

# 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.

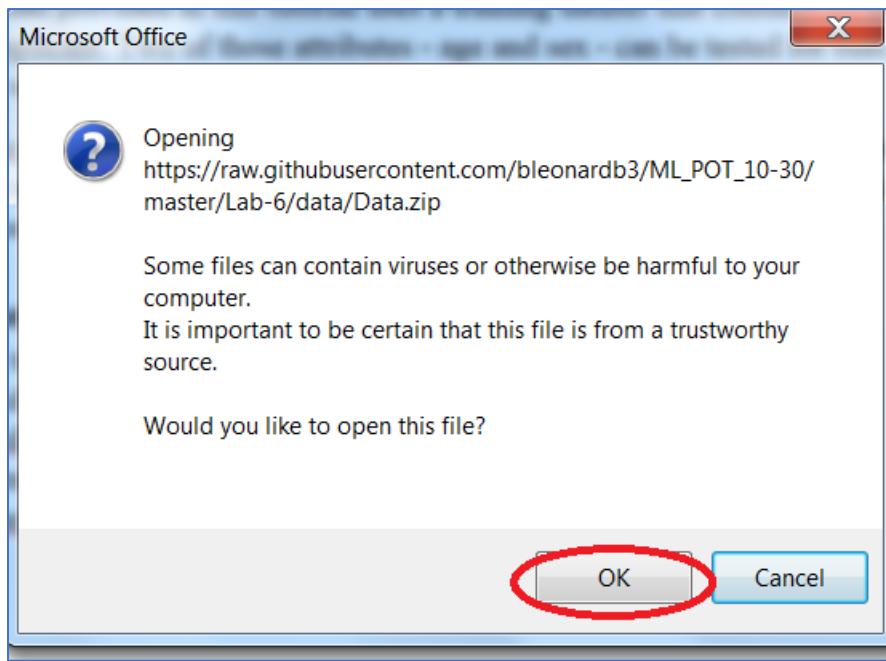
The credit risk model provided in this tutorial uses a training dataset that contains 20 attributes about each loan applicant. Two of those attributes - age and sex - can be tested for bias. For this tutorial, the focus will be on bias against sex and age.

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`.

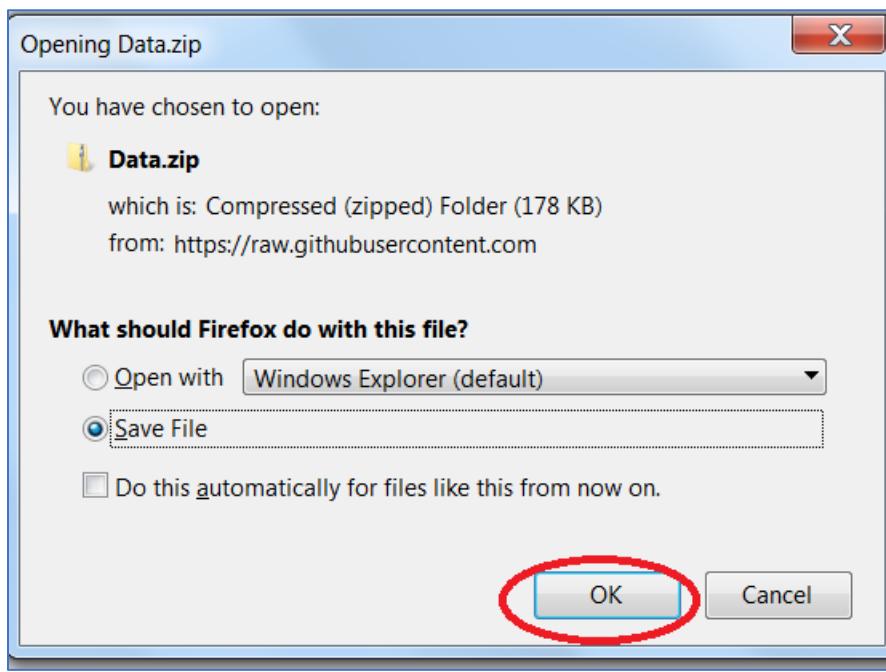
## Download the Lab Files

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`

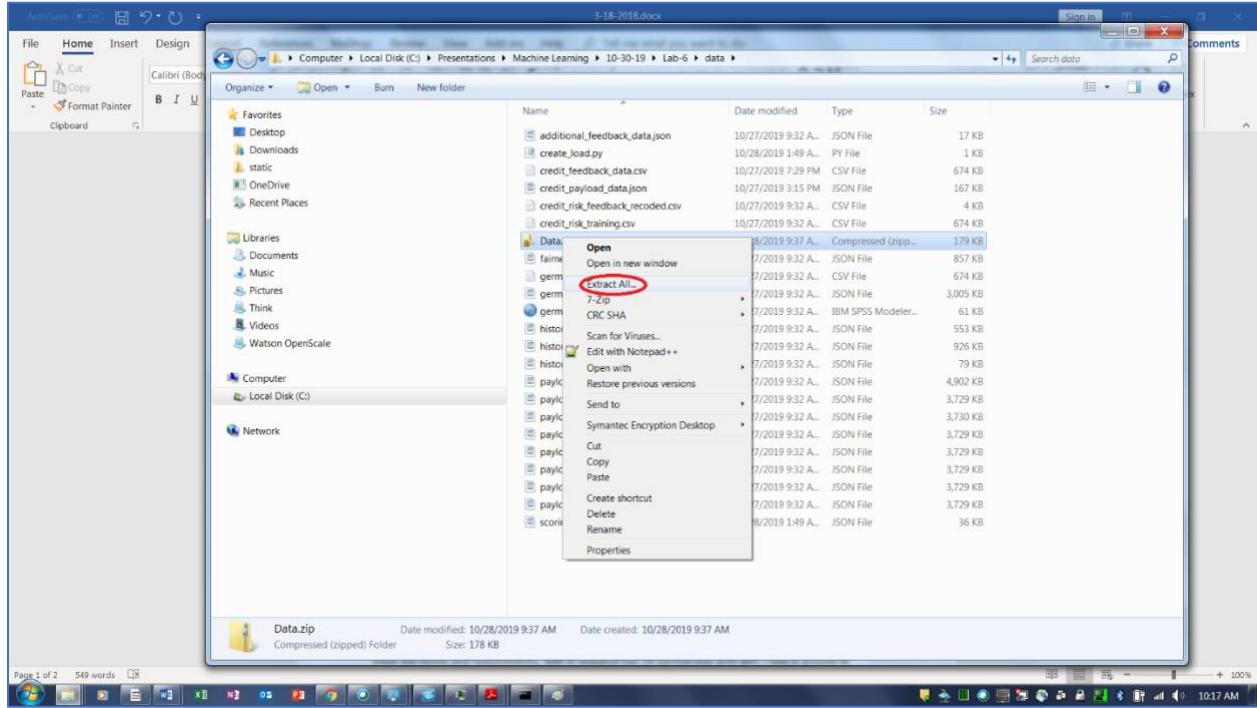
2. Click **OK**. Note your browser may not prompt this message.



3. Click **OK**.



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

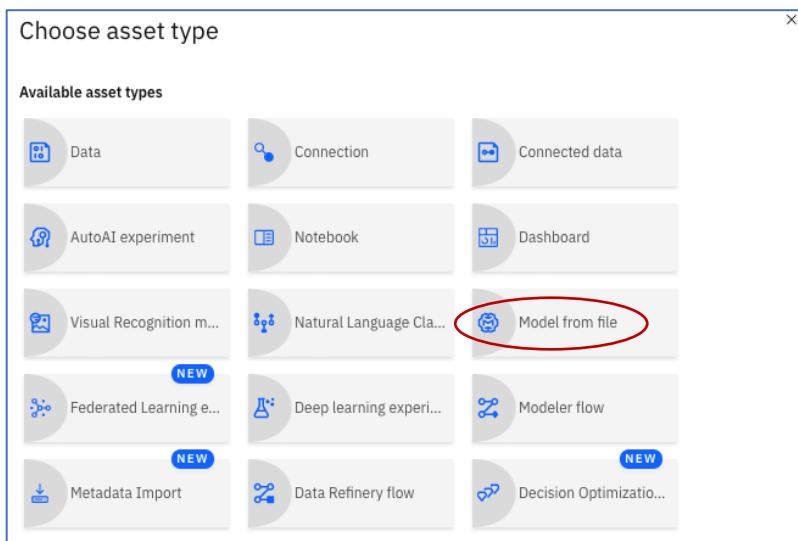


## Import the Credit Risk Model

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



2. Click on **Model from file**.



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

The screenshot shows the 'Import model' interface. On the left, there's a sidebar with a '+ New' button and a 'Gallery sample' button, which is circled in red. In the center, there are two cards: 'Credit Risk' (circled in red) and 'Customer Satisfaction Prediction'. The 'Credit Risk' card has a detailed 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.' At the bottom right of the screen, the 'Import' button is also circled in red.

## Deploy the Credit Risk Model

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

The screenshot shows the 'credit-risk' project overview. At the top right, there's a blue button labeled 'Promote to deployment space', which is circled in red. To the right of the button, there's a summary of the model: 'Last modified at May 16, 2021 4:42 PM', 'Type: mllib\_2.4', 'Model ID: bc250345-ec0b-4579-81a9-ed...', 'Software specification: spark-mllib\_2.4', and a 'Tags' section with a note to 'Add tags to make assets easier to find.'

2. Click on **Watson Studio Labs** for the Target space, check “**Go to the model in the space after promoting it,**” and click **Promote**.

Target space  
Watson Studio Labs

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

Cancel Promote

3. Click Create deployment.

Deployments / openscale-express-path-15c8db... / credit-risk

credit-risk

Create deployment

Deployments Schema

You don't have any deployments yet  
Create your first deployment for this model. [Learn more](#)

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

Associated asset  
credit-risk

Deployment type

**Online**  Run the model on data in real-time, as data is received by a web service.

**Batch** Run the model against data as a batch process.

Name **credit-risk-deploy**

Description Deployment description

Tags Add tags to make assets easier to find.

Cancel **Create**

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)	<b>credit-risk-deploy</b>	Deployed	May 16, 2021 4:49 PM
Batch	(0)			

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

The screenshot shows the API reference section for the 'credit-risk-deploy' endpoint. At the top, it says 'Deployed' and 'Online'. Below that, there are tabs for 'API reference' (which is selected) and 'Test'. Under 'API reference', there's a 'Direct link' section with an 'Endpoint' URL: <https://us-south.ml.cloud.ibm.com/m1/v4/deployments/f38f4e1c-faf7-46c7-b4b1-2c3a6b502f39/predict>. To the right of the URL is a 'Bearer <token>' field with a help icon. Below the URL are 'IAM' and 'Test' buttons. Further down, there's a 'Code snippets' section with tabs for 'cURL' (selected), Java, JavaScript, Python, and Scala.

## Begin OpenScale Configuration

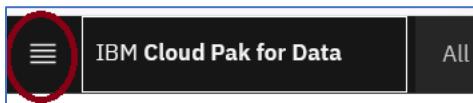
1. Right-click on **IBM Cloud Pak for Data**. Click on **Open Link in New Tab**.

The screenshot shows a browser context menu for the 'IBM Cloud Pak for Data' link. The menu items are: All, Open Link in New Tab (highlighted with a red circle), Open Link in New Window, Open Link in New Private Window, Bookmark Link, Save Link As..., Save Link to Pocket, Copy Link, Search Google for "IBM Cloud Pak f...", Inspect Accessibility Properties, and Inspect (Q).

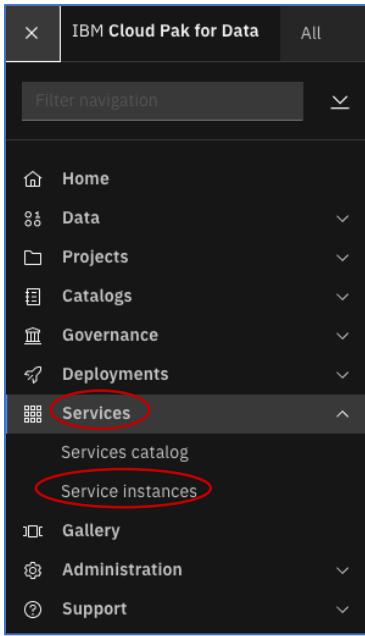
2. Click on the new **IBM Cloud Pak for Data** browser tab.



3. Click on the hamburger icon  in the top left corner.



4. Click on **Services**, and **Service instances**.



5. 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

**6. Click on **Launch Application**.**

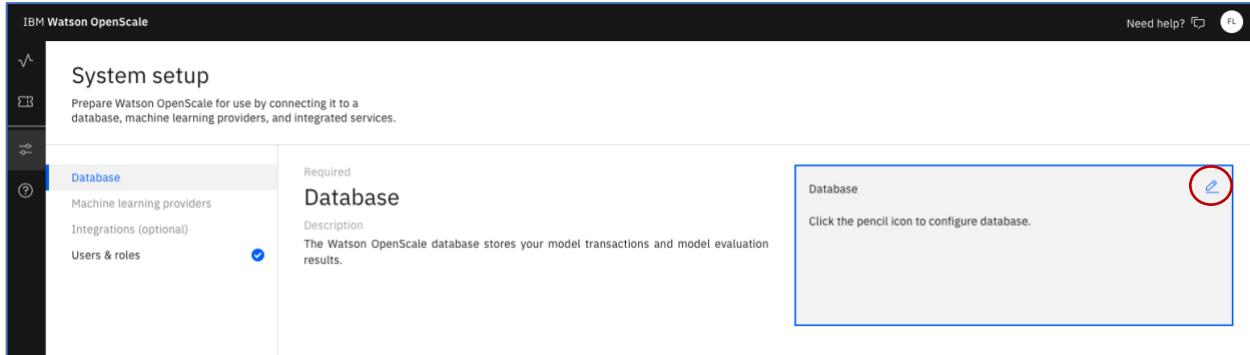
The screenshot shows the Watson OpenScale application interface. At the top, there's a navigation bar with 'Resource list / Watson OpenScale' and status indicators like 'Active'. Below the navigation is a sidebar with 'Getting started', 'Manage' (which is selected), and 'Plan'. In the center, there's a circular icon with a stylized 'X' or scale-like symbol. Below the icon, the text 'Watson OpenScale' is displayed. A welcome message says 'Welcome to Watson OpenScale, let's get started.' Underneath the message is a blue button labeled 'Launch Application', which is circled in red. At the bottom of the screen, there are links for 'Documentation' and 'Community', and a feedback icon.

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

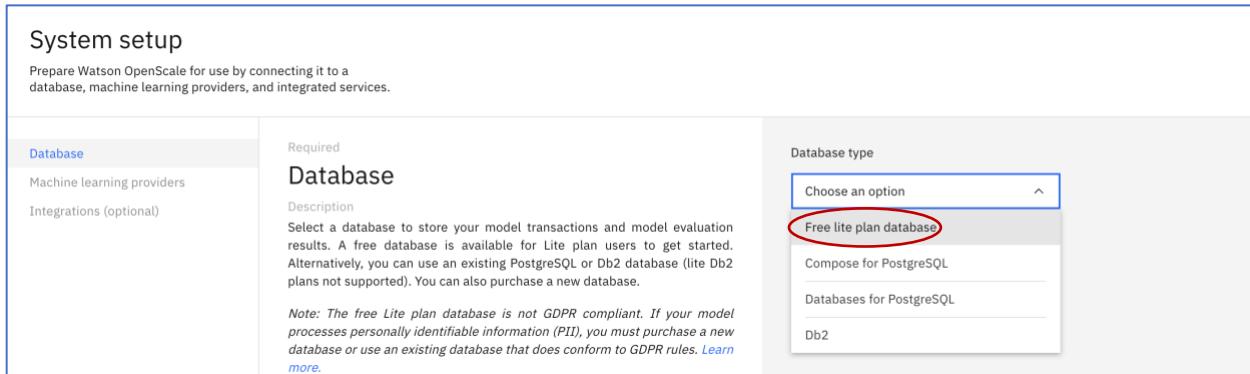
The screenshot shows the 'Welcome to Watson OpenScale' page. It features a large circular icon with a blue gradient and some white dots. Below the icon, the text 'Welcome to Watson OpenScale' is displayed. A paragraph explains the purpose of the tool: 'Watson OpenScale maintains the health of AI models 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.' Below this text, another paragraph says: '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?' At the bottom of the page, there are two buttons: 'Manual setup' (circled in red) and 'Auto setup'.

# Setup System

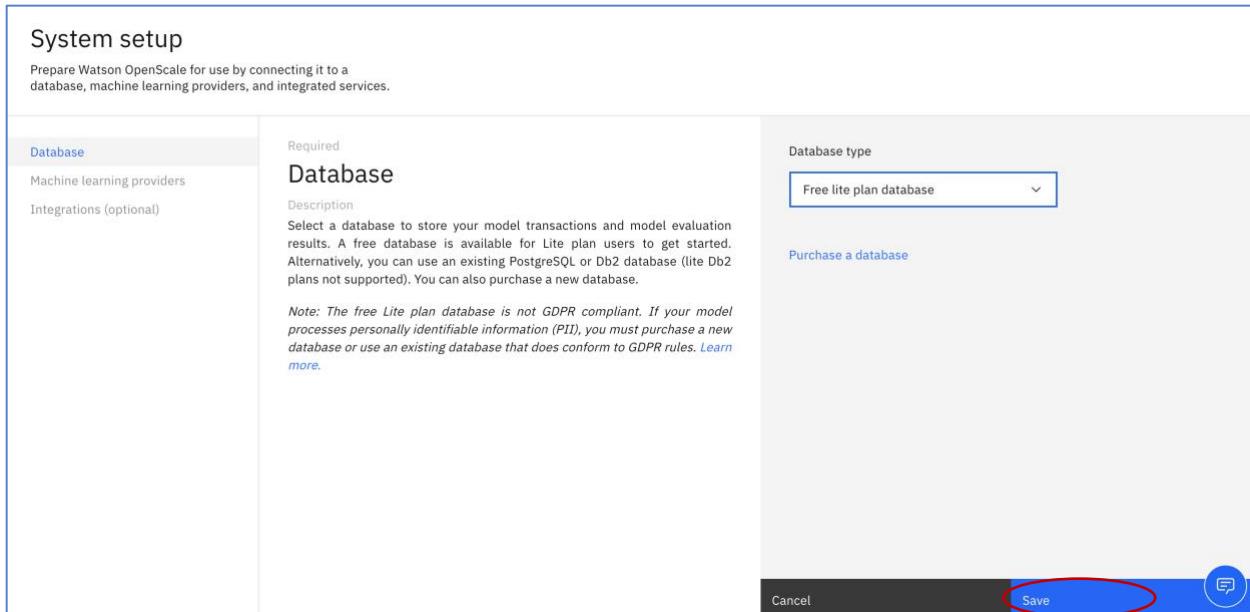
1. In the system setup, we need to set up a database to collect the payload logging data. We also need to specify which deployed model will be monitored.
2. Click on the  icon on the Database tile.



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

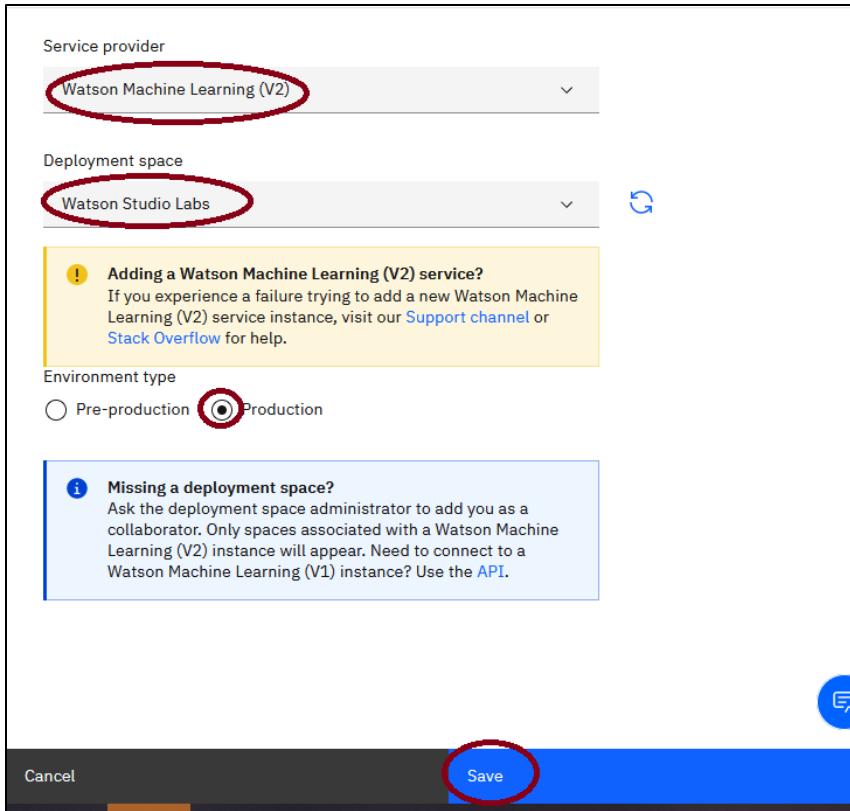
Description

Click edit to enter provider description.

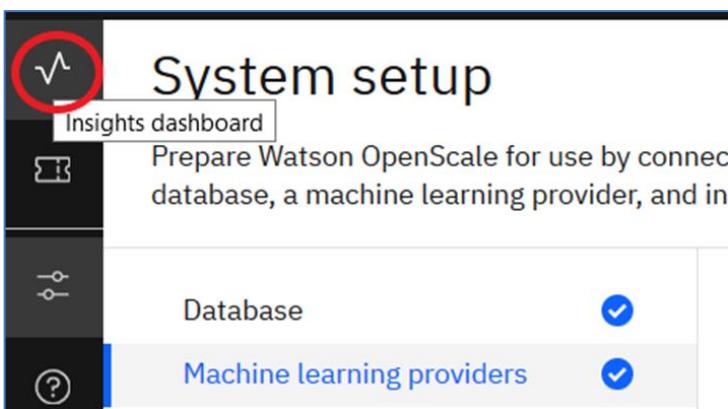
Connection

Click edit to enter the connection information.

## 8. Click on Watson Machine Learning (V2) for the Service provider type. Scroll down and click on Watson Studio Labs for the Deployment Space, click on Production for the Environment type, and click on Save.



9. Click on the icon.



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

The screenshot shows the IBM Watson OpenScale Insights Dashboard. At the top right, there is a blue button labeled "Add to dashboard" with a plus sign, which is circled in red. Below the header, there are four categories: "Deployments Monitored" (0), "Quality Alerts" (0), "Fairness Alerts" (0), and "Drift Alerts" (0). There are also filters for "Tags", "Alert type", "Machine learning provider", and "Sort by Severity". A search bar at the bottom left contains the placeholder "Find models".

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

This is a modal dialog titled "Select a model deployment". It asks to choose a machine learning provider and provides deployment details. A dropdown menu for "Machine learning Provider" is set to "New provider (Production)". Below is a table of deployments:

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
<input checked="" type="radio"/> credit-risk-deploy	-	Sun, May 16, 2021, 4:49 PM EDT

At the bottom, there are "Cancel" and "Configure" buttons, with "Configure" being circled in red.

12. Click on **Configure monitors**.

A modal dialog box displays the message "Selections saved." and a green checkmark icon followed by the text "Done. Click **Configure monitors** to set up your monitors." At the bottom, there are "Close" and "Configure monitors" buttons, with "Configure monitors" being circled in red.

13. 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.

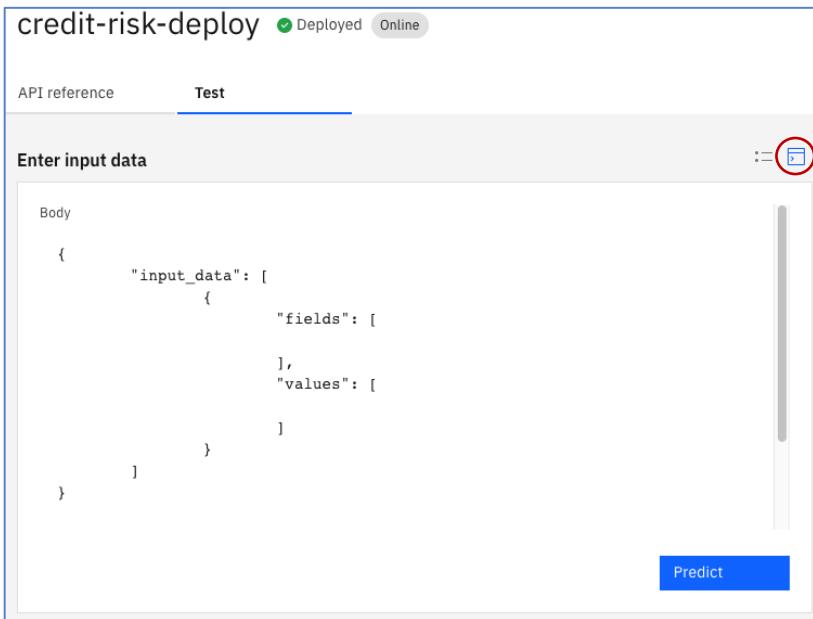
1. Return to the tab from earlier that shows your deployed credit-risk model.

The screenshot shows the Watson Studio interface for a deployed model named "credit-risk-deploy". The "API reference" tab is selected. Below it, the "Test" tab is visible. The "Direct link" section displays the endpoint URL: `https://us-south.ml.cloud.ibm.com/v4/deployments/f38f4e1c-faf7-46c7-b4b1-2c3a6b502f39/predict`. To the right of the URL are two buttons: "Bearer <token>" with a help icon and "IAM". Below the URL is a "Code snippets" section with tabs for cURL, Java, JavaScript, Python, and Scala.

2. Click on the **Test** tab.

The screenshot shows the same Watson Studio interface, but the "Test" tab is now selected, indicated by a red circle. The "API reference" tab is still present but not active. The "Direct link" section remains the same, showing the endpoint URL and IAM/Bearer token options. The "Code snippets" section with its tabs is also visible below.

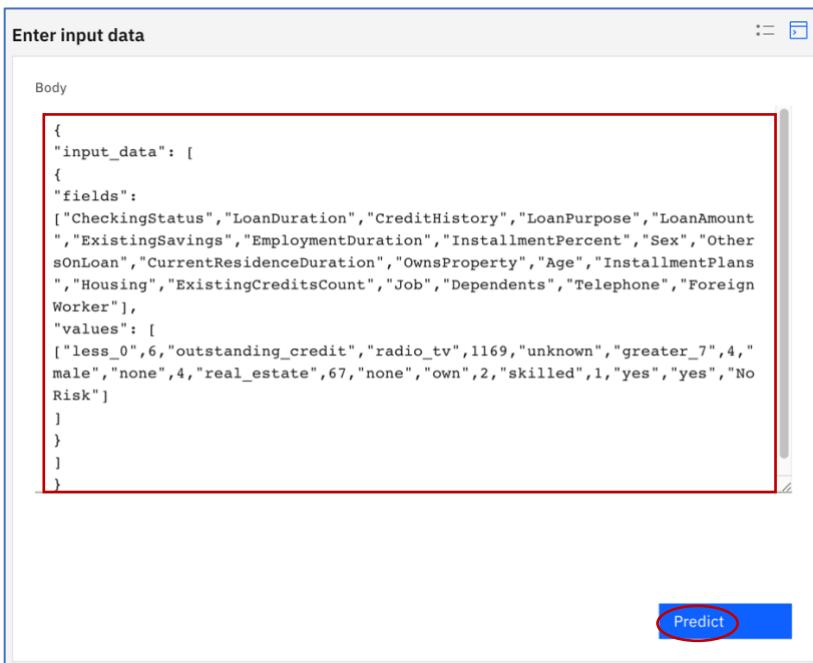
3. Click on the  icon to accept input as JSON.



The screenshot shows the 'Test' tab of the Azure API Management interface for the 'credit-risk-deploy' service. The 'Enter input data' section contains a JSON template for 'input\_data'. A red circle highlights the copy icon (a clipboard with a plus sign) located at the top right of the input area. Below the input area is a 'Predict' button.

```
{  
    "input_data": [  
        {  
            "fields": [  
                ],  
            "values": [  
                ]  
        }  
    ]  
}
```

4. Copy the file contents of **credit\_payload\_data.json** into the **input data** area and click on **Predict**.



The screenshot shows the 'Test' tab of the Azure API Management interface for the 'credit-risk-deploy' service. The 'Enter input data' section contains a large JSON payload. A red rectangle highlights the entire JSON content. A red circle highlights the 'Predict' button at the bottom right.

```
{  
    "input_data": [  
        {  
            "fields": [  
                "CheckingStatus", "LoanDuration", "CreditHistory", "LoanPurpose", "LoanAmount",  
                "ExistingSavings", "EmploymentDuration", "InstallmentPercent", "Sex", "OthersOnLoan",  
                "CurrentResidenceDuration", "OwnsProperty", "Age", "InstallmentPlans",  
                "Housing", "ExistingCreditsCount", "Job", "Dependents", "Telephone", "Foreign  
Worker"],  
            "values": [  
                {"less_0": 6, "outstanding_credit": "radio_tv", "radio_tv": 1169, "unknown": "greater_7", "greater_7": 4, "male": "male", "none": 4, "real_estate": 67, "none": "own", "own": 2, "skilled": 1, "yes": "yes", "no": "No  
Risk"}  
            ]  
        }  
    ]  
}
```

5. The results should appear as below.

## Configure Model Details

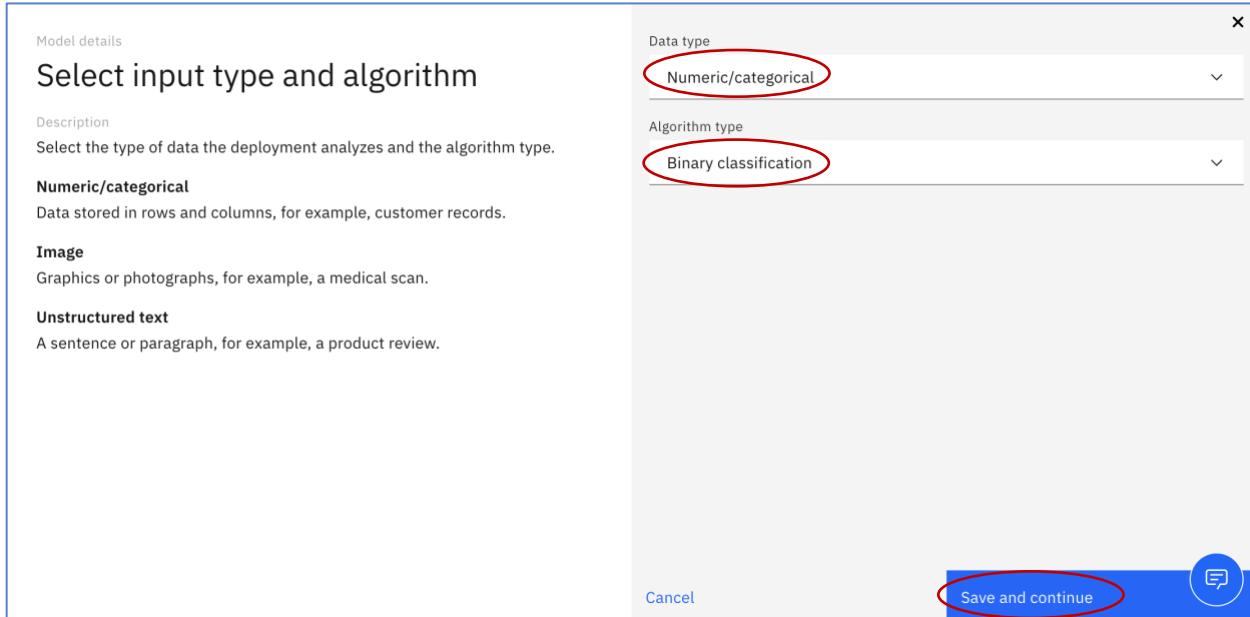
1. Switch back to Watson OpenScale by clicking on the Watson OpenScale browser tab.



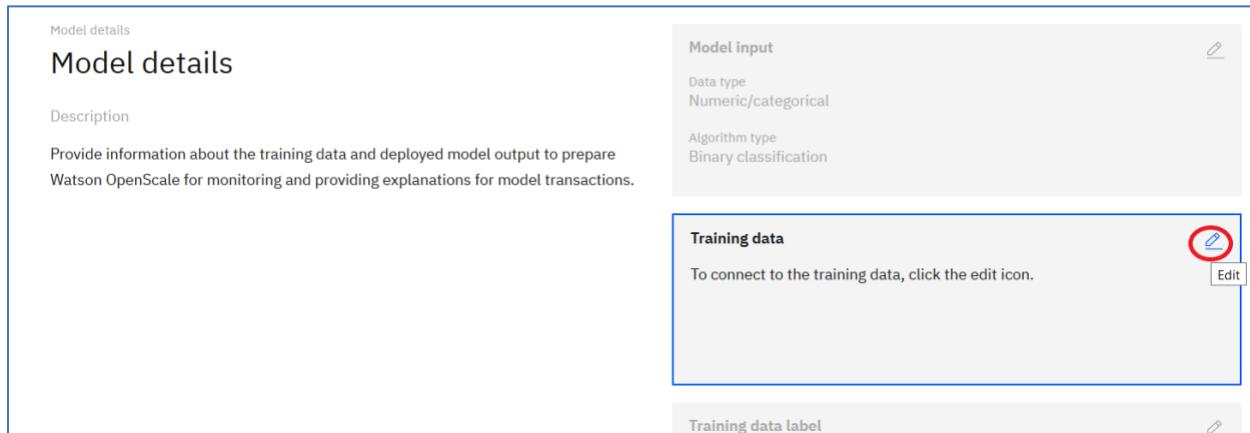
2. Click on pencil icon to edit the **Model input**.

Model details	Model input
Description	To select the data type and algorithm type, click the edit icon.
Provide information about the training data and deployed model output to prepare Watson OpenScale for monitoring and providing explanations for model transactions.	

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



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



- Select **Cloud Object Storage** as the **Location**.
- Copy and paste the following text as the **resource\_id**:

1613a7c4-d7b1-4872-a1c2-41db3b7f3d91

- Copy and paste the following text as the **apikey**:

3TMR6f7dKSPuzOWEEGsPoII17BCnUPNr6CrmCyL2zGBI

## 8. Click Connect

Storage type  
Database or cloud storage

Location  
Cloud Object Storage

Resource instance ID  
1613a7c4-d7b1-4872-a1c2-41db3b7f3d91

API key  
.....

Connect

## 9. Select **a3trainingdata** as the bucket, select **german\_credit\_data\_biased\_training.csv** as the Data set, and click **Next**.

Storage type  
Database or cloud storage

Location  
Cloud Object Storage

Resource instance ID  
1613a7c4-d7b1-4872-a1c2-41db3b7f3d91

Bucket  
a3trainingdata

Data set  
german\_credit\_data\_biased\_training.csv

Cancel Next

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

The screenshot shows the 'credit-risk-deploy' project page. On the left, there's a sidebar with 'Model info' sections like 'Model details' (selected), 'Endpoints', 'Evaluations' (Fairness, Quality, Drift, Explainability), and 'Import settings'. The main area is titled 'Select the label column' with a description: 'From the selected training features, select a single feature as the label. The label represents the correct prediction (ground-truth) for each record.' A modal window titled 'Select the label column' lists a single feature: 'Features (1)' - 'Risk' with type 'A'. At the bottom of the modal are 'Cancel', 'Back', and 'Next' buttons, with 'Next' being circled in red.

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

The screenshot shows the 'credit-risk-deploy' project page. The 'Model details' section is selected in the sidebar. The main area is titled 'Select the training features' with a 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).'. A modal window titled 'Select the training features' lists 20 features: 'Features (20)', 'Age', 'CheckingStatus', 'CreditHistory', 'CurrentResidenceDuration', 'Dependents', and 'EmploymentDuration'. Each row includes a checkbox for 'Type' and a checkbox for 'Categorical'. The 'Next' button at the bottom of the modal is circled in red.

12. 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**

13. 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**

14. 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".

**Model info:**

- Model details** (selected)
- Endpoints**
- Evaluations**

  - Fairness**
  - Quality** (circled in red)
  - Drift**
  - Explainability**

- Import settings**
- Go to model summary**

**Model details:**

**Description:** Provide information about the training data and deployed model output to prepare Watson OpenScale for monitoring and providing explanations for model transactions.

**Model input:**

**Data type:** Numeric/categorical  
**Algorithm type:** Binary classification

**Training data:**

**Storage type:** Database or cloud storage  
**Location of training data:** Db2  
**Hostname or IP address:** dashdb-txn-sbox-yp-dal09-03.services.dal.bluemix.net  
**SSL port:**

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

This screenshot shows the Watson OpenScale configuration interface for a model named "credit-risk-deploy".

**Model info:**

- Model details** (selected)
- Endpoints**
- Evaluations**

  - Fairness**
  - Quality** (circled in red)
  - Drift**
  - Explainability**

- Import settings**
- Go to model summary**

**Quality:**

**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.

**Note:** The Quality metric measures the model's ability to correctly predict outcomes that match labeled data (ground truth) provided by humans. The quality metrics evaluated are standard data science statistics based on model type. [Learn more](#).

**Quality threshold:**

To select quality threshold values, click the edit icon. (Icon circled in red)

**Sample size:**

To select the minimum and maximum sample sizes, click the edit icon.

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, a sidebar lists 'Model info' (Model details, Endpoints), 'Evaluations' (Fairness, Quality, Drift, Explainability), and 'Import settings'. The 'Fairness' evaluation is highlighted with a red oval. The main content area shows the 'Quality' monitor configuration. It includes a 'Description' section stating the monitor evaluates model quality and identifies decline. A note explains the Quality metric measures the model's ability to correctly predict outcomes matching labeled data. To the right, there are two sections: 'Quality threshold' (set to 0.9) and 'Sample size' (minimum 100, maximum 10,000). A blue message icon is at the bottom right.

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

This screenshot shows the same configuration page after editing the 'Favorable outcomes'. The 'Fairness' evaluation is now highlighted with a red oval. The 'Favorable outcomes' section is shown with a red circle around its edit icon. The 'Sample size' section is also visible. A blue message icon is at the bottom right.

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 href="#">A</a>
<b>Sex</b>	<input checked="" type="checkbox"/>	80	<a href="#">A</a>
OthersOnLoan	<input type="checkbox"/>	80	<a href="#">A</a>
CurrentResidenceDuration	<input type="checkbox"/>	80	<a href="#">A</a>
OwnsProperty	<input type="checkbox"/>	80	<a href="#">A</a>
<b>Age</b>	<input checked="" type="checkbox"/>	80	<a href="#">A</a>
InstallmentPlans	<input type="checkbox"/>	80	<a href="#">A</a>
Housing	<input type="checkbox"/>	80	<a href="#">A</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.

The screenshot shows the 'Specify the monitored groups for [Age]' page under the 'Fairness' section. On the left, there's a 'Description' section with instructions about monitoring groups and a 'Recommended groups' section. On the right, a modal dialog titled 'Select the groups to monitor [Age]' is open. It has input fields for 'Minimum value: 19' (with '26' circled in red) and 'Maximum value: 74' (with '74' circled in red), and a blue 'Add value' button. Below these are dropdown menus for 'Values', 'Monitored', 'Reference', and 'Recommended'. Under 'Values', '19-25' and '44-67' have checkboxes. Under 'Monitored', '19-43' and '44-67' have checkboxes. Under 'Reference', '19-43' has a checked checkbox. Under 'Recommended', '44-67' has a checked checkbox. At the bottom of the modal are 'Cancel', 'Back', and 'Next' buttons, with 'Next' being highlighted.

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**.

The screenshot shows the same 'Specify the monitored groups for [Age]' page and modal dialog as the previous one, but with specific changes highlighted. In the 'Monitored' column, the checkbox for '19-25' is circled in red. In the 'Reference' column, the checkbox for '26-74' is circled in red. In the 'Set fairness alert threshold [Age]' field, the value '95' is circled in red. The 'Next' button at the bottom of the modal is also circled in red.

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 Watson OpenScale interface for fairness configuration. On the left, a main panel titled "Specify the monitored groups for [Sex]" contains a "Description" section about monitoring groups and a "Set fairness alert threshold" section with a value of "95". A callout box labeled "Recommended groups" provides information about recommended monitoring groups. On the right, an overlay titled "Select the groups to monitor [Sex]" lists "female" and "male" with checkboxes for "Monitored" and "Reference". The "female" row has "Monitored" checked and "male" has "Reference" checked. The "Save" button at the bottom of the overlay is 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 "credit-risk-deploy" model configuration page. In the "Evaluations" section, the "Drift" option is selected and highlighted with a red circle. The "Fairness" section is expanded, showing its description and configuration options. The "Favorable outcomes" and "Sample size" sections are also visible on the right.

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

Dashboard / Configure

### credit-risk-deploy

<b>Model info</b>	<b>Drift</b>	
Model details	<input checked="" type="radio"/>	Drift model To select a drift model training option, click the edit icon.
Endpoints	<input checked="" type="radio"/>	
<b>Evaluations</b>	<b>Drop in accuracy</b>	
Fairness	<input checked="" type="radio"/>	
Quality	<input checked="" type="radio"/>	
<b>Drift</b>	<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.

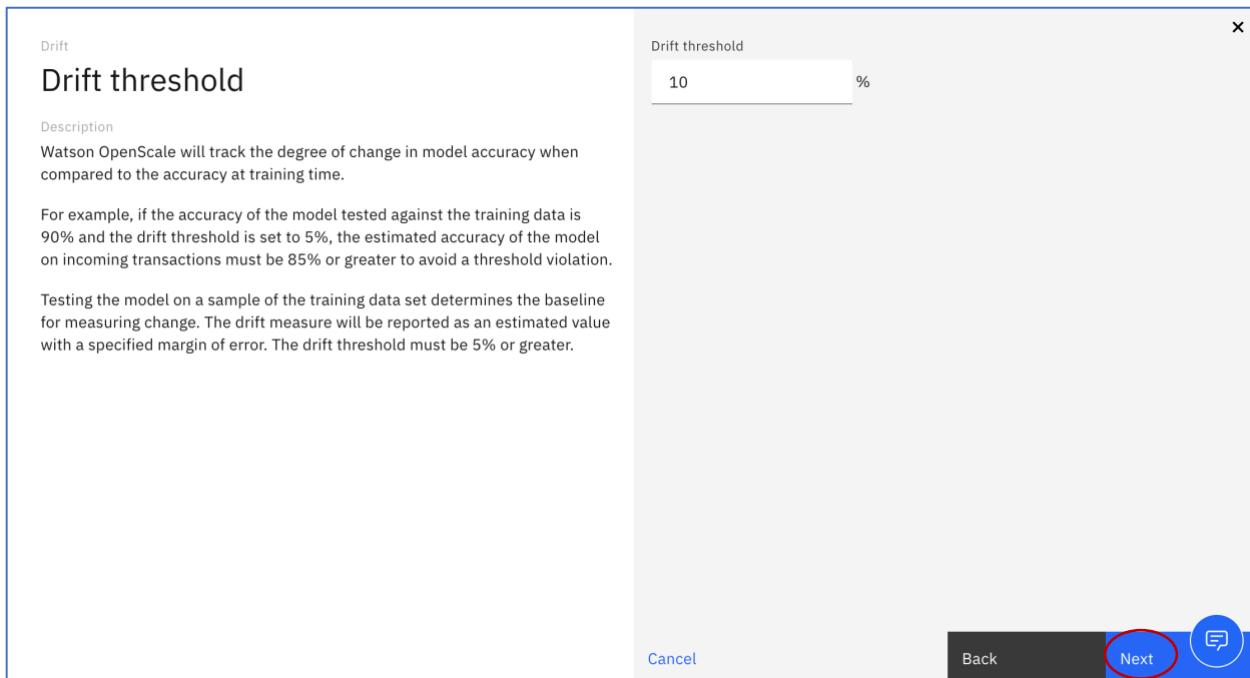
Training option

Train in Watson OpenScale

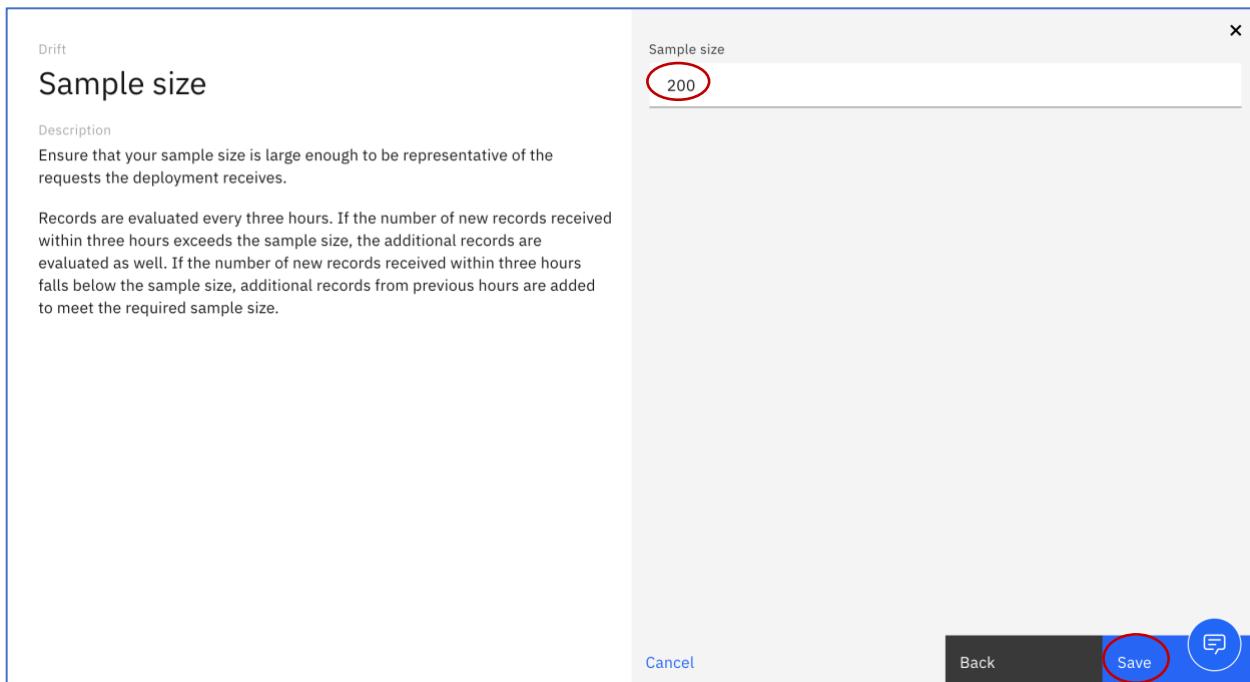
Train in a data science notebook

Cancel **Next**

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



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

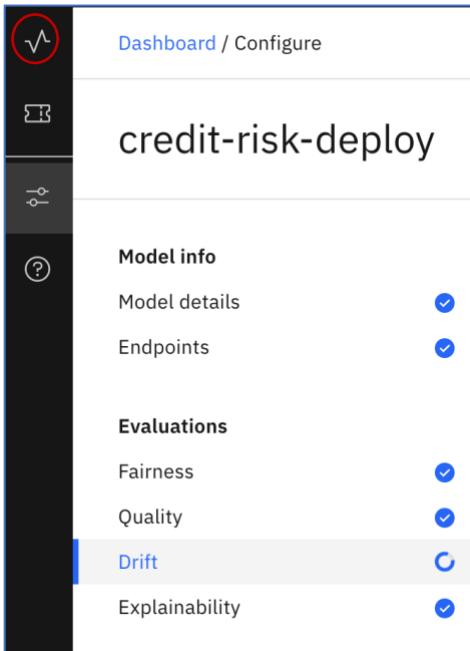


6. This completes the Drift configuration.

## Submit Feedback and View Quality Metrics

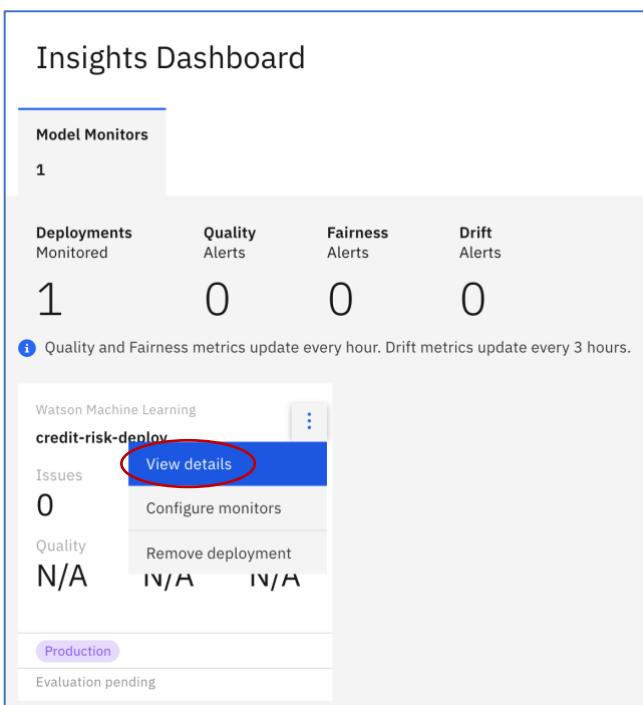
In order to measure quality, scored transactions including human labeled feedback must be provided.

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



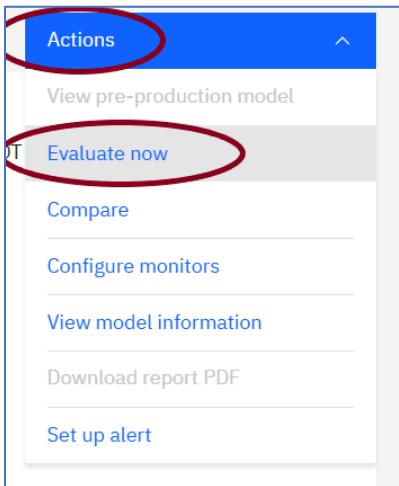
The screenshot shows the 'Model info' section of the Insights Dashboard. On the left is a sidebar with icons for Dashboard, Model info, Evaluations, Drift, and Explainability. The 'Drift' icon is highlighted with a blue bar at the bottom. The main area displays 'credit-risk-deploy' under 'Model info'. 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**.

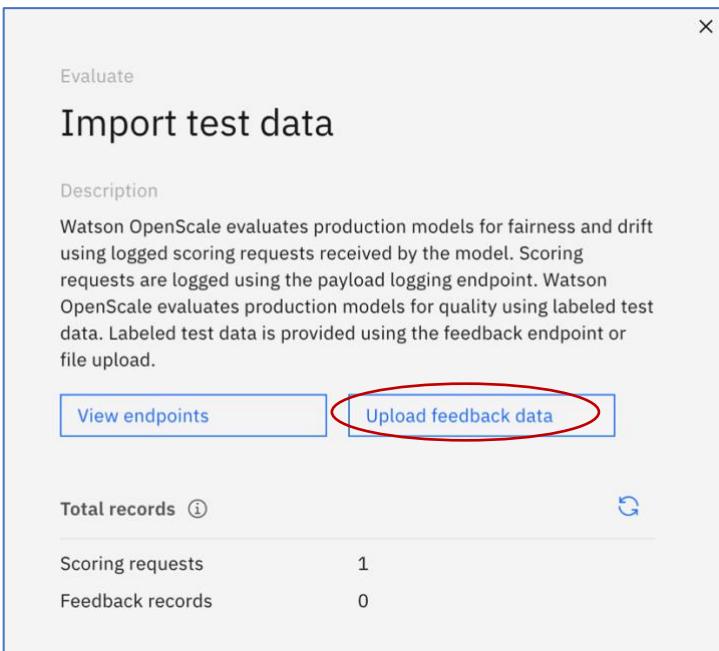


The screenshot shows the 'Watson Machine Learning' section of the Insights Dashboard for 'credit-risk-deploy'. It includes metrics for Deployments Monitored (1), Quality Alerts (0), Fairness Alerts (0), and Drift Alerts (0). A note says 'Quality and Fairness metrics update every hour. Drift metrics update 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 circle), 'Configure monitors', and 'Remove deployment'. At the bottom, there's a 'Production' button and a note 'Evaluation pending'.

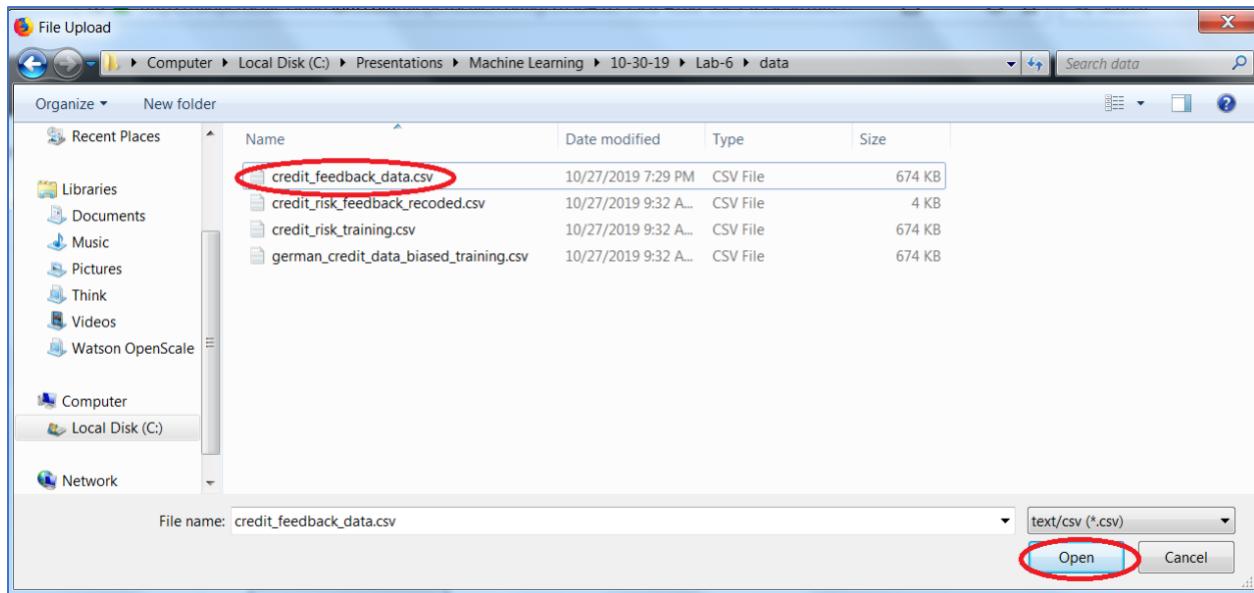
3. It will take a minute or so to bring up the **Evaluations** page. Click on **Actions** in the top right corner of your dashboard and then click **Evaluate now**.



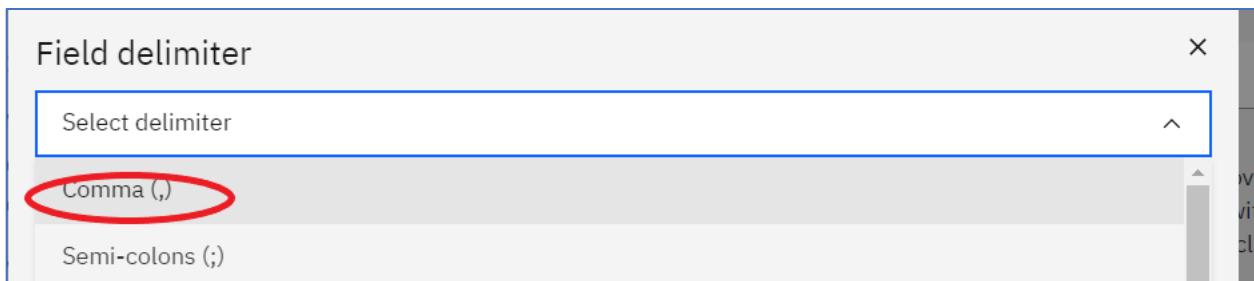
4. Watson OpenScale evaluates models for quality using labeled test data. Labeled test data is provided using the feedback endpoint or by file upload. We will use the file upload options. Click on **Upload feedback data**.



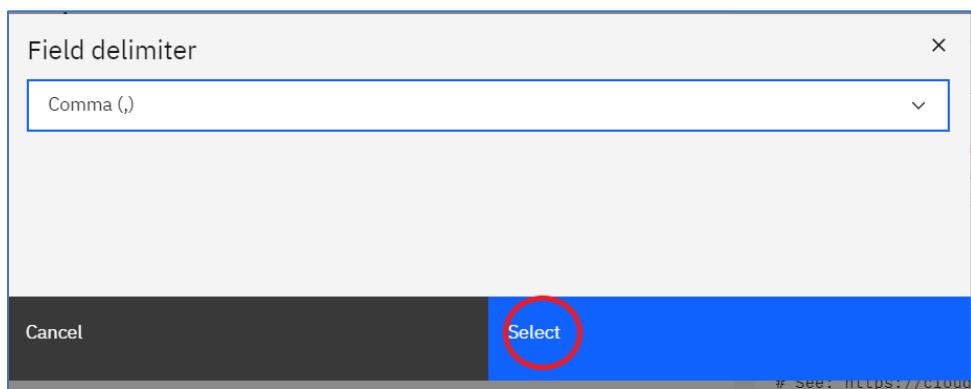
5. Navigate to the feedback file **credit\_feedback\_data.csv**. Click on **Open**.



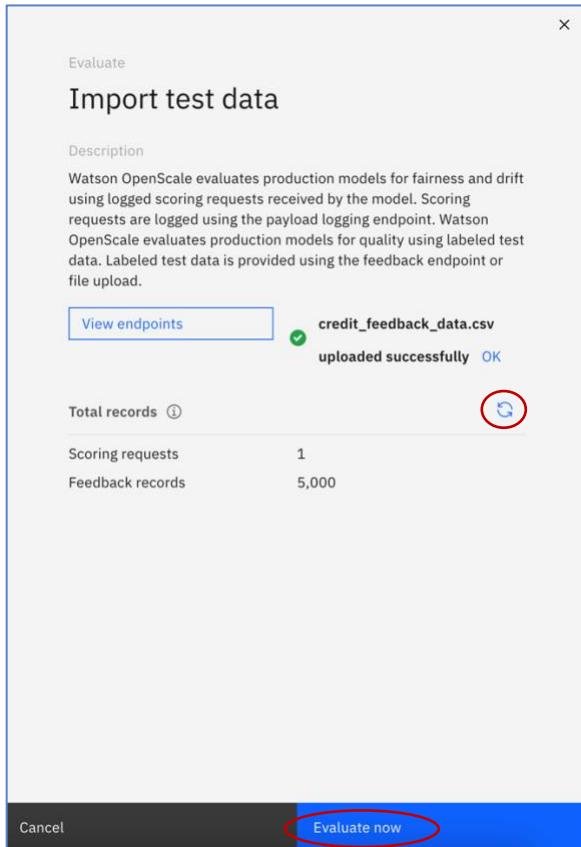
6. Select **Comma** as the **Delimiter**.



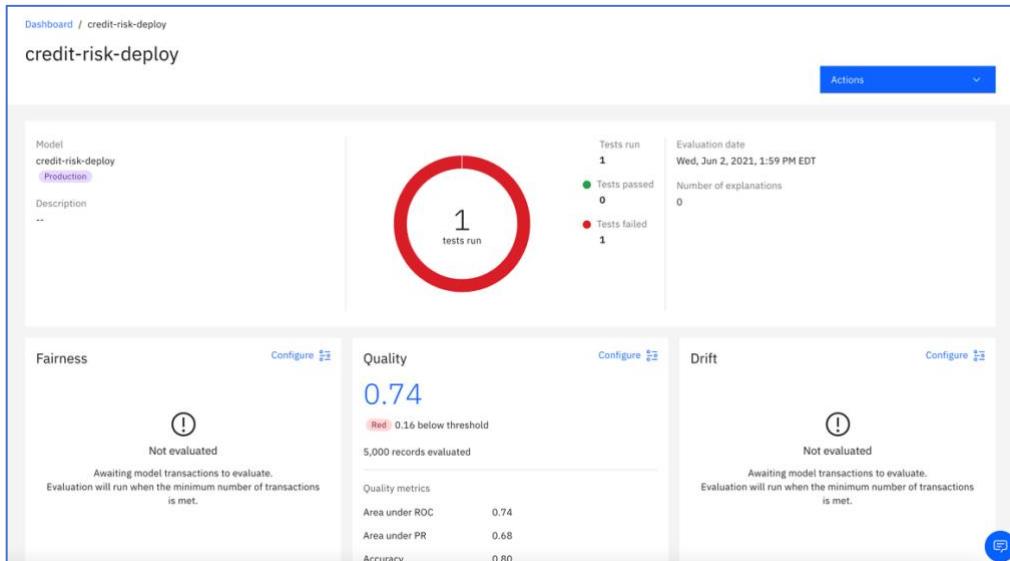
7. Click **Select**.



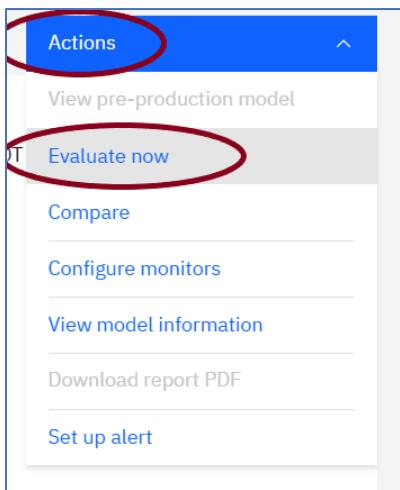
8. After the file is successfully uploaded, click on the refresh button to see the Feedback records increment, then click on the **Evaluate now**.



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. The Fairness and drift are not evaluated yet because we only had 1 entry in the credit\_payload\_data.json file.



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

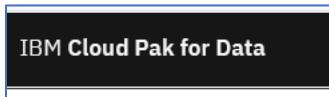


11. Leave Watson OpenScale at the Evaluation page while, you score transactions below.

## 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 Cloud Pak for Data by clicking on the **Cloud Pak for Data** browser tab.



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

A screenshot of the 'credit-risk-deploy' page in the Cloud Pak for Data interface. The 'Test' tab is selected. On the left, there is an 'Enter input data' section with a JSON input field containing the following code:Body
{
 "input\_data": [
 {
 "fields": [
 "CheckingStatus", "LoanDuration", "CreditHistory", "LoanPurpose", "LoanAmount",
 "ExistingSavings", "EmploymentDuration", "InstallmentPercent", "Sex", "Other
 sOnLoan", "CurrentResidenceDuration", "OwnsProperty", "Age", "InstallmentPlans
 ", "Housing", "ExistingCreditsCount", "Job", "Dependents", "Telephone", "Foreign
 Worker"
 ],
 "values": [
 {"less\_0": 6, "outstanding\_credit": "radio\_tv", "1169": "unknown", "greater\_7": 4, "male": "none", "4": "real\_estate", "67": "none", "own": 2, "skilled": 1, "yes": "yes", "No
 Risk": 1}
 ]
 }
 ]
}A 'Predict' button is located at the bottom of this section. On the right, there is a 'Result' section displaying the JSON output:0 {
 "predictions": [
 {
 "fields": [
 "CheckingStatus",
 "LoanDuration",
 "CreditHistory",
 "LoanPurpose",
 "LoanAmount",
 "ExistingSavings",
 "EmploymentDuration",
 "InstallmentPercent",
 "Sex",
 "OthersOnLoan",
 "CurrentResidenceDuration",
 "OwnsProperty",
 "Age",
 "InstallmentPlans",
 "Housing",
 "ExistingCreditsCount",
 "Job",
 "Dependents",
 "Telephone",
 "ForeignWorker",
 "CheckingStatus\_IX",
 "CreditHistory\_IX"
 ]
 }
 ]
}

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", "Cur
```

## 5. Click on Predict

credit-risk-deploy

Overview Implementation Test

Enter input data

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

Predict

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



## 7. Click Evaluate now.

Evaluate

Import test data

Description

Watson OpenScale evaluates production models for fairness and drift using logged scoring requests received by the model. Scoring requests are logged using the payload logging endpoint. Watson OpenScale evaluates production models for quality using labeled test data. Labeled test data is provided using the feedback endpoint or file upload.

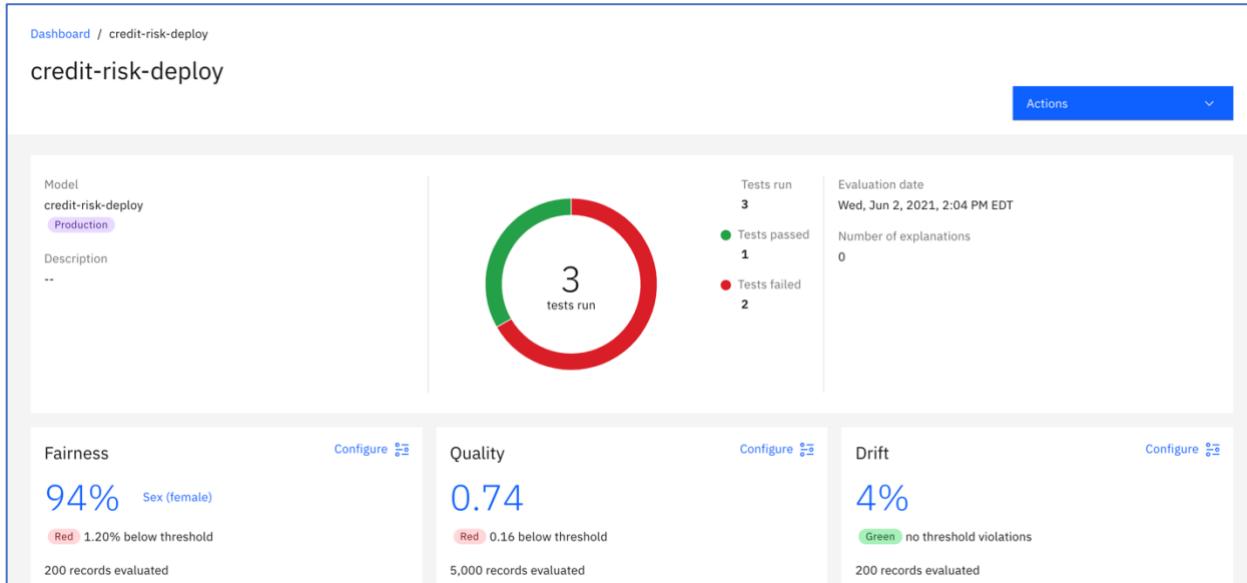
[View endpoints](#) [Upload feedback data](#)

Total records ⓘ

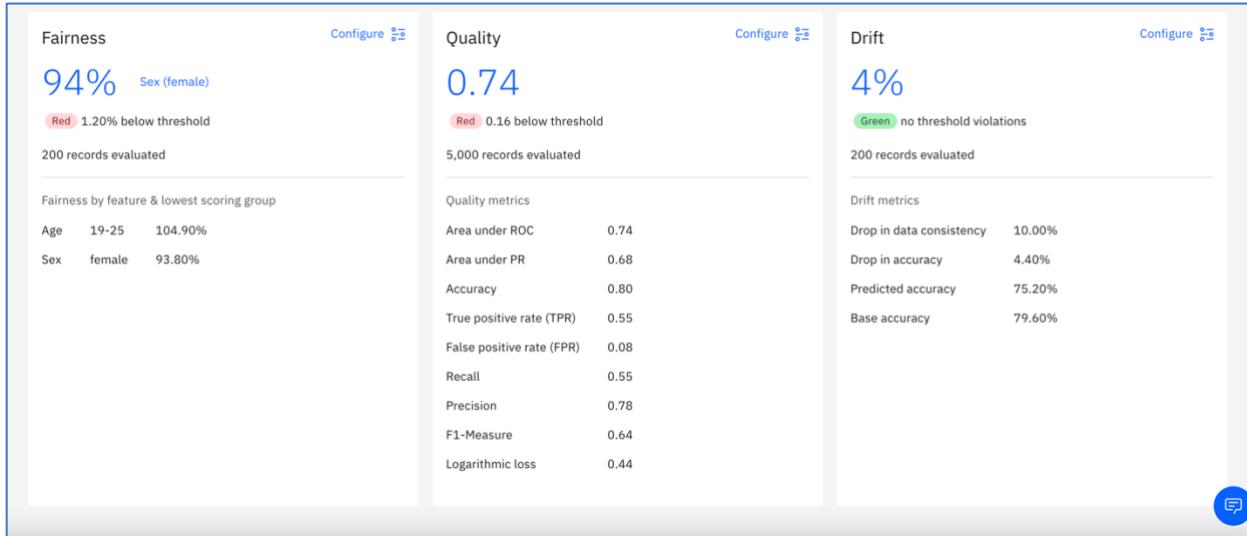
Scoring requests	201
Feedback records	5,000

Cancel **Evaluate now**

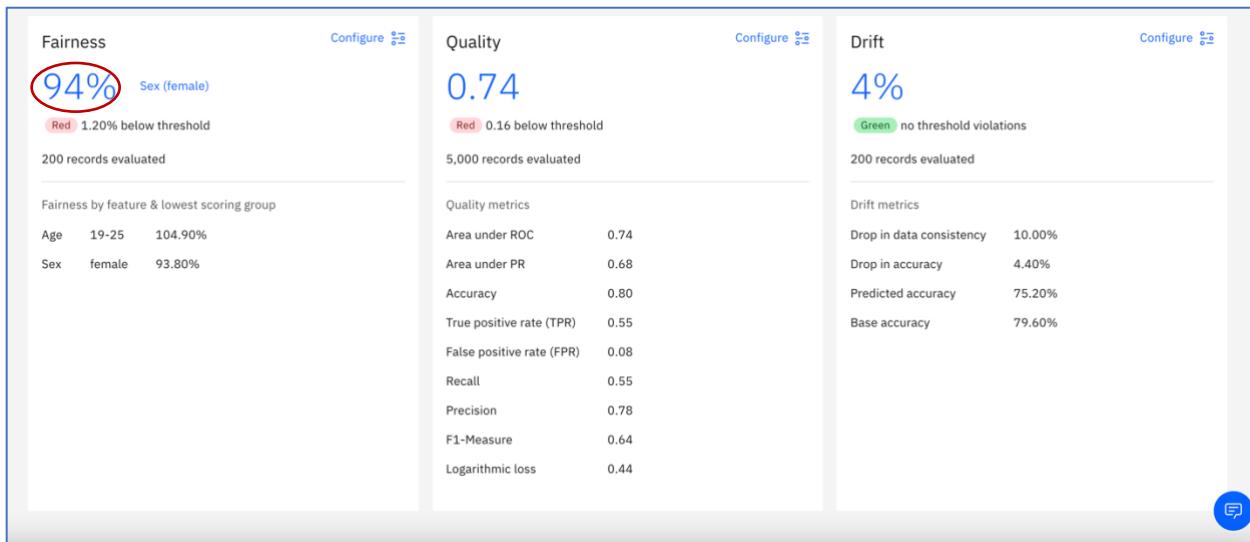
8. Please wait 3-5 minutes for the Evaluations page to display the metrics. Three tests have now been run. The quality test from before, and two new tests. One for fairness, and one for Drift. The fairness test has failed because 93% fairness is lower than our threshold of 95%. The Drift metric passed 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.



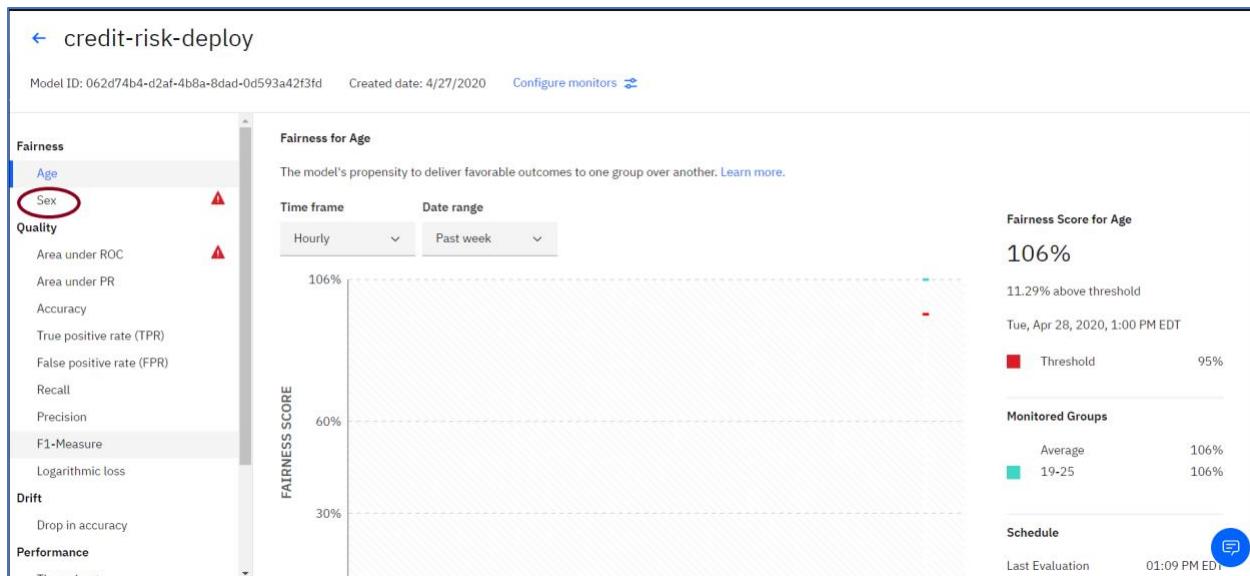
9. Scroll down to see the metric details.



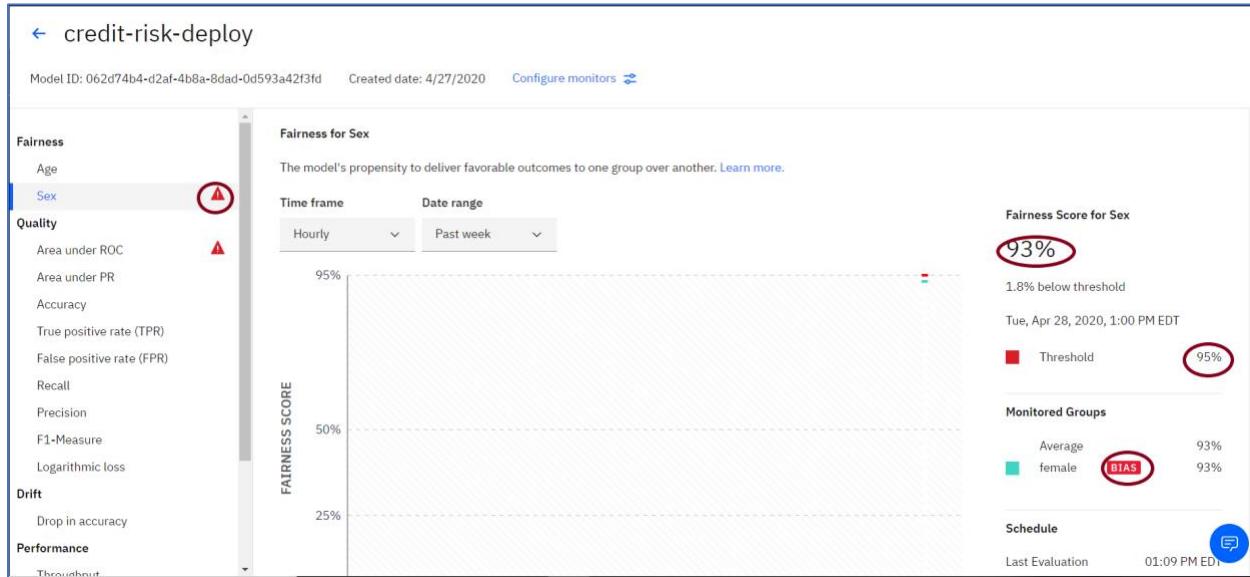
10. Click on the Fairness metric.



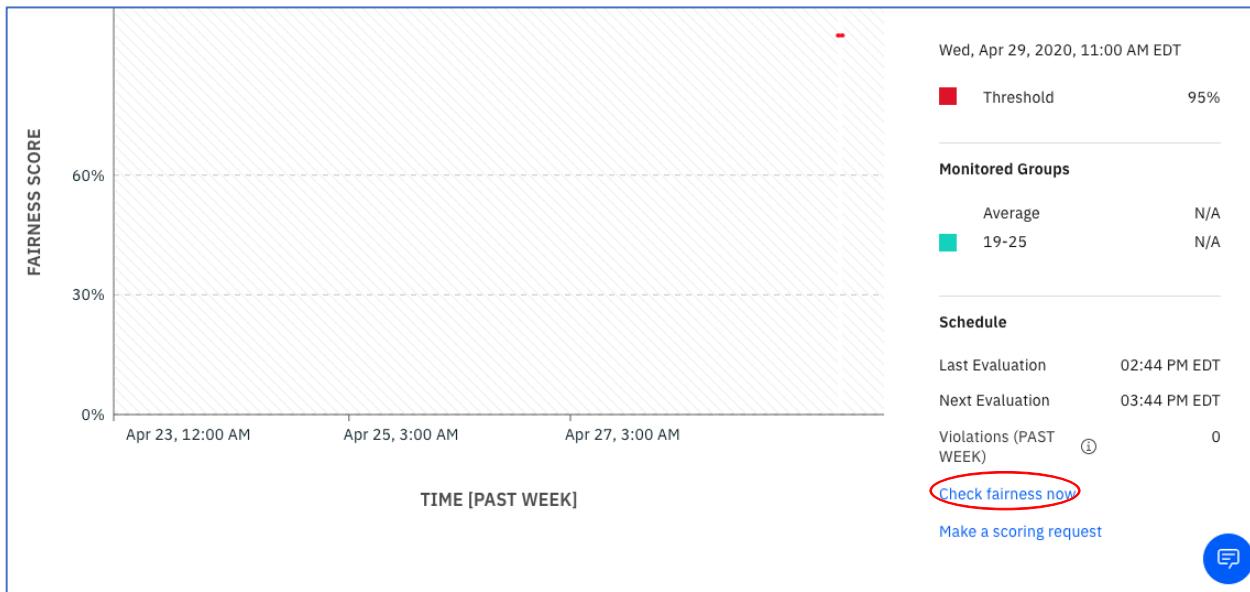
11. The time-series view is displayed. Click on **Sex**.



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.

The screenshot shows two related dashboards for monitoring fairness in a deployed machine learning model.

**Top Dashboard: Fairness for Sex**

- Left sidebar:** A vertical list of metrics under "Fairness" (Age, Sex, Quality, Drift, Performance, Throughput) with "Sex" selected. Icons with upward triangles indicate issues.
- Center:** A line chart titled "FAIRNESS SCORE" from 0% to 95%. It shows a single data point at 95% with a red threshold line at 93.8%. A callout box says "Click to view details".
- Right side:**
  - Fairness Score for Sex:** 93% (1.8% below threshold), last evaluated on Tue, Apr 28, 2020, 2:00 PM EDT.
  - Monitored Groups:** Average (93%) vs female (93%, labeled "BIAS").
  - Schedule:** Last Evaluation (02:09 PM EDT).

**Bottom Dashboard: Fairness**

- Top controls:** Monitored attribute (Sex), Data Set (Balanced), Date and Time (5/16/2021, 6:00 PM), and a "View payload transactions" button.
- Message bar:** "No new data added since last fairness computation. Viewing results from May 16, 2021, 06:08 PM".
- Summary:** Fairness score 94%, Favorable outcomes "No Risk".
- Text:** How the fairness score was determined (balanced data set): 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](#).
- Chart:** A bar chart of "% FAVORABLE OUTCOMES" for "female" (Monitored) and "male" (Reference). The female bar is purple and reaches approximately 76%, while the male bar is dark teal and reaches 81%.

This screen allows you to view the fairness score broken up by % of favorable outcomes for female (monitored group) vs male (reference group).

15. Click on **View Payload Transaction** to display a list of transactions.

The screenshot shows the Fairness section of the dashboard. It includes filters for 'Monitored attribute' (Sex), 'Data Set' (Debiased), and date/time (5/16/2021, 6:00 PM). A prominent blue button at the bottom right is labeled 'View payload transaction', which is circled in red.

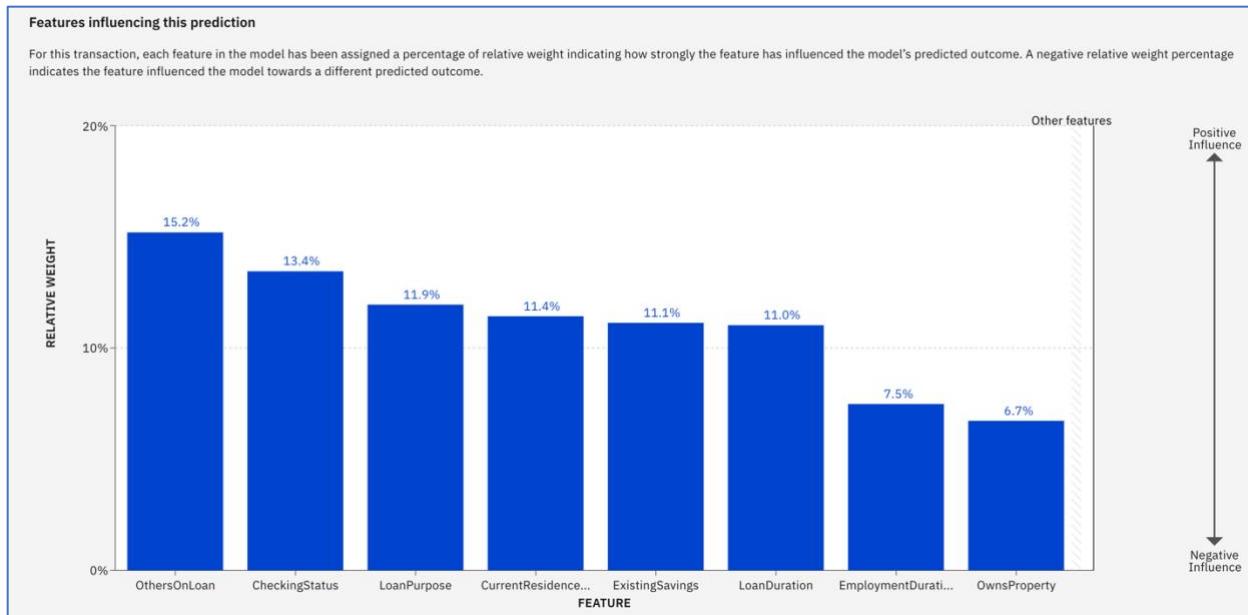
16. Click **Explain** next to a transaction to get an explanation of the factors that caused the deployed model to make the prediction it did for that transaction. I picked the first transaction that resulted in a Risk prediction. Note that it may take a few minutes for the transactions to show.

This screenshot shows a table of transactions. The first row, which has a 'Risk' outcome, has an 'Explain' link under the 'Action' column, which is circled in red. To the right of the table, there are sections for 'Payload Table' and 'Corrected Records', and below that, two bar charts comparing 'Current Model' and 'De-biased Model' for 'No Risk' and 'Risk' outcomes.

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

This screenshot shows the 'Transaction details' page for a specific transaction. The 'Explain' tab is active. It displays the transaction ID, received date (Jun 02, 2021, 02:08:25 PM EDT), deployed model (credit-risk-deploy Production), and language (Not applicable). Below this, the 'Predicted outcome' is listed as 'No Risk' with a 53.08% confidence level. A detailed explanation states: 'The credit-risk model has 53.08% confidence that the outcome of this transaction would be No Risk. The top three features influencing the model's predicted outcome are OthersOnLoan, CheckingStatus, and LoanPurpose.'

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



19. Click on the Dashboard icon .

IBM Watson OpenScale

Explanations / e6c3f89cd6eecd79faed2696ea53408e-129

Transaction details

Search by Transaction ID

Explain      Inspect

Transaction: e6c3f89cd6eecd79faed2696ea53408e-129      Received on: Jul 21, 2020, 03:47:01 PM EDT      Deployed model: credit-risk-deploy      Language: Not applicable

20. 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.

IBM Watson OpenScale

Need help?  

Insights Dashboard

Refresh  Add to dashboard 

Deployments Monitored: 1      Quality Alerts: 1      Fairness Alerts: 1      Drift Alerts: 0

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

Find models 

New provider: credit-risk-deploy 

Issues: 2  

Quality: 0.74      Fairness: 94%      Drift: 4%  
1 alert      1 alert

Production   
Evaluated 4 minutes 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.