

Lab: Introduction to Watson OpenScale

Introduction

Businesses today are increasingly certain that AI will be a driving force in the evolution of their industries over the next few years. Yet for every successful AI project, there are many that fail to reach widespread adoption in the business and achieve their expected outcomes. This is partly because the mechanics of AI deployment can be complex, and there are still gaps in skills and tooling that can make it difficult for data science, IT operations, and business teams to work in lockstep. But beyond the operational challenges, there are also much more profound issues of trust and transparency that businesses need to address before they can truly turn AI into a business advantage.

Knowledge workers must be able to trust AI and explain the decisions it helps make before they will incorporate it in their business processes. If AI is a black box that simply takes in data and produces obscure, unexplainable outcomes, then there is no way for the business to judge whether these systems are producing fair, accurate outcomes, or have confidence in AI's ability to augment decision-making. Equally, the business will not be able to explain outcomes to customers, auditors, or compliance teams.

IBM Watson OpenScale is an open platform that helps remove barriers to enterprise-scale AI. Watson OpenScale enables the enterprise to:

- Measure performance of production AI and its impact on business goals
- Track actionable metrics in a single console
- Explain AI outcomes
- Detect and mitigate harmful bias to improve outcomes
- Accept feedback to compute accuracy measures
- Accelerate the integration of AI into existing business applications.

Objectives

The goal of this lab is to familiarize the user with the features of Watson OpenScale. After completing this lab, you will understand how to:

1. Import a machine learning model
2. Deploy the model
3. Provision Watson OpenScale
4. Configure the payload logging database and Machine Learning provider
5. Score Data
6. Prepare Deployed Model for Monitoring
7. Configure Payload Logging
8. Configure Quality
9. Configure Fairness
10. Configure Drift
11. Submit Feedback and View Quality Metrics

12. Score Data and View Fairness Metrics
13. Explain a Transaction.

Lab Use Case

Traditional lenders are under pressure to expand their digital portfolio of financial services to a larger and more diverse audience, which requires a new approach to credit risk modeling. Their data science teams currently rely on standard modeling techniques - like decision trees and logistic regression - which work well for moderate datasets and make recommendations that can be easily explained. This satisfies regulatory requirements that credit lending decisions must be transparent and explainable.

To provide credit access to a wider and riskier population, applicant credit histories must expand beyond traditional credit, like mortgages and car loans, to alternate credit sources like utility and mobile phone plan payment histories, plus education and job titles. These new data sources offer promise, but also introduce risk by increasing the likelihood of unexpected correlations which introduce bias based on an applicant's age, gender, or other personal traits.

The data science techniques most suited to these diverse datasets, such as gradient boosted trees and neural networks, can generate highly accurate risk models, but at a cost. Such "black box" models generate opaque predictions that must somehow become transparent, to ensure regulatory approval such as Article 22 of the General Data Protection Regulation (GDPR), or the federal Fair Credit Reporting Act (FCRA) managed by the Consumer Financial Protection Bureau.

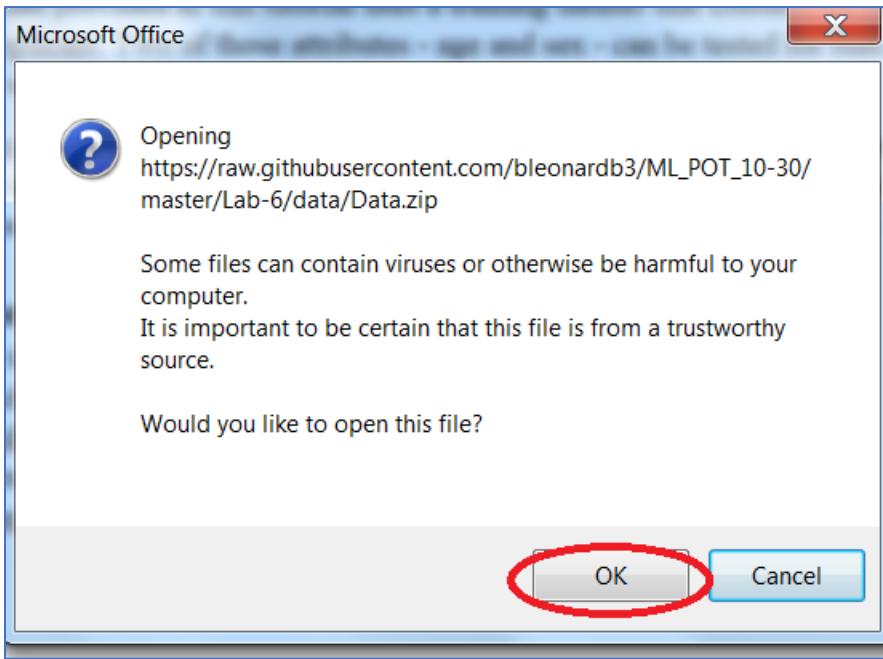
The credit risk model provided in this tutorial uses a training dataset that contains 20 attributes about each loan applicant. Two of those attributes - age and sex - can be tested for bias. For this tutorial, the focus will be on bias against sex and age.

Watson OpenScale will monitor the deployed model's propensity for a favorable outcome ("No Risk") for one group (the Reference Group) over another (the Monitored Group). In this tutorial, the Monitored Group for sex is `female`, while the Monitored Group for age is `19 to 25`.

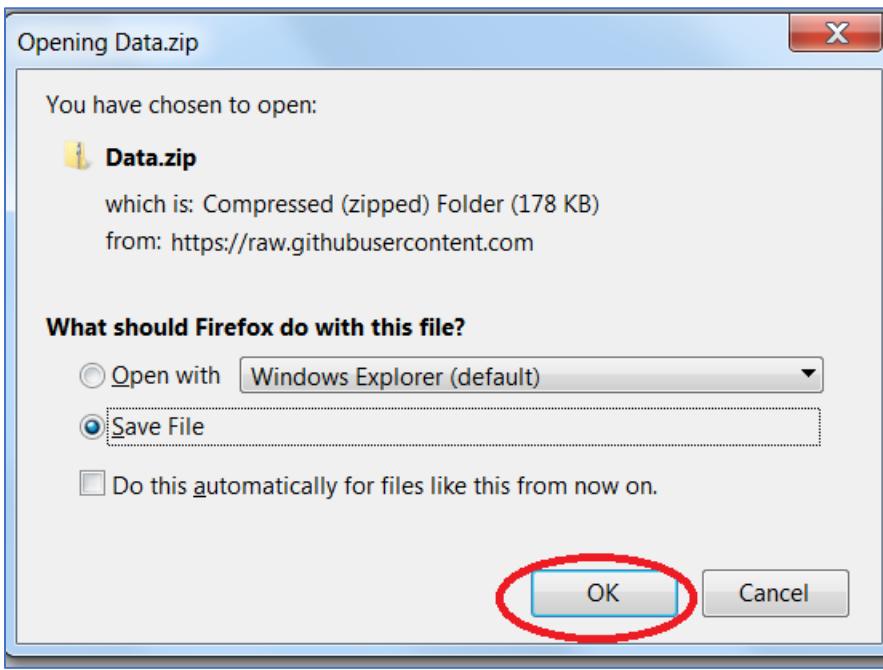
Download the Lab Files

1. Click [here](#) to download the Data.zip file.
 1. `credit_feedback_data.csv`
 2. `credit_payload_data.json`
 3. `german_credit_data_biased_training.csv`
 4. `scoring.json`

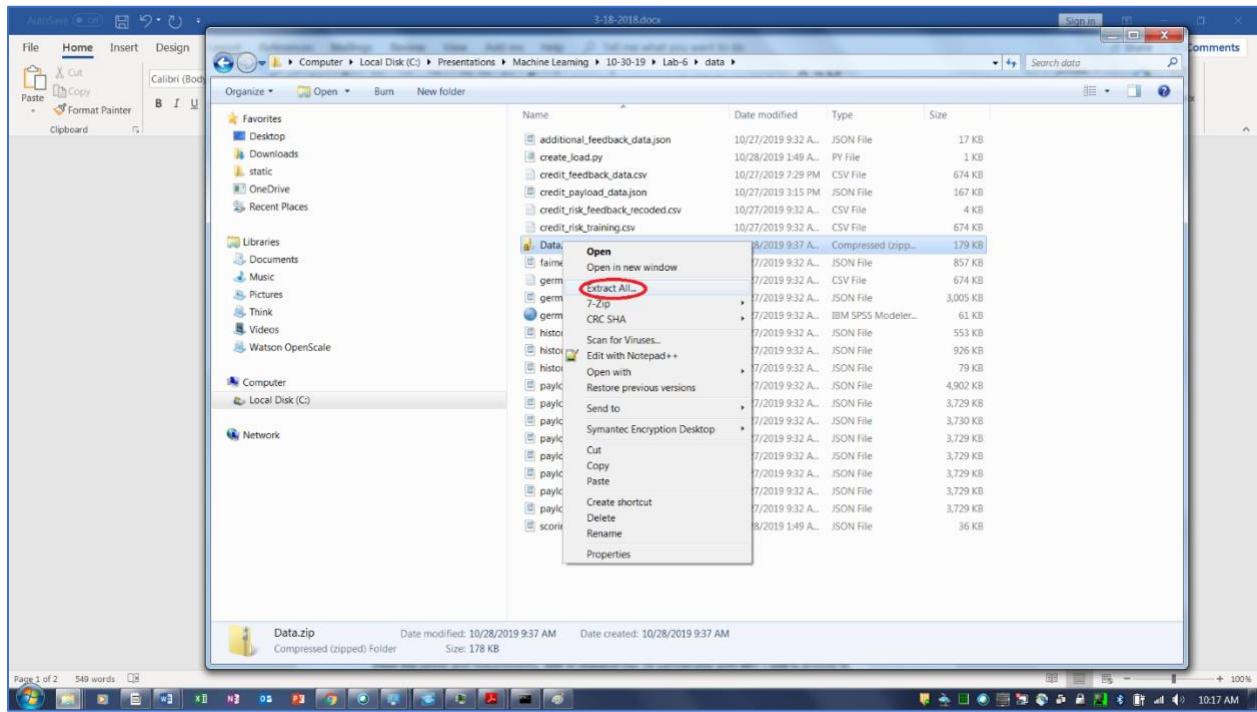
2. Click **OK**. Note your browser may not prompt this message.



3. Click **OK**.

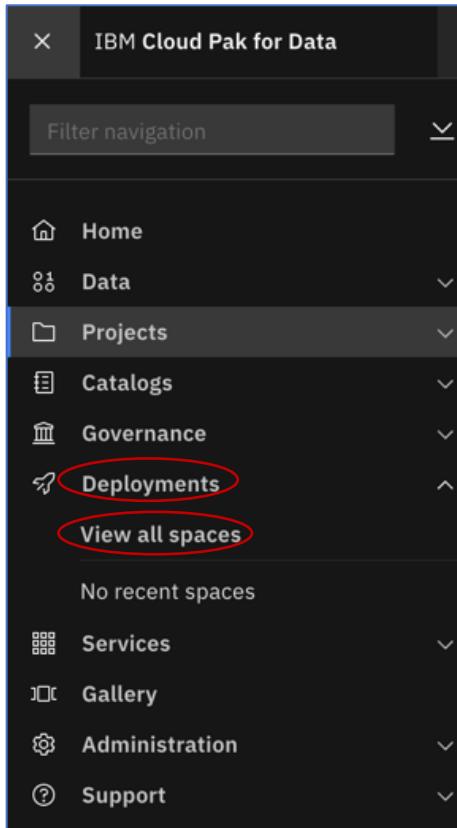


4. Navigate to the folder where the file is saved. Select the Data.zip file, right-click, and click **Extract All**.

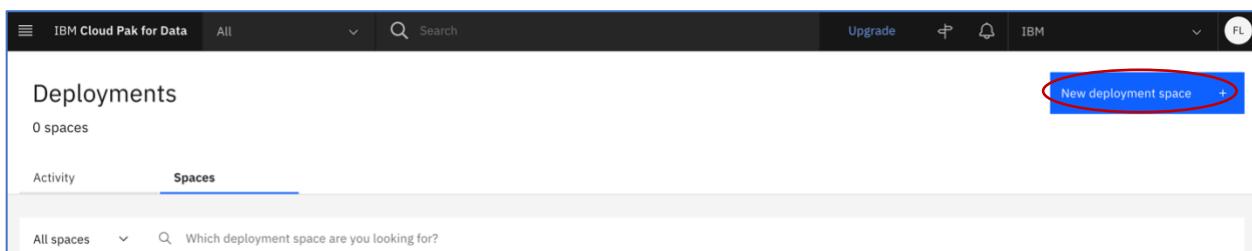


Create a Deployment Space

1. From the Watson Studio project, click on the  icon in the top left.
2. Click on **Deployments** and **View all spaces**.



3. Click on **New deployment space**.



4. Enter a Name (the example images are using a generated “openscale-express-path” name).
5. Scroll down and select a machine learning service.
6. Click Create.

Create a deployment space

Use a space to collect assets in one place to create, run, and manage deployments

Name
openscale-express-path

Description (Optional)
Deployment space description

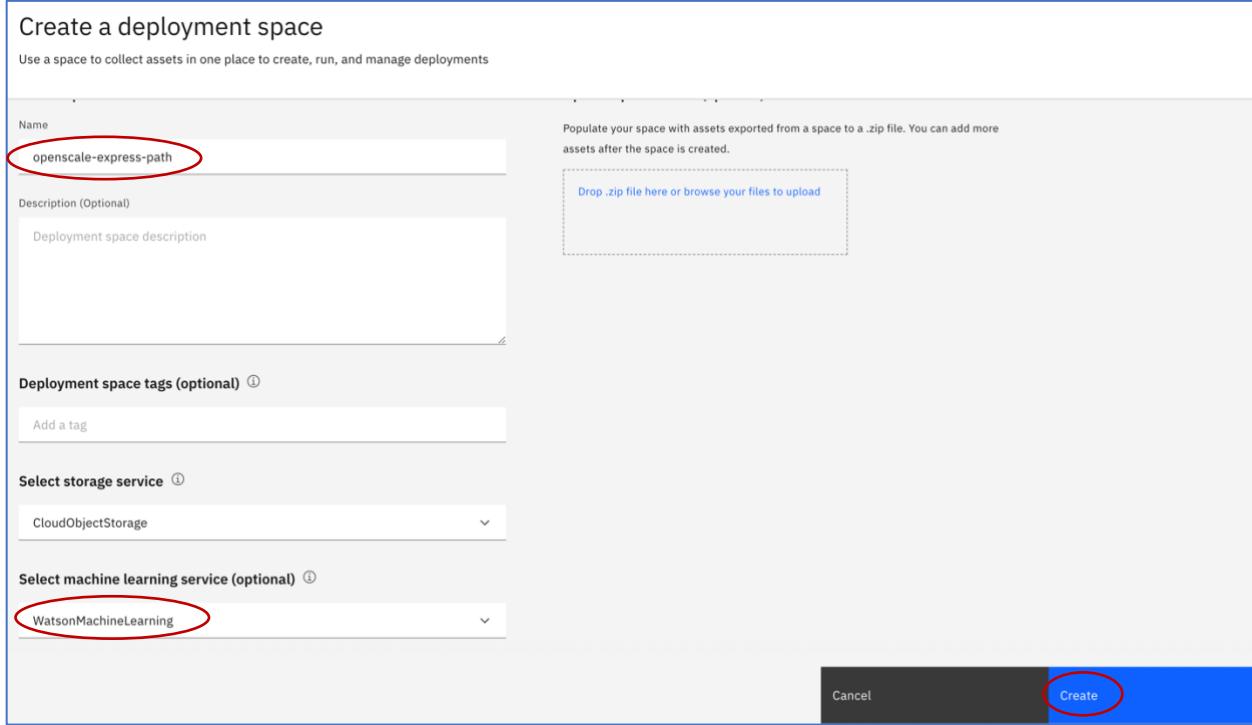
Populate your space with assets exported from a space to a .zip file. You can add more assets after the space is created.
Drop .zip file here or browse your files to upload

Deployment space tags (optional) ⓘ
Add a tag

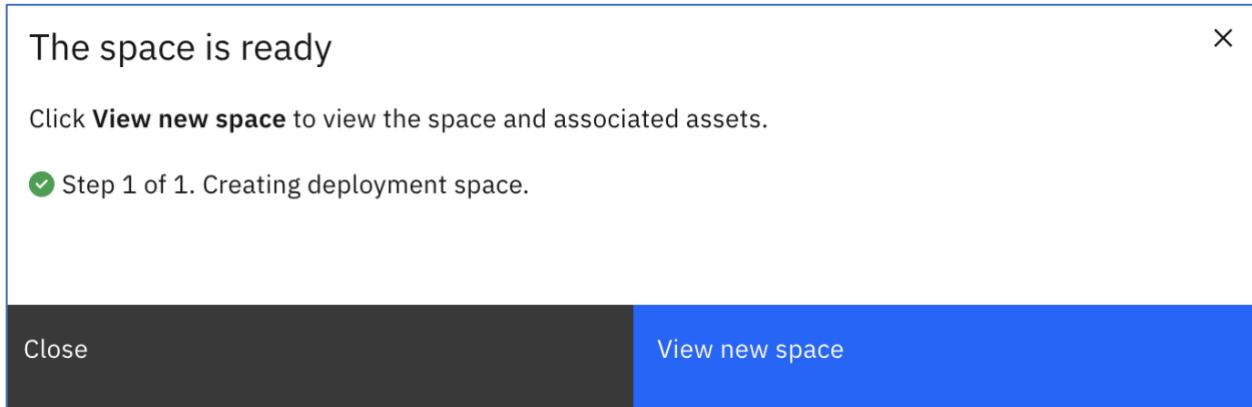
Select storage service ⓘ
CloudObjectStorage

Select machine learning service (optional) ⓘ
WatsonMachineLearning

Cancel Create



7. Click **Close** and return to your Watson Studio project.

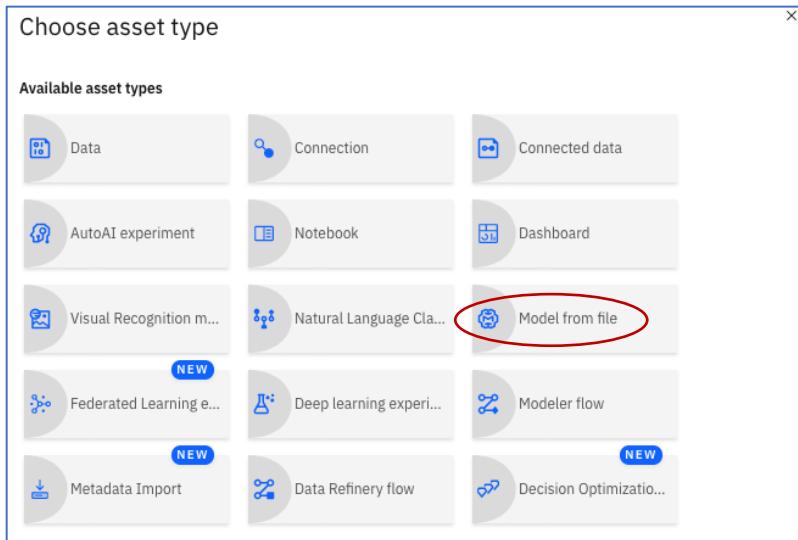


Import the Credit Risk Model

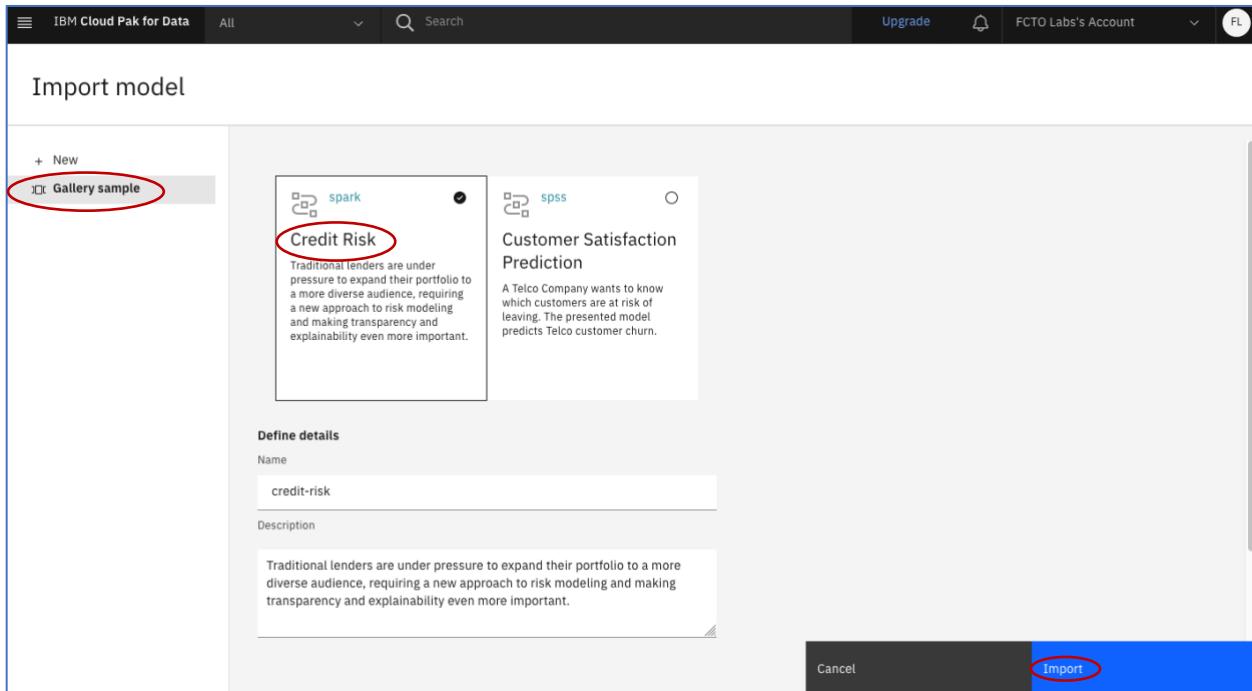
- From the Watson Studio project, click on **Add to project**.



- Click on **Model from file**.



- From the **Import model** page, click on **Gallery sample**, click on **Credit Risk**, click on **Import**.



Deploy the Credit Risk Model

1. On the following page, click **Promote to deployment space**.

The screenshot shows the 'credit-risk' model details in the Watson Studio Labs project. The 'Input Schema' and 'Output' sections are displayed. The 'Promote to deployment space' button is highlighted with a red oval.

Input Schema

Column	Type
Age	"integer"
CheckingStatus	"string"
CreditHistory	"string"
CurrentResidenceDuration	"integer"
Dependents	"integer"
EmploymentDuration	"string"
ExistingCreditsCount	"integer"
ExistingSavings	"string"

Output

Column	Type
Age	"integer"
CheckingStatus	"string"
CreditHistory	"string"
CurrentResidenceDuration	"integer"
Dependents	"integer"
EmploymentDuration	"string"
ExistingCreditsCount	"integer"
ExistingSavings	"string"

Model Details

- Description: Traditional lenders are under pressure to expand their portfolio to a more diverse audience, requiring a new approach to risk modeling and making transparency and explainability even more important.
- Created: May 16, 2021 4:42 PM
- Type: mllib_2.4
- Model ID: bc250345-ec0b-4579-81a9-ed...
- Software specification: spark-mllib_2.4
- Tags: Add tags to make assets easier to find.

2. Select your deployment space (in the image I am using openscale-express-path with a string of letters after it), for the Target space, check “**Go to the model in the space after promoting it**,” and click **Promote**.

Promote to space

Target space: openscale-express-path-158dbf8-a3e6-4da4-ac8d-d7b4180b6a12

Why don't I see all of my spaces? ⓘ

Go to the model in the space after promoting it

Selected assets (1)

Asset name	Format
credit-risk	Model

Description (optional)

Description of assets

Promote

3. Click Create deployment.

The screenshot shows a web interface for managing deployments. At the top, there's a breadcrumb navigation: Deployments / openscale-express-path-15c8db... / credit-risk. Below the breadcrumb, the title 'credit-risk' is displayed. There are two tabs: 'Deployments' (which is underlined, indicating it's the active tab) and 'Schema'. In the center, there's a large circular icon containing a rocket launching into clouds. To the right of the icon, the text 'You don't have any deployments yet' is shown, followed by 'Create your first deployment for this model. [Learn more](#)'. In the top right corner of the main content area, there's a blue button labeled 'Create deployment' with a small gear icon next to it. This button is circled in red.

4. From the **Create Deployment** page, click **Online**, type **credit-risk-deploy** for the **Name**, and click on **Create**.

The screenshot shows a 'Create a deployment' dialog box. At the top, it says 'Create a deployment'. Below that, there's a section for 'Associated asset' with 'credit-risk' selected. Under 'Deployment type', there are two options: 'Online' (which is circled in red) and 'Batch'. The 'Online' option is described as 'Run the model on data in real-time, as data is received by a web service.' The 'Batch' option is described as 'Run the model against data as a batch process.' Further down, there's a 'Name' field which contains 'credit-risk-deploy' (also circled in red). Below the name field is a 'Description' field with the placeholder 'Deployment description'. At the bottom of the dialog, there's a 'Tags' section with the instruction 'Add tags to make assets easier to find.' On the far right, there are 'Cancel' and 'Create' buttons. The 'Create' button is highlighted with a red circle.

5. The deployment status should go from **In progress** to **Deployed**. If the status doesn't change after a minute or so, refresh the browser.

credit-risk

Create deployment ↗

Deployments Schema

DEPLOYMENT TYPES		1 Online Deployment(s)		
		Name	Status	Last modified
Online	(1)	credit-risk-deploy	Deployed	May 16, 2021 4:49 PM
Batch	(0)			

6. Click on **credit-risk-deploy**.

credit-risk

Create deployment ↗

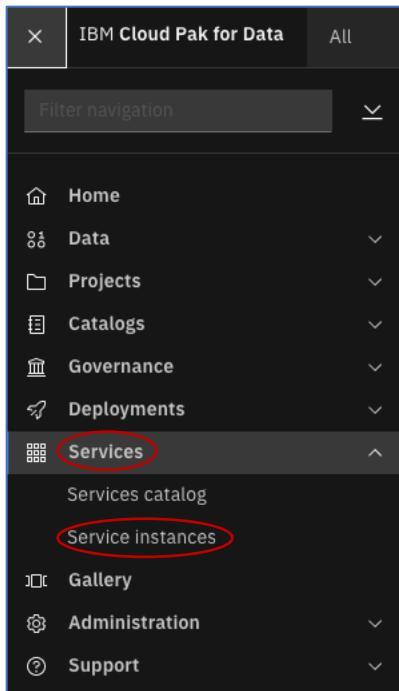
Deployments Schema

DEPLOYMENT TYPES		1 Online Deployment(s)		
		Name	Status	Last modified
Online	(1)	credit-risk-deploy	Deployed	May 16, 2021 4:49 PM
Batch	(0)			

7. Keep this tab open, we will return to this page later.

Begin OpenScale Configuration

1. Click on the hamburger icon ☰ in the top left corner.
2. Click on **Services**, and **Service instances**.



3. Click the box to the right of your OpenScale instance.

Service instances

To upgrade a service plan, first [upgrade](#) your IBM Cloud account. Then choose [Upgrade service](#) or [Manage in IBM Cloud](#) from the menu in the service's row.

Filter by: Resource Groups ▾ 2 × Locations ▾ 1 × fctolabs17@gmail.com ▾ Prod

Find service instances

Name	Group	Location
cloud-object-storage-ts	Default	Global
WatsonMachineLearning	Default	Dallas
KnowledgeCatalog	Default	Dallas
Watson OpenScale-z3	Default	Dallas
WatsonStudio	Default	Dallas

4. Click on **Launch Application**.

Resource list /

Watson OpenScale-qe Active Add tags

Details Actions...

Getting started Manage Plan



Watson OpenScale

Welcome to Watson OpenScale, let's get started.

Launch Application

Documentation Community 

FEEDBACK



5. Make sure to click on **Manual setup**.

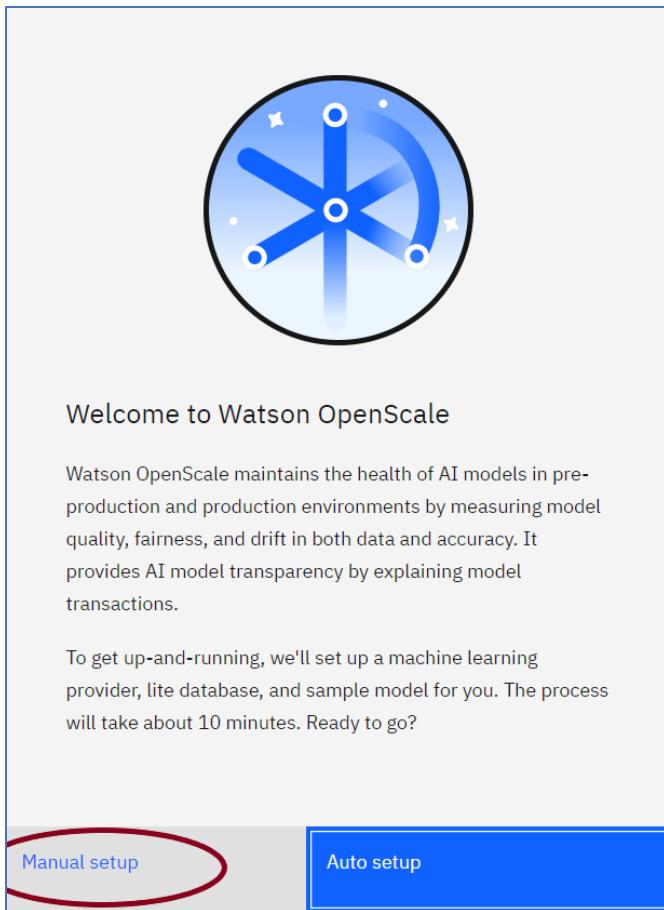


Welcome to Watson OpenScale

Watson OpenScale maintains the health of AI models in pre-production and production environments by measuring model quality, fairness, and drift in both data and accuracy. It provides AI model transparency by explaining model transactions.

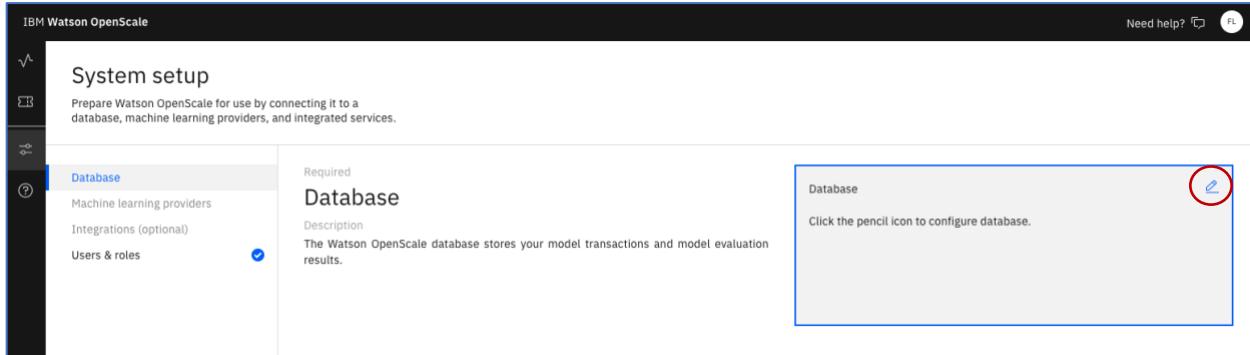
To get up-and-running, we'll set up a machine learning provider, lite database, and sample model for you. The process will take about 10 minutes. Ready to go?

Manual setup **Auto setup**

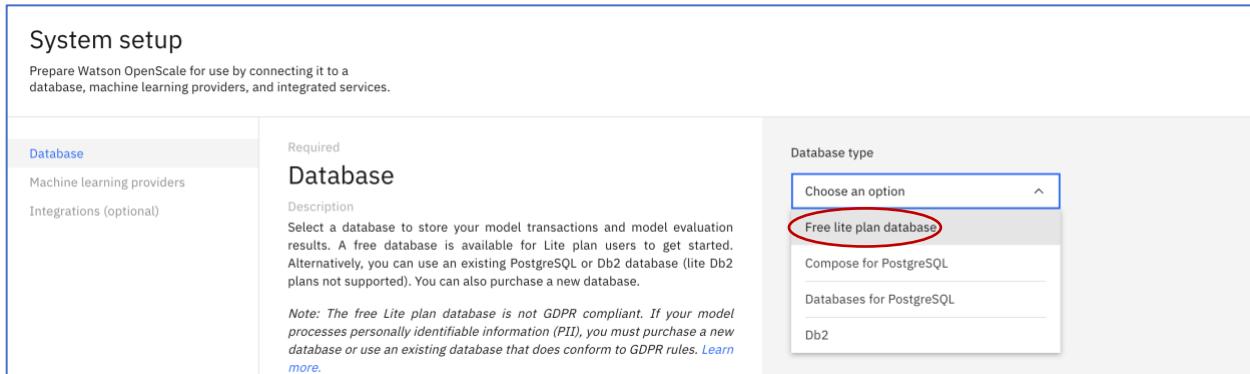


Setup System

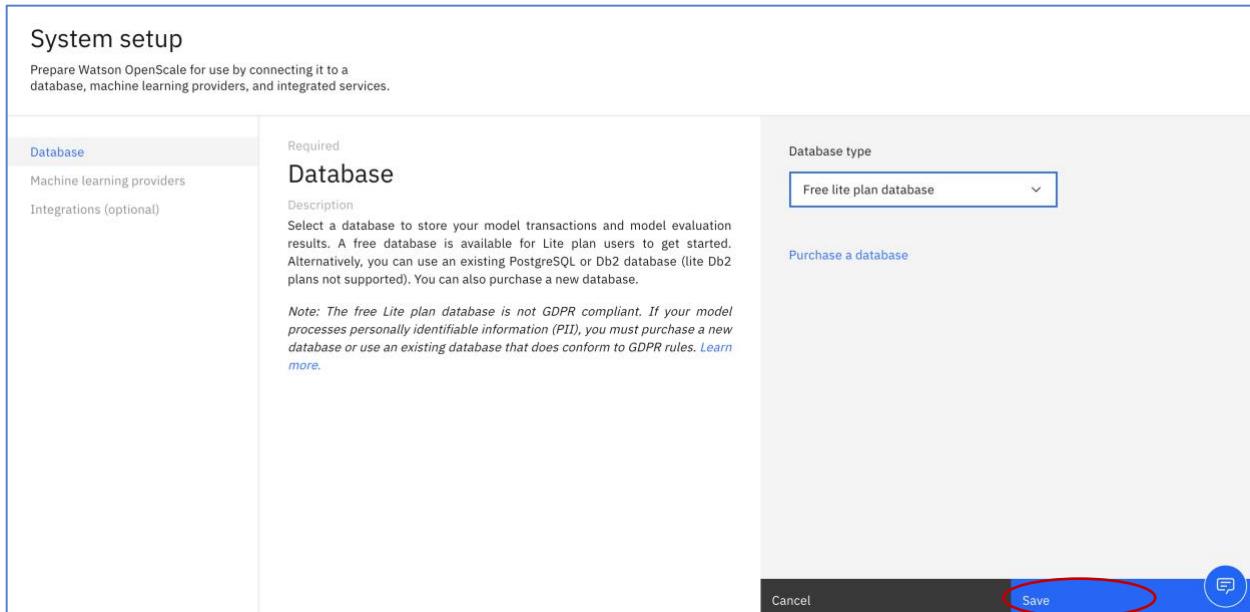
1. In the system setup, we need to set up a database to collect the payload logging data. We also need to specify which deployed model will be monitored.
2. Click on the  icon on the Database tile.



3. Click on **Free Lite plan database** for **Database type** and click on **Save**.



4. Click **Save**.



5. Click on Machine learning providers.

System setup

Prepare Watson OpenScale for use by connecting it to a database, machine learning providers, and integrated services.

Database

Required

Database

Description

The Watson OpenScale database stores your model transactions and model evaluation results.

Database

Database type

Free lite plan database

Database

Internal database

Schema

public

6. Click on Add machine learning provider.

System setup

Prepare Watson OpenScale for use by connecting it to a database, machine learning providers, and integrated services.

Database

Required

Machine learning providers

Description

Watson OpenScale connects to deployed models stored in a machine learning environment.

Add machine learning provider +

7. Click on pencil icon to edit the connection.

System setup

Prepare Watson OpenScale for use by connecting it to a database, a machine learning provider, and integrated services.

Database

Machine learning providers

Integrations (optional) beta

Back to all providers

Machine learning providers

New provider

Description

Click edit to enter provider description.

Connection

Click edit to enter the connection information.

8. Click on Watson Machine Learning (V2) for the Service provider type.

System setup

Prepare Watson OpenScale for use by connecting it to a database, machine learning providers, and integrated services.

Database

Machine learning providers

Integrations (optional)

Users & roles

Machine learning providers

Connection

New provider

Description

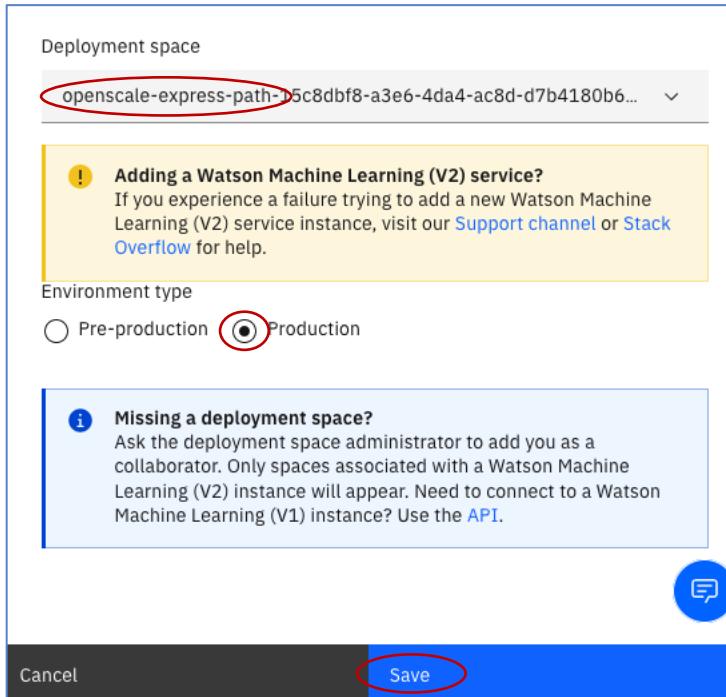
Service provider

Watson Machine Learning (V2)

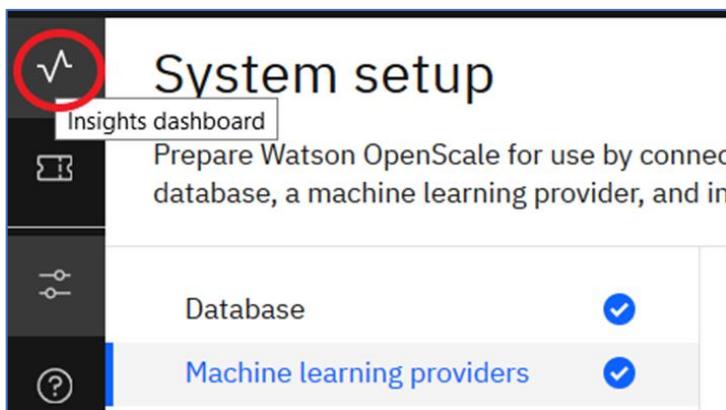
Watson Machine Learning (V2)

Custom Environment

9. Scroll down and **select your deployment space** (I am using openscale-express-path) for the Deployment Space, click on **Production** for the **Environment type**, and click on **Save**.



10. Click on the icon.



11. Click on **Add** to add a deployment to monitor.

IBM Watson OpenScale

Need help? [?](#) FL

Insights Dashboard

Refresh [↻](#) Add to dashboard +

Deployments Monitored	Quality Alerts	Fairness Alerts	Drift Alerts
0	0	0	0

Filter by Tags ▾ Alert type ▾ Machine learning provider ▾ Sort by Severity ▾

Q Find models

12. Click on **credit-risk-deploy** and then click on **Configure** to configure the model details, and the quality, fairness, and drift monitors.

Select a model deployment

Choose a machine learning provider and provide deployment details.

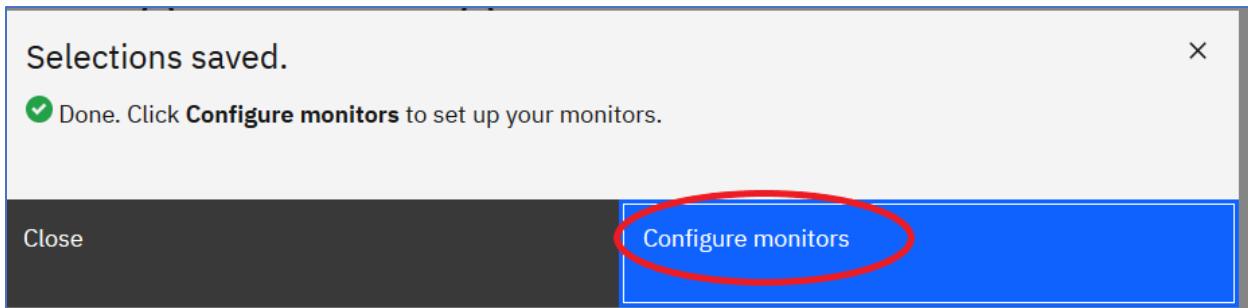
Machine learning Provider

New provider (Production) ▾

Deployment	Description	Created
GermanCreditRiskModelChallenger	Created by Watson OpenScale Express Path.	Thu, Mar 25, 2021, 10:30 AM EDT
GermanCreditRiskModel	Created by Watson OpenScale Express Path.	Thu, Mar 25, 2021, 10:32 AM EDT
GermanCreditRiskModelPreProd	Created by Watson OpenScale Express Path.	Thu, Mar 25, 2021, 10:31 AM EDT
credit-risk-deploy	-	Sun, May 16, 2021, 4:49 PM EDT

Cancel Configure

13. Click on **Configure monitors**.



14. Setup is not complete. Do not proceed until you do the scoring step below.

Score Data

Before proceeding with the monitor configuration, we need to send scoring data to the deployed model in order to generate payload logging data that the monitors can consume. We will use the credit_risk_data.json file as sample data that Watson Studio will submit to the deployed model.

1. Return to the tab from earlier that shows your deployed credit-risk model (**if you have this tab open skip to step 4**), if you do not have this tab open, paste the following link into your browser:
<https://dataplatform.cloud.ibm.com/ml-runtime/spaces?context=cpdaas>

2. Click on your deployment space.

The screenshot shows the 'Deployments' section of the IBM Cloud Pak for Data interface. At the top, there's a header with 'IBM Cloud Pak for Data', a search bar, and some account information. Below that, it says 'Deployments' and '1 space'. There are two tabs: 'Activity' and 'Spaces', with 'Spaces' being the active one. A search bar and a filter dropdown ('All spaces') are also present. A table lists a single deployment: 'openscale-express-path-15c8dbf8-a3e6-4da4-ac8d-d7b4180b6a12'. The table columns include Name, Last modified, Your role, Collaborators, Tags, Online deployments, and Jobs. The 'Name' column value is circled in red.

3. Click on Deployments and credit-risk-deploy.

The screenshot shows the deployment details page for 'credit-risk-deploy'. At the top, it shows the path 'Deployments / openscale-express-path-15c8dbf8-a3e6-4da4-ac8d-d7b4180b6a12'. There are tabs for 'Assets', 'Deployments' (which is highlighted with a red box and circled in red), 'Jobs', and 'Manage'. A search bar is below the tabs. The main area shows 'Deployments (4)' and a table with columns: Name, Type, Status, Asset, Tags, and Last modified. One row in the table is circled in red, showing the deployment name 'credit-risk-deploy'.

4. Click on the **Test** tab.

The screenshot shows the IBM Cloud Pak for Data interface. At the top, there's a navigation bar with 'IBM Cloud Pak for Data' and a search bar. Below it, a breadcrumb trail shows 'Deployments / openscale-express-path-15c8db... / credit-risk / credit-risk-deploy'. The main area displays a deployment named 'credit-risk-deploy' which is 'Deployed' and 'Online'. There are two tabs at the bottom: 'API reference' and 'Test', with 'Test' being the active tab and circled in red.

5. Click on the icon to accept input as JSON.

This screenshot shows the 'Enter input data' screen within the 'Test' tab. It has a 'Body' section containing a JSON template for input data. The 'Body' section starts with a '{' and ends with a '}'. Inside, there's a 'input_data' key with a '[' and a ']'. Under 'input_data', there's a key 'fields' with a '[' and a ']', and a key 'values' with a '[' and a ']'. Below the JSON template is a 'Predict' button. A red circle highlights the small 'JSON' icon located to the right of the 'Body' label.

6. Copy the file contents of **credit_payload_data.json** into the **input data** area and click on **Predict**.

This screenshot shows the 'Enter input data' screen with the JSON payload from 'credit_payload_data.json' pasted into the 'Body' field. The entire JSON content is enclosed in a large red rectangle. Below the JSON is a 'Predict' button, which is also circled in red.

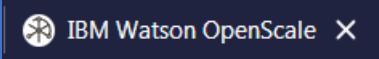
7. The results should appear as below.

The screenshot shows the Watson OpenScale API Test interface. At the top, it says "credit-risk-deploy" with a green "Deployed" status and an "Online" button. Below that, there are two tabs: "API reference" and "Test", with "Test" being the active tab. On the left, under "Enter input data", there is a large text area containing a JSON array of transaction data. On the right, under "Result", there is a JSON object representing the model's predictions. A red circle highlights the "Predict" button at the bottom center of the interface.

```
[{"id": 1, "fields": ["CheckingStatus", "LoanDuration", "CreditHistory", "LoanPurpose", "LoanAmount", "ExistingSavings", "EmploymentDuration", "InstallmentPercent", "Sex", "OthersOnLoan", "CurrentResidenceDuration", "OwnsProperty", "Age", "InstallmentPlans"]}, {"id": 2, "fields": ["CheckingStatus", "LoanDuration", "CreditHistory", "LoanPurpose", "LoanAmount", "ExistingSavings", "EmploymentDuration", "InstallmentPercent", "Sex", "OthersOnLoan", "CurrentResidenceDuration", "OwnsProperty", "Age", "InstallmentPlans"]}, {"id": 3, "fields": ["CheckingStatus", "LoanDuration", "CreditHistory", "LoanPurpose", "LoanAmount", "ExistingSavings", "EmploymentDuration", "InstallmentPercent", "Sex", "OthersOnLoan", "CurrentResidenceDuration", "OwnsProperty", "Age", "InstallmentPlans"]}, {"id": 4, "fields": ["CheckingStatus", "LoanDuration", "CreditHistory", "LoanPurpose", "LoanAmount", "ExistingSavings", "EmploymentDuration", "InstallmentPercent", "Sex", "OthersOnLoan", "CurrentResidenceDuration", "OwnsProperty", "Age", "InstallmentPlans"]}, {"id": 5, "fields": ["CheckingStatus", "LoanDuration", "CreditHistory", "LoanPurpose", "LoanAmount", "ExistingSavings", "EmploymentDuration", "InstallmentPercent", "Sex", "OthersOnLoan", "CurrentResidenceDuration", "OwnsProperty", "Age", "InstallmentPlans"]}, {"id": 6, "fields": ["CheckingStatus", "LoanDuration", "CreditHistory", "LoanPurpose", "LoanAmount", "ExistingSavings", "EmploymentDuration", "InstallmentPercent", "Sex", "OthersOnLoan", "CurrentResidenceDuration", "OwnsProperty", "Age", "InstallmentPlans"]}, {"id": 7, "fields": ["CheckingStatus", "LoanDuration", "CreditHistory", "LoanPurpose", "LoanAmount", "ExistingSavings", "EmploymentDuration", "InstallmentPercent", "Sex", "OthersOnLoan", "CurrentResidenceDuration", "OwnsProperty", "Age", "InstallmentPlans"]}, {"id": 8, "fields": ["CheckingStatus", "LoanDuration", "CreditHistory", "LoanPurpose", "LoanAmount", "ExistingSavings", "EmploymentDuration", "InstallmentPercent", "Sex", "OthersOnLoan", "CurrentResidenceDuration", "OwnsProperty", "Age", "InstallmentPlans"]}, {"id": 9, "fields": ["CheckingStatus", "LoanDuration", "CreditHistory", "LoanPurpose", "LoanAmount", "ExistingSavings", "EmploymentDuration", "InstallmentPercent", "Sex", "OthersOnLoan", "CurrentResidenceDuration", "OwnsProperty", "Age", "InstallmentPlans"]}, {"id": 10, "fields": ["CheckingStatus", "LoanDuration", "CreditHistory", "LoanPurpose", "LoanAmount", "ExistingSavings", "EmploymentDuration", "InstallmentPercent", "Sex", "OthersOnLoan", "CurrentResidenceDuration", "OwnsProperty", "Age", "InstallmentPlans"]}, {"id": 11, "fields": ["CheckingStatus", "LoanDuration", "CreditHistory", "LoanPurpose", "LoanAmount", "ExistingSavings", "EmploymentDuration", "InstallmentPercent", "Sex", "OthersOnLoan", "CurrentResidenceDuration", "OwnsProperty", "Age", "InstallmentPlans"]}, {"id": 12, "fields": ["CheckingStatus", "LoanDuration", "CreditHistory", "LoanPurpose", "LoanAmount", "ExistingSavings", "EmploymentDuration", "InstallmentPercent", "Sex", "OthersOnLoan", "CurrentResidenceDuration", "OwnsProperty", "Age", "InstallmentPlans"]}, {"id": 13, "fields": ["CheckingStatus", "LoanDuration", "CreditHistory", "LoanPurpose", "LoanAmount", "ExistingSavings", "EmploymentDuration", "InstallmentPercent", "Sex", "OthersOnLoan", "CurrentResidenceDuration", "OwnsProperty", "Age", "InstallmentPlans"]}, {"id": 14, "fields": ["CheckingStatus", "LoanDuration", "CreditHistory", "LoanPurpose", "LoanAmount", "ExistingSavings", "EmploymentDuration", "InstallmentPercent", "Sex", "OthersOnLoan", "CurrentResidenceDuration", "OwnsProperty", "Age", "InstallmentPlans"]}, {"id": 15, "fields": ["CheckingStatus", "LoanDuration", "CreditHistory", "LoanPurpose", "LoanAmount", "ExistingSavings", "EmploymentDuration", "InstallmentPercent", "Sex", "OthersOnLoan", "CurrentResidenceDuration", "OwnsProperty", "Age", "InstallmentPlans"]}, {"id": 16, "fields": ["CheckingStatus", "LoanDuration", "CreditHistory", "LoanPurpose", "LoanAmount", "ExistingSavings", "EmploymentDuration", "InstallmentPercent", "Sex", "OthersOnLoan", "CurrentResidenceDuration", "OwnsProperty", "Age", "InstallmentPlans"]}, {"id": 17, "fields": ["CheckingStatus", "LoanDuration", "CreditHistory", "LoanPurpose", "LoanAmount", "ExistingSavings", "EmploymentDuration", "InstallmentPercent", "Sex", "OthersOnLoan", "CurrentResidenceDuration", "OwnsProperty", "Age", "InstallmentPlans"]}]
```

Configure Model Details

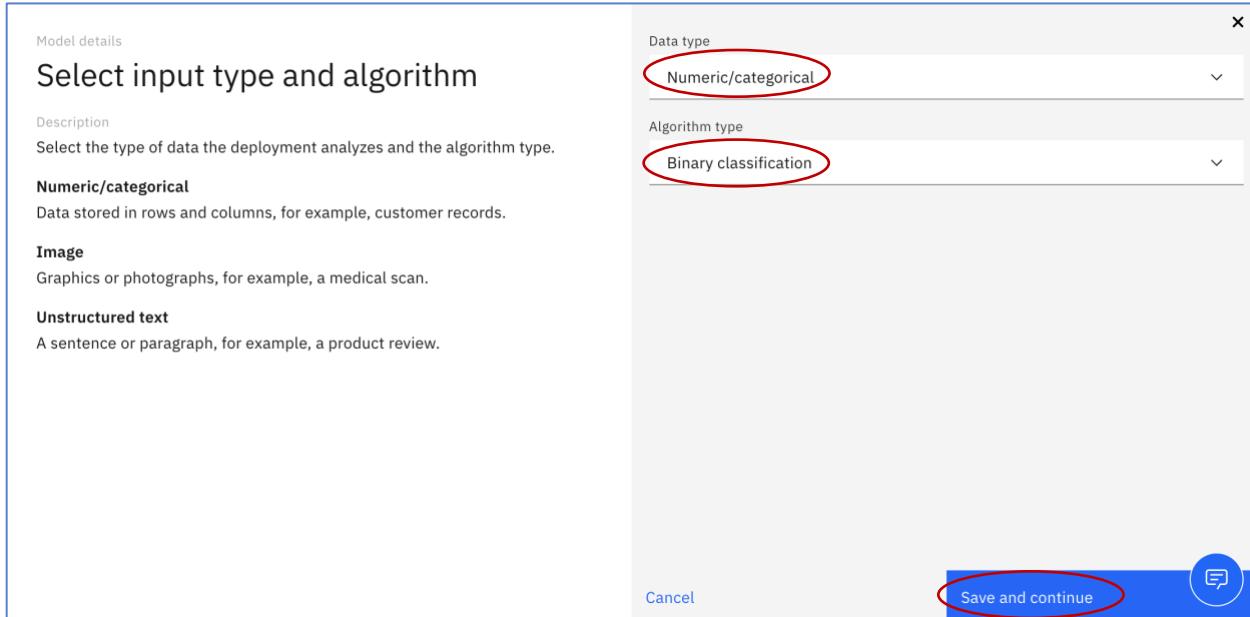
1. Switch back to Watson OpenScale by clicking on the Watson OpenScale browser tab.



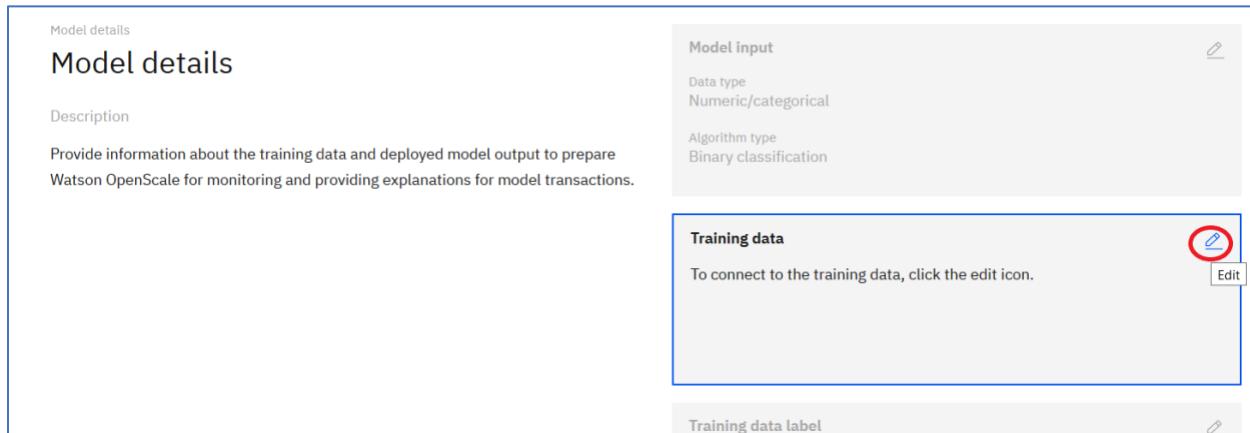
2. Click on pencil icon to edit the **Model input**.

The screenshot shows the Watson OpenScale Model Details configuration interface. It consists of three main sections: "Model details", "Model input", and "Model transaction".
- "Model details": Contains a "Description" section with the text: "Provide information about the training data and deployed model output to prepare Watson OpenScale for monitoring and providing explanations for model transactions."
- "Model input": Contains a text area with the placeholder: "To select the data type and algorithm type, click the edit icon." A red circle highlights the edit icon (a pencil symbol) located at the top right of this section.
- "Model transaction": Contains the text: "Model transaction Successful". An edit icon is also present here.

3. Click on **Numeric/categorical** for the **Data type**. Click on **Binary classification** for the **Algorithm type**. Click on **Save and Continue**.



4. Click on pencil icon to edit **Training data**.



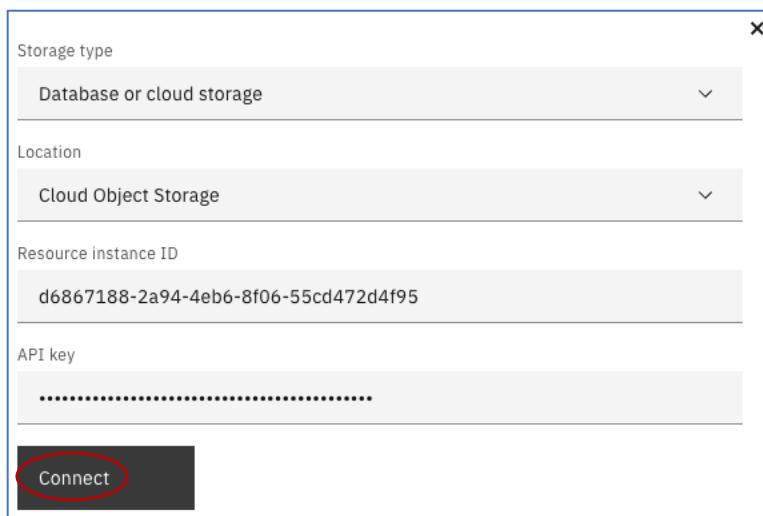
5. Copy and paste the following text as the **resource_id**:

d6867188-2a94-4eb6-8f06-55cd472d4f95

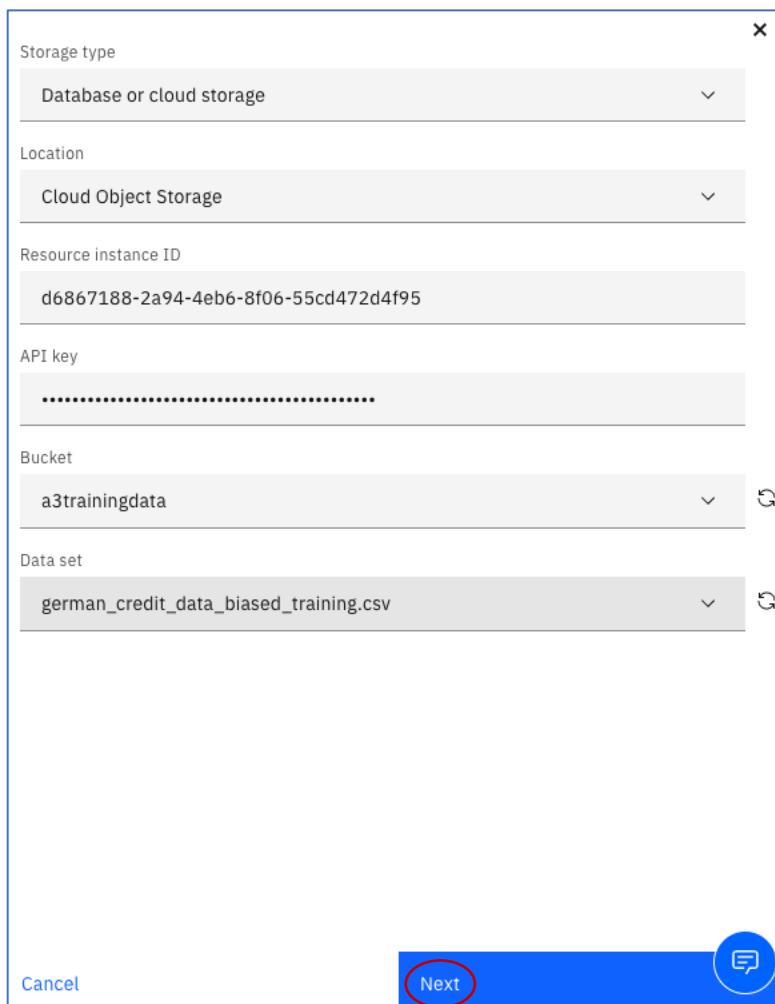
6. Copy and paste the following text as the **apikey**:

JzxKc8k1IZat1W14ZZgY0sKgFBEQGQAi9RmYdPtq1vIE

7. Click Connect



8. Select **a3trainingdata** as the bucket, select **german_credit_data_biased_training.csv** as the Data set, and click **Next**.



9. Watson OpenScale has determined that Risk is the label (target) column. Click **Next**.

credit-risk-deploy

Model info

- Model details (selected)
- Endpoints
- Evaluations
 - Fairness
 - Quality
 - Drift
 - Explainability

Import settings

Go to model summary

Select the label column

Description: From the selected training features, select a single feature as the label. The label represents the correct prediction (ground-truth) for each record.

Features (1)	Type
Risk	A

Cancel Back Next

10. All of the features are used to train the model. Watson OpenScale has determined the feature types. Click **Next**.

Model details

Select the training features

Description: From the training data, select the features used to train the model.

For each selected feature with a numeric data type, indicate if the numeric feature values represent codes or categories by checking the Categorical checkbox. This instructs OpenScale to process the feature as a set of classifications (ex. ZIP code) rather than continuous numeric values (ex. median household income).

Select the training features

Features (20)	Type	Categorical
Age	81	<input type="checkbox"/>
CheckingStatus	A	<input checked="" type="checkbox"/>
CreditHistory	A	<input checked="" type="checkbox"/>
CurrentResidenceDuration	81	<input type="checkbox"/>
Dependents	81	<input type="checkbox"/>
EmploymentDuration	A	<input type="checkbox"/>

Cancel Back Next

11. We've already set up the logging (**Logging is active**) so click **Next**.

Model details

Examining model output

Description

Watson OpenScale tracks and stores transactions processed by this model. To prepare Watson OpenScale, send a scoring request. You can send a scoring request in one of the following ways:

Send JSON payload
Enter payload data and send a scoring request directly from Watson OpenScale.

Use the payload logging API
Send a scoring request from an external application or data science notebook using code snippets.

Scoring method

Automatic logging

Logging is active Click Next

Cancel Back **Next**

12. Watson OpenScale has determined the feature that contains the prediction generated by the AI deployment. Click **Save**.

Model details

Specify model output details

Description

Select the prediction column
From the model output data, select the column that contains the prediction generated by the deployed model.

Select the prediction probability column
The prediction probability column contains the model's confidence in the prediction it provides.

Probability column detected
Watson OpenScale automatically selected the probability column for this model.

Select the prediction and probability columns

Features (3)	Type	Prediction	Probability
prediction	81	<input type="checkbox"/>	<input type="checkbox"/>
predictedLabel	A	<input checked="" type="checkbox"/>	
probability	BB		<input checked="" type="checkbox"/>

Cancel Back **Save**

13. Model details are now complete. Note that Explainability input is also complete. The next step is to configure Quality.

Configure Quality

The Quality Monitor evaluates how well your deployed model predicts accurate outcomes. It identifies when model quality declines so you can retrain appropriately.

1. Click **Quality** to configure the quality inputs.

This screenshot shows the Watson OpenScale configuration interface for a model named "credit-risk-deploy". On the left, there's a sidebar with "Model info" and "Evaluations" sections. Under "Evaluations", the "Quality" option is highlighted with a red circle. The main panel displays "Model details" with a description about training data and deployed model output. To the right, there are two sections: "Model input" (data type: Numeric/categorical, algorithm type: Binary classification) and "Training data" (storage type: Database or cloud storage, location: Db2, hostname: dashdb-txn-sbox-yp-dal09-03.services.dal.bluemix.net, SSL port). Each section has an edit icon.

2. Click on the pencil icon to edit the **Quality threshold**.

This screenshot shows the Watson OpenScale configuration interface for the "Quality" metric. The sidebar shows "Model info" and "Evaluations" sections. In the "Evaluations" section, the "Quality" option is selected and highlighted with a red circle. The main panel displays the "Quality" metric details, including its description: "The Quality monitor evaluates how well your model predicts accurate outcomes. It identifies when model quality declines, so you can retrain your model appropriately." Below this, a note explains that the Quality metric measures the model's ability to correctly predict outcomes. There is also a link to "Learn more". To the right, there are two edit sections: "Quality threshold" (with an edit icon circled in red) and "Sample size" (with an edit icon). A blue message icon is located at the bottom right.

3. Enter 0.9 for the Threshold value and click **Next**.

Quality

Quality threshold

Description

Area under ROC

For binary classification models, it will check the score which measures the model's ability to distinguish two classes. The higher the score, the better the model is at identifying class A as class A and class B as class B. The score of 1 is perfect, while a score of .50 is equal to a random guess.

Additional quality metrics captured for this model include:

- Area under PR
- Accuracy
- True positive rate (TPR)
- False positive rate (FPR)
- Recall
- Precision
- F1-Measure
- Logarithmic loss

Threshold value: Area under ROC

0.9

Cancel Next

4. Set **100** for the minimum the sample size to be analyzed for quality and click **Save**.

Quality

Sample size

Description

Ensure that your minimum sample size is large enough to be accurately represent the variety of requests the deployment receives.

Minimum sample size (number of transactions)

100

Cancel Back Save

5. This completes the **Quality** configuration. The next step is to configure Fairness.

Configure Fairness

The Fairness monitor checks your deployment for biases. It tracks when the model shows a propensity to provide a particular outcome more often for one group over another.

1. Click on **Fairness** to configure the Fairness monitor.

This screenshot shows the 'credit-risk-deploy' configuration page. On the left, the 'Evaluations' section has 'Fairness' selected, indicated by a red oval. The main area displays the 'Quality' monitor settings. A 'Quality threshold' panel shows a value of 0.9. A 'Sample size' panel shows minimum and maximum values of 100 and 10,000 respectively. A blue message icon is visible in the bottom right corner.

2. Click on the pencil icon to edit the **Favorable outcomes**.

This screenshot shows the 'credit-risk-deploy' configuration page. The 'Evaluations' section has 'Fairness' selected. The main area displays the 'Fairness' monitor settings. A 'Favorable outcomes' panel has a red oval around its edit icon. A 'Sample size' panel below it has a red oval around its edit icon. A 'Features to evaluate (0)' panel at the bottom right has a red oval around its 'Add feature' button. A blue message icon is visible in the bottom right corner.

3. Check the Favorable check box for **No Risk** and check the Unfavorable check box for **Risk**. Then click **Next**.

Fairness

Select the favorable outcomes

Description

For each group, Watson OpenScale will calculate the percentage of transactions that receive a favorable outcome.

Select the values that represent favorable (preferable) outcomes. You can also add a value manually if it is not included in the list.

Select the favorable outcomes

Enter a value

Add value

Values	Favorable	Unfavorable
No Risk	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Risk	<input type="checkbox"/>	<input checked="" type="checkbox"/>

Cancel

4. Change the **Minimum sample size** to 200 and click **Next**.

Fairness

Sample size

Description

Ensure that your minimum sample size is large enough to be accurately represent the variety of requests the deployment receives.

Minimum sample size (number of transactions)

200

Cancel

5. Scroll if needed and click on the **Sex** check box and the **Age** check box to monitor those features for bias, and then click on **Next**. Note, these may already be checked.

Fairness

Select the features to monitor

Description

For each feature you select, Watson OpenScale will monitor the deployed model's tendency to provide a favorable (preferred) outcome for one group over another.

Features are monitored individually, but the Watson OpenScale debiasing algorithm will correct bias issues for all monitored features together.

ⓘ With the Lite plan, you can select up to 2 features to monitor. [View upgrade options.](#)

Recommended features

Watson OpenScale analyzed your training data to recommend which features should be monitored for fairness. These features are identified in the Recommended column.

Feature	Monitored	Score	Action
InstallmentPercent	<input type="checkbox"/>	81	A
Sex	<input checked="" type="checkbox"/>	80	A
OthersOnLoan	<input type="checkbox"/>	80	A
CurrentResidenceDuration	<input type="checkbox"/>	80	A
OwnsProperty	<input type="checkbox"/>	80	A
Age	<input checked="" type="checkbox"/>	80	A
InstallmentPlans	<input type="checkbox"/>	80	A
Housing	<input type="checkbox"/>	80	A

Cancel Back **Next**

6. Enter 19 for the **minimum value** and 25 for the maximum value and then click **Add value**. We are defining the age range 19-25 as the age monitoring group.

Fairness

Specify the monitored groups for [Age]

Description

Add value ranges and select the groups to monitor. Minimum and maximum values from the training data are presented for reference.

The percentage of favorable outcomes delivered to the monitored groups will be compared to the percentage of favorable outcomes delivered to the remaining groups (the reference groups) to check for potential bias.

A fairness score of 100% implies that the monitored group and reference group received an equal number of favorable values. Likewise, a fairness score of 50% implies that the monitored group received half as many favorable outcomes as the reference group.

Set the fairness alert threshold to track when the fairness value falls below an acceptable level.

Recommended groups

Watson OpenScale analyzed this feature to recommend which groups should be monitored for fairness. These groups are identified in the Recommended column.

Values	Monitored	Reference	Recommended
19-43	<input type="checkbox"/>	<input checked="" type="checkbox"/>	Reference
44-67	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Monitored

Select the groups to monitor [Age]

Minimum value: 19 Maximum value: 74

19 25 **Add value**

Set fairness alert threshold [Age]

80

Cancel Back **Next**

7. Enter 26 as the **minimum value** and 74 as the **maximum value** and then click **Add value**. We are defining the age range 26-74 as the reference group.

Values	Monitored	Reference	Recommended
19-25	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
19-43	<input type="checkbox"/>	<input checked="" type="checkbox"/>	Reference
44-67	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Monitored

8. Check the **Monitored** check box for the 19-25 group and check the **Reference** check box for the 26-74 group. Set **95** for the **fairness alert threshold**. If OpenScale has already added “recommended” groups (as seen in the screenshots), uncheck those and ensure that the 19-25 group and 26-74 group you added are the only ones checked. Click **Next**.

Values	Monitored	Reference	Recommended
19-25	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
19-43	<input type="checkbox"/>	<input type="checkbox"/>	Reference
26-74	<input type="checkbox"/>	<input checked="" type="checkbox"/>	
44-67	<input type="checkbox"/>	<input type="checkbox"/>	Monitored

9. Check the **Monitored** check box for female and check the **Reference** check box for male. Set **95** for the **fairness alert threshold**. Click on **Save**.

The screenshot shows the Fairness configuration interface. On the left, a main panel titled "Specify the monitored groups for [Sex]" contains a "Description" section about monitoring groups and a fairness alert threshold. A callout box labeled "Recommended groups" provides information about recommended monitoring groups. On the right, an overlay window titled "Select the groups to monitor [Sex]" lists "female" and "male" with checkboxes for "Monitored" and "Reference". The "female" row has the "Monitored" checkbox checked. The "male" row has the "Reference" checkbox checked. Below this is a field "Set fairness alert threshold [Sex]" containing the value "95", which is circled in red. At the bottom of the overlay are "Cancel", "Back", and "Save" buttons, with "Save" also being circled in red.

10. This completes the Fairness configuration. The next step is to configure Drift.

Configure Drift

The Drift monitor measures two types of changes. It measures the drop in accuracy of the deployed model during runtime. The model accuracy could drop if there is an increase in the number of transactions similar to ones that the model was not able to accurately evaluate in the training data.

It measures the drop in consistency of the data in runtime as compared to the characteristics of the data at training.

1. Click on **Drift** to configure the Drift monitor.

The screenshot shows the Drift configuration interface for the "credit-risk-deploy" model. On the left, a sidebar lists "Model info", "Evaluations" (with "Fairness" selected), and "Explainability". The "Drift" option under "Evaluations" is highlighted with a red circle. The main panel shows the "Fairness" configuration, which includes a "Description" section and a "Favorable outcomes" section listing "Favorable outcomes" and "No Risk". To the right, a "Sample size" section is shown with a minimum sample size of 200.

2. Click on the pencil icon to select a **drift model training option**.

Dashboard / Configure

credit-risk-deploy

Model info	Drift	
Model details	<input checked="" type="radio"/>	Drift model To select a drift model training option, click the edit icon.
Endpoints	<input checked="" type="radio"/>	
Evaluations	Drop in accuracy	
Fairness	<input checked="" type="radio"/>	
Quality	<input checked="" type="radio"/>	
Drift	<input type="radio"/>	Drift threshold To select drift threshold value, click the edit icon.
Explainability	<input checked="" type="radio"/>	
Import settings	A drop in model accuracy and data consistency may lead to a negative impact on the business outcomes associated with the model.	
Go to model summary		Sample size <input type="text"/>

3. Watson OpenScale will detect a drop in accuracy using a custom drift model generated from the training data. Similarly, it detects a drop in data consistency by analyzing your training data. Click on **Train in Watson OpenScale**. Click **Next**.

Drift

Train a drift model

Description

Watson OpenScale will detect a drop in accuracy using a custom drift model generated from your training data. Similarly, it detects a drop in data consistency by analyzing your training data. Watson OpenScale can analyze the data and train the model for you or you can do it yourself using a custom notebook.

Train in Watson OpenScale

If you connected your training data to Watson OpenScale and it is less than 500 MB, use this option.

Train in a data science notebook

If you did not connect your training data to Watson OpenScale or it exceeds 500 MB, use this option.

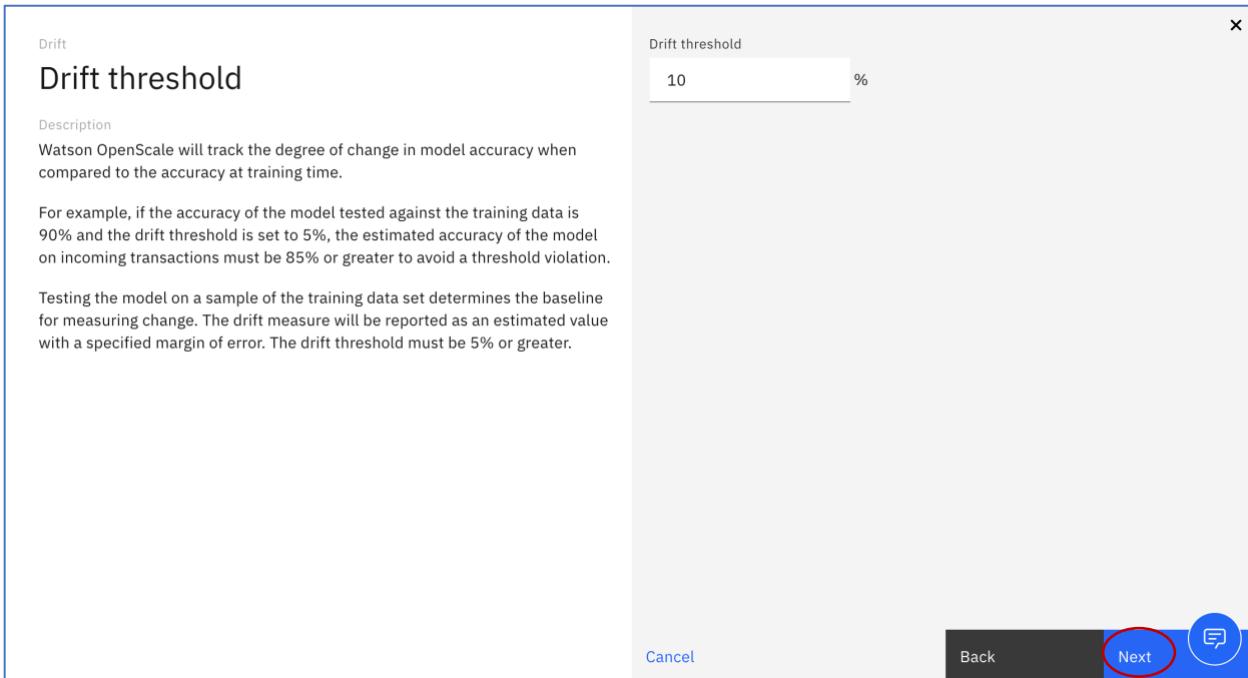
Training option

Train in Watson OpenScale

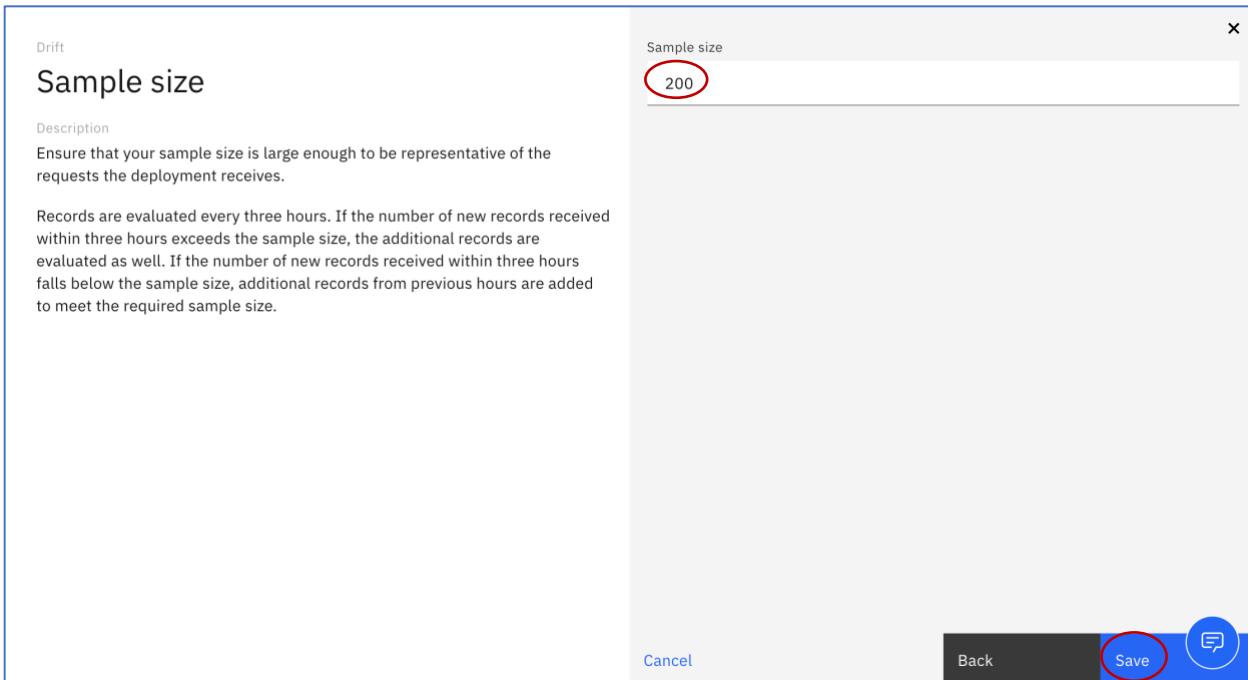
Train in a data science notebook

Cancel **Next**

4. Set the drift alert threshold. Leave **10%**. Click **Next**.



5. Set the **Sample size** to compute Drift. Select **200**. Click **Save**.

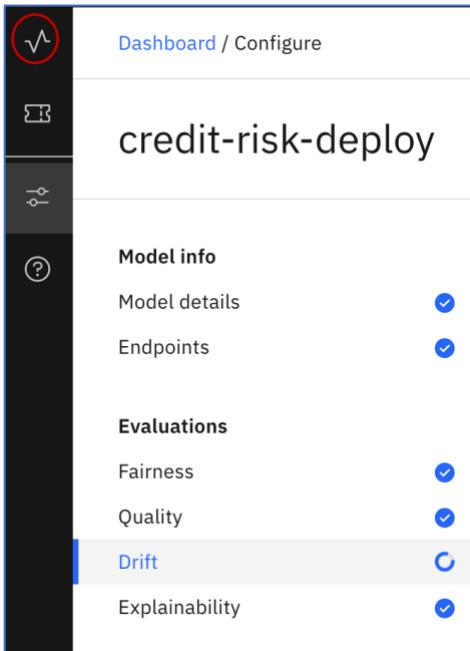


6. This completes the Drift configuration.

Submit Feedback and View Quality Metrics

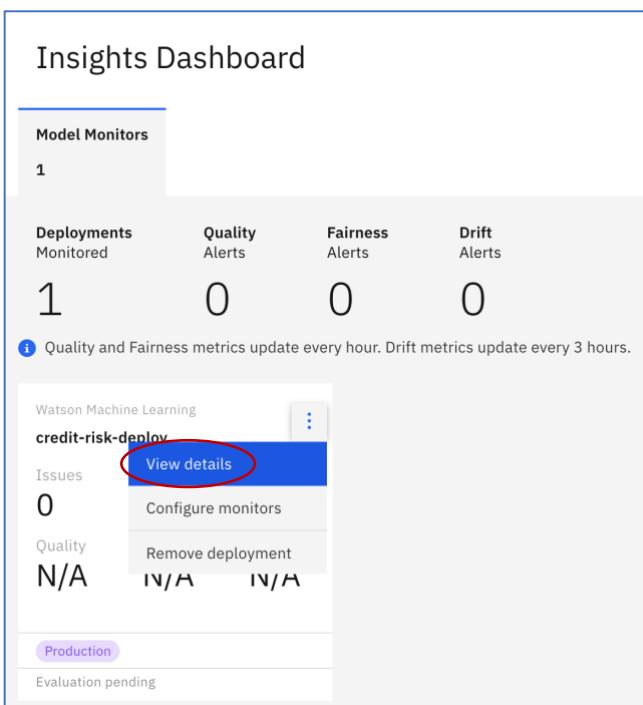
In order to measure quality, scored transactions including human labeled feedback must be provided.

1. Click on the  to display the **Insights Dashboard**.



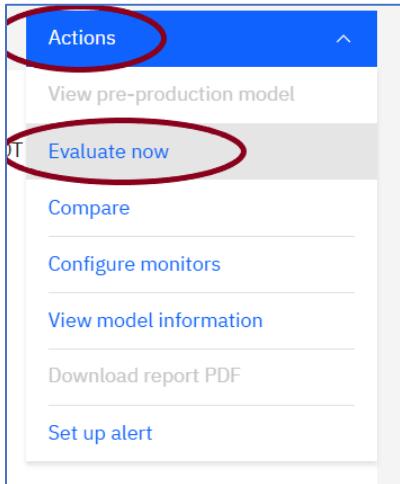
The screenshot shows the 'Model info' section of the Insights Dashboard. On the left is a sidebar with icons for Dashboard, Model info, Evaluations, Drift, and Explainability. The 'Drift' icon is highlighted with a blue bar at the bottom. The main area displays 'credit-risk-deploy' under 'Model info'. Under 'Evaluations', 'Fairness' and 'Quality' are checked, while 'Drift' is currently selected, indicated by a blue background and a blue checkmark. 'Explainability' is also listed.

2. Click on vertical ellipse  and then click on **View Details**.

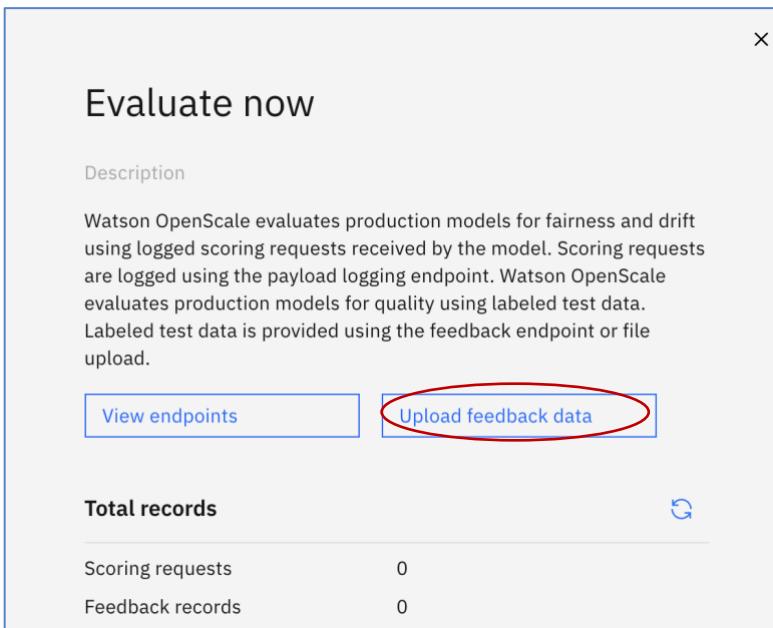


The screenshot shows the 'Watson Machine Learning' section of the Insights Dashboard for 'credit-risk-deploy'. It includes metrics for Deployments Monitored (1), Quality Alerts (0), Fairness Alerts (0), and Drift Alerts (0). A note says 'Quality and Fairness metrics update every hour. Drift metrics update every 3 hours.' Below this is a card for 'credit-risk-deploy' with 'Issues' (0) and 'Quality' (N/A). A vertical ellipsis menu is open, showing options: 'View details' (which is highlighted with a red oval), 'Configure monitors', and 'Remove deployment'. At the bottom, there's a 'Production' button and a note 'Evaluation pending'.

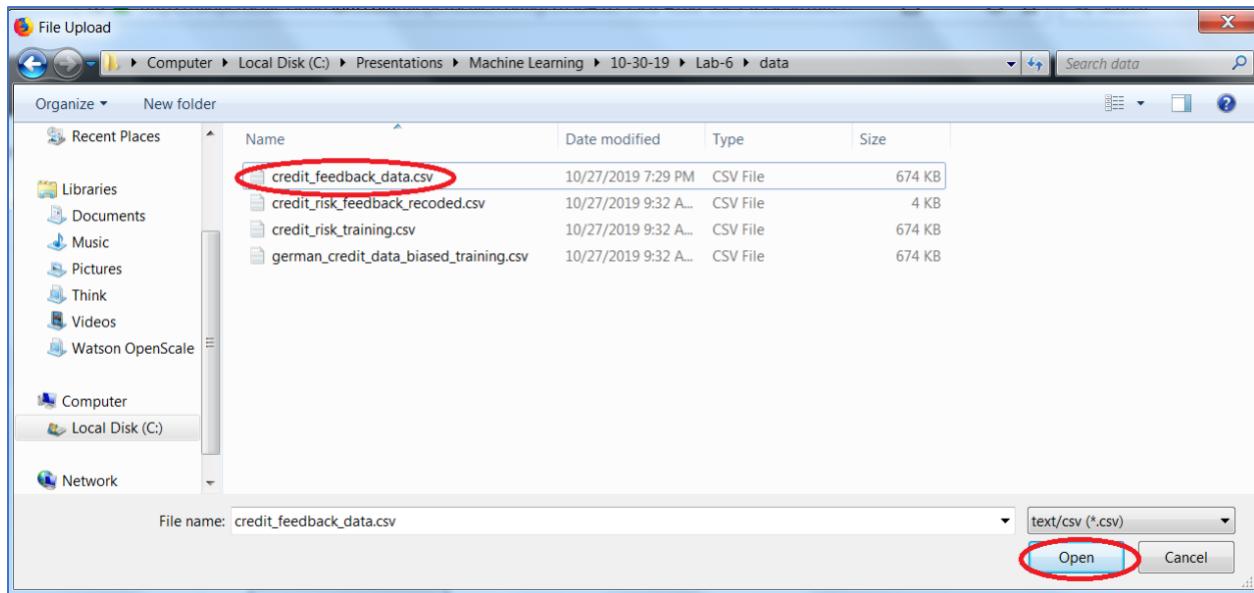
3. It will take a minute or so to bring up the **Evaluations** page. Click on **Actions** in the top right corner of your dashboard and then click **Evaluate now**.



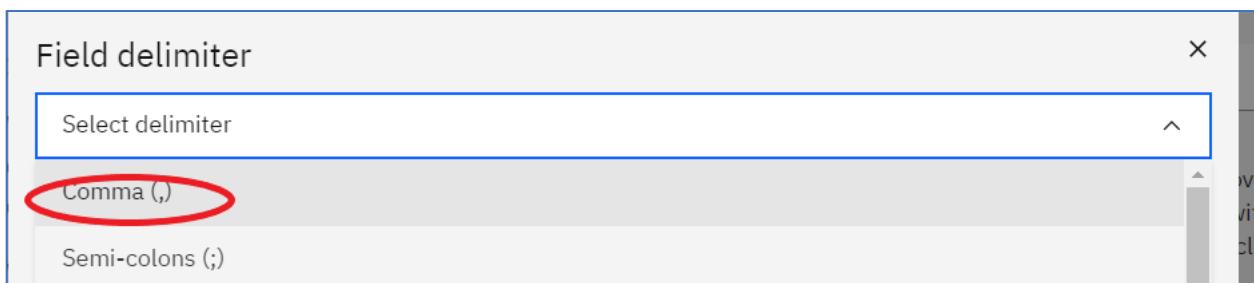
4. Watson OpenScale evaluates models for quality using labeled test data. Labeled test data is provided using the feedback endpoint or by file upload. We will use the file upload options. Click on **Upload feedback data**.



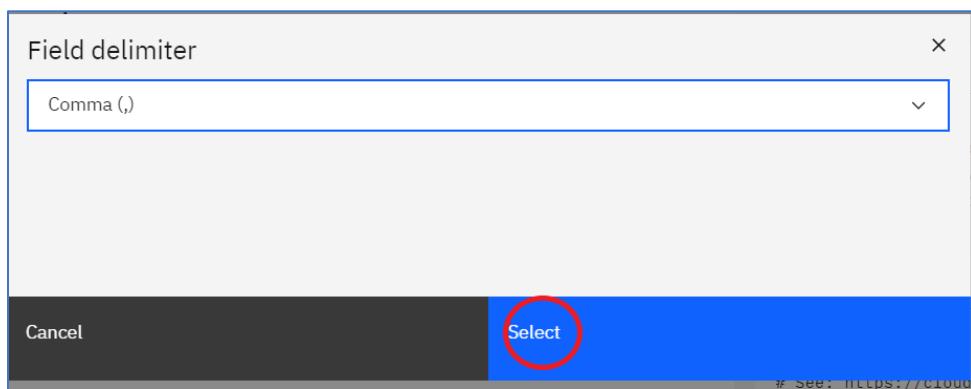
5. Navigate to the feedback file **credit_feedback_data.csv**. Click on **Open**.



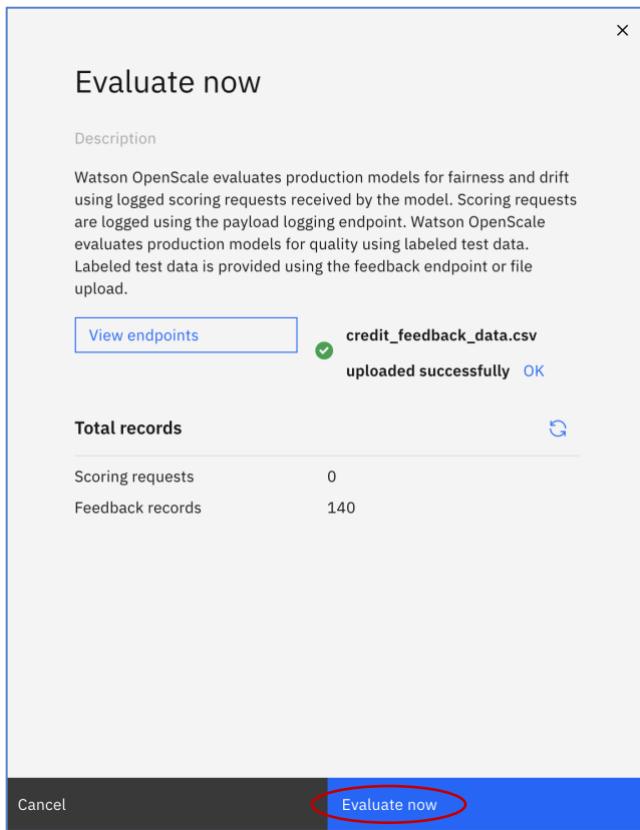
6. Select **Comma** as the **Delimiter**.



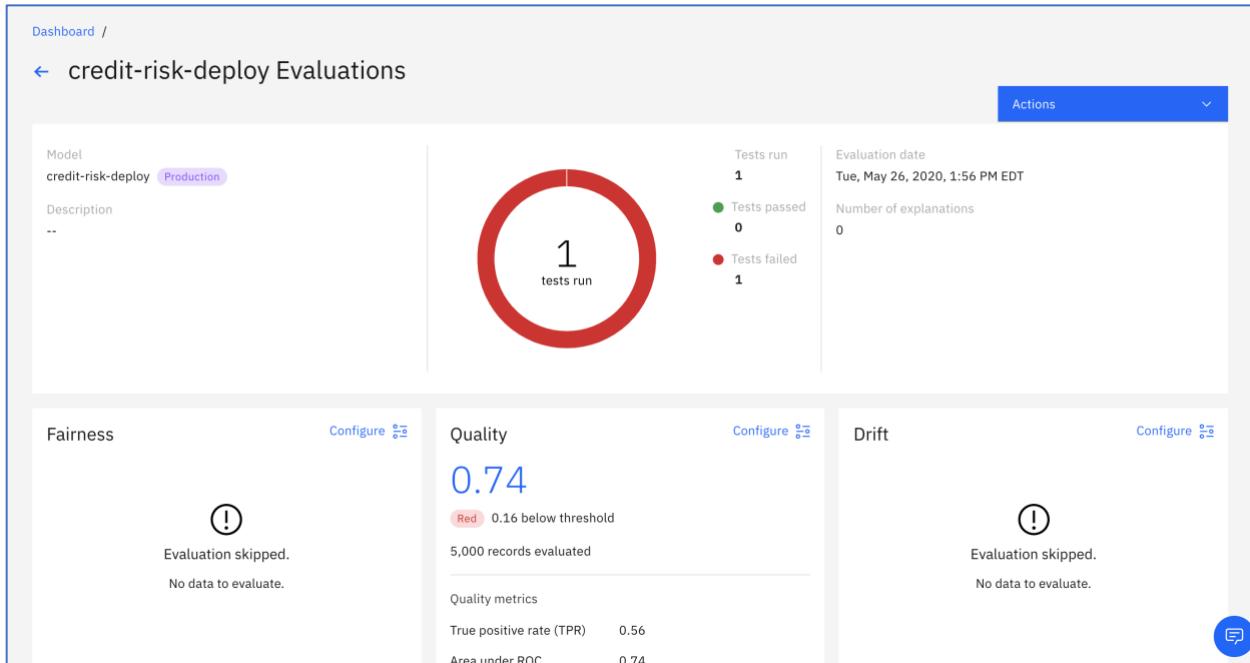
7. Click **Select**.



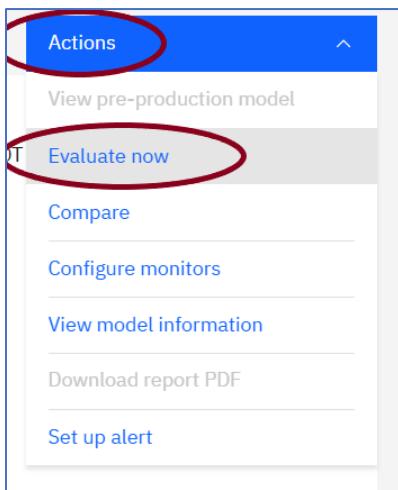
8. After the file is successfully uploaded, click on the **Evaluate now**.



9. Please wait about 3-5 minutes until the evaluation is done. The quality results are displayed. The quality test failed because the accuracy is below the quality threshold.



10. Click on **Actions** and click on **Evaluate Now**.



11. Leave Watson OpenScale at the Evaluation page while, you score transactions below.

Score Transactions and View Fairness and Drift Metrics

In order to display Fairness metrics and Drift metrics, we need to direct transactions to the deployed model. We will use the scoring.json file as sample data that Watson Studio will submit to the deployed model

1. Return to Watson Studio by clicking on the **Watson Studio** browser tab.



2. You should be at the **Test** tab of the **credit-risk-deploy** page.

A screenshot of the Watson Studio interface, specifically the 'credit-risk-deploy' project under the 'Test' tab. On the left, there's a section titled 'Enter input data' with two text areas. The top text area contains JSON-like data for 'no_checking', 'prior_payments_delayed', 'car_new', and 'car_other'. The bottom text area contains data for 'all_credits_paid_back', 'car_new', 'car_new', and 'savings_insurance'. Below these is a 'Predict' button. To the right, there's a large JSON schema for the fields: "fields": ["CheckingStatus", "LoanDuration", "CreditHistory", "LoanPurpose", "LoanAmount", "ExistingSavings", "EmploymentDuration", "InstallmentPercent", "Sex", "OthersOnLoan", "CurrentResidenceDuration", "OwnsProperty", ...].

3. CLEAR out the contents of the **input data** area.
4. Navigate to where the scoring.json file and cut and paste the contents of the file into the **input data** area.

```
[{"fields": ["CheckingStatus", "LoanDuration", "CreditHistory", "LoanPurpose", "LoanAmount", "ExistingSavings", "EmploymentDuration", "InstallmentPercent", "Sex", "OthersOnLoan", "CurrentResidenceDuration", "OwnsProperty", ... ]}]
```

5. Click on Predict

The screenshot shows the 'credit-risk-deploy' interface with the 'Test' tab selected. On the left, there's a section titled 'Enter input data' containing a JSON object representing a dataset. On the right, there's a large JSON object representing a schema or configuration. A red circle highlights the 'Predict' button at the bottom left of the interface.

6. Return to Watson OpenScale by clicking on the Watson OpenScale browser tab.

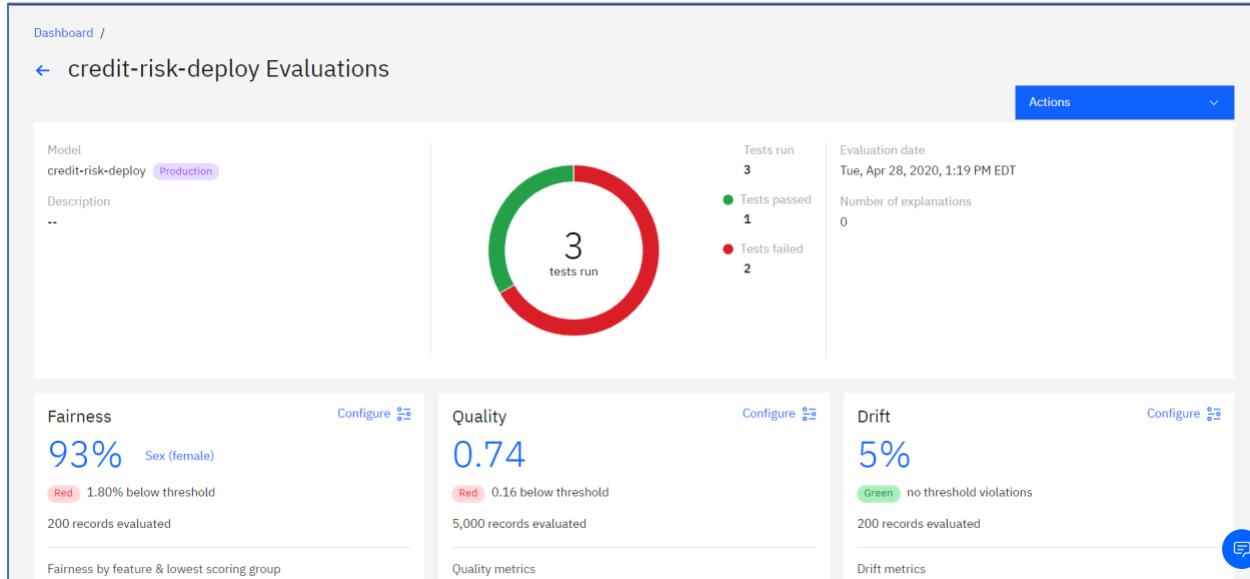


7. Click Evaluate now.

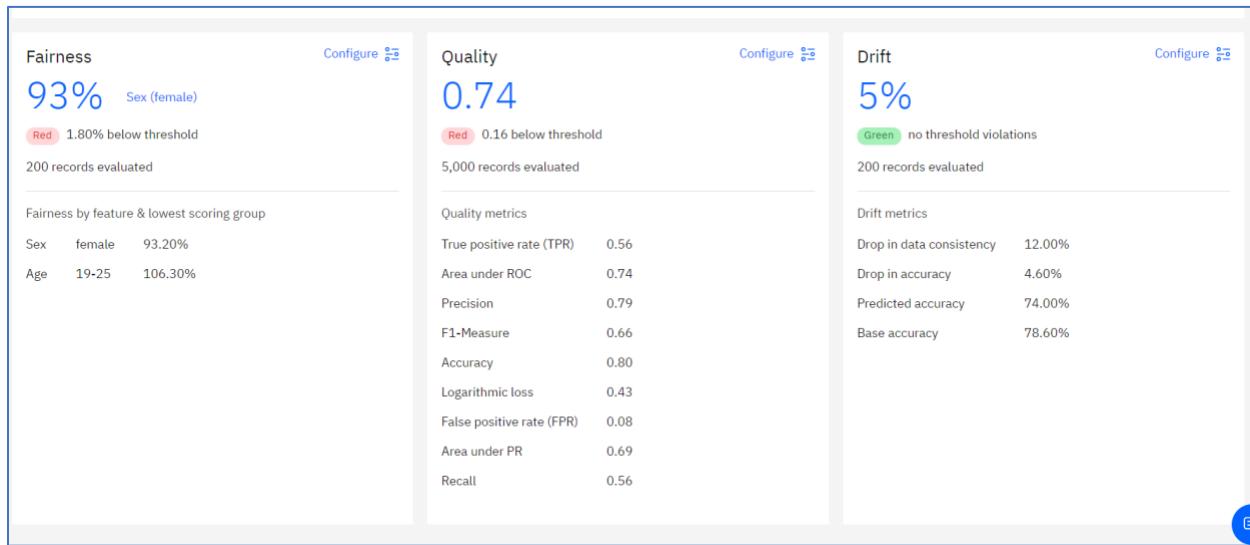
The screenshot shows the 'Evaluate now' dialog box. It includes a 'Description' section with text about Watson OpenScale's functionality, two buttons ('View endpoints' and 'Upload feedback data'), a 'Total records' summary table, and a 'Cancel' button at the bottom left. The 'Evaluate now' button at the bottom right is highlighted with a red circle.

Total records	
Scoring requests	200
Feedback records	5,000

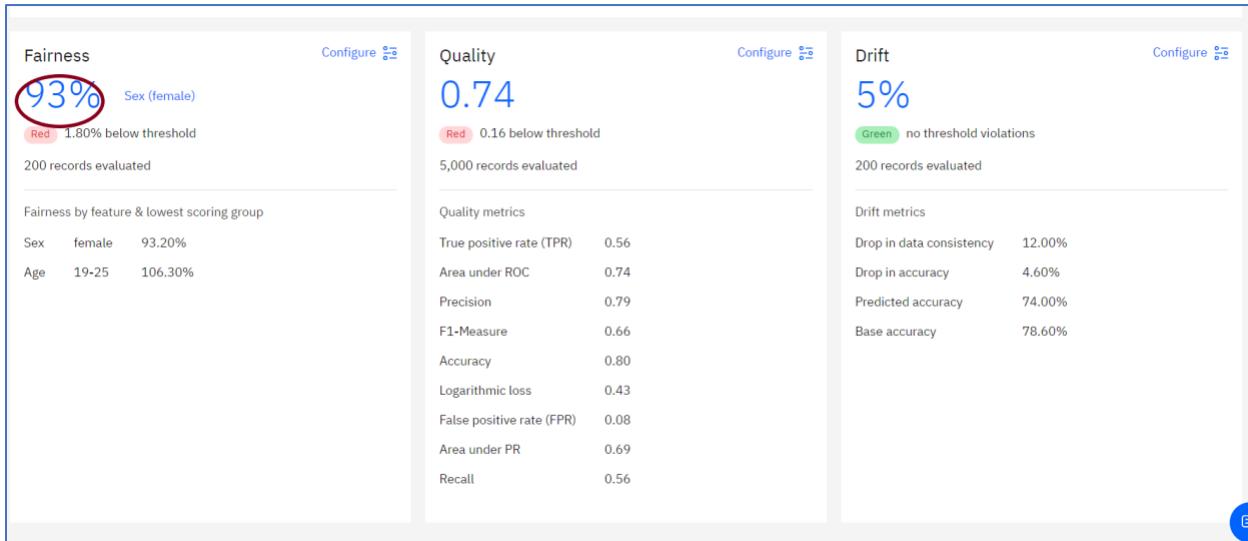
8. Please wait 3-5 minutes for the Evaluations page to display the metrics. Three tests have now been run. The quality test from before, and two new tests. One for fairness, and one for Drift. The fairness test has failed because 93% fairness is lower than our threshold of 95%. The Drift metric passed as the 5% drift is less than our drift threshold of 10%. Note, that lower drift is better, whereas lower fairness is obviously worse. Your evaluation results may be slightly different.



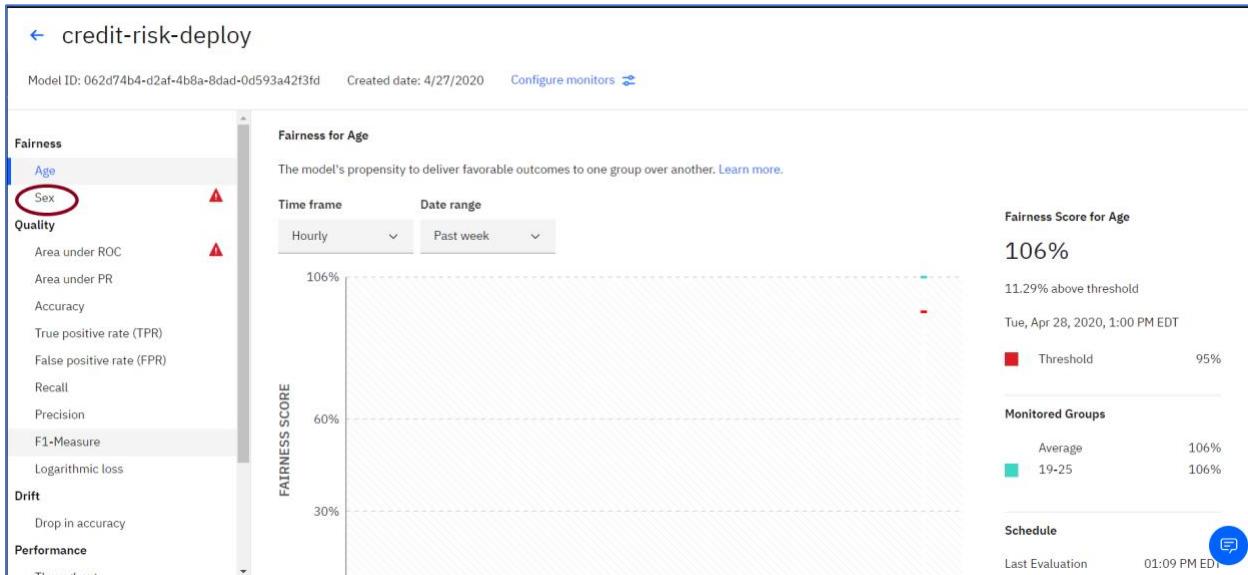
9. Scroll down to see the metric details.



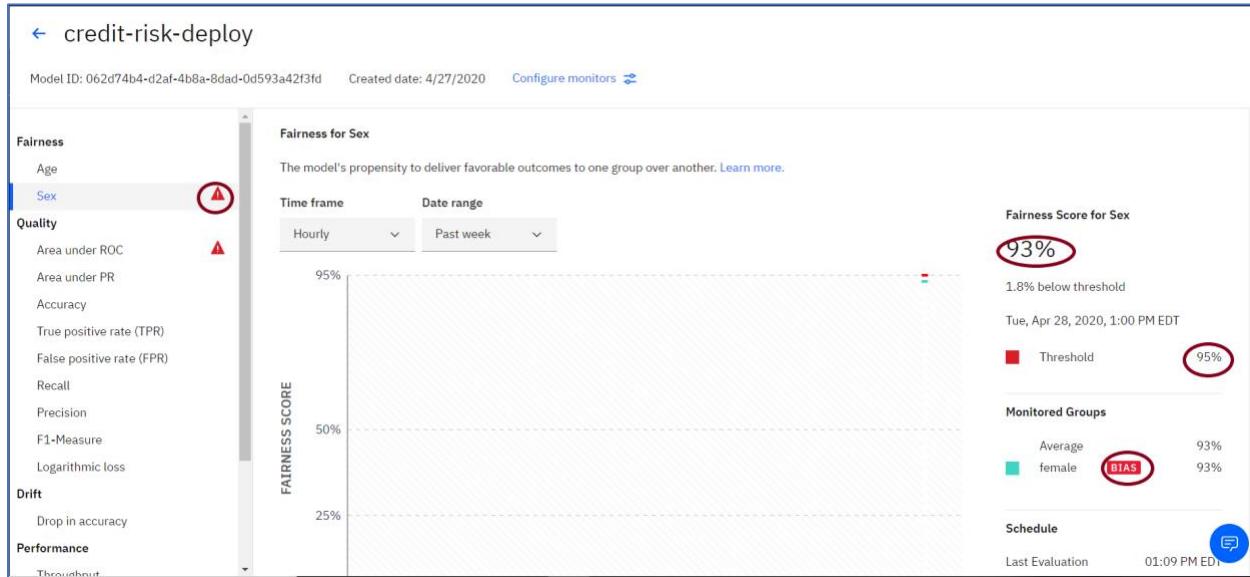
10. Click on the Fairness metric.



11. The time-series view is displayed. Click on Sex.



12. A time-series display for the Sex metric is shown. Currently, we have only run one evaluation. We can see the red triangle indicating an alert next to Sex. The Fairness score is listed at 93% which is less than the threshold of 95%.



13. Scroll down and click on **Check fairness now**.



14. Click on the timeline to view details.

[credit-risk-deploy](#)

Model ID: 062d74b4-d2af-4b8a-8dad-0d593a42f3fd Created date: 4/27/2020 Configure monitors

Fairness

- Age
- Sex**
- Quality
- Area under ROC
- Area under PR
- Accuracy
- True positive rate (TPR)
- False positive rate (FPR)
- Recall
- Precision
- F1-Measure
- Logarithmic loss
- Drift
- Drop in accuracy
- Performance
- Throughput

Fairness for Sex

The model's propensity to deliver favorable outcomes to one group over another. [Learn more.](#)

Time frame: Hourly Date range: Past week

Click to view details

Fairness Score for Sex
93%
1.8% below threshold
Tue, Apr 28, 2020, 2:00 PM EDT

Monitored Groups
Average: 93%
female: **BIAIS**: 93%

Schedule
Last Evaluation: 02:09 PM EDT

Dashboard / credit-risk-deploy / Evaluations / Fairness

Fairness

Monitored attribute: Sex Data Set: Balanced Date and Time: 5/16/2021 6:00 PM

No new data added since last fairness computation. Viewing results from May 16, 2021, 06:08 PM

Fairness score	Favorable outcomes	How the fairness score was determined (balanced data set)
94%	No Risk	The monitored group female received favorable outcomes 76.0% of the time. The perfect equality is 81.0%. The fairness score for Sex is 93.8% (76.0/81.0). View calculation.

View percentage View count

15. The discrepancy between Male and Female results are sufficient to trigger a bias alert.

Click on **Debiased**. Note that it may take some time for the Debiased endpoint to become available.

The screenshot shows the Fairness section of the dashboard. The 'Monitored attribute' is set to 'Sex'. The 'Data Set' dropdown is open, showing 'Balanced' (selected) and 'Debiased'. A tooltip for 'Debiased' indicates: 'perfect equality is 81 calculation.' The 'Fairness score' is 94%, and the outcome is 'No Risk'.

16. The results show that applying a debiasing scheme will reduce the bias to close to zero.

The endpoint for invoking the debiasing algorithm can be obtained by clicking on View Debiased Endpoint. For now, click on **View Payload Transaction** to display a list of transactions.

The screenshot shows the Fairness section of the dashboard. The 'Monitored attribute' is set to 'Sex' and the 'Data Set' is set to 'Debiased'. The 'View payload transactions' button is highlighted with a red circle.

17. Click **Explain** next to a transaction to get an explanation of the factors that caused the deployed model to make the prediction it did for that transaction. I picked the first transaction that resulted in a Risk prediction. Note that it may take a few minutes for the transactions to show.

The screenshot shows the 'Payload Table' section. It lists transactions with columns: Transaction ID, Sex, Bias Detected, Outcome, and Action. The last transaction listed has an 'Action' column value of 'Risk' and an 'Explain' link, which is highlighted with a red circle.

Transaction ID	Sex	Bias Detected	Outcome	Action
61a034fa736dabc57626b399cb139d38-1	male		No Risk	Explain
61a034fa736dabc57626b399cb139d38-10	female		No Risk	Explain
61a034fa736dabc57626b399cb139d38-100	male		No Risk	Explain
61a034fa736dabc57626b399cb139d38-101	male		No Risk	Explain
61a034fa736dabc57626b399cb139d38-102	male		No Risk	Explain
61a034fa736dabc57626b399cb139d38-103	male		No Risk	Explain
61a034fa736dabc57626b399cb139d38-104	male		No Risk	Explain
61a034fa736dabc57626b399cb139d38-105	female		Risk	Explain

18. The results show the confidence level for the result including an explanation of how the result was determined and which features were most important.

Explanations / e6c3f89cd6eeecb79faed2696ea53408e-129

Transaction details

Explain Inspect

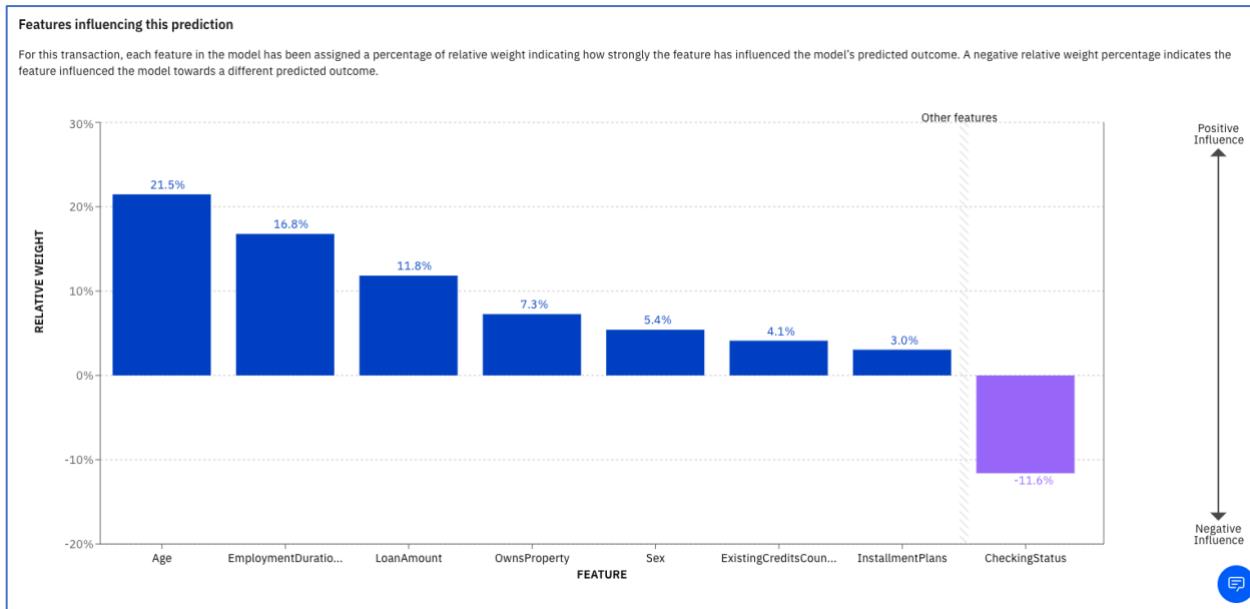
Transaction e6c3f89cd6eeecb79faed2696ea53408e-129	Received on Jul 21, 2020, 03:47:01 PM EDT	Deployed model credit-risk-deploy	Language Not applicable
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Predicted outcome ⓘ Risk
The credit-risk model has **50.74% confidence** that the outcome of this transaction would be **Risk**. The top three features influencing the model's predicted outcome are Age, EmploymentDuration, and LoanAmount. The feature CheckingStatus is influencing the model toward a predicted outcome of No Risk.

Confidence level
50.74%

Search by Transaction ID

19. Scroll down to view how features influence the model's predicted outcome towards negative or positive.



20. Click on the Dashboard icon

IBM Watson OpenScale

Explanations / e6c3f89cd6eeecb79faed2696ea53408e-129

Transaction details

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Need help? ⓘ

Search by Transaction ID

21. The Dashboard view provides a snapshot view of how the deployed models are performing. Since we are only monitoring one deployment, there is only 1 monitoring tile displayed. You can drill down from this view to get the details on each of the metrics for a given deployment, as we've shown in this lab.

The screenshot shows the Watson OpenScale Insights Dashboard. At the top, it says "Model Monitors" with a value of 1. On the right, there's a blue button labeled "Add to dashboard +". Below this, there are four categories: Deployments Monitored (1), Quality Alerts (1), Fairness Alerts (1), and Drift Alerts (0). A note below states: "Quality and Fairness metrics update every hour. Drift metrics update every 3 hours." The main content area displays a card for the "credit-risk-deploy" model. It shows 2 Issues, with 1 under the "QUALITY" tab and 1 under the "BIAS" tab. Below this, there are three cards: Quality (0.74, 1 alert), Fairness (93%, 1 alert), and Drift (5%). The status is "Production" and it was "Evaluated 48 seconds ago".

Congratulations! You have completed the Lab!!!

- ✓ Imported a machine learning model
- ✓ Deployed the model
- ✓ Provisioned Watson OpenScale
- ✓ Configured the payload logging database and Machine Learning provider
- ✓ Scored Data
- ✓ Prepared the Deployed Model for Monitoring
- ✓ Configured Payload Logging
- ✓ Configured Quality Monitoring
- ✓ Configured Fairness Monitoring
- ✓ Configured Drift Monitoring
- ✓ Submitted Feedback and Viewed Quality Metrics
- ✓ Scored Data and Viewed Fairness and Drift Metrics
- ✓ Explained a Transaction.