanic model was deployed.** Unless you changed the default space (dev) on creating your Watson Studio account, they should match. Otherwise update the Space value, if needed (if you have multiple spaces defined you will see them listed when clicking on the down arrow in the Space field). Click on the **Deploy** button

The Delivery Pipeline automates continuous deployment.

App name: ⓘ

Titanic-20180722183628794

IBM Cloud API Key: ⓘ

..... 👁

Create +

Region

Organization

Space

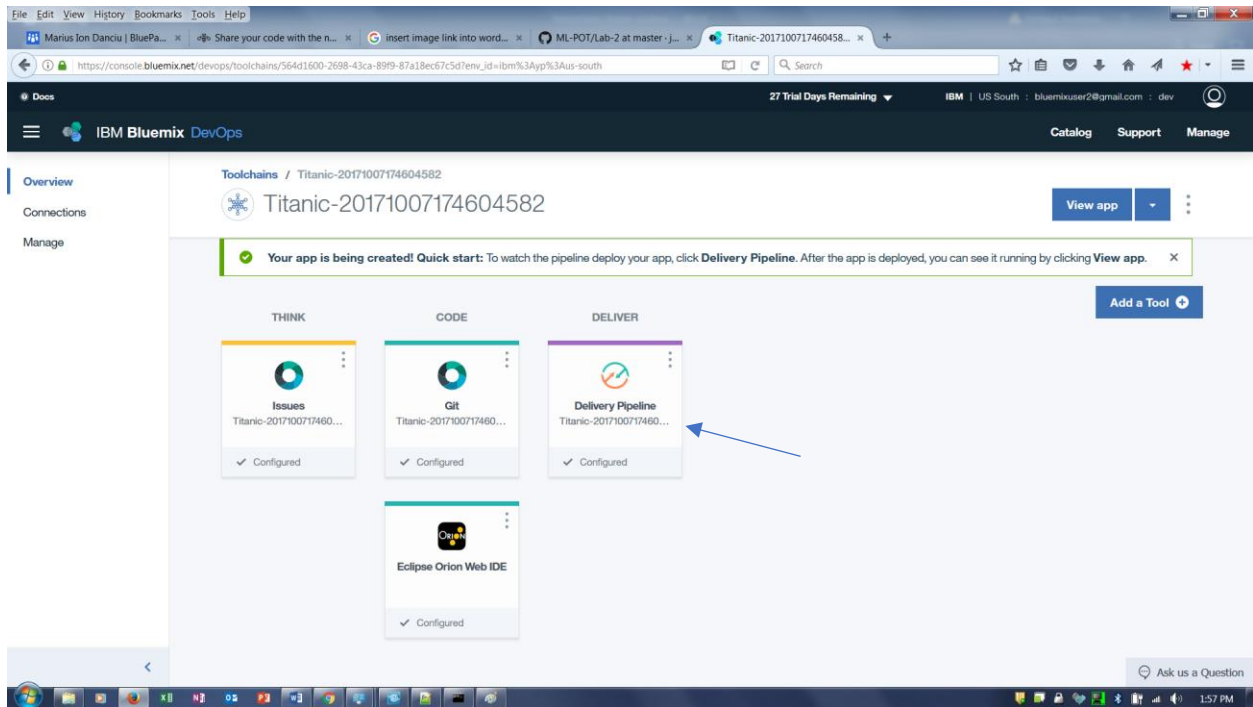
US South (Production) ▼

DSXUser30000@gm... ▼

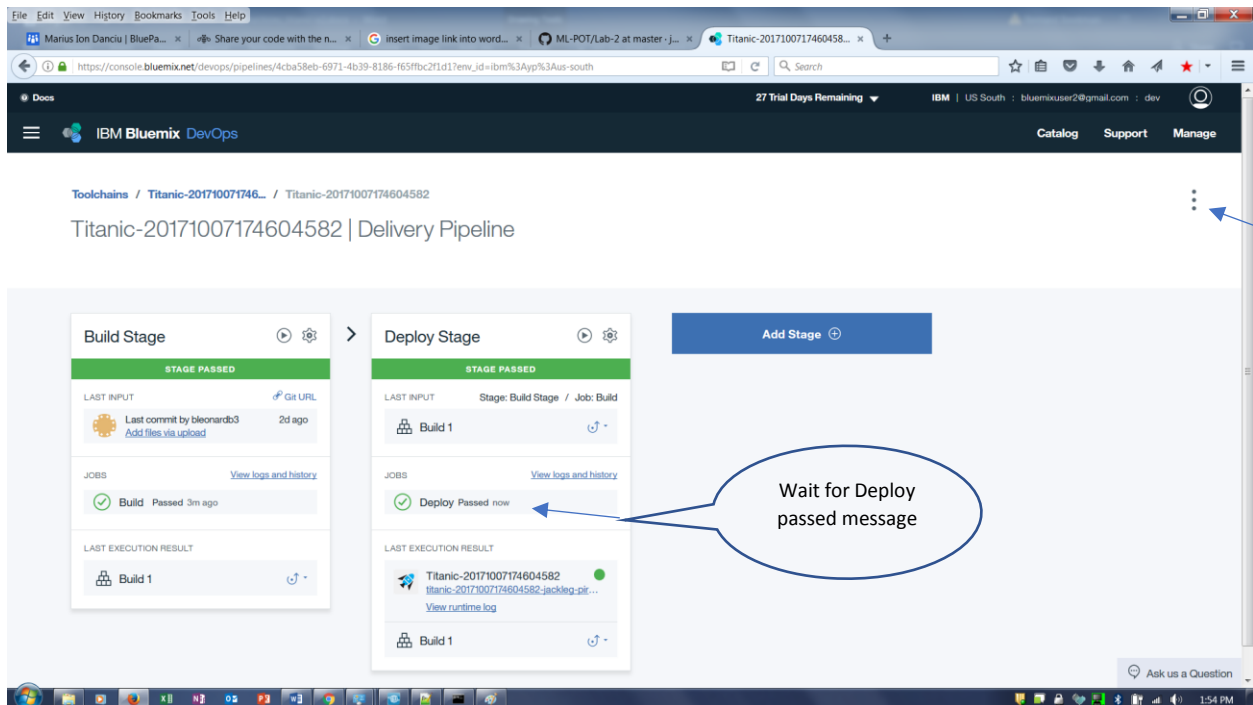
dev ▼

Deploy

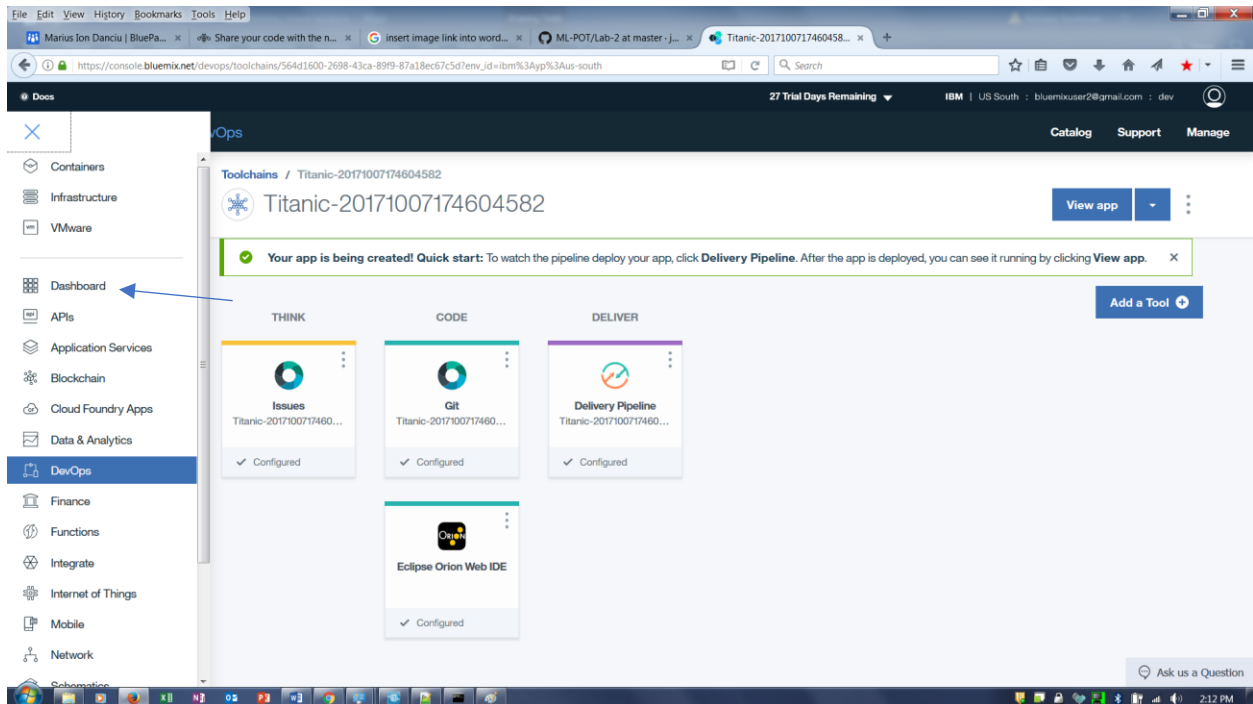
5. Your app is being created! To watch the pipeline deploy your app, click **Delivery Pipeline**.




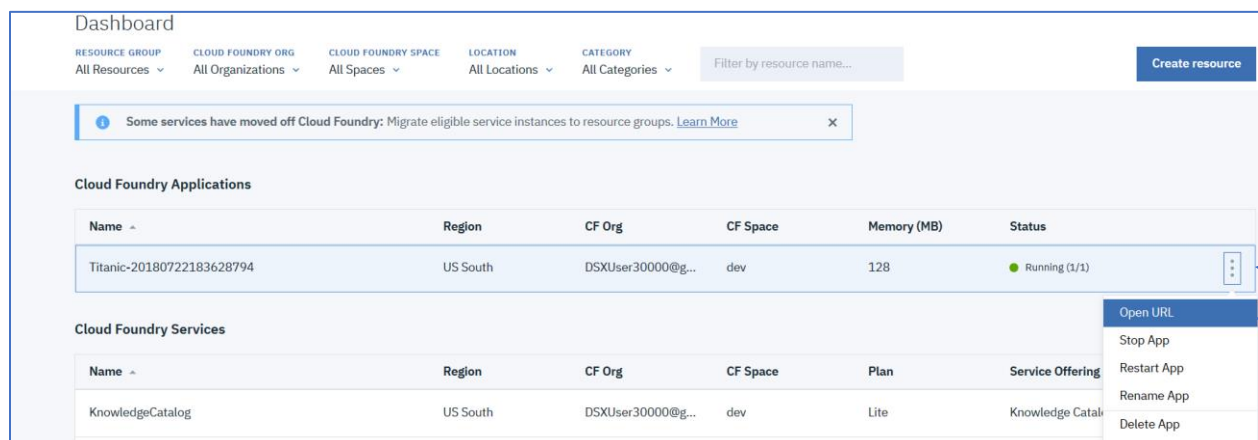
6. After the app is deployed successfully (should say Deploy Passed in the Deploy stage-may take about 2 minutes), return to the Delivery Pipeline by clicking on the vertical ellipse and click on **View Toolchain**.



7. You can see the running app by clicking  icon in the left-hand corner and Dashboard in the pulldown to navigate to the **Dashboard** where the running application should be listed.



8. Click on the vertical ellipse  on the right-side of the Titanic application listing and then click on **Open URL** to view the web application. If the **Open URL** option does not appear (sometimes it is delayed), you can click on the Titanic application, and on the next screen, click on Visit App URL



9. The web form collecting the Titanic passenger data should appear. Note that the application is not functional until we connect it to the Watson Machine Learning service so if you Submit you will get an error! Close the Titanic Prediction tab.

10. We are now going to connect the application to the Watson Machine Learning service that was created earlier. Click on the application name.

The screenshot shows the IBM Bluemix Dashboard. At the top, there's a search bar and a 'Create' button. Below, the 'Cloud Foundry Apps (1)' section shows a table with one app: 'Titanic-20171007174604582'. A blue arrow points to the app name. Below this is the 'Services (5)' section, which lists various services like Continuous Delivery, Data Science Experience, DSX-ObjectStorage, DSX-Spark, and Watson Machine Learning.

NAME	ROUTE	MEMORY (MB)	INSTANCES	RUNNING	STATE	ACTIONS
Titanic-20171007174604582	titanic-20171007174604582-jackleg-pirogue.myblu	128	1	1	Running	

NAME	SERVICE OFFERING	PLAN	ACTIONS
Continuous Delivery	Continuous Delivery	Free (Deprecated)	
Data Science Experience-gz	Data Science Experience	Lite	
DSX-ObjectStorage	Object Storage	Lite	
DSX-Spark	Apache Spark	Lite	
Watson Machine Learning	Machine Learning	Free	

11. Scroll down until you see the Connections panel. Click on **Create Connection**.

The screenshot shows the IBM Cloud console for the app 'Titanic-20171130220547025'. The 'Connections' panel is active, showing 'No services are connected to this app'. A blue arrow points to the 'Create connection' button. The 'Runtime cost' section shows '\$0.00' for current charges and '\$0.00' for estimated total.

Cloud Foundry apps / Titanic-20171130220547025 Running Visit App URL

Org: jpattier@us.ibm.com Location: US South Space: dev

BUILDPACK: Python

INSTANCES: 1 (All instances are running, Health is 100%)

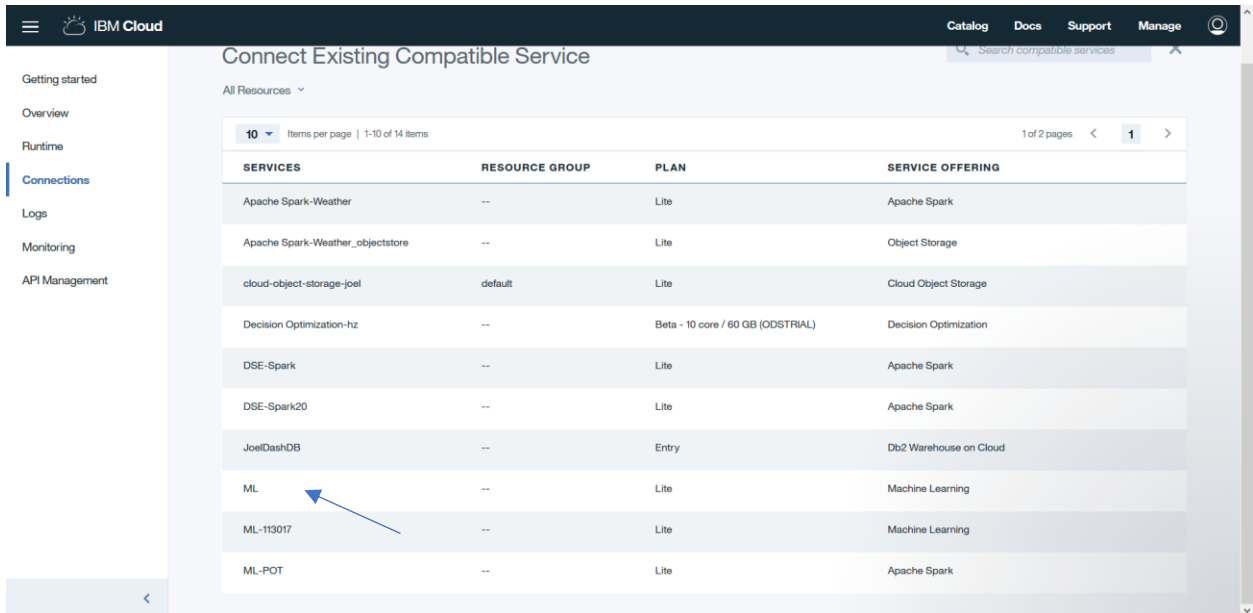
MB MEMORY PER INSTANCE: 128

TOTAL MB ALLOCATION: 128 (7.875 GB still available)

Connections: No services are connected to this app. You can bind a service: [Create connection](#)

Runtime cost: \$0.00 (Current charges for billing period) | \$0.00 (Estimated total for billing period Nov 1, 2017 - Nov 30, 2017). View full usage details

12. You should see at least 3 services listed, a Cloud Object Storage service, a Spark service, and a Watson Machine Learning service. Click on the **Machine Learning** service for your application, and then click on **Connect**.



IBM Cloud

Catalog Docs Support Manage

Search compatible services

Getting started

Overview

Runtime

Connections

Logs

Monitoring

API Management

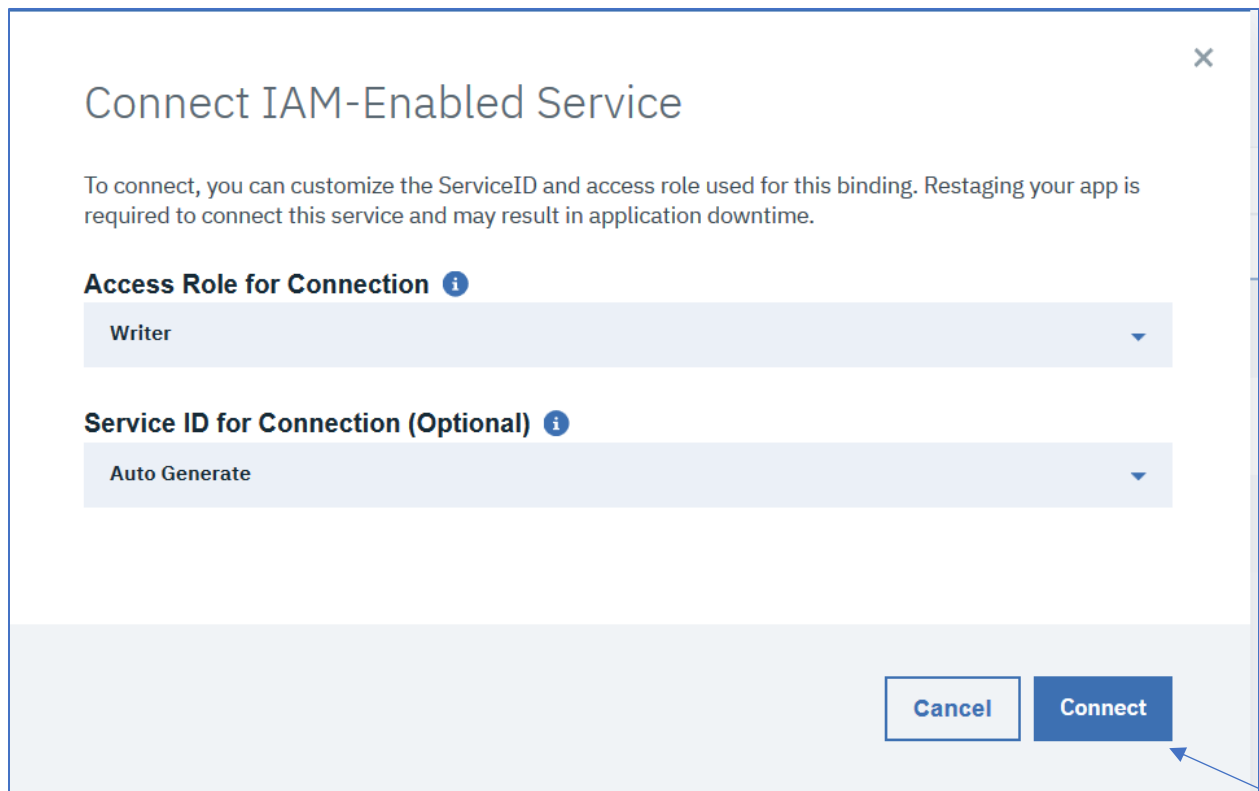
Connect Existing Compatible Service

All Resources

10 Items per page | 1-10 of 14 items 1 of 2 pages 1

SERVICES	RESOURCE GROUP	PLAN	SERVICE OFFERING
Apache Spark-Weather	--	Lite	Apache Spark
Apache Spark-Weather_objectstore	--	Lite	Object Storage
cloud-object-storage-joel	default	Lite	Cloud Object Storage
Decision Optimization-hz	--	Beta - 10 core / 60 GB (ODSTRIAL)	Decision Optimization
DSE-Spark	--	Lite	Apache Spark
DSE-Spark20	--	Lite	Apache Spark
JoelDashDB	--	Entry	Db2 Warehouse on Cloud
ML	--	Lite	Machine Learning
ML-113017	--	Lite	Machine Learning
ML-POT	--	Lite	Apache Spark

13. A **Connect IAM-enabled service** pop up will appear. Just click **Connect**.



Connect IAM-Enabled Service

To connect, you can customize the ServiceID and access role used for this binding. Restaging your app is required to connect this service and may result in application downtime.

Access Role for Connection ⓘ

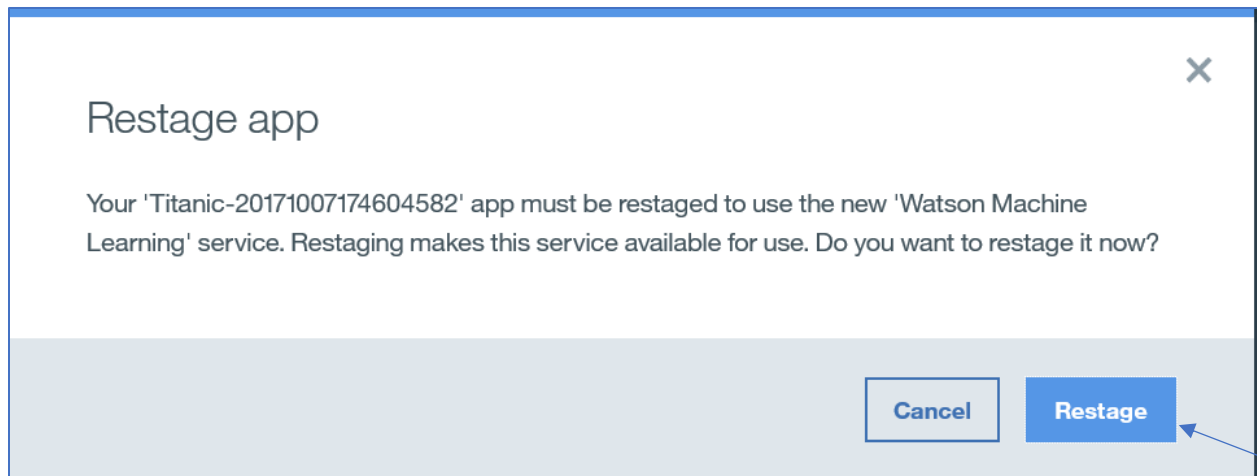
Writer



Service ID for Connection (Optional) ⓘ

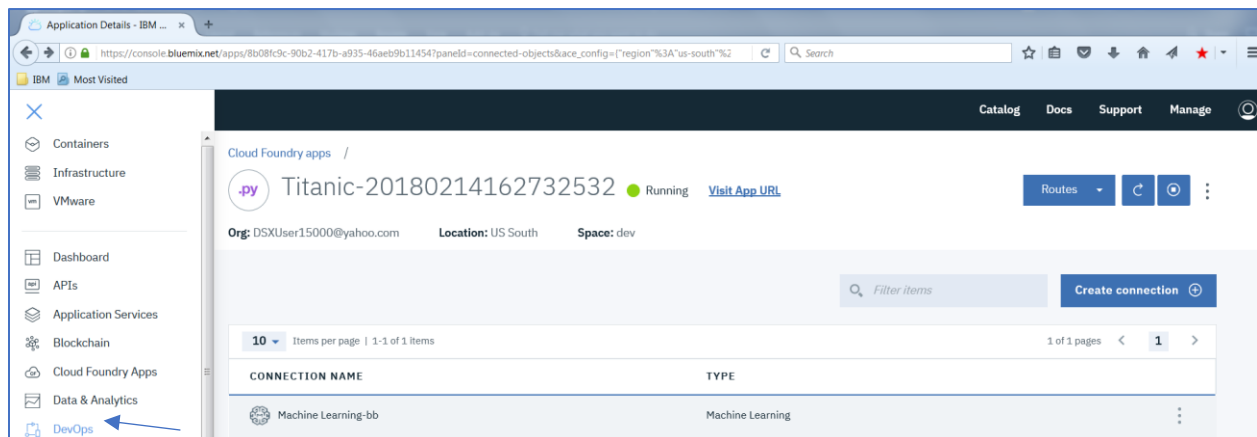
Auto Generate

Cancel Connect

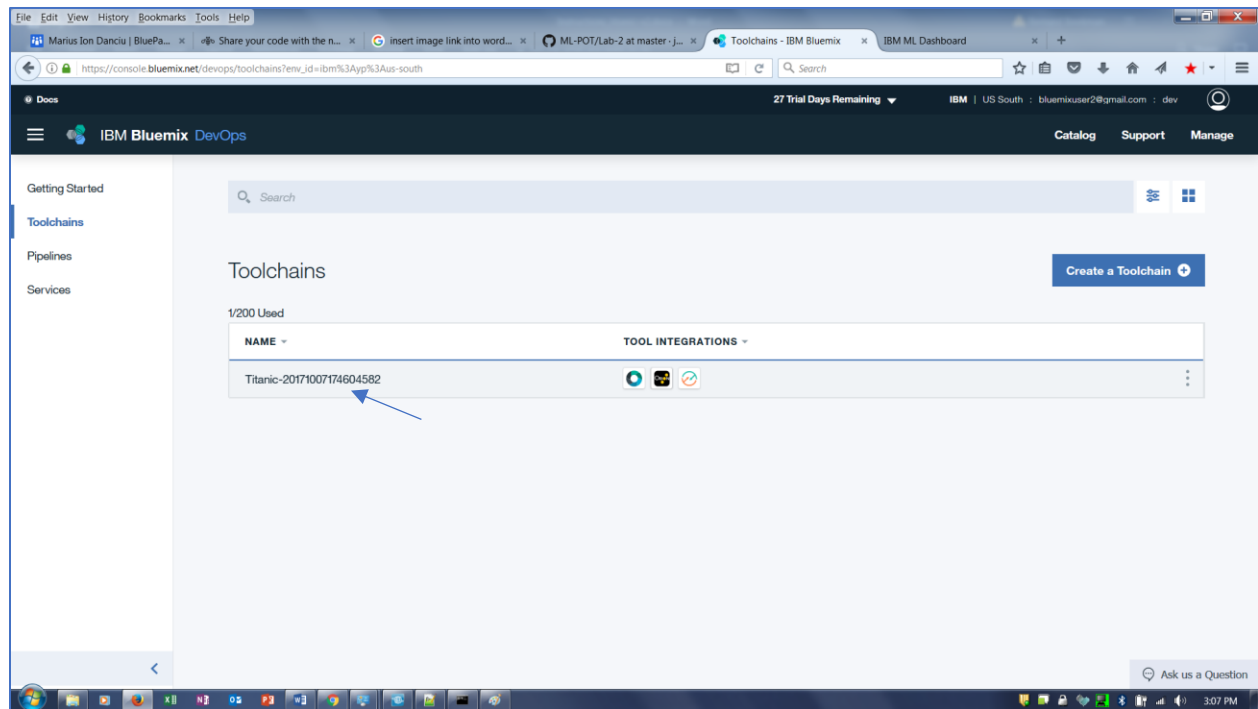
14. A **Restage app** pop up will appear. Click on **Restage**.



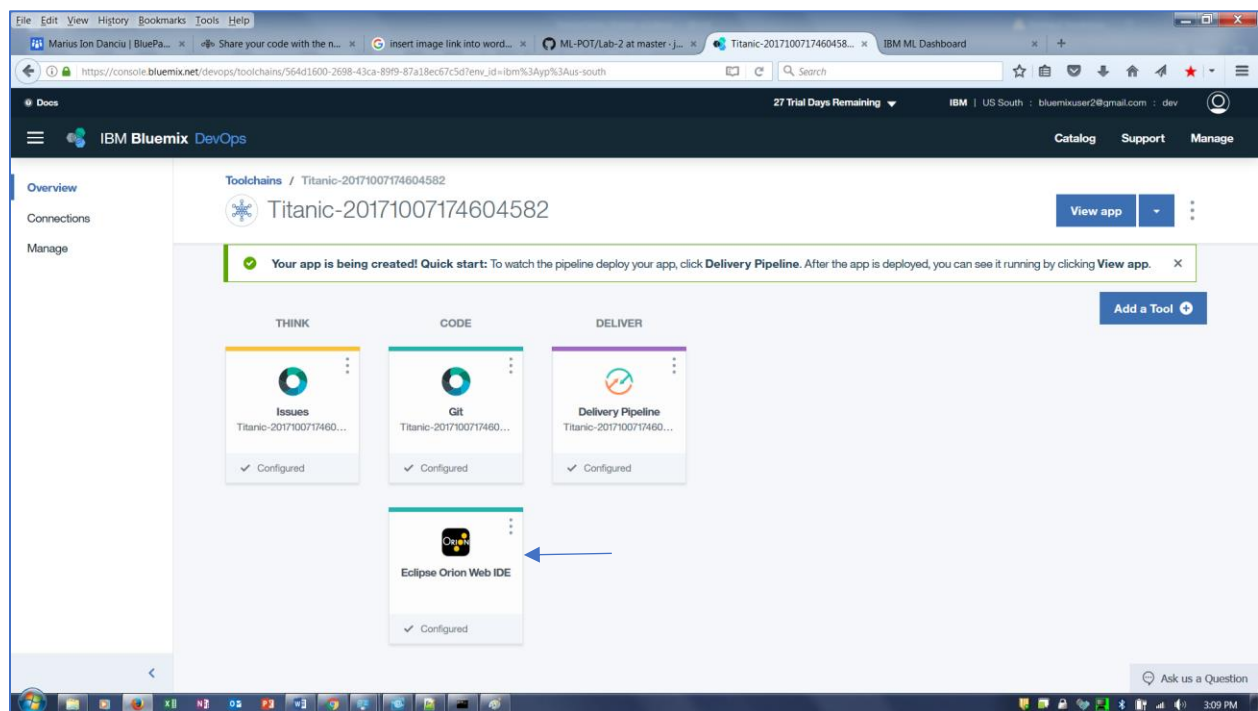
15. Wait for the application status to change to  **This app is awake** , or something similar.
16. We now have tied the web application to the Watson Machine Learning service. Note that the Watson Machine Learning service could have more than one deployed model available to select and then embed in the web application. In our case, we have only one deployed model. We now need to copy the scoring endpoint of that deployed model (previously copy and pasted into Notepad) and paste it in the web application code.
- Click on the  icon and click on DevOps in the pulldown to navigate to the Toolchain.



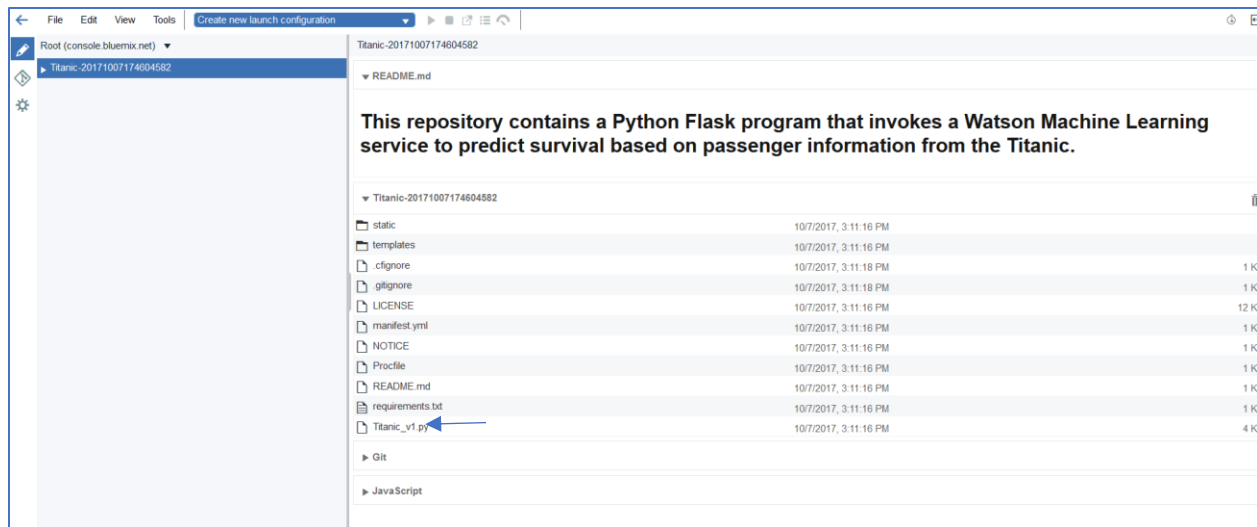
17. We are now going to paste the scoring endpoint into the application code. Click on the Toolchain (Titanic-2018xxxxx below).




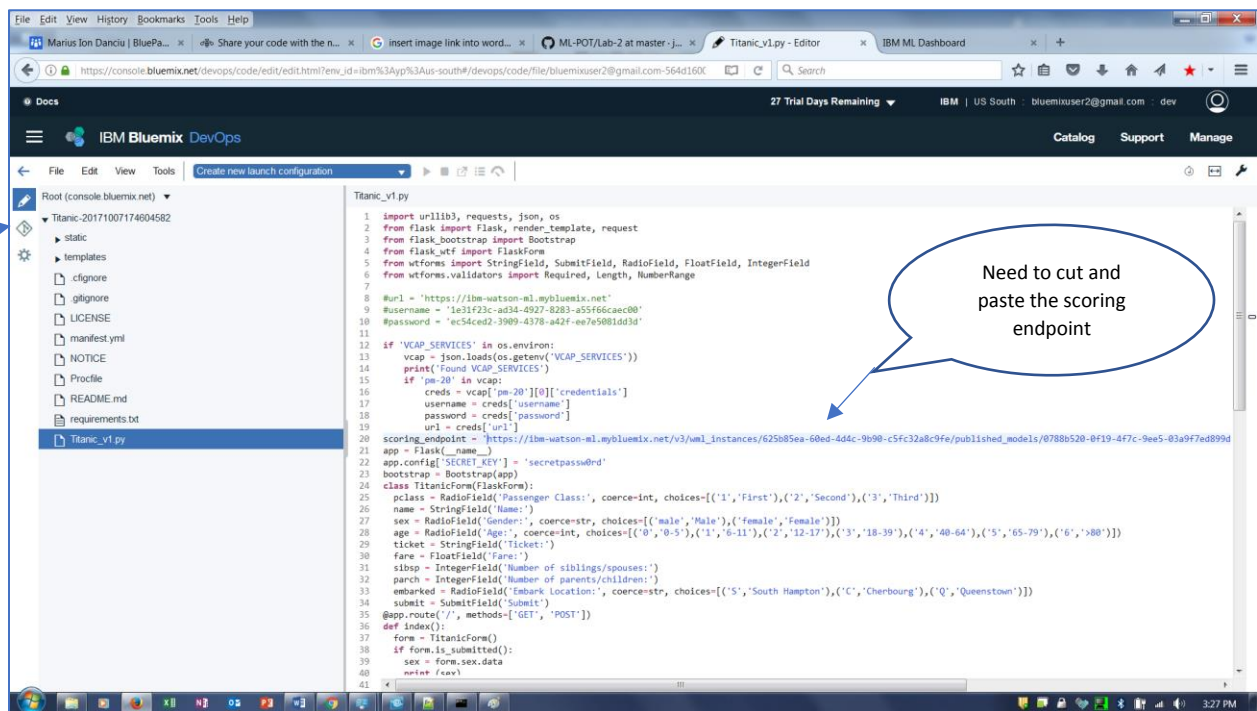
18. Click on the Eclipse Orion Web IDE.



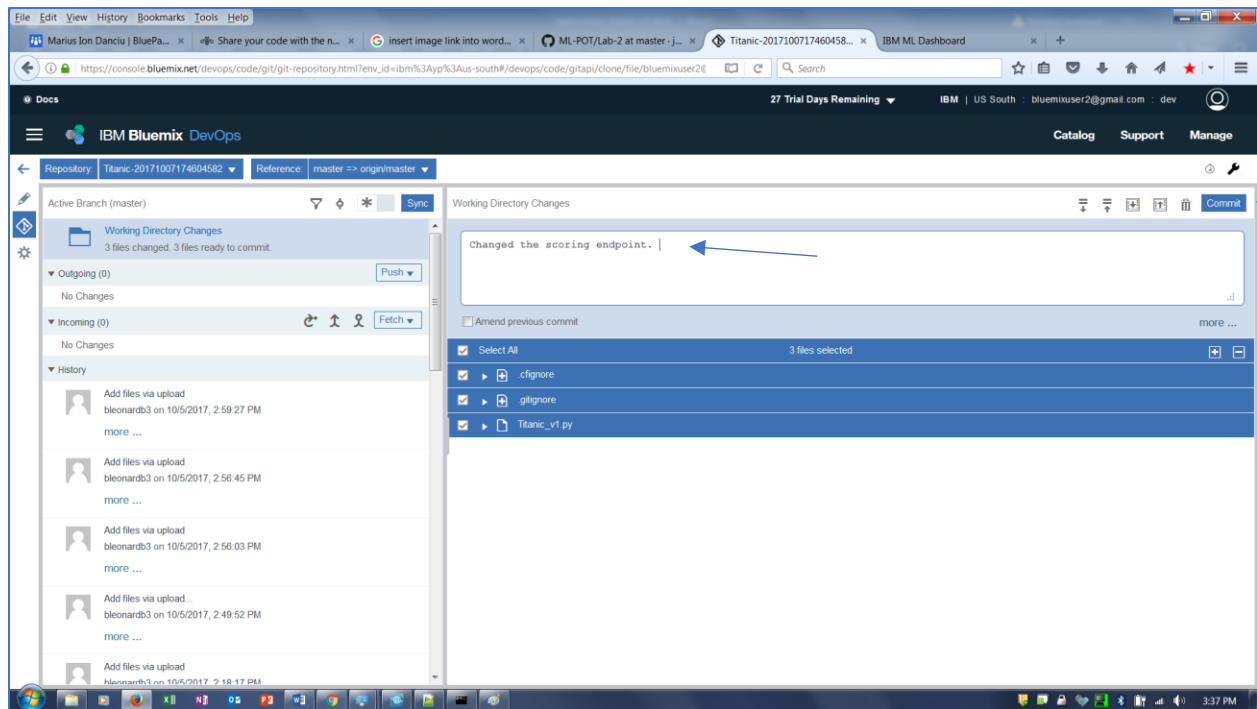
19. Click on the Titanic_v1.py file. This is a python source file.



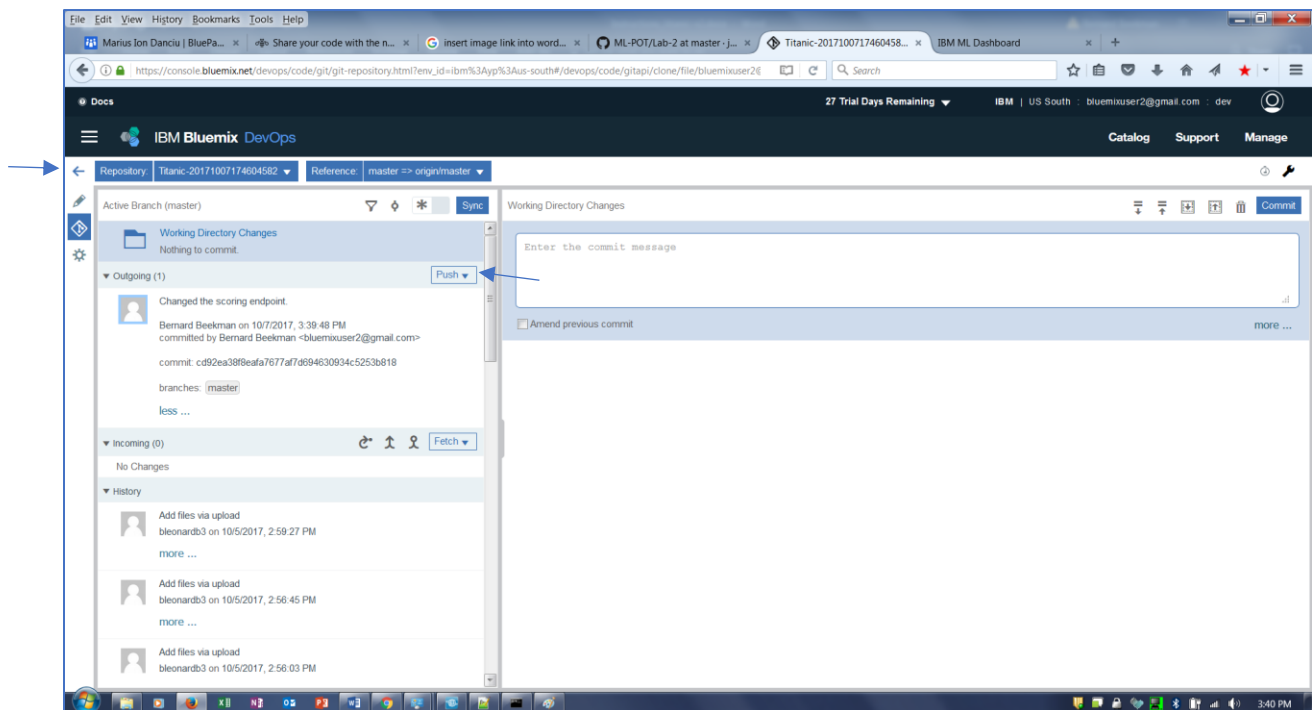
20. Go back to the Notepad file, and copy the scoring endpoint to the clipboard. Look around line 20 in the Titanic_v1.py file for the “scoring endpoint =”. Select the scoring endpoint value in line 20 (starting with https:// may want to use Shift-End to get to the end of the line, and then back up one space to not select the endpoint quote – if you do just make sure to put it back in). Enter Ctrl-V to paste the new scoring endpoint from your Notepad file. Enter Ctrl-S or File > Save to save the file. Then click on the  icon on the top left.



21. The next step is to commit the change to the git repository. Enter “Changed the Scoring Endpoint” in the Enter Commit Message field, and then click on **Commit**.





22. Then click on **Push** to push the changes to the central Git repo which will start the build and deploy of the application. Click on the left arrow to return to the Toolchain.



23. Click on the **Delivery Pipeline** to view status of the deployment as before. Once the Deployment status shows **Deploy passed now** (note it shouldn't take long so click

Reload in case the UI didn't update), click on the vertical ellipse and then click on the **View Toolchain** option to return to the Toolchain screen.

24. You can see the running app by clicking  icon in the left-hand corner and Dashboard in the pulldown to navigate to the **Dashboard** where the running application should be listed. Click on the vertical ellipse  on the right-side of the Titanic application listing and then click on **Open URL** to view the web application (See steps 7 and 8 above).
25. The web form should appear. Enter data in all the fields and click on the **Submit** button. (the submit button is located at the bottom of the web form – you may need to scroll).

To determine the survival prediction, please enter the following:

Passenger Class:

☒ First
☐ Second
☐ Third

Name:

Gender:

☒ Male
☐ Female

Number of siblings/spouses:

Number of parents/children:

Ticket:

Fare:

Embark Location:

☒ South Hampton
☐ Cherbourg
☐ Queenstown

Age:

☒ 0-5
☐ 6-11
☐ 12-17

26. You should see something similar to the following depending on the values of the input fields that you entered. Click on the **Try Again!**, if you want to experiment with different inputs.

Titanic Prediction

prediction:survived
probability: 0.827966430684

[Try Again!](#)