

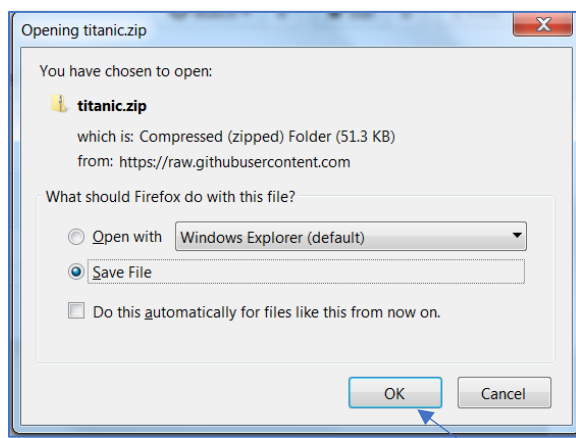
# Watson Machine Learning Overview


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

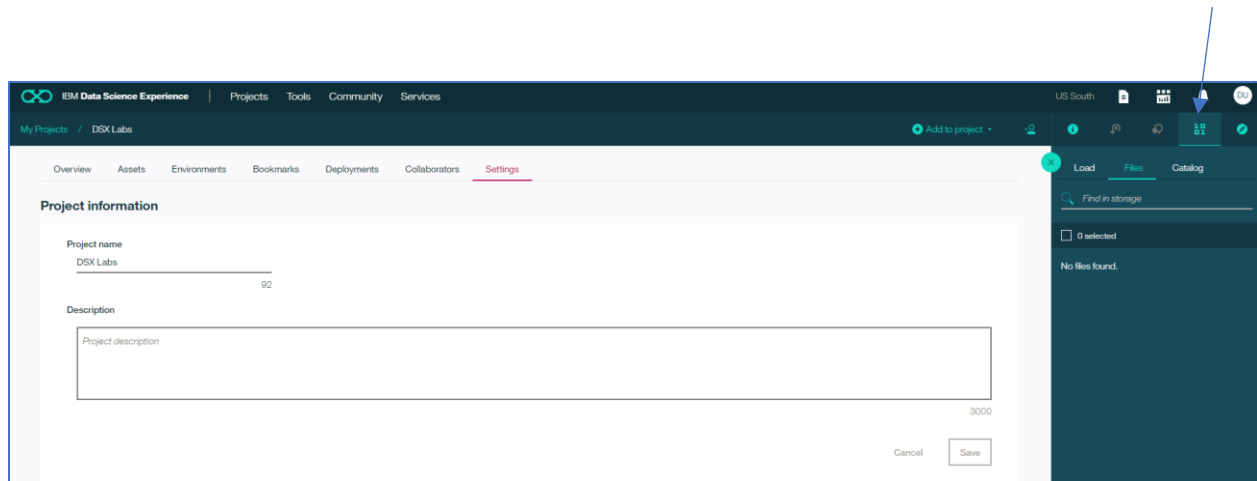
1. Adding a data asset to the Watson Studio Labs project
2. Creating a Model to predict whether a passenger would survive
3. Deploying and Testing the Model
4. Deploying a simple web front-end and connecting it to the Titanic deployed model.

## Step 1: Adding a Data Asset to the project

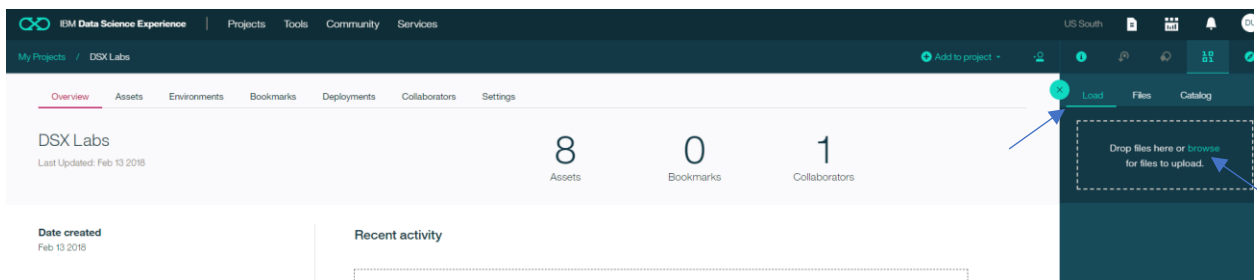
1. Download the Titanic data file from the following location by clicking on the link [Titanic Data](#).
2. Click on the **OK** button in the pop-up dialog.



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.

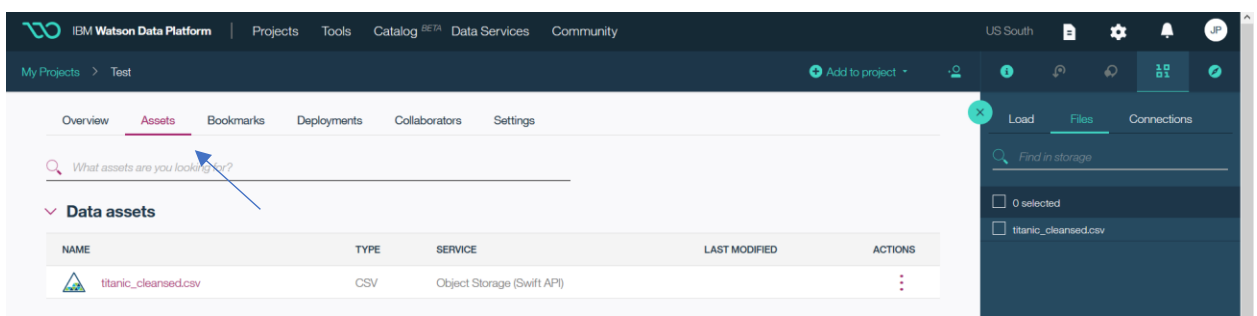


3. Click on **Load** and then **browse** and then go to the folder where the titanic\_cleansed.csv is stored. Select titanic\_cleansed.csv and then click Open.



## Step 2: Create a Model to predict survival

1. Click on the **Assets** Tab



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

My Projects / Watson Studio Labs + Add to project

Models

Natural Language Classifier models BETA + New Natural Language Classifier model

NAME	MODEL ID	SERVICE INSTANCE	LAST MODIFIED	ACTIONS
You don't have any Natural Language Classifier models yet.				

Visual Recognition models + New Visual Recognition model

NAME	MODEL ID	SERVICE INSTANCE	LAST MODIFIED	ACTIONS
You don't have any Visual Recognition models yet.				

Watson Machine Learning models + New Watson Machine Learning model

NAME	STATUS	TYPE	RUNTIME	LAST MODIFIED	ACTIONS
You don't have any Watson Machine Learning models yet.					

- Enter a **Model Name** (eg Titanic), optionally a **Description**, leave the default for the **Machine Learning Service** (should be the one created in the pre-reqs), leave **Model Builder** selected, select the **Spark Service** created in the pre-reqs, select **Manual**, and click on **Create**.

New model

Define model details

Name  
Titanic

Description  
Model description

Machine Learning Service  
Machine Learning

Select model type

☒ Model builder ☐ From file ☐ From sample

Spark Service or Environment  
Only Spark environments supporting Scala kernels can be used for model builder creation.

Spark

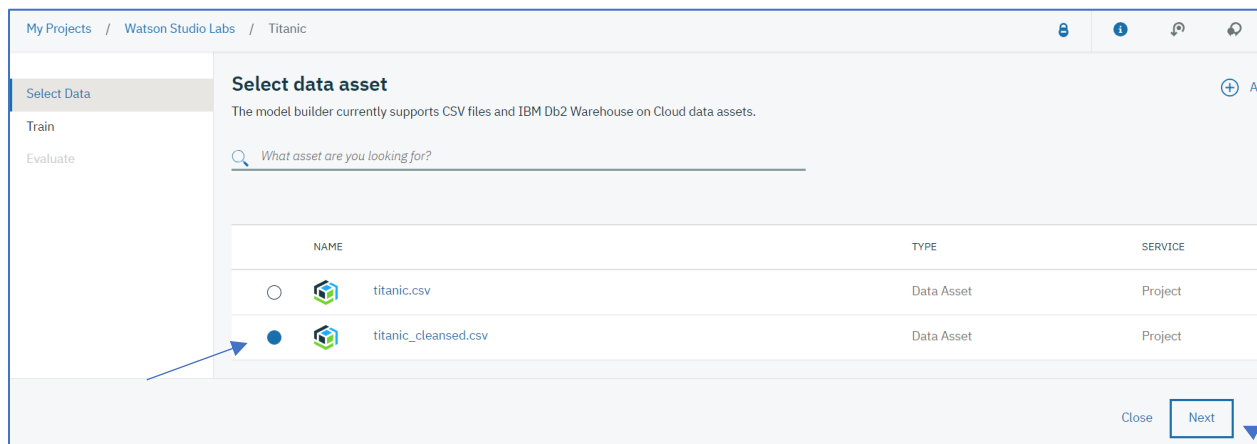
**Automatic**  
Prepare my data and create a model automatically

**Manual**  
Let me prepare my data and select which models to train

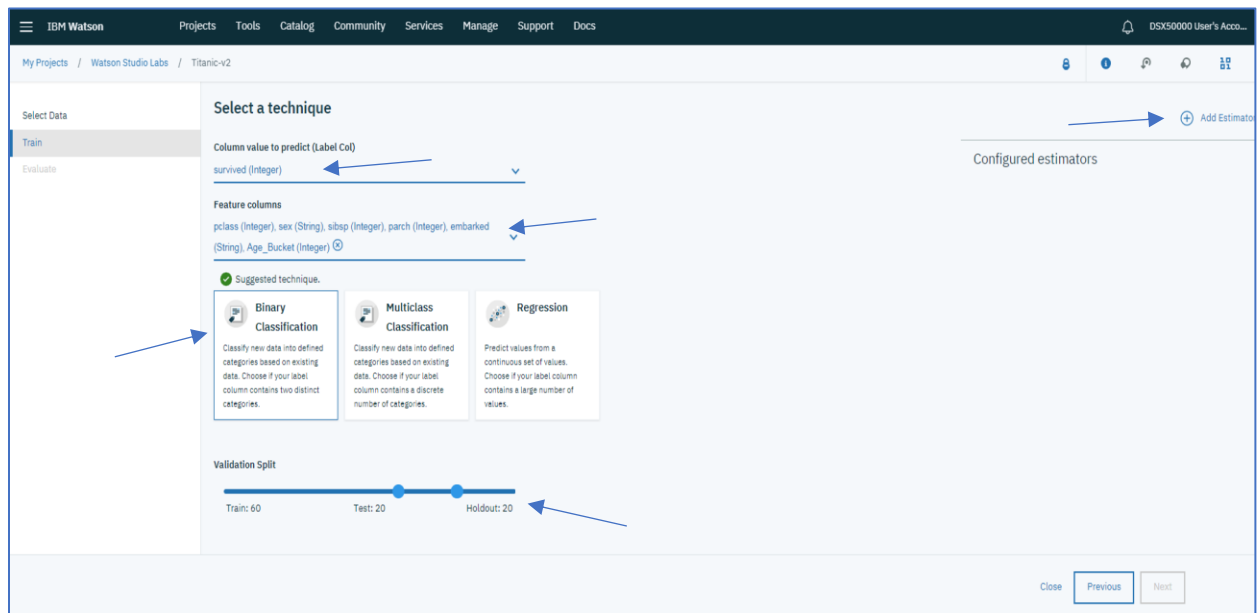
Need something more flexible? Create a [notebook](#) or design a [Modeler flow](#)

Cancel Create

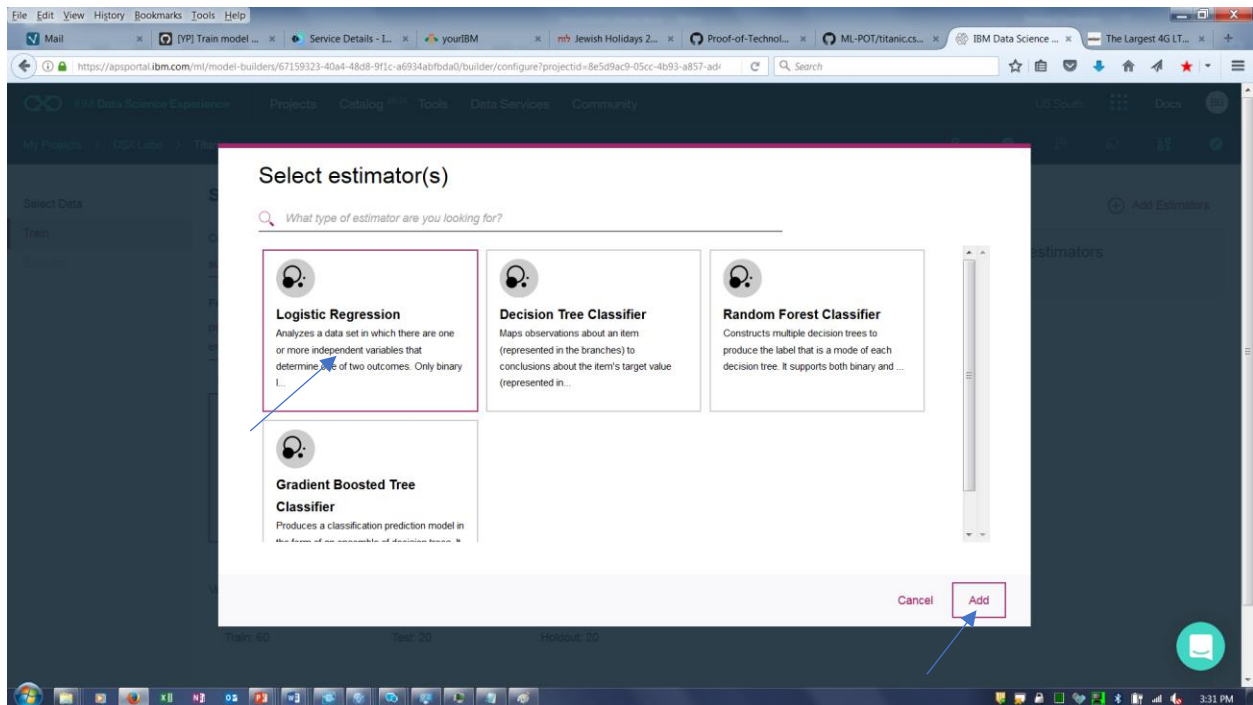
- Click on the `titanic_cleansed.csv` and click on **Next**



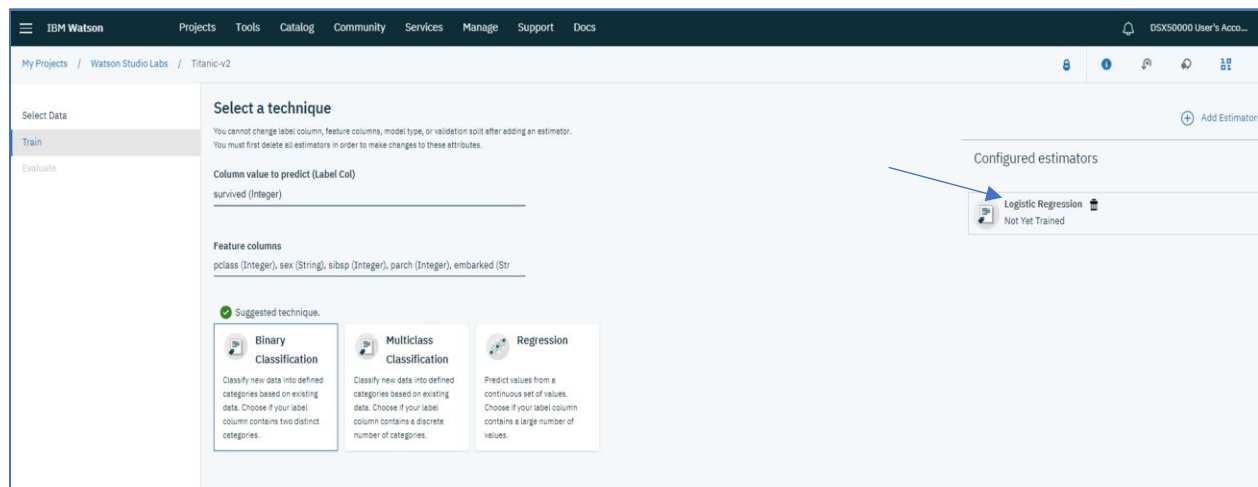
- For **Column value to predict (Label Col)** select **survived**. For **Feature columns** select the following features (**pclass, sex, sibsp, parch, fare, embarked, and Age\_Bucket**) . Click on the **Binary Classification** Box (which is suggested by the service). Adjust the **Validation Split** as 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. Note you can adjust the algorithm's hyperparameters by clicking on Logistic Regression.



8. For now we will leave the hyperparameters unchanged, so click **Cancel**.

## Configure Logistic Regression

Weight column  
[Select](#) 

Elastic net parameter (double)  
0


Fit an intercept  
☐ `fitIntercept`


Maximum iterations for convergence (integer)  
100

Regularization parameter (double)  
0

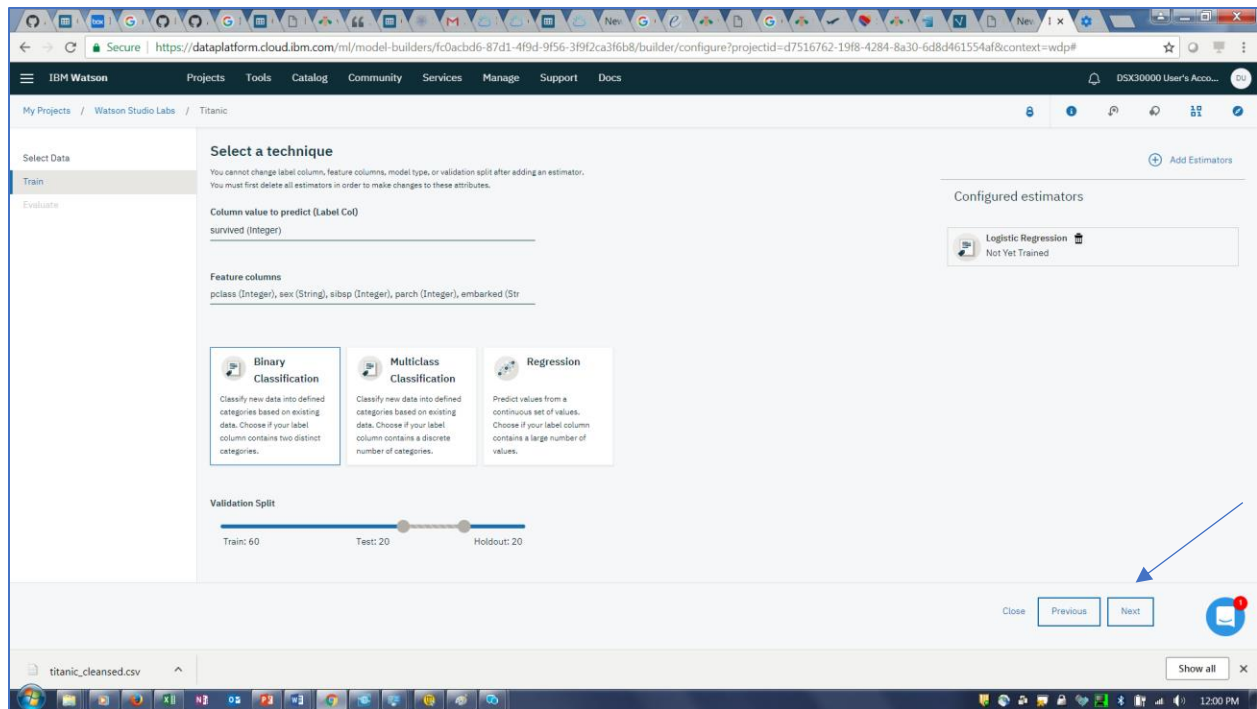
Standardize the training features before fitting the model  
☐ `standardization`

Threshold (double)  
0.5



 [Cancel](#) [Save](#)

9. Select the **Next** button.

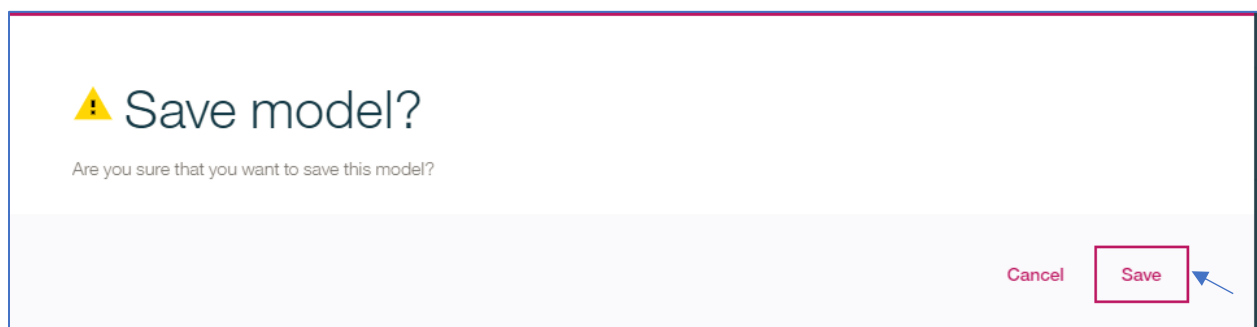


10. The system trains and evaluates each model. If more than one model was selected, the models would be listed in descending order of quality with the best result at the top. Note: if a model fails to run (rare, but happens), select Previous, delete the estimator, and re-add it. Then run again. Click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

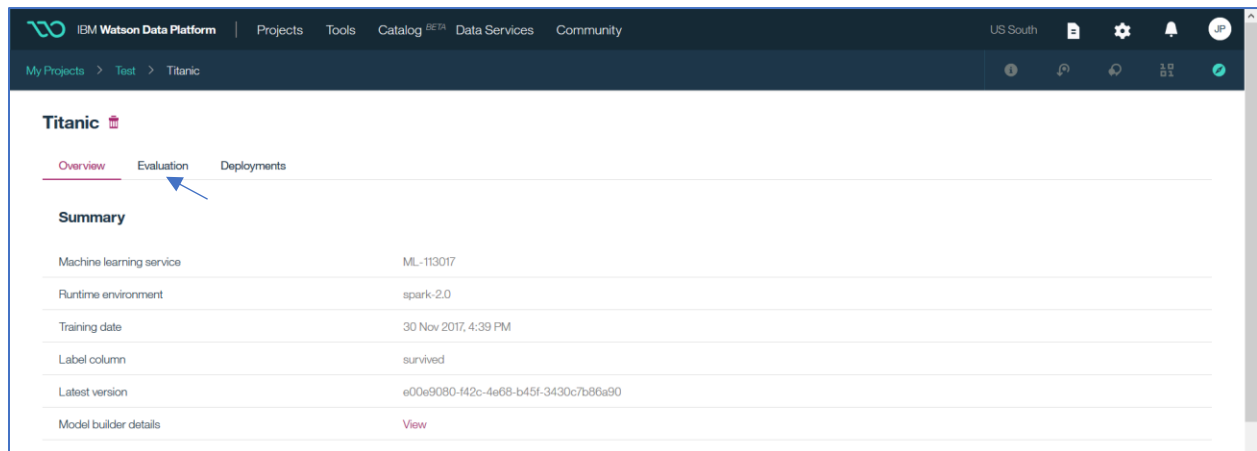
The screenshot shows the 'Select model' screen with a table of model performance metrics. A blue arrow points to the 'LogisticRegression' row, and another blue arrow points to the 'Save' button at the bottom right.

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

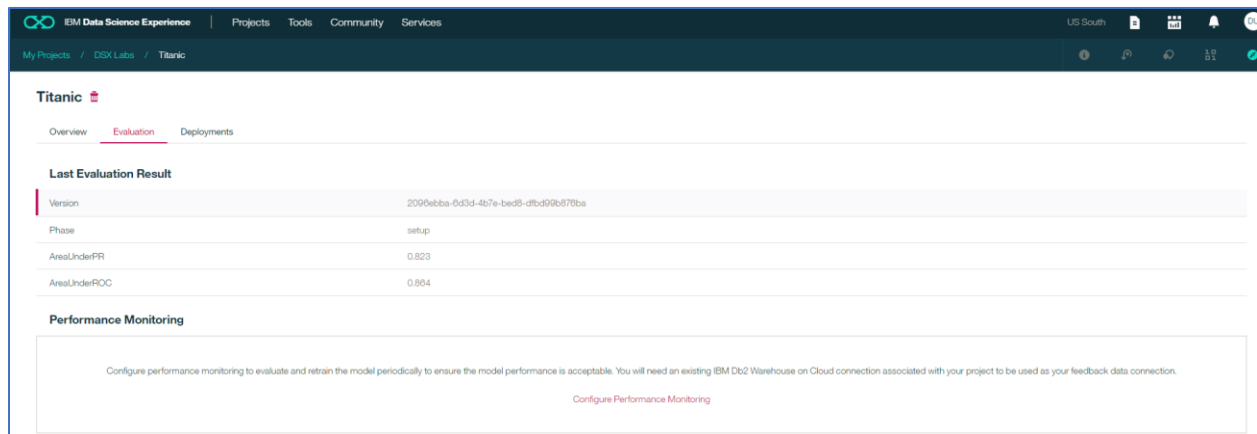
11. Click **Save** again on the next screen.



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



13. 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.

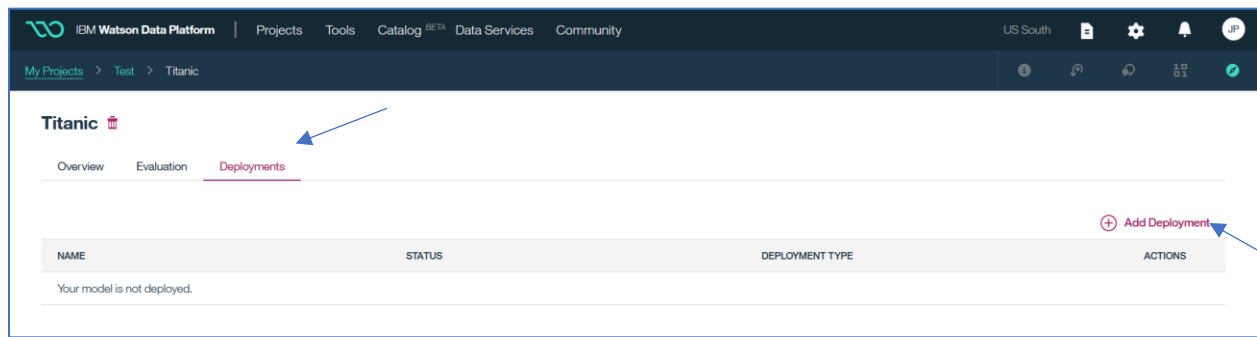


## Step 3: Deploying a Model

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**





- Three options for deployment are available. For this lab, we are going to embed the predictive model scoring in a web application. Enter **Titanic\_Deployment** for **Name**, optionally a **Description**, select the **Web Service** radio button, 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

- The system responds with an acknowledgement that the model was successfully deployed. Click on **Titanic\_Deployment** to test the deployed API.

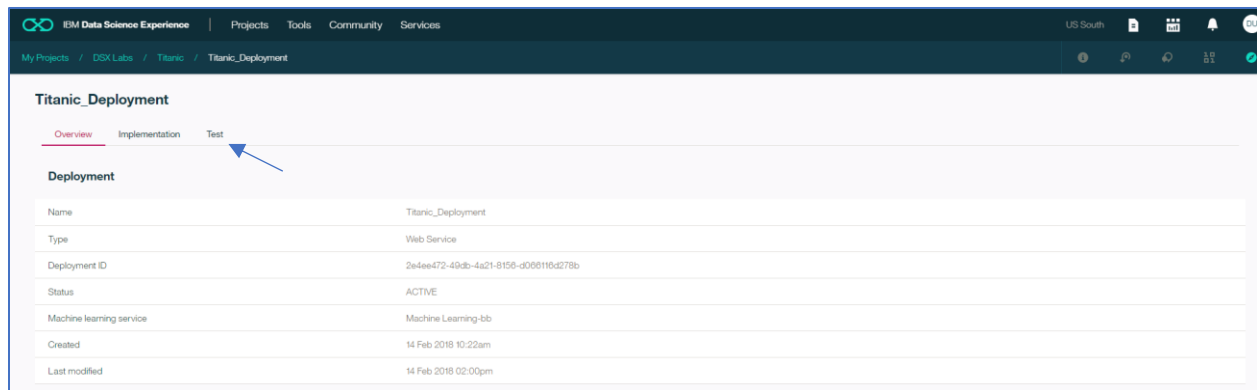
Titanic

Overview Evaluation Deployments Lineage

+ Add Deployment

NAME	STATUS	DEPLOYMENT TYPE	ACTIONS
Titanic_Deployment	DEPLOY_SUCCESS	Web Service	⋮

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



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 - 200

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

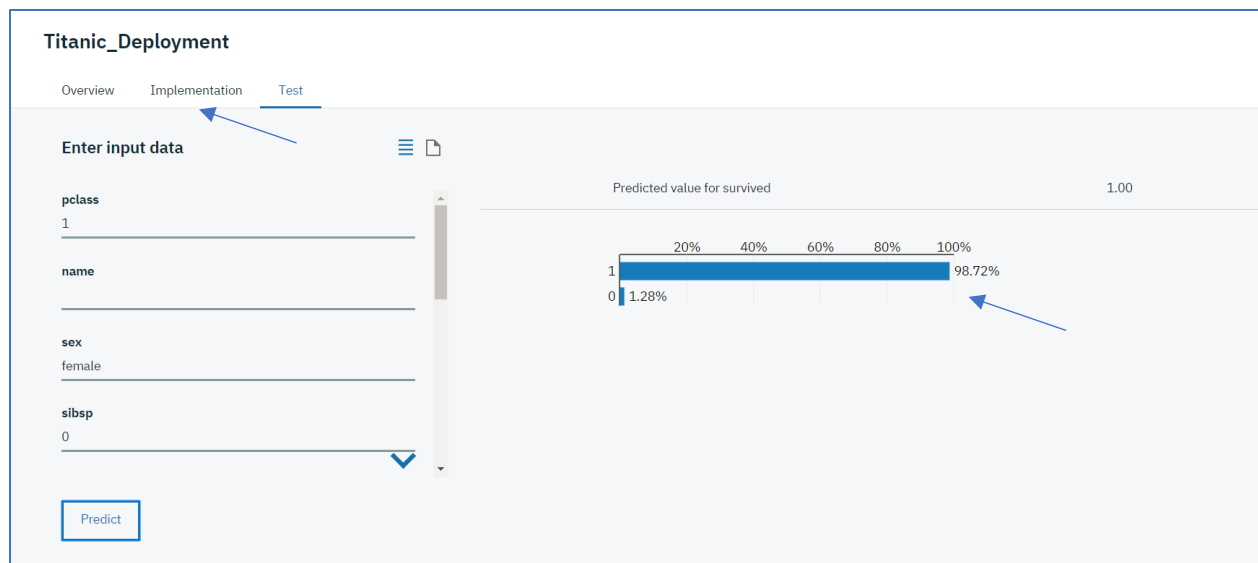
sibsp

0

✓

Predict

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



8. 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 'Implementation' tab of the 'Titanic\_Deployment' interface. It displays the 'Scoring End-point' as [https://ibm-watson-milmybluemix.net/v3/wml\\_instances/c4862b9a-5cb3-4d8e-9864-3255e55464e5/published\\_models/11465e1f-818a-4239-8db6-37312d8d32a7/deployments/2e4ee472-49db-4a21-8156-d06118d278b/online](https://ibm-watson-milmybluemix.net/v3/wml_instances/c4862b9a-5cb3-4d8e-9864-3255e55464e5/published_models/11465e1f-818a-4239-8db6-37312d8d32a7/deployments/2e4ee472-49db-4a21-8156-d06118d278b/online). The 'Authorization' is 'Bearer <token>' and the 'Content-type' is 'application/json'. A blue arrow points to the 'View API Specification' link. Below, the 'Code Snippets' section shows a cURL command and a Python script for retrieving the authentication token.

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

```
# 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

# 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 account, when you click **Deploy**, it is automatically added with the free [Lite](#) plan selected.

You will need to configure 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:** (i)  
Titanic-20180722183628794

**IBM Cloud API Key:** (i)  
IBM Cloud API Key Create +

\*The value is required.

Region	Organization	Space
The bluemix region	The bluemix org	The bluemix space

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

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

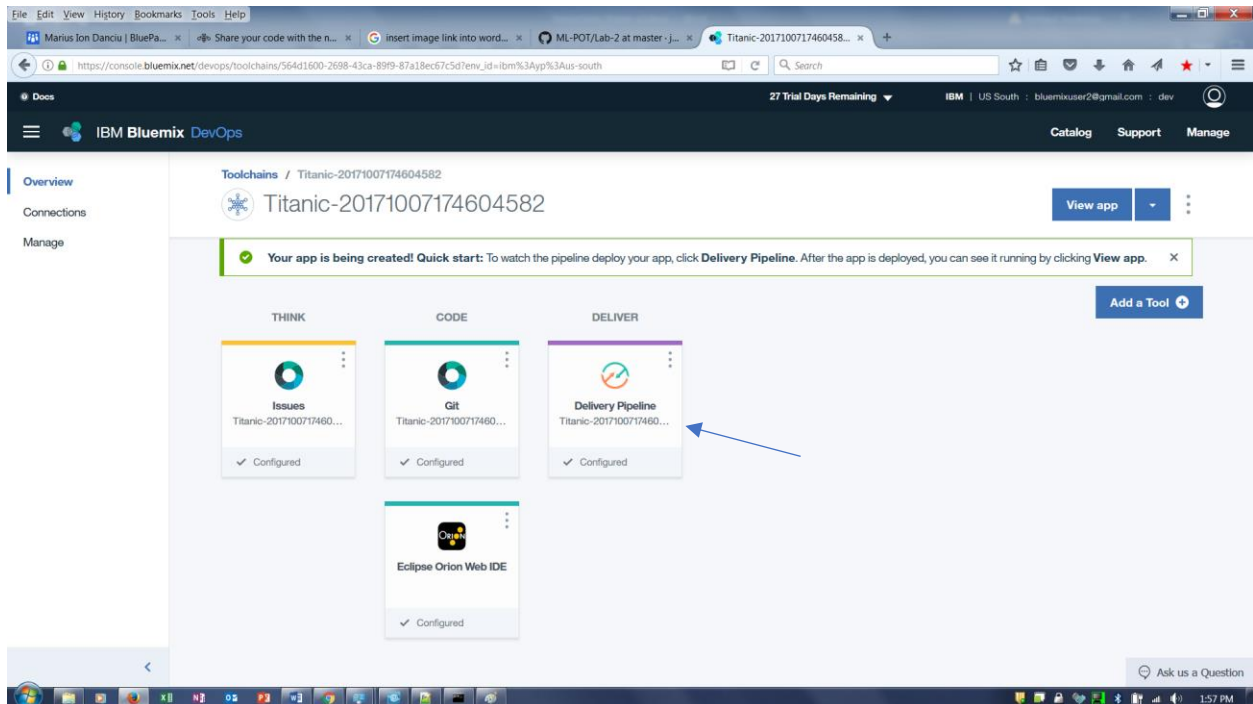
US South (Production) ▼


DSXUser30000@gm... ▼

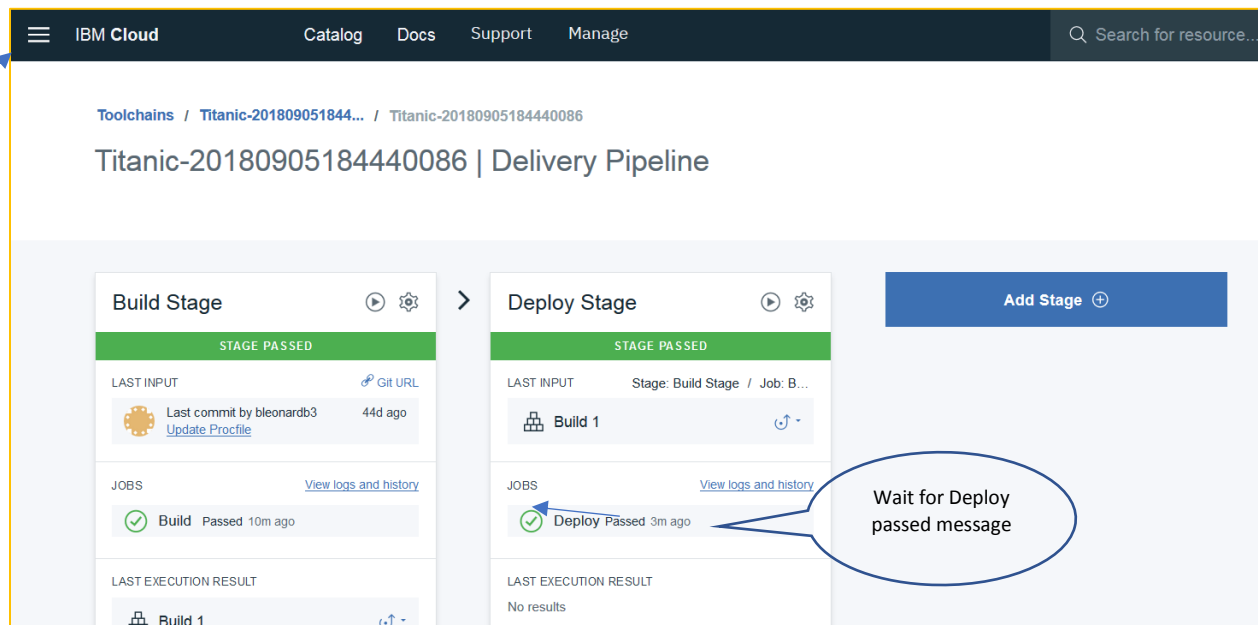
dev ▼

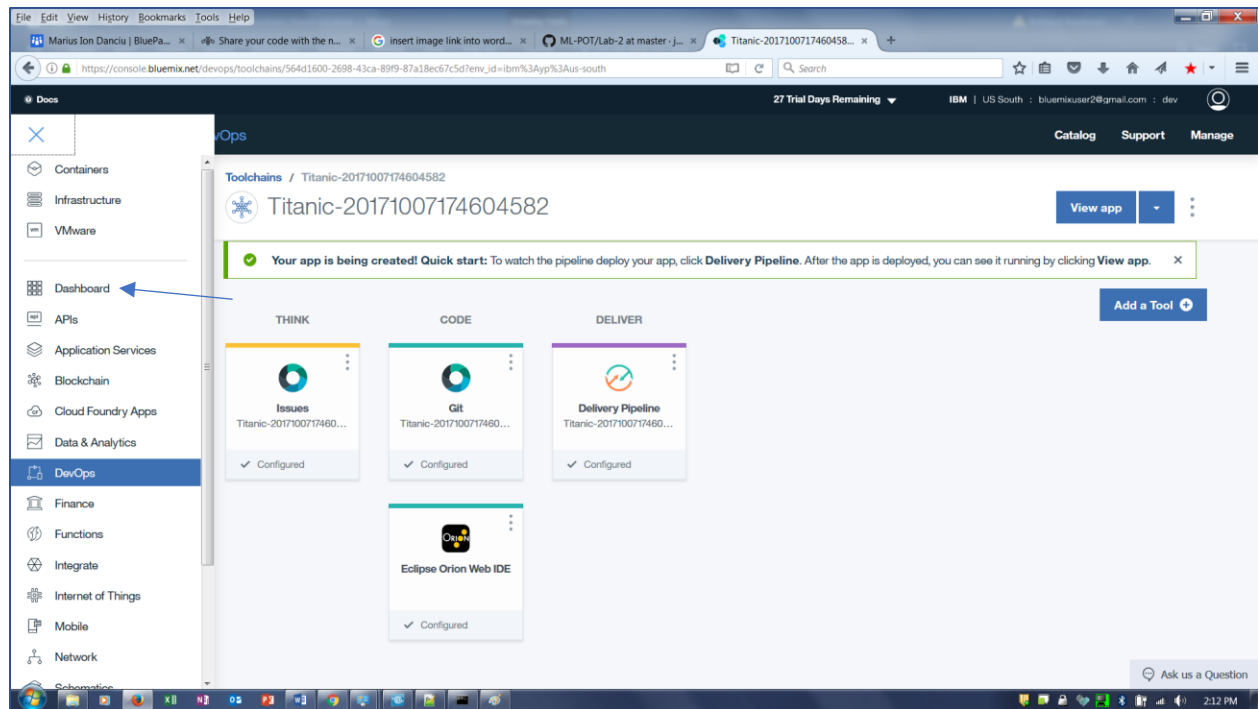
Deploy

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

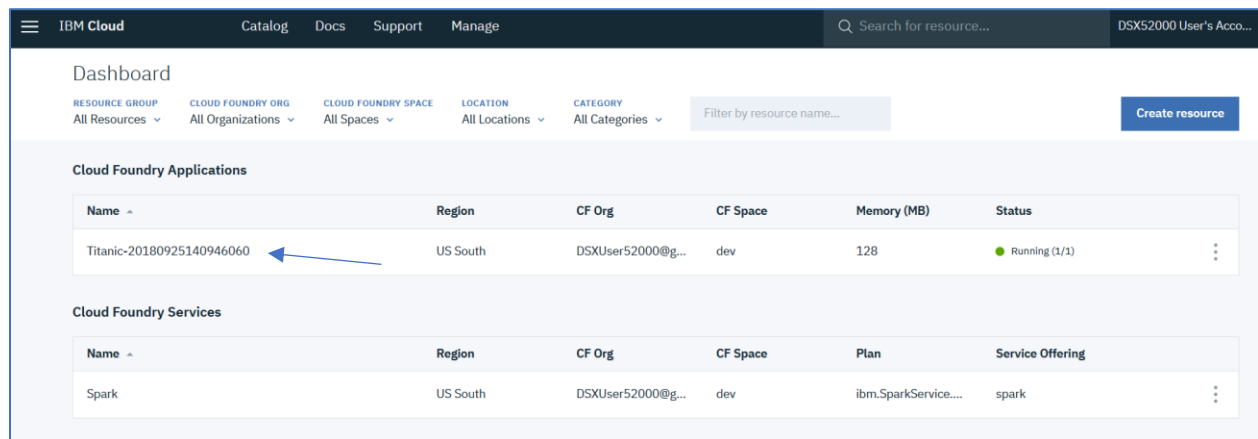


6. After the app is deployed successfully (should say Deploy Passed in the Deploy stage- may take about 2 minutes), view the running app by clicking the hamburger  icon in the left-hand corner and **Dashboard** in the pulldown to navigate to the **Dashboard** where the running application should be listed.








7. Click on the Titanic application name.




8. Click on **Visit App URL**




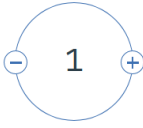
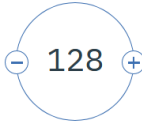

Cloud Foundry apps /

 Titanic-20180925140946060  This app is awake. [Visit App URL](#) 

Org: DSXUser52000@gmail.com Location: US South Space: dev

Routes 

Runtime

			
BUILDPACK	INSTANCES	MB MEMORY PER INSTANCE	TOTAL MB ALLOCATION
Python	1 All instances are running Health is 100%	128	128 MB still available

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 browser tab.

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:**

10. We are now going to connect the application to the Watson Machine Learning service that was created earlier. Scroll down until you see the Connections panel. Click on **Create Connection**.

IBM Cloud

Cloud Foundry apps / Titanic-20171130220547025 Running Visit App URL

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

**BUILDPACK**  
Python

**INSTANCES**  
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)

Current and estimated cost excludes connected services.

**View full usage details**

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

Connect Existing Compatible Service

Search compatible services

All Resources

10 Items per page | 1-3 of 3 items

SERVICES	RESOURCE GROUP	PLAN	SERVICE OFFERING
cloud-object-storage-id	Default	Lite	Cloud Object Storage
Machine Learning	Default	Lite	Machine Learning
Spark	--	Lite	Apache Spark

**Connect**

12. 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

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


Restage app

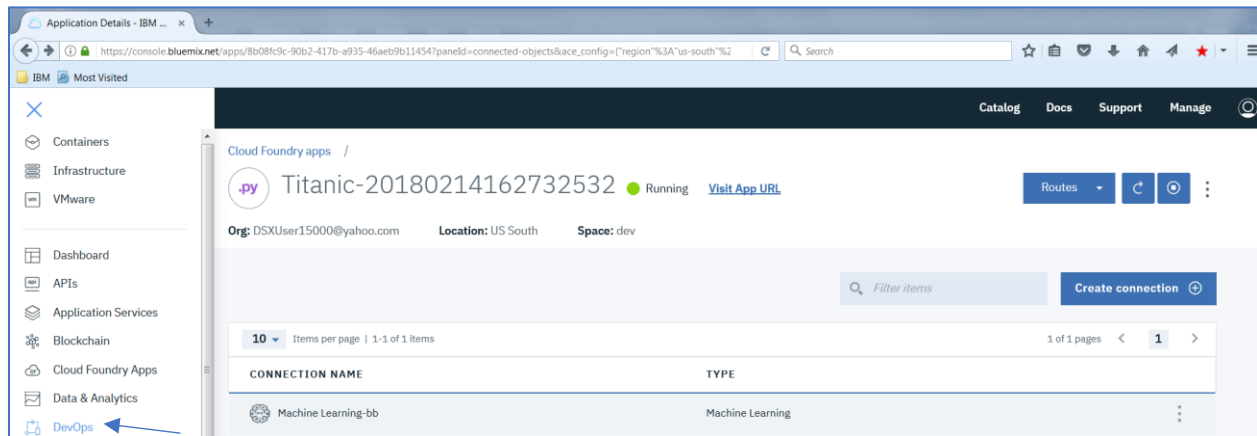
Your 'Titanic-20171007174604582' app must be restaged to use the new 'Watson Machine Learning' service. Restaging makes this service available for use. Do you want to restage it now?

Cancel Restage

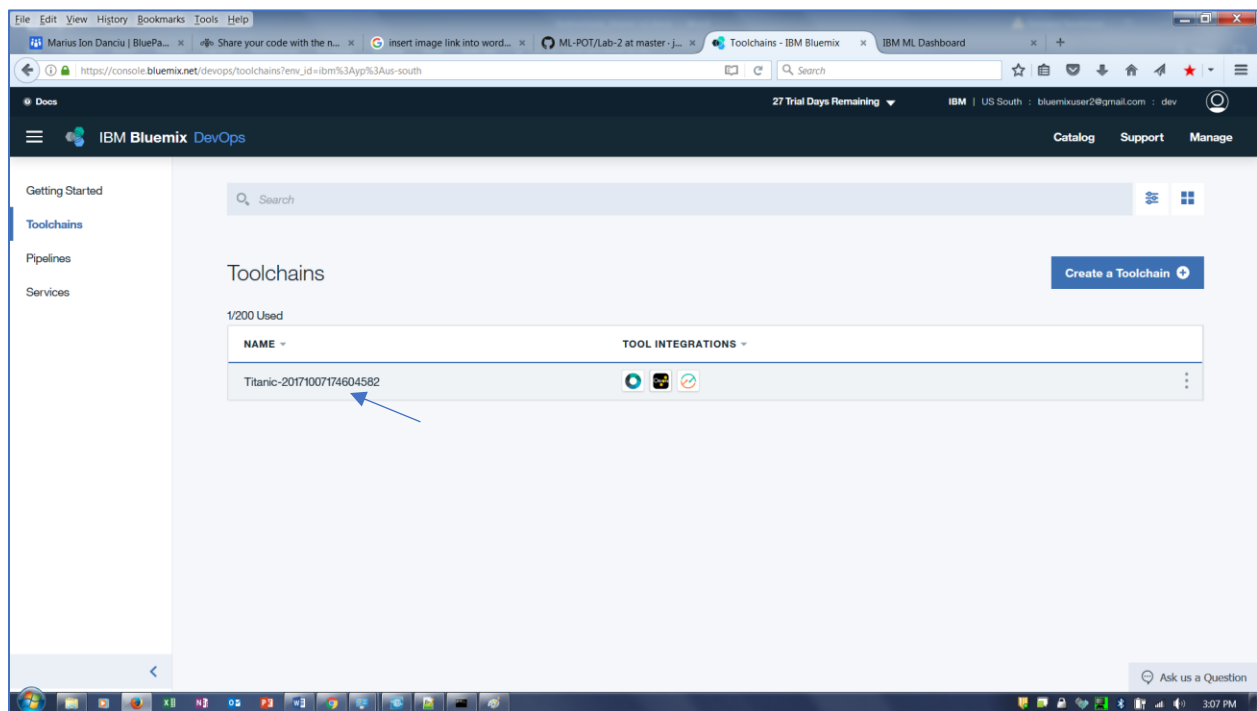
14. Wait for the application status to change to  This app is awake , or something similar.

15. 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

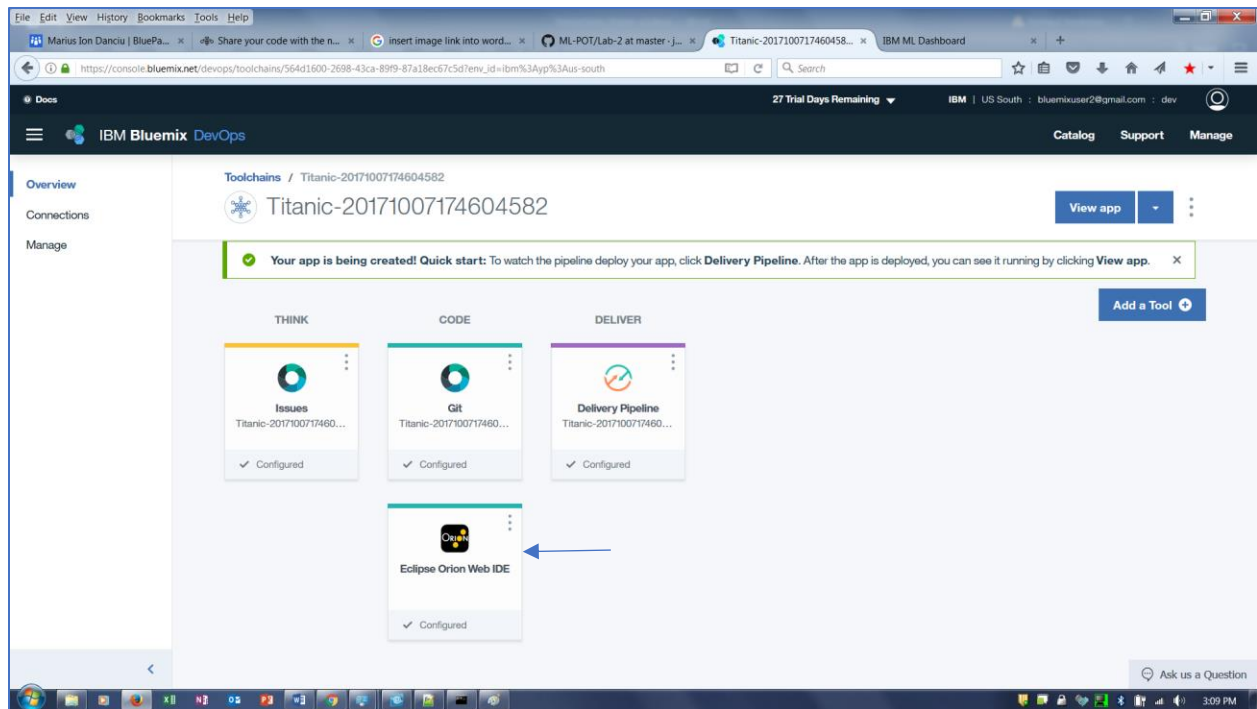
(previously copy and pasted into Notepad ) and paste it in the web application code.  
Click on the  icon and click on DevOps in the pulldown to navigate to the Toolchain.



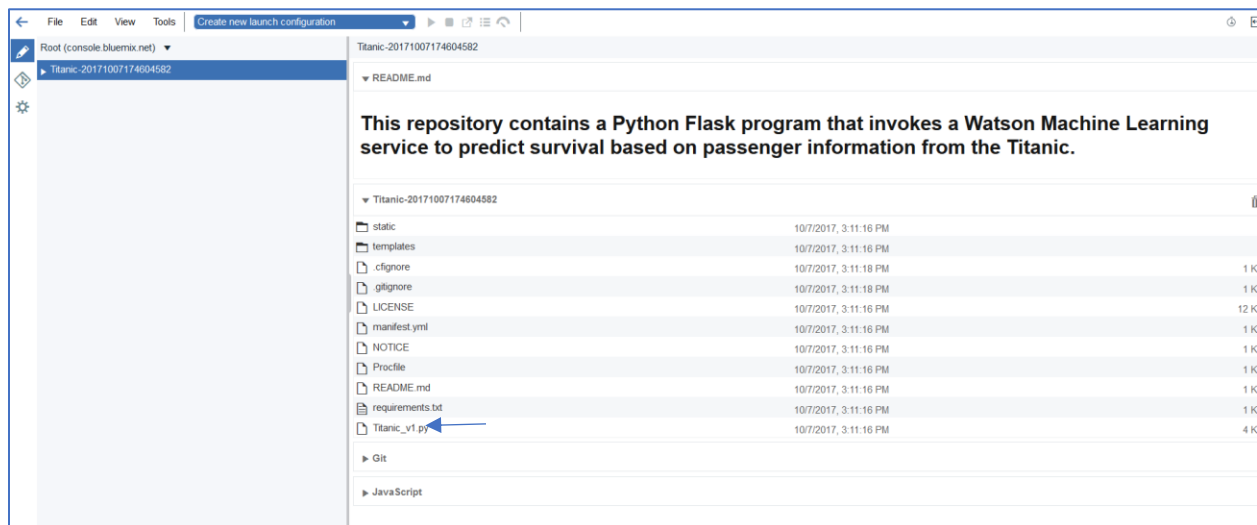
16. We are now going to paste the scoring endpoint into the application code. Click on the Toolchain (Titanic-2018xxxxx below).




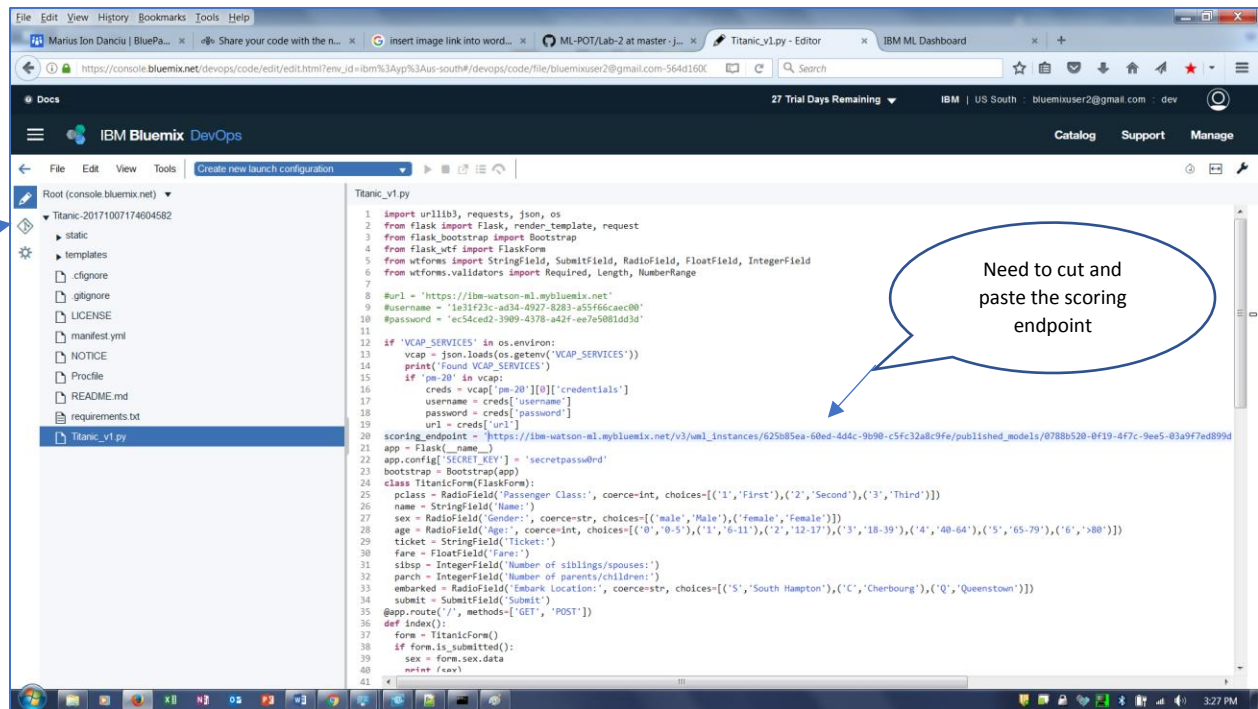
17. Click on the Eclipse Orion Web IDE.



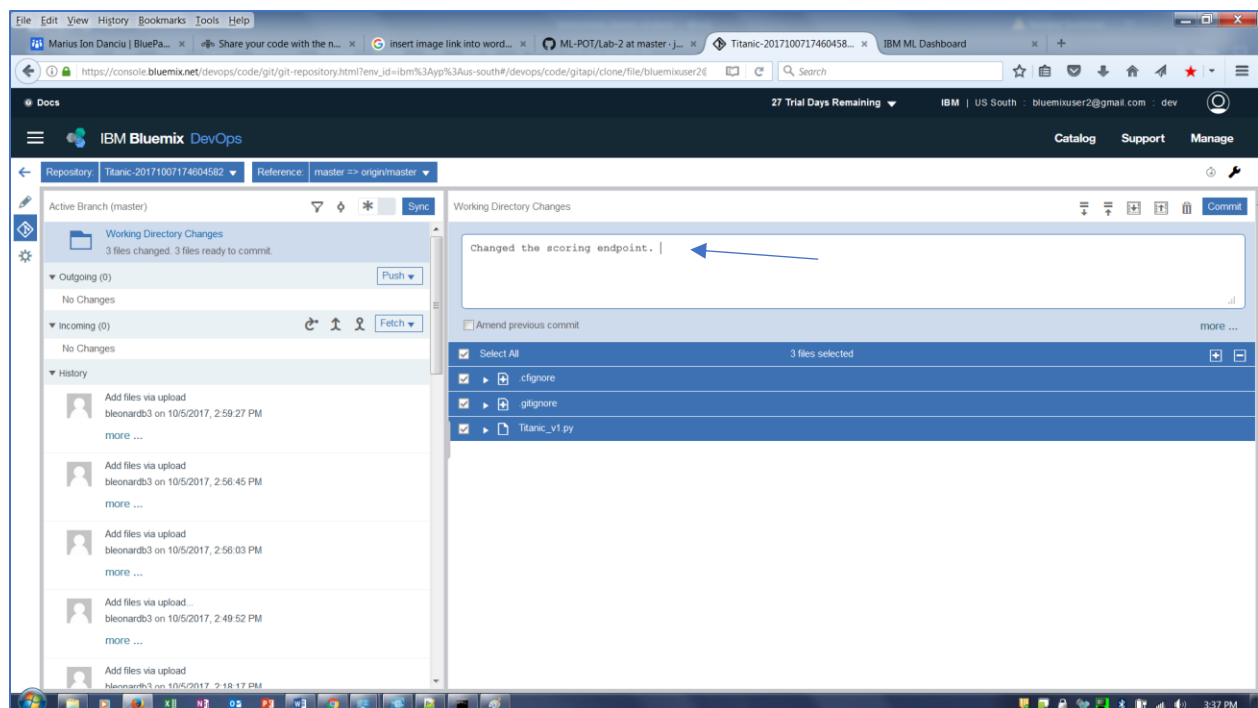
18. Click on the `Titanic_v1.py` file. This is a python source file.



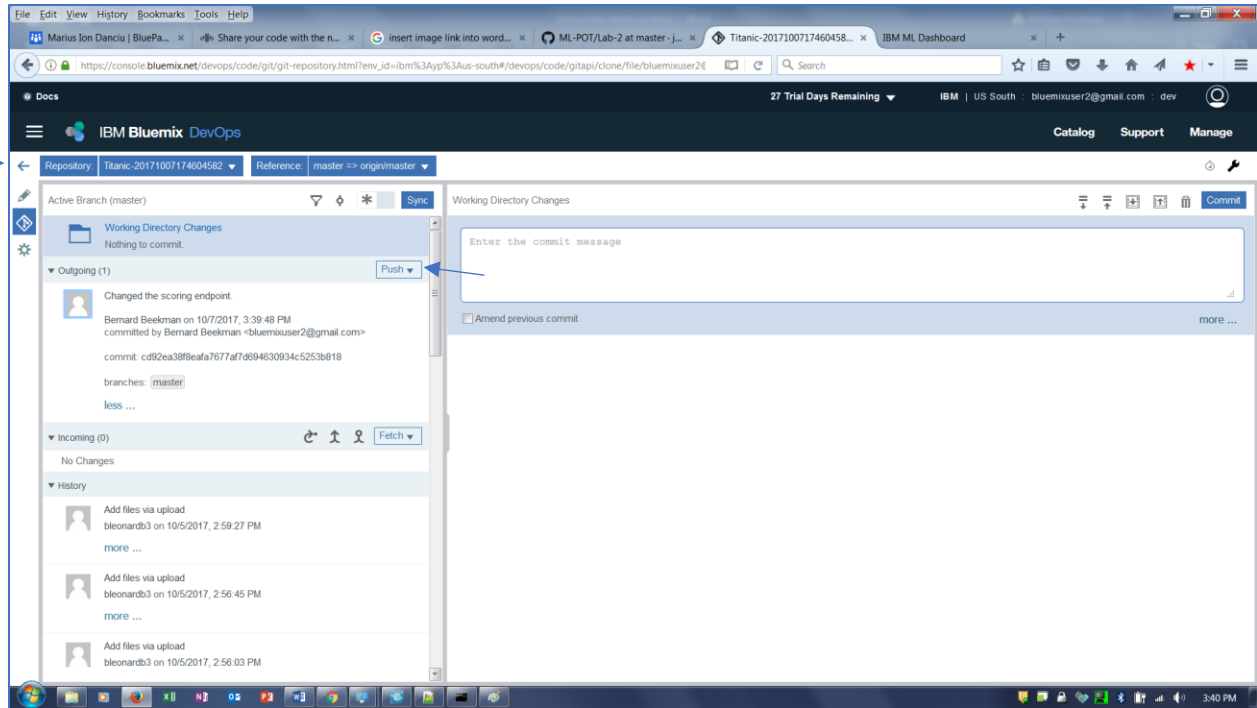
19. Go back to the Notepad file, and copy the scoring endpoint to the clipboard. Look around line 20 in the `Titanic_v1.py` file for the “scoring endpoint =”. Select the scoring endpoint value in line 20 (starting with `https://` may want to use Shift-End to get to the end of the line, and then back 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.




20. 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**.



21. 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.



22. Click on the **Delivery Pipeline** to view status of the deployment as before. Once the Deployment status shows **Deploy passed now** it shouldn't take longer than 2 minutes so reload the browser in case the UI didn't update). 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 **Titanic** Application and then **Visit App url**. (See steps 6, 7 and 8 above).
23. 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

24. 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!](#)