

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.

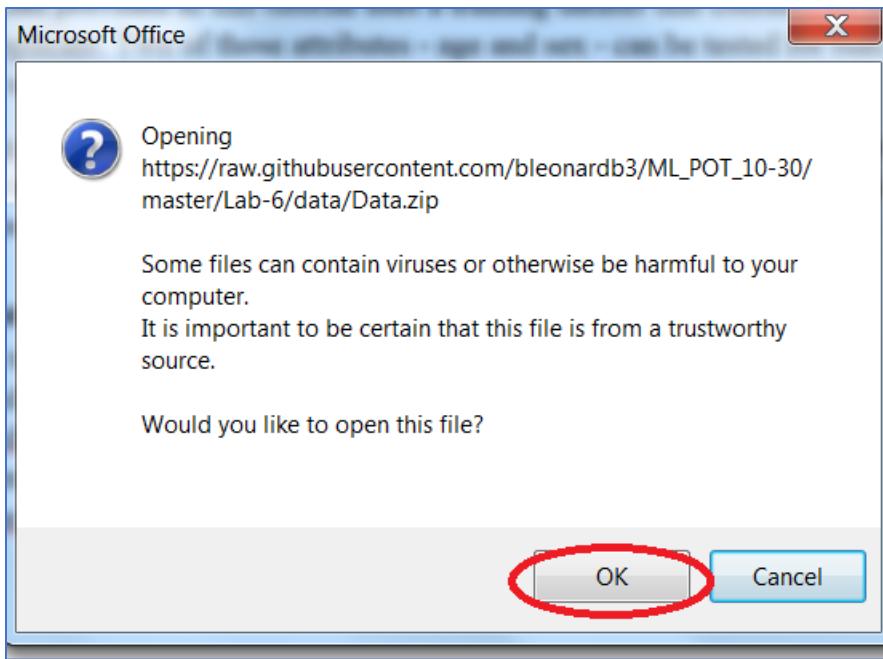
The data science techniques most suited to these diverse datasets, such as gradient boosted trees and neural networks, can generate highly accurate risk models, but at a cost. Such "black box" models generate opaque predictions that must somehow become transparent, to ensure regulatory approval such 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.

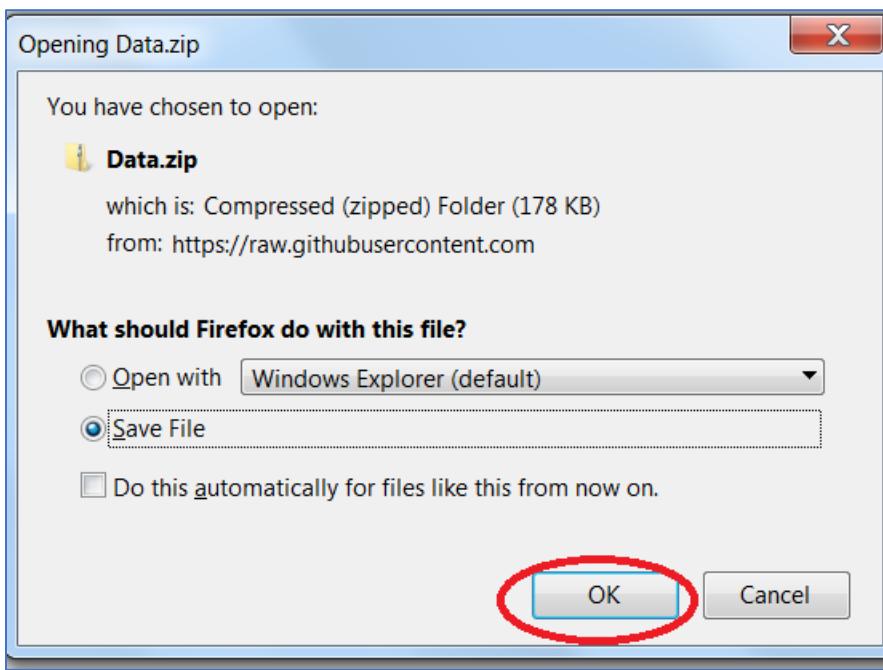
Watson OpenScale will monitor the deployed model's propensity for a favorable outcome ("No Risk") for one group (the Reference Group) over another (the Monitored Group). In this tutorial, the Monitored Group for sex is `female`, while the Monitored Group for age is `19 to 25`.

Download the Lab Files

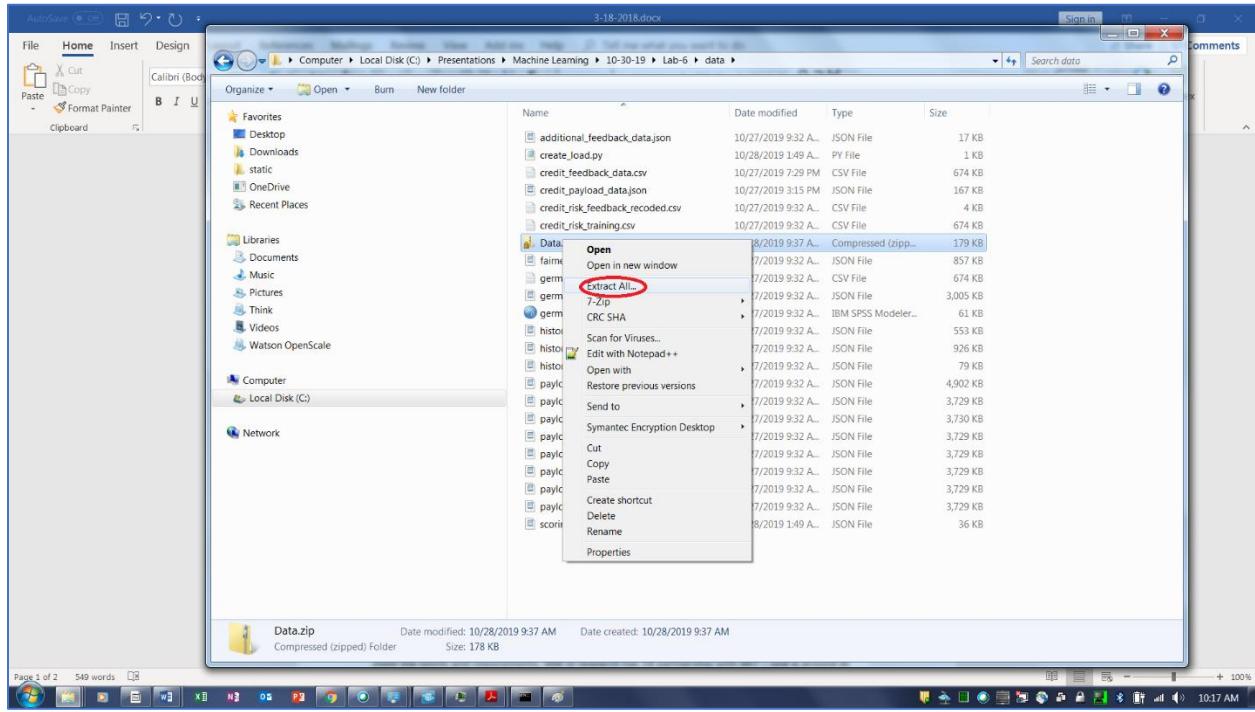
1. Click [here](#) to download the Data.zip file.
 1. `credit_feedback_data.csv`
 2. `credit_payload_data.json`
 3. `german_credit_data_biased_training.csv`
 4. `scoring.json`
2. Click **OK**. Note your browser may not prompt this message.



3. Click **OK**.

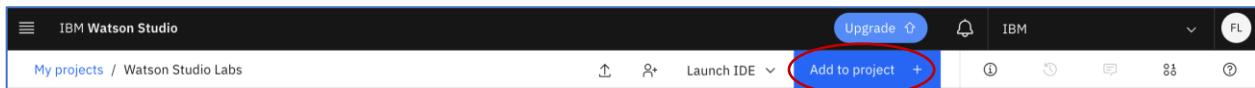


4. Navigate to the folder where the file is saved. Select the Data.zip file, right-click, and click **Extract All**.

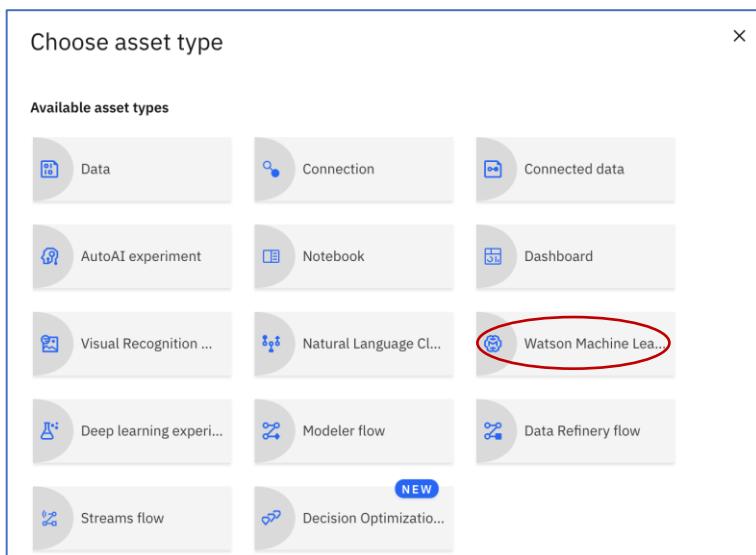


Import the Credit Risk Model

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



- Click on **Watson Machine Learning**.



- From the **Import model** page, click on **From sample** for the **Select model type**, click on **Credit Risk**, click on **Import**.

Import model

Define model details

Name: credit-risk

Description: Model description

Machine Learning Service: WatsonMachineLearning

Select model type

From file From sample

SPARK
Credit Risk

Traditional lenders are under pressure to expand their portfolio to a more diverse audience, requiring a new approach to risk modeling and transparency and explainability even more important.

SPSS
Customer Satisfaction Prediction

A Telco Company wants to know which customers are at risk of leaving. The presented model predicts Telco customer churn.

Cancel **Import**

Deploy the Credit Risk Model

- From the **Model** page, click on the **Deployments** tab.

Model
credit-risk

Overview **Evaluation** **Deployments** **Lineage**

Summary

Machine learning service	WatsonMachineLearning
Model Type	mllib-2.3
Runtime environment	spark-2.3
Training date	26 May 2020, 12:44 PM
Label column	Risk
Latest version	97f52945-3ceb-449a-966b-a4352ef2e586

- Click on **Add Deployments**.

Model
credit-risk

Overview **Evaluation** **Deployments** **Lineage**

Add Deployment +

NAME	STATUS	TYPE	ACTIONS
Your model is not deployed			

3. From the **Create Deployment** page, type **credit-risk-deploy** for the **Name**, select **Web service** for the Deployment type, and click on **Save**.

Create Deployment

Define deployment details

Name

Description

Deployment type
 Web service
 Batch prediction

Cancel Save

4. The deployment status should go from **INITIALIZING** to **DEPLOY SUCCESS**. If the status doesn't change after a minute or so, refresh the browser.

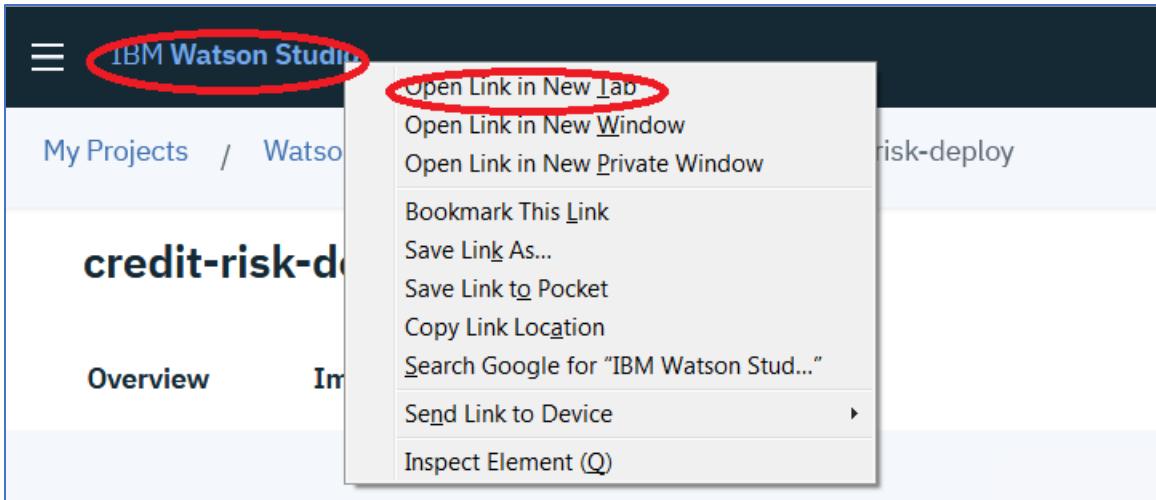
Model
credit-risk

Overview Evaluation **Deployments** Lineage Add Deployment +

NAME	STATUS	TYPE	ACTIONS
credit-risk-deploy	Deploy success	Web Service	⋮

Provision Watson OpenScale.

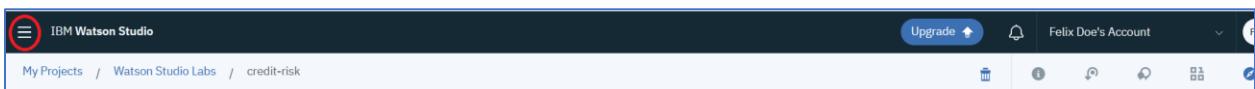
1. Right-click on the IBM Watson Studio label and click on Open link in New Tab.



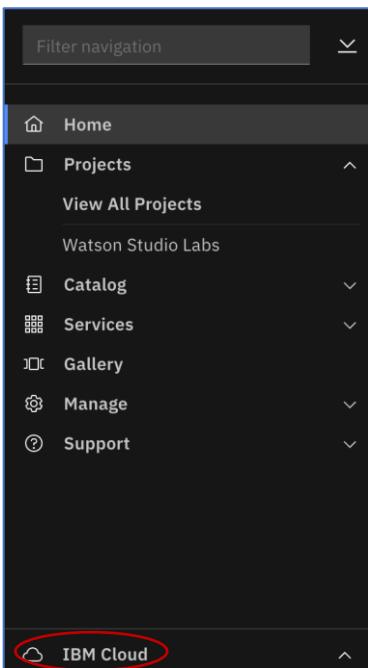
2. Click on the new Watson Studio browser tab.



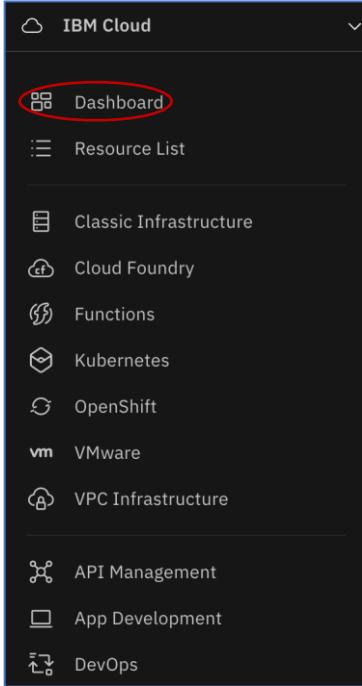
3. Click on the hamburger icon  in the top left corner.



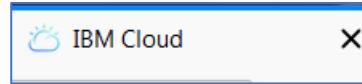
4. Click on IBM Cloud.



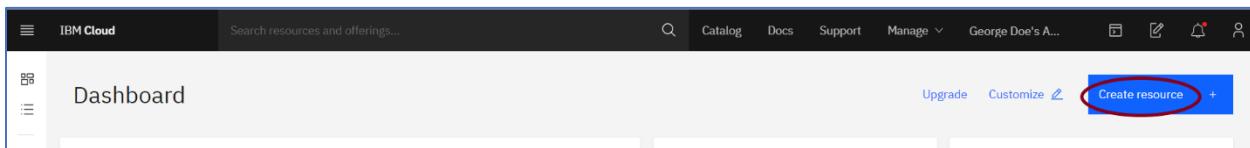
5. Click on **Dashboard**. If the Dashboard option does not show up, please refresh your browser.



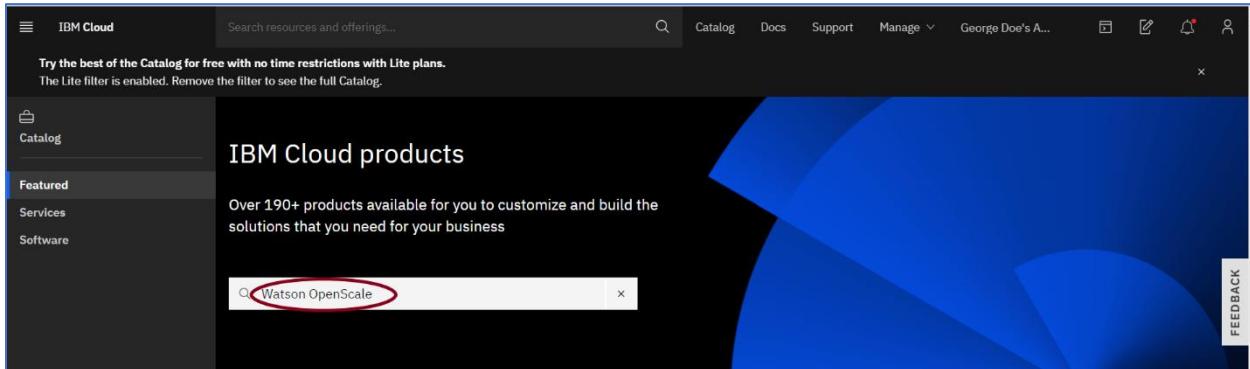
6. Note that the browser tab has been renamed to IBM Cloud.



7. Click on **Create resource**



8. Enter **Watson OpenScale** and hit the <Enter> key.



9. Click on Watson OpenScale.

Search results for 'Watson OpenScale' 1 result

Filters: Lite [Clear all](#)

Watson OpenScale
IBM - Services - AI

IBM Watson OpenScale is an enterprise-grade environment for AI infused applications that provides enterprises...

Services • Lite • Free • IAM-enabled

10. Click on Create.

Catalog / Services /

Watson OpenScale

Author: IBM • Date of last update: 02/21/2020 • [Docs](#) • [API docs](#)

[Create](#) [About](#)

Select a region

Select a region

Dallas

Select a pricing plan

Displayed prices do not include tax. Monthly prices shown are for country or region: [United States](#)

Plan	Features	Pricing
Lite	Lite - Maximum 5 deployed models to be monitored	Free

Summary

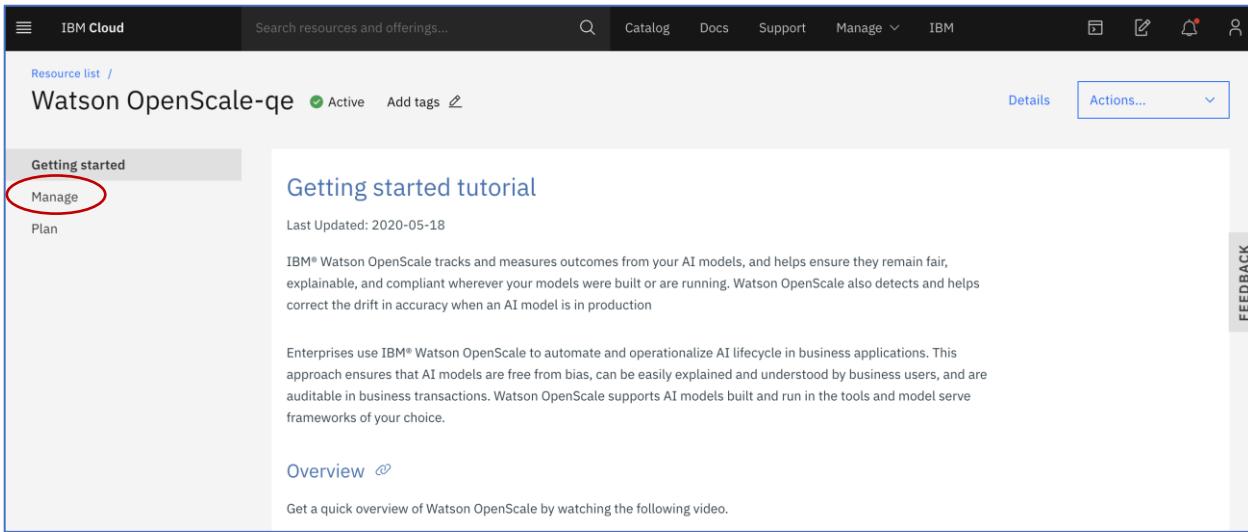
Watson OpenScale Free

Region: Dallas
Plan: Lite
Service name: Watson OpenScale-qe
Resource group: Default

[Create](#) FEEDBACK

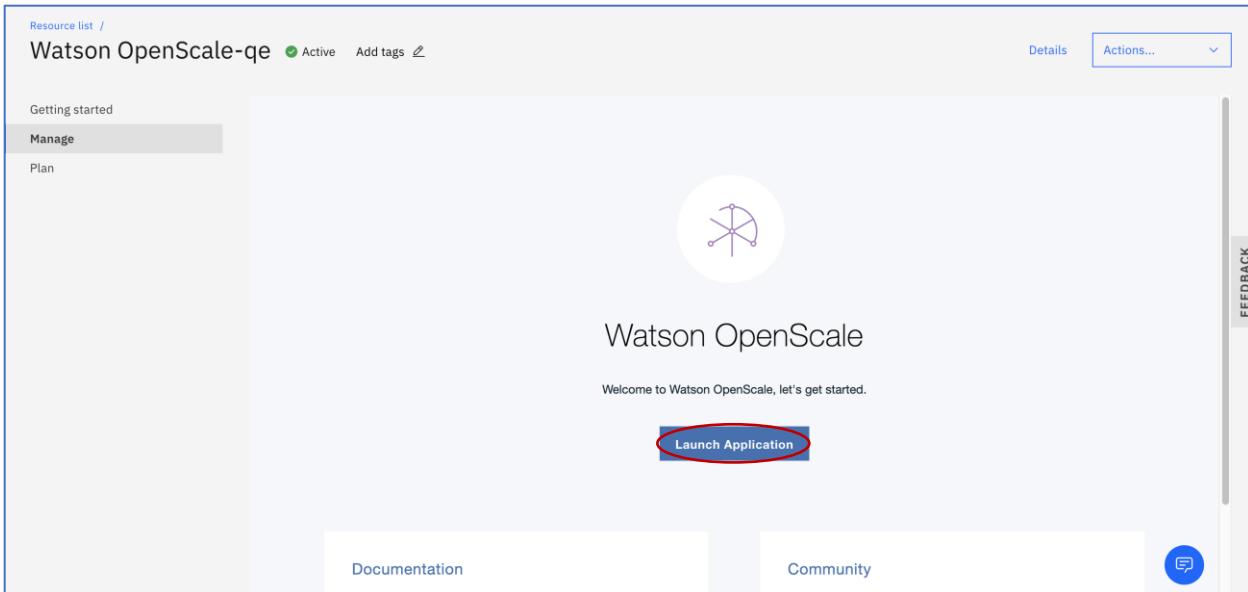
[Add to estimate](#) View terms

11. Click on Manage.



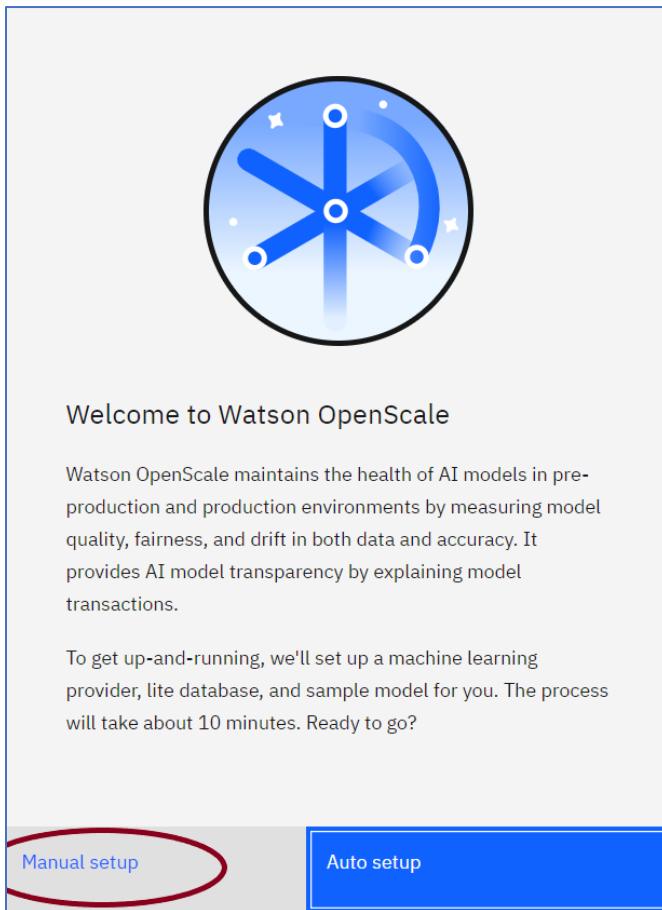
The screenshot shows the IBM Cloud interface with the 'Watson OpenScale-qe' resource selected. The 'Manage' tab is highlighted with a red circle. The main content area displays a 'Getting started tutorial' with a summary of Watson OpenScale's purpose and how it automates AI lifecycle management. A 'Launch Application' button is visible at the bottom of the page.

12. Click on Launch Application.



The screenshot shows the Watson OpenScale application landing page. The 'Launch Application' button is highlighted with a red circle. The page includes a welcome message and links to 'Documentation' and 'Community'.

13. Make sure to click on **Manual 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.

A screenshot of the IBM Watson OpenScale system setup interface. The left sidebar shows a tree view with "System setup" expanded, and "Database" selected. The main area has a "Required" section titled "Database" with a "Description" field containing the text: "The Watson OpenScale database stores your model transactions and model evaluation results." To the right of the database section is a box containing the text "Database" and "Click the pencil icon to configure database.", with a red circle and arrow highlighting the pencil icon.

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

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)	Required Database Description Select a database to store your model transactions and model evaluation results. A free database is available for Lite plan users to get started. Alternatively, you can use an existing PostgreSQL or Db2 database (lite Db2 plans not supported). You can also purchase a new database. <i>Note: The free Lite plan database is not GDPR compliant. If your model processes personally identifiable information (PII), you must purchase a new database or use an existing database that does conform to GDPR rules. Learn more.</i>	Database type Choose an option Free lite plan database (highlighted) Compose for PostgreSQL Databases for PostgreSQL Db2
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4. Click **Save**.

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)	Required Database Description Select a database to store your model transactions and model evaluation results. A free database is available for Lite plan users to get started. Alternatively, you can use an existing PostgreSQL or Db2 database (lite Db2 plans not supported). You can also purchase a new database. <i>Note: The free Lite plan database is not GDPR compliant. If your model processes personally identifiable information (PII), you must purchase a new database or use an existing database that does conform to GDPR rules. Learn more.</i>	Database type Free lite plan database Purchase a database Cancel Save (highlighted)
--	---	--

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 Machine learning providers (highlighted) <input checked="" type="checkbox"/> Integrations (optional)	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

Machine learning providers **Required**

Integrations (optional)

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 [← Back to all providers](#)

Integrations (optional) [beta](#)

Machine learning providers [edit](#)

New provider

Description [edit](#)

Click edit to enter provider description.

Connection [edit](#)

Click edit to enter the connection information.

8. Click on **Watson Machine Learning** for the Service provider type.

System setup

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

Database

Machine learning providers **Connection**

Integrations (optional) [beta](#)

Machine learning providers

Description Connect to the provider where your deployed models are stored and specify if the environment is a pre-production or production environment.

Pre-production environments Test pre-production models by uploading test data sets (csv files) and running evaluations. When the model is ready, approve it for production.

Production environments Monitor production models by logging model transactions and sending feedback (labeled test data) to Watson OpenScale for continuous evaluation.

Service provider type

Choose an option

Watson Machine Learning **Watson Machine Learning**

Custom Environment

Amazon SageMaker

Microsoft Azure ML Studio

Microsoft Azure ML Service

9. Click on **Watson Machine Learning** for the **Service provider type**, **WatsonMachineLearning** for the **Watson Machine Learning service**. Click on **Production** for the **Environment type**. Click on **Save**.

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

Connection

New provider

Description

Connect to the provider where your deployed models are stored and specify if the environment is a pre-production or production environment.

Pre-production environments

Test pre-production models by uploading test data sets (csv files) and running evaluations. When the model is ready, approve it for production.

Production environments

Monitor production models by logging model transactions and sending feedback (labeled test data) to Watson OpenScale for continuous evaluation.

Watson Machine Learning

Watson Machine Learning service

WatsonMachineLearning

Environment type

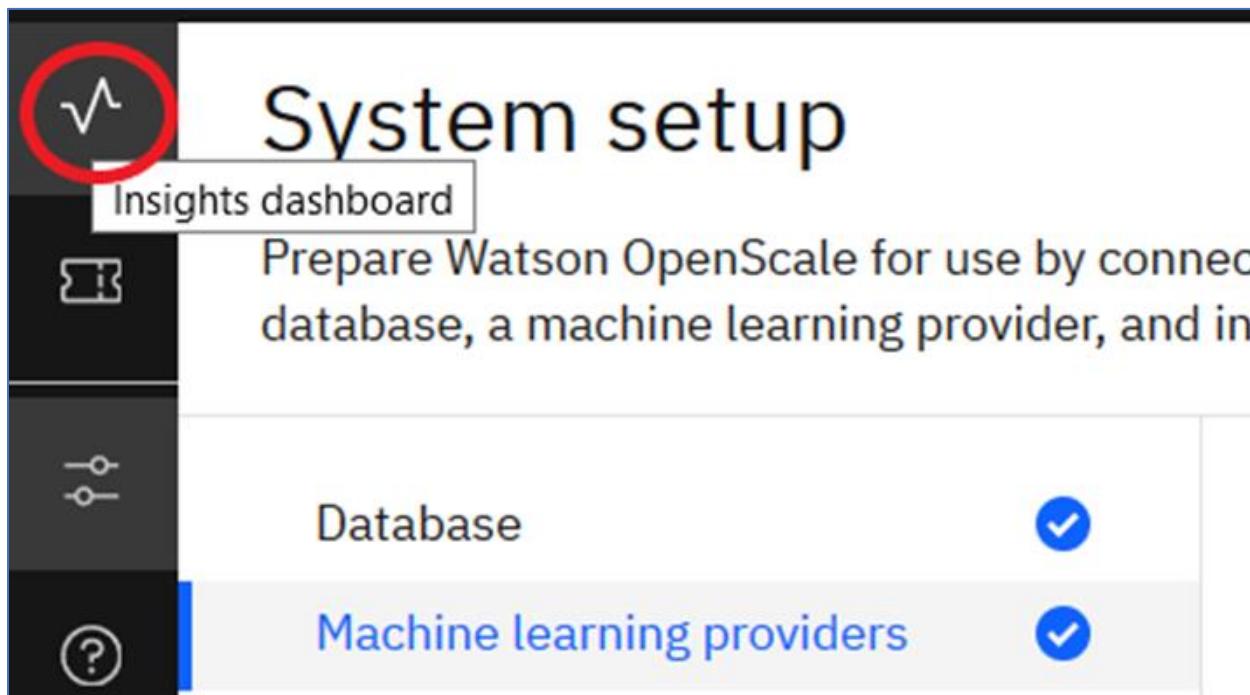
Pre-production

Production

Note: Watson OpenScale can auto-detect Watson Machine Learning instances located in the same region only. To add Watson Machine Learning instances located in other regions, select the "Other" option from "Watson Machine Learning service" dropdown.

Cancel

10. Click on the  icon.



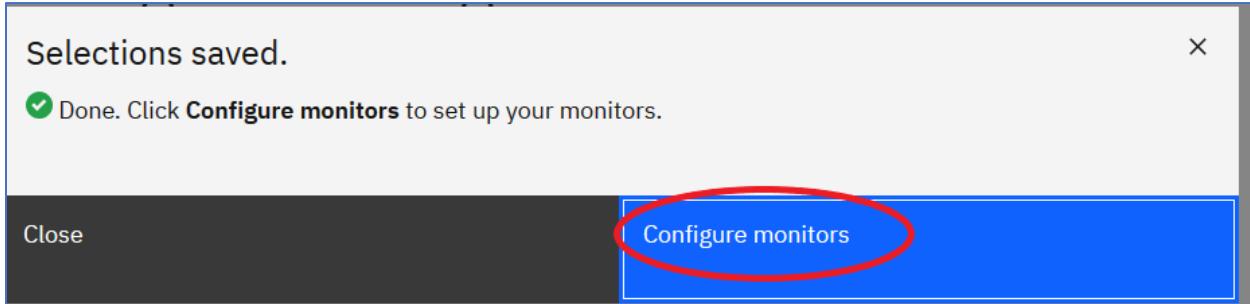
11. Click on **Add** to add a deployment to monitor.

The screenshot shows the Insights Dashboard interface. At the top left, there's a section titled "Model Monitors" with a value of "0". Below this, there are four categories: "Deployments Monitored" (0), "Quality Alerts" (0), "Fairness Alerts" (0), and "Drift Alerts" (0). In the center, a message says "Add a deployed model to get started." Below this message is a blue button with the text "Add +".

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

The screenshot shows a modal dialog titled "Select a model deployment". It contains a sub-instruction: "Select the deployment you want to monitor.". Below this is a "Machine learning Provider" dropdown set to "New provider (Production)". The main content area displays a table with three columns: "Deployment", "Description", and "Created". A single row is shown, with the "Deployment" column containing "credit-risk-deploy" (circled in red). The "Description" column shows "Tue, Mar 24, 2020, 11:52 AM EDT". At the bottom of the dialog are two buttons: "Cancel" and "Configure" (also circled in red).

13. Click on **Configure monitors**.



14. Setup is now 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. Click on the **Watson Studio** Browser tab
2. You should be back at the **credit-risk Model** page. Click on **credit-risk-deploy**.

The screenshot shows the IBM Watson Studio interface. The top navigation bar includes "IBM Watson Studio", "Upgrade", "IBM", and a "FL" icon. Below the bar, the URL is "My Projects / Watson Studio Labs / credit-risk". The main area shows a "Model" named "credit-risk". There are four tabs: "Overview", "Evaluation", "Deployments" (which is highlighted in blue), and "Lineage". Under the "Deployments" tab, there is a table with columns: NAME, STATUS, TYPE, and ACTIONS. One row in the table is highlighted with a red circle around the "NAME" column value "credit-risk-deploy". The status is "Deploy success" and the type is "Web Service".

3. Click on the **Test** tab.

The screenshot shows the "credit-risk-deploy" page under the "Test" tab. The "Test" tab is highlighted with a red circle. The page displays deployment details in a table:

Name	credit-risk-deploy
Type	Web Service
Deployment ID	f74d6ed9-db6a-4176-a2d4-0ec1ca749fcc
Status	Deploy success
Asset type	Model
Asset name	credit-risk

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

credit-risk-deploy

Overview Implementation **Test**

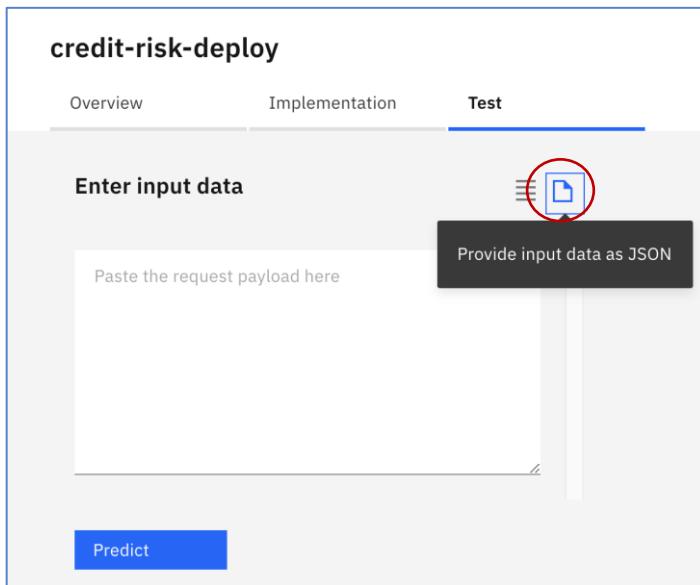
Enter input data

Paste the request payload here

Provide input data as JSON



Predict



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

credit-risk-deploy

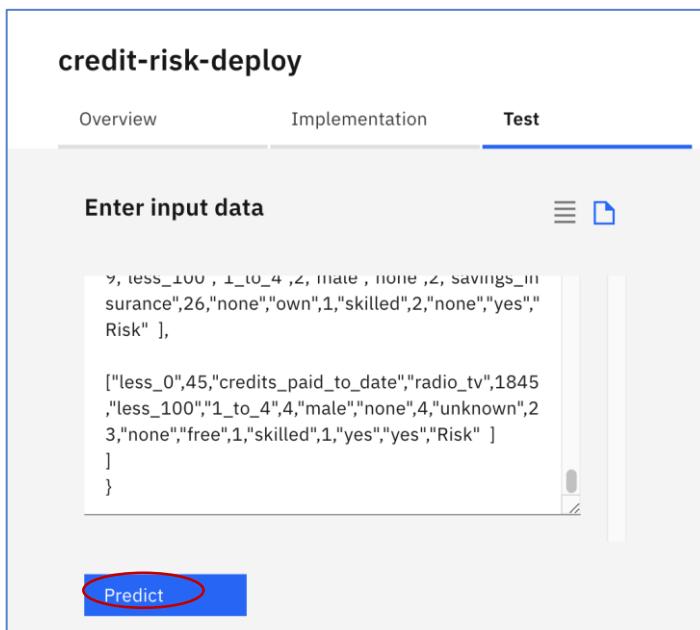
Overview Implementation **Test**

Enter input data



```
..., less_100 , 1_to_4 ,2, male , none ,2, savings_in  
surance",26,"none","own",1,"skilled",2,"none","yes",  
"Risk" ],  
  
["less_0",45,"credits_paid_to_date","radio_tv",1845  
,"less_100","1_to_4",4,"male","none",4,"unknown",2  
3,"none","free",1,"skilled",1,"yes","yes","Risk" ]  
]  
}
```

Predict



6. The results should appear as below.

The screenshot shows the Watson OpenScale interface with the tab 'Test' selected. On the left, there's a section titled 'Enter input data' containing two code snippets. The top snippet is a JSON array of two objects representing bank account data:

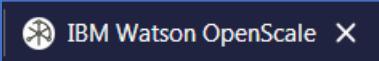
```
[{"no_checking":24, "prior_payments_delayed":car_new":2538,"less_100":greater_7":4,"male":none":4,"car_other":47,"none":own":2,"unskilled":2,"none":yes":Risk"}, {"0_to_200":15,"all_credits_paid_back":car_new":1264,"100_to_500":1_to_4":2,"male":none":2,"savings_insurance":25,"none":rent":1,"skilled":1,"none":yes":Risk} ]
```

Below this is a blue 'Predict' button. To the right, a large JSON object defines the fields for the model input:

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

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 'Model details' page. On the left, under 'Model details', there's a 'Description' section with a note about training data and model output. On the right, the 'Model input' section is highlighted with a red circle around its edit icon. Below it, the 'Model transaction' section shows a successful transaction.

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.

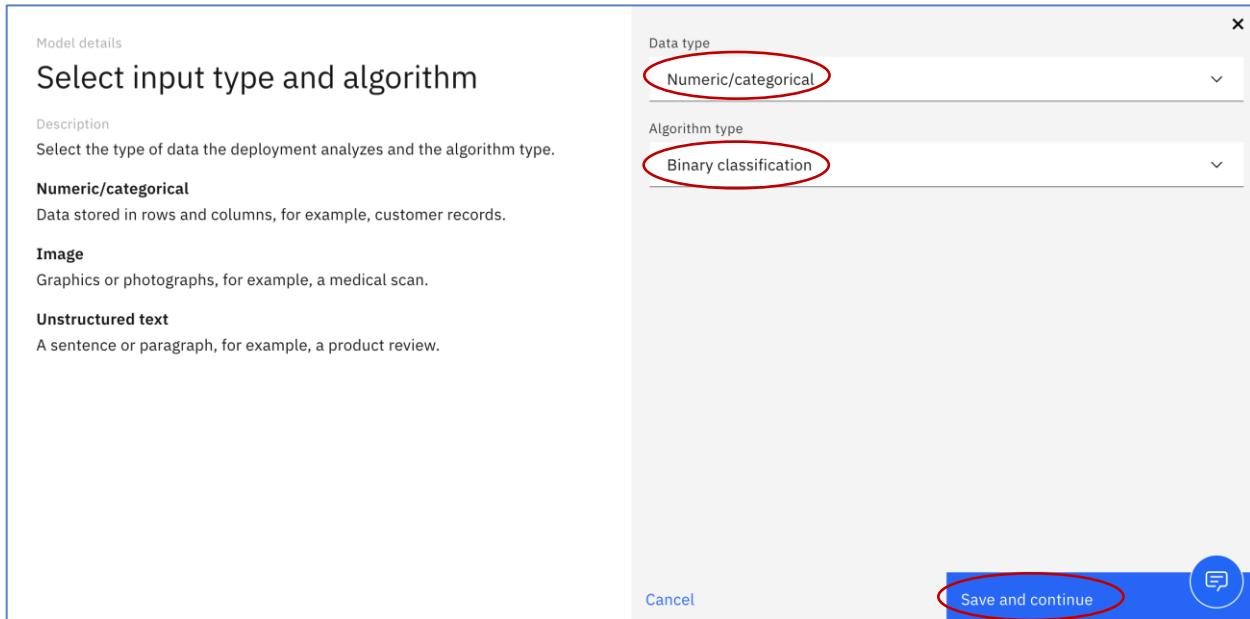
Model input

To select the data type and algorithm type, click the edit icon.

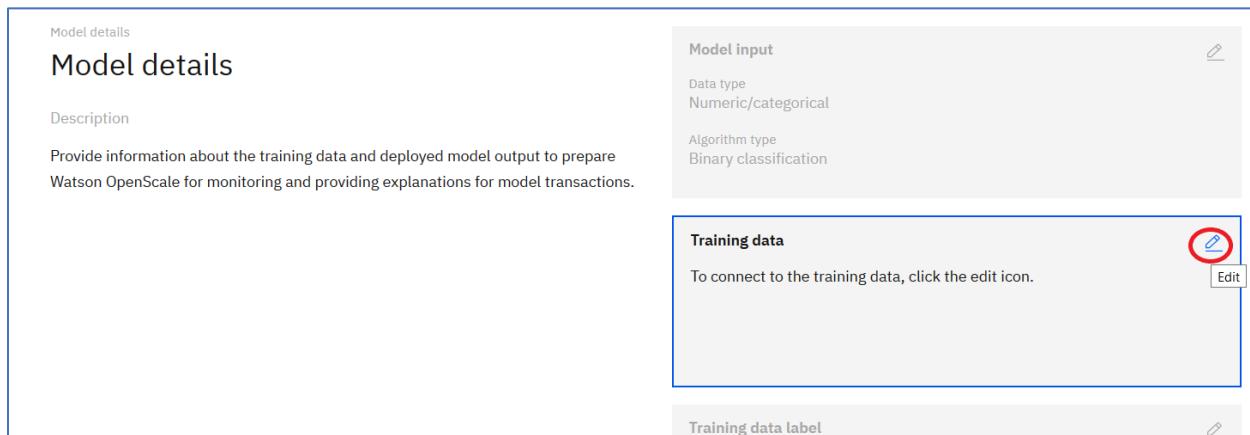
Model transaction

Model transaction
Successful

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. Accept the defaults for the database configuration and click **Next**.

credit-risk-deploy

Model info

Model details

Endpoints

Evaluations

Fairness

Quality

Drift

Explainability

Import settings

[Go to model summary](#)

Hostname: dasnode-txn-spoxy-p-daiuy-u3.services.dai.duemix.net

SSL port: 50001

Database: BLUDB

Username: cmb91569

Password:

Schema: CMB91569

Table: CREDIT_RISK_TRAIN_DATA

[Cancel](#) [Next](#)

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

credit-risk-deploy

Model info

Model details

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](#)

7. 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
<input checked="" type="checkbox"/>	Age	81	<input type="checkbox"/>
<input checked="" type="checkbox"/>	CheckingStatus	A	<input checked="" type="checkbox"/>
<input checked="" type="checkbox"/>	CreditHistory	A	<input checked="" type="checkbox"/>
<input checked="" type="checkbox"/>	CurrentResidenceDuration	81	<input type="checkbox"/>
<input checked="" type="checkbox"/>	Dependents	81	<input type="checkbox"/>
<input checked="" type="checkbox"/>	EmploymentDuration	A	<input type="checkbox"/>

Cancel Back Next

8. 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

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

The screenshot shows the 'Specify model output details' step. On the left, there's a note: 'Watson OpenScale automatically selected the probability column for this model.' On the right, a modal window titled 'Select the prediction and probability columns' lists three features: 'prediction', 'predictedLabel', and 'probability'. The 'predictedLabel' row has a checked checkbox under 'Prediction'.

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

10. 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.

The screenshot shows the 'credit-risk-deploy' configuration page. The 'Model info' sidebar has 'Quality' selected (circled in red). The main panel shows the 'Model details' section with a description about training data and deployed model output, and the 'Model input' section with details like data type (Numeric/categorical) and algorithm type (Binary classification).

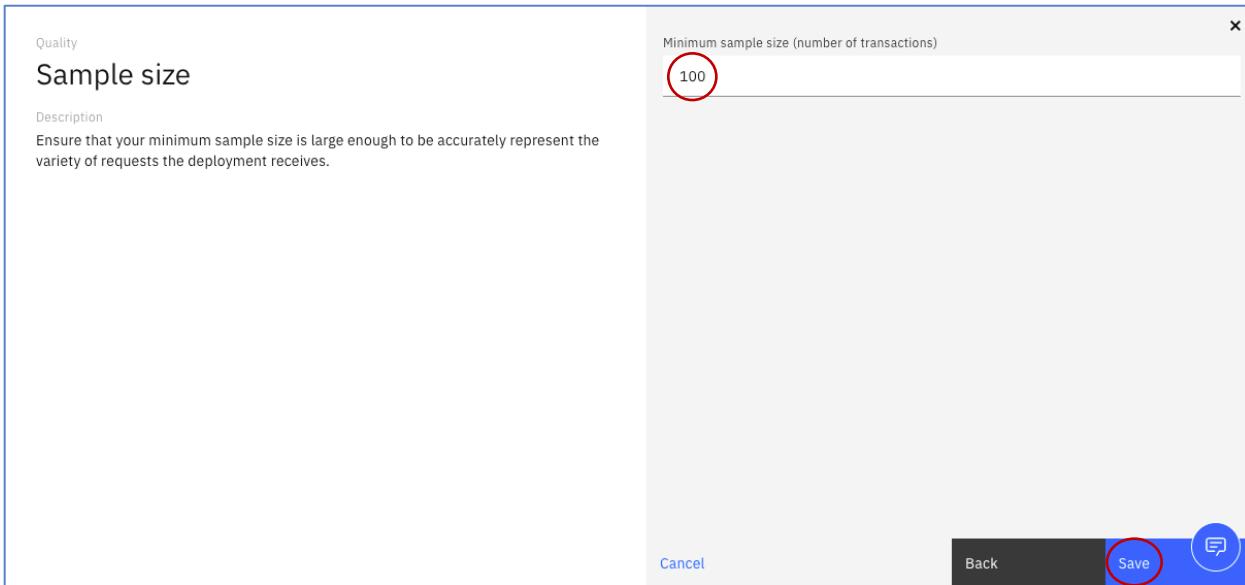
2. Click on the pencil icon to edit the **Quality threshold**.

The screenshot shows the 'credit-risk-deploy' model configuration page. On the left, there's a sidebar with 'Model info' (Model details, Endpoints), 'Evaluations' (Fairness, Quality, Drift, Explainability), and links for Import settings and Go to model summary. The main area is titled 'Quality' with a sub-section 'Quality'. It includes a 'Description' of the Quality monitor and a note about the Quality metric. A 'Quality threshold' section is present, with a text input field containing '0.9' and a pencil icon circled in red. Below it is a 'Sample size' section with a text input field and a pencil icon.

3. Enter .9 for the Threshold value and click **Next**.

A modal dialog box titled 'Quality threshold' is shown. It has a 'Description' section for 'Area under ROC' which explains the metric for binary classification models. Below this is a list of additional quality metrics. On the right, a configuration panel shows 'Threshold value: Area under ROC' with the value '0.9' in a red-circled input field. At the bottom of the dialog are 'Cancel' and 'Next' buttons, with 'Next' also circled in red.

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

Model info		Quality	Quality threshold	Sample size
Model details	<input checked="" type="radio"/>	Description	Threshold value: Area under ROC 0.9	Minimum sample size 100
Endpoints	<input checked="" type="radio"/>	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 .		Maximum sample size 10,000
Evaluations				
Fairness	<input type="radio"/>			
Quality	<input checked="" type="radio"/>			
Drift	<input type="radio"/>			
Explainability	<input checked="" type="radio"/>			
Import settings				
Go to model summary				

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

The screenshot shows the Watson OpenScale dashboard with the project name "credit-risk-deploy". On the left sidebar, under "Model info", "Fairness" is selected. Under "Evaluations", "Fairness" is also selected. In the main content area, the "Fairness" monitor is configured. A callout box highlights the "Favorable outcomes" section, which contains a note: "To select the favorable outcomes, click the edit icon." A red circle highlights the edit icon (pencil icon) next to the heading. Below this, there is a "Sample size" section with a similar note and edit icon.

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

The screenshot shows a modal dialog titled "Select the favorable outcomes". It includes a description: "For each group, Watson OpenScale will calculate the percentage of transactions that receive a favorable outcome." Below this, it says: "Select the values that represent favorable (preferable) outcomes. You can also add a value manually if it is not included in the list." The dialog lists two categories: "No Risk" and "Risk". For "No Risk", the "Favorable" checkbox is checked (highlighted with a red circle). For "Risk", the "Unfavorable" checkbox is checked (highlighted with a red circle). At the bottom right of the dialog, the "Next" button is highlighted with a red oval.

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 Back Next

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.

Select the features to monitor

<input type="checkbox"/> InstallmentPercent	81	<input checked="" type="checkbox"/>
<input checked="" type="checkbox"/> Sex	81	<input checked="" type="checkbox"/>
<input type="checkbox"/> OthersOnLoan	81	<input type="checkbox"/>
<input type="checkbox"/> CurrentResidenceDuration	81	<input type="checkbox"/>
<input type="checkbox"/> OwnsProperty	81	<input type="checkbox"/>
<input checked="" type="checkbox"/> Age	81	<input checked="" type="checkbox"/>
<input type="checkbox"/> InstallmentPlans	81	<input type="checkbox"/>
<input type="checkbox"/> Housing	81	<input type="checkbox"/>

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

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.

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

Set fairness alert threshold [Age]
80

Cancel Back Next

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"/>	
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

Set fairness alert threshold [Age]
95

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**.

Values	Monitored	Reference	Recommended
female	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Monitored
male	<input type="checkbox"/>	<input checked="" type="checkbox"/>	Reference

Set fairness alert threshold [Sex]
95

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.

Dashboard / Configure

credit-risk-deploy

Model info

- Model details
- Endpoints

Evaluations

- Fairness
- Quality
- Drift **Drift**
- Explainability

[Import settings](#)

[Go to model summary](#)

Fairness

Description

The Fairness monitor checks your deployments for biases. It tracks when the model shows a tendency to provide a favorable (preferable) outcome more often for one group over another. You will specify which values represent favorable outcomes, select the features to monitor for bias (for example, Age or Sex), and specify the groups to monitor for each selected feature.

Favorable outcomes

Favorable outcomes
No Risk

Unfavorable outcomes
Risk

Sample size

Minimum sample size
200

Features to evaluate (2)

Add feature +

Age

Monitored groups
19-25

Fairness threshold
95%

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

Dashboard / Configure

credit-risk-deploy

Model info

- Model details
- Endpoints

Evaluations

- Fairness
- Quality
- Drift **Drift**
- Explainability

[Import settings](#)

[Go to model summary](#)

Drift

Description

The drift test measures two types of changes.

Drop in accuracy
structured binary and multi-class classification models only
Watson OpenScale estimates the drop in accuracy of the model at runtime. The model accuracy could drop if there is an increase in transactions similar to those which the model was unable to evaluate correctly in the training data.

Drop in data consistency
Watson OpenScale estimates the drop in consistency of the data at runtime as compared to the characteristics of the data at training time.

A drop in model accuracy and data consistency may lead to a negative impact on the business outcomes associated with the model.

Drift model

To select a drift model training option, click the edit icon.

Drift threshold

To select drift threshold value, click the edit icon.

Sample size

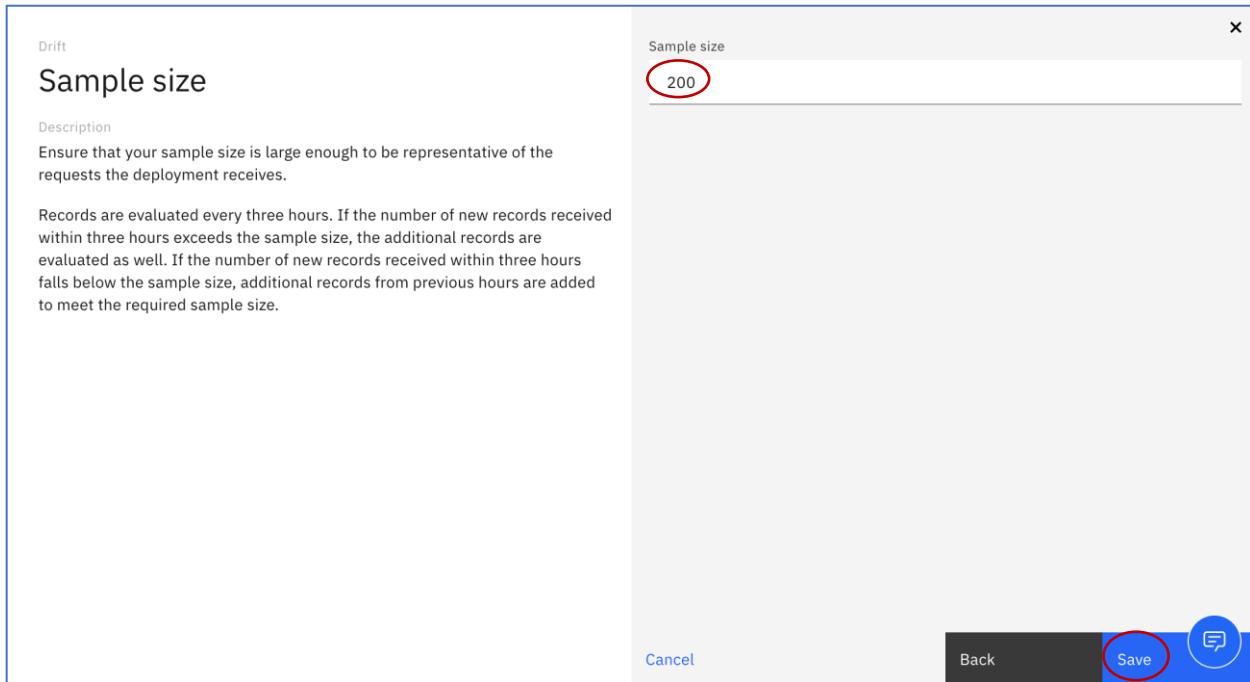
3. Watson OpenScale will detect a drop in accuracy using a custom drift model generated from the training data. Similarly, it detects a drop in data consistency by analyzing your training data. Click on **Train in Watson OpenScale**. Click **Next**.

The screenshot shows the 'Drift' section of the Watson OpenScale interface. On the left, under 'Train a drift model', there's a 'Description' block explaining that Watson OpenScale will detect a drop in accuracy using a custom drift model generated from training data. It also mentions that it can analyze data and train a model for you or do it yourself using a custom notebook. Below this are two sections: 'Train in Watson OpenScale' (selected) and 'Train in a data science notebook'. Both sections provide instructions for connecting training data to Watson OpenScale. At the bottom right of the main panel are 'Cancel' and 'Next' buttons, with 'Next' being highlighted with a red circle.

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

The screenshot shows the 'Drift threshold' section of the Watson OpenScale interface. On the left, there's a 'Description' block explaining that Watson OpenScale tracks the degree of change in model accuracy compared to training time. It provides examples of how the drift threshold is used to determine if incoming transactions meet baseline accuracy requirements. At the bottom right of the main panel are 'Cancel', 'Back', and 'Next' buttons, with 'Next' being highlighted with a red circle.

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



- 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.

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

The screenshot shows the Insights Dashboard for the 'credit-risk-deploy' model. On the left is a sidebar with icons for 'Dashboard', 'Deployments', 'Model info', 'Evaluations', and 'Feedback'. The 'Evaluations' section is expanded, showing 'Model info' and 'Evaluations' subsections. Under 'Evaluations', 'Fairness', 'Quality', and 'Drift' are listed, with 'Drift' highlighted by a blue selection bar. Other sections like 'Explainability' and 'Feedback' are also visible.

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

Insights Dashboard

Model Monitors
1

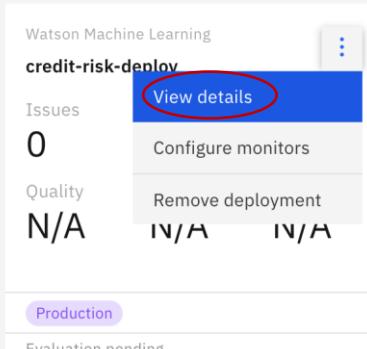
Deployments Monitored	Quality Alerts	Fairness Alerts	Drift Alerts
1	0	0	0

Quality and Fairness metrics update every hour. Drift metrics update every 3 hours.

Watson Machine Learning
credit-risk-deploy

Issues	Configure monitors
0	Remove deployment

Production
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**.

Actions

View pre-production model

Evaluate now

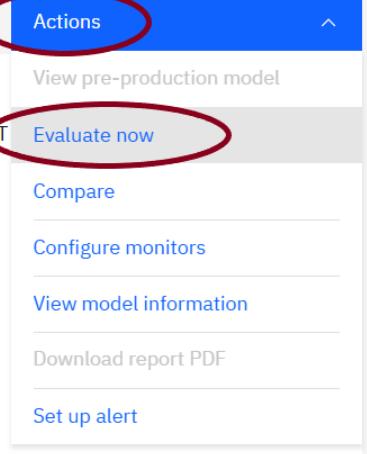
Compare

Configure monitors

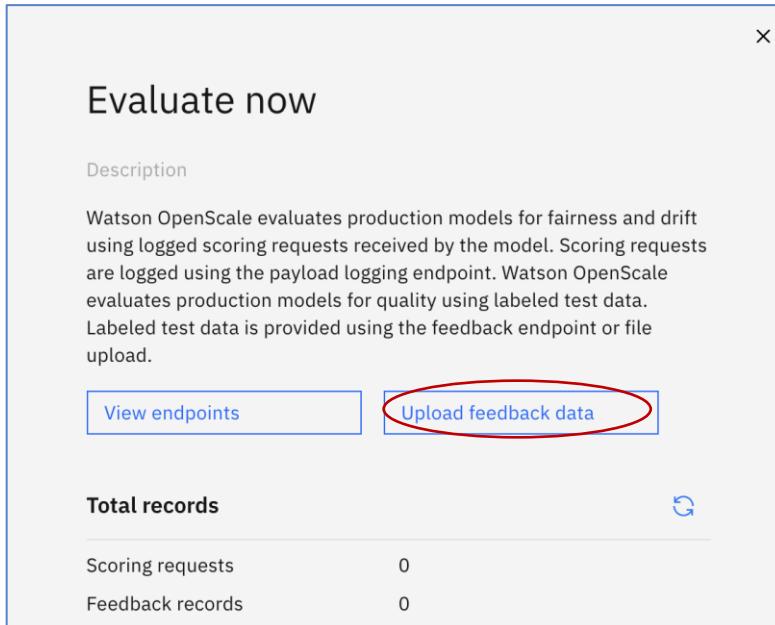
View model information

Download report PDF

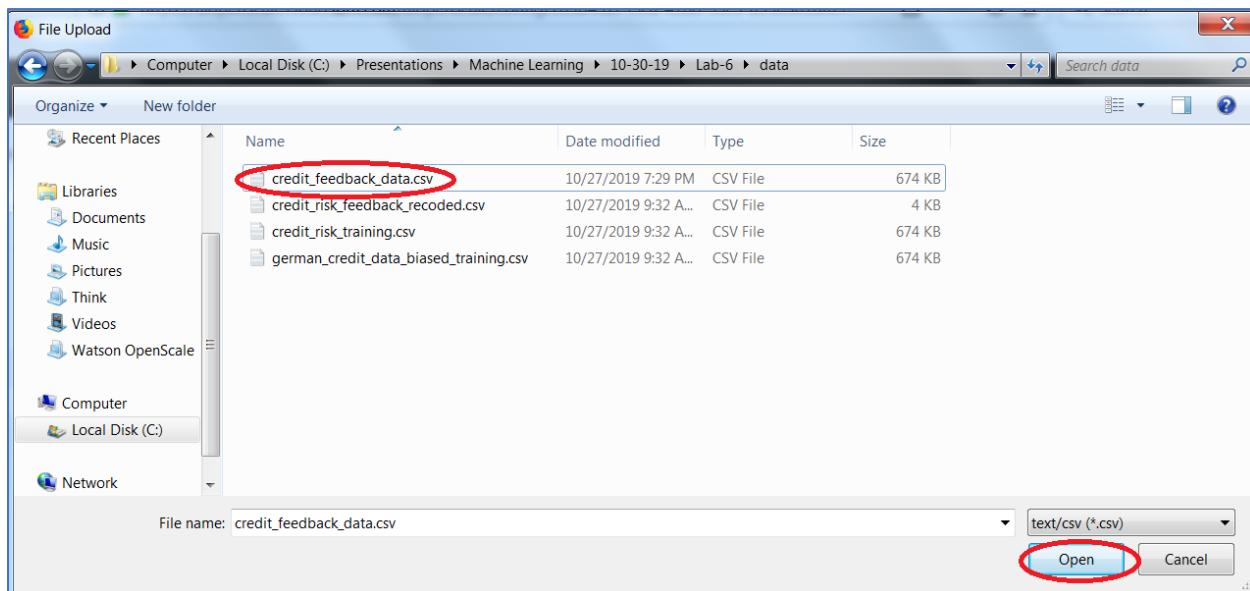
Set up alert



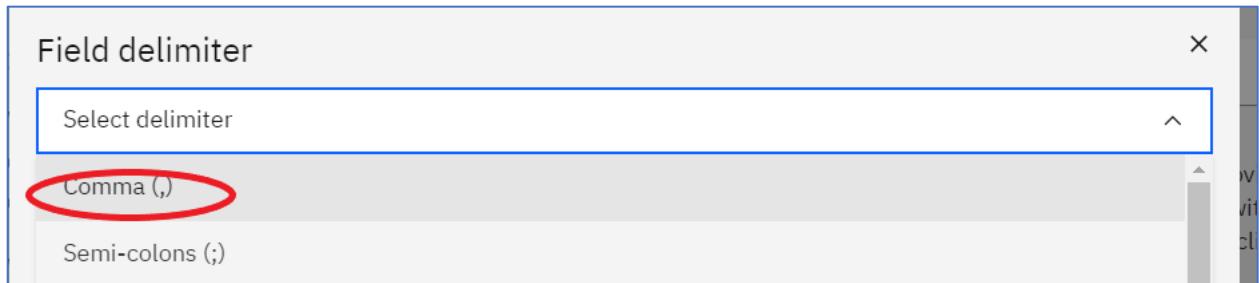
4. Watson OpenScale evaluates models for quality using labeled test data. Labeled test data is provided using the feedback endpoint or by file upload. We will use the file upload options. Click on **Upload feedback data**.



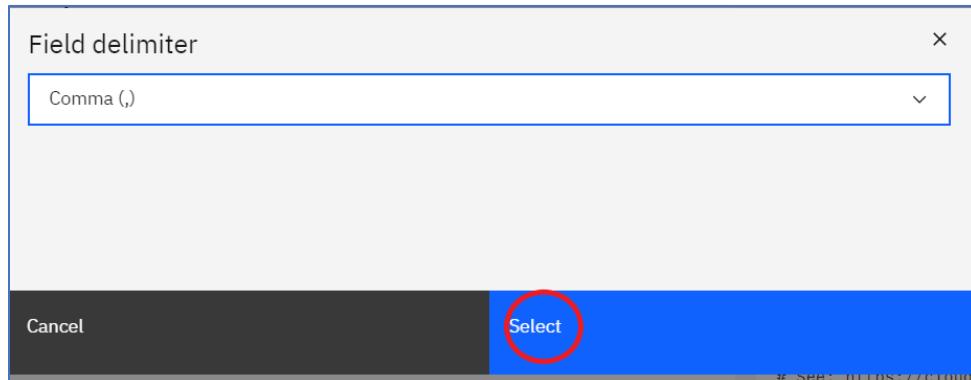
5. Navigate to the feedback file **credit_feedback_data.csv**. Click on **Open**.



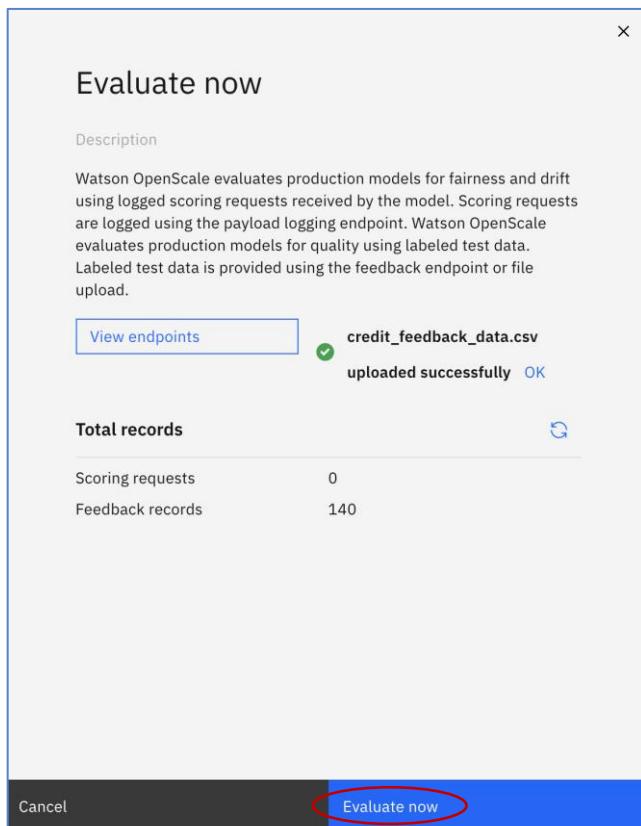
6. Select **Comma** as the **Delimiter**.



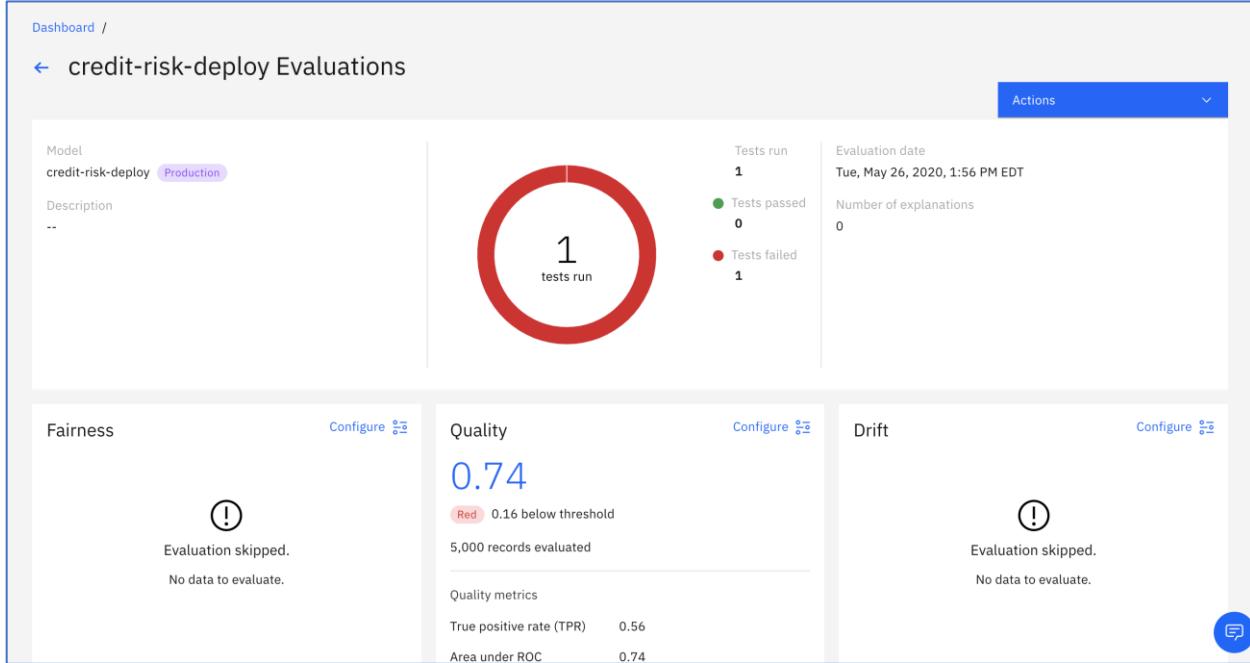
7. Click Select.



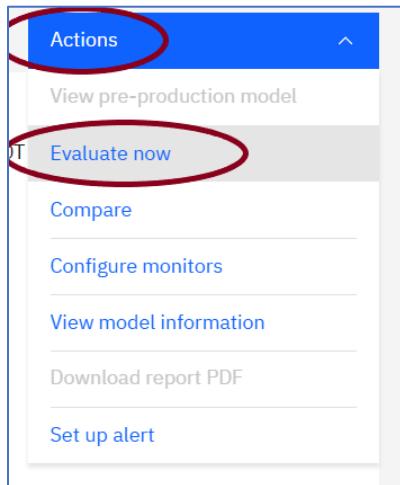
8. After the file is successfully uploaded, click on the **Evaluate now**.



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 "credit-risk-deploy" page in the Watson Studio interface. The top navigation bar shows "My projects / Watson Studio Labs / credit-risk / credit-risk-deploy". The main content area has tabs for "Overview", "Implementation", and "Test", with "Test" being the active tab. Below the tabs is a section titled "Enter input data" containing a code editor with JSON-like input data. At the bottom of this section is a blue "Predict" button. To the right of the code editor is a large, empty white area.

```
[{"no_checking": 24, "prior_payments_delayed": "car_new", "new": 2538, "less_100": "greater_7", "male": "none", "4": "car_other", "47": "none", "own": "2", "unskilled": "2", "none": "yes", "Risk": "0_to_200"}, {"all_credits_paid_back": "car_new", "15": "100_to_500", "1": "1_to_4", "2": "male", "none": "2", "savings_insurance": "25", "none": "rent", "1": "skilled", "1": "none", "yes": "Risk"}]
```

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**

A screenshot of the "credit-risk-deploy" page in the Watson Studio interface, similar to the previous one but with a red circle drawn around the "Predict" button. The "Test" tab is active, and the "Enter input data" section contains the same JSON input data as before. The "Predict" button is highlighted with a red oval.

```
[{"skilled": 1, "none": "yes"}, {"no_checking": 25, "prior_payments_delayed": "radio_tv", "2215": "unknown", "4_to_7": 4, "male": "none", "4": "car_other", "34": "none", "rent": 2, "skilled": 1, "none": "yes"}, {"no_checking": 51, "outstanding_credit": "business", "5188": "greater_1000", "greater_7": 4, "male": "co-applicant", "4": "savings_insurance", "43": "none", "own": "2", "skilled": 1, "none": "yes"}]
```

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



and then click on the refresh icon, You should now see 200 Scoring requests.

Evaluate now

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	200
Feedback records	5,000

7. Click **Evaluate now**.

×

Evaluate now

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.

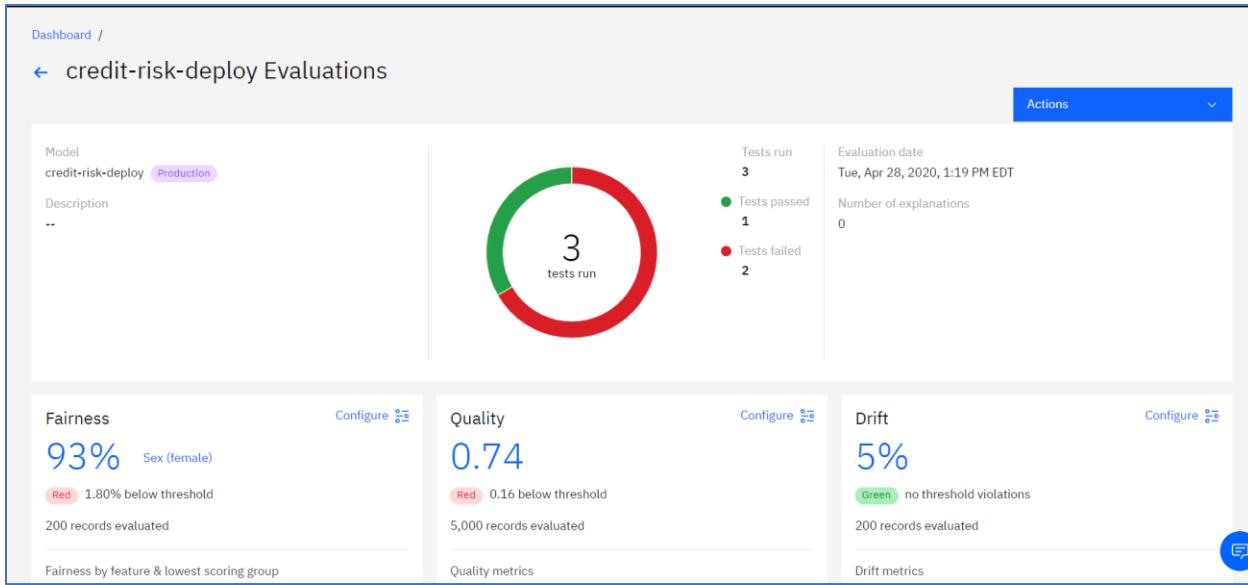
[View endpoints](#) [Upload feedback data](#)

Total records 

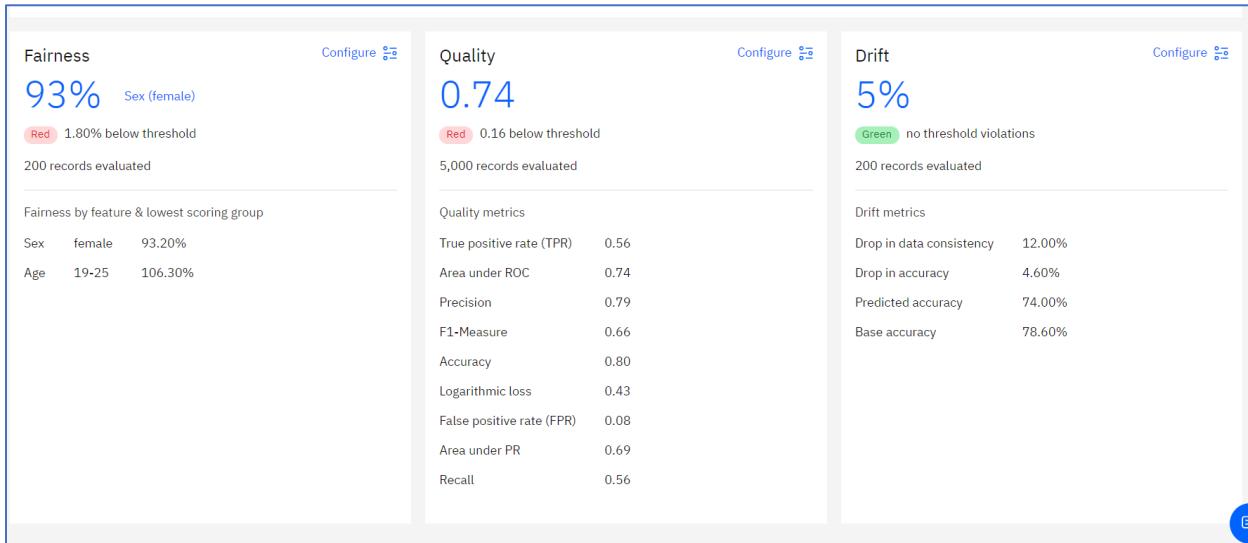
Scoring requests	200
Feedback records	5,000

[Cancel](#) [Evaluate now](#)

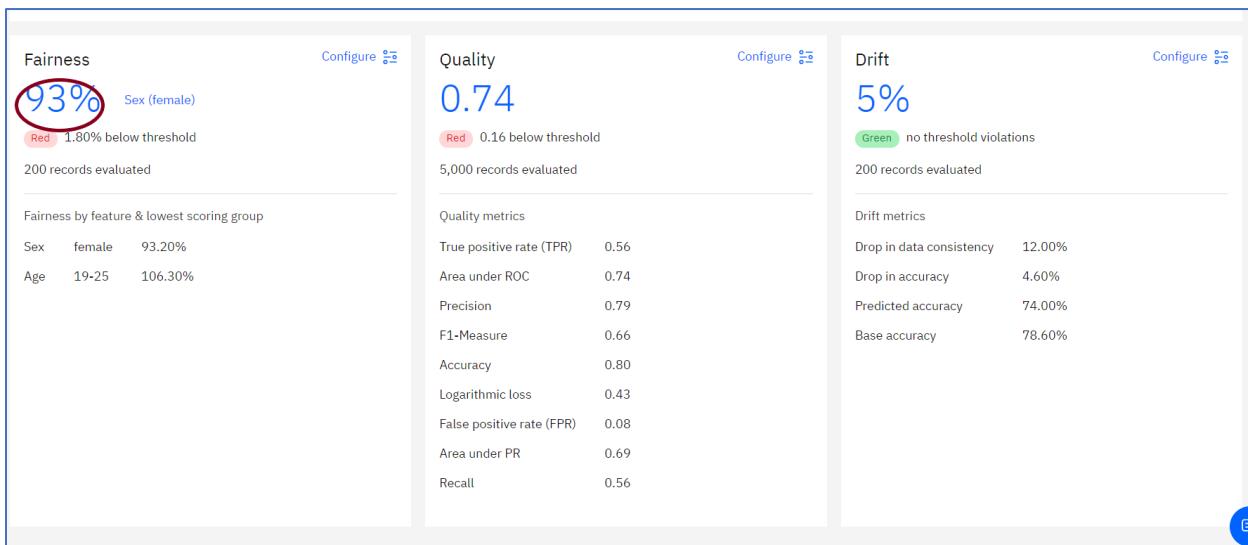
8. Please wait 3-5 minutes for the Evaluations page to display the metrics. Three tests have now been run. The quality test from before, and two new tests. One for fairness, and one for Drift. The fairness test has failed because 93% fairness is lower than our threshold of 95%. The Drift metric passed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



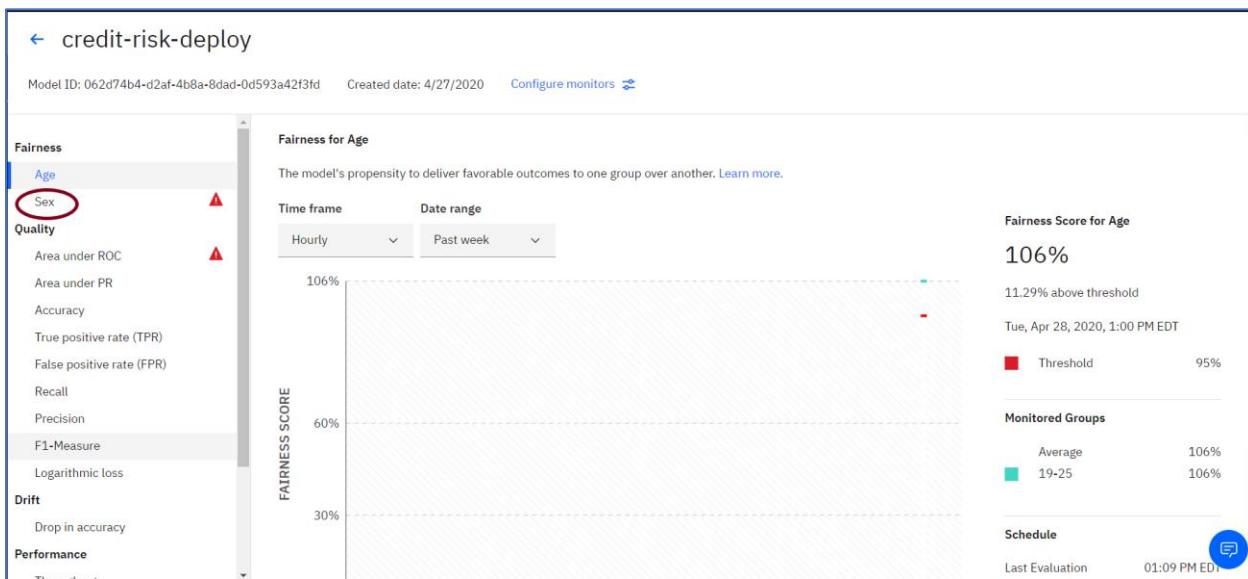
9. Scroll down to see the metric details.



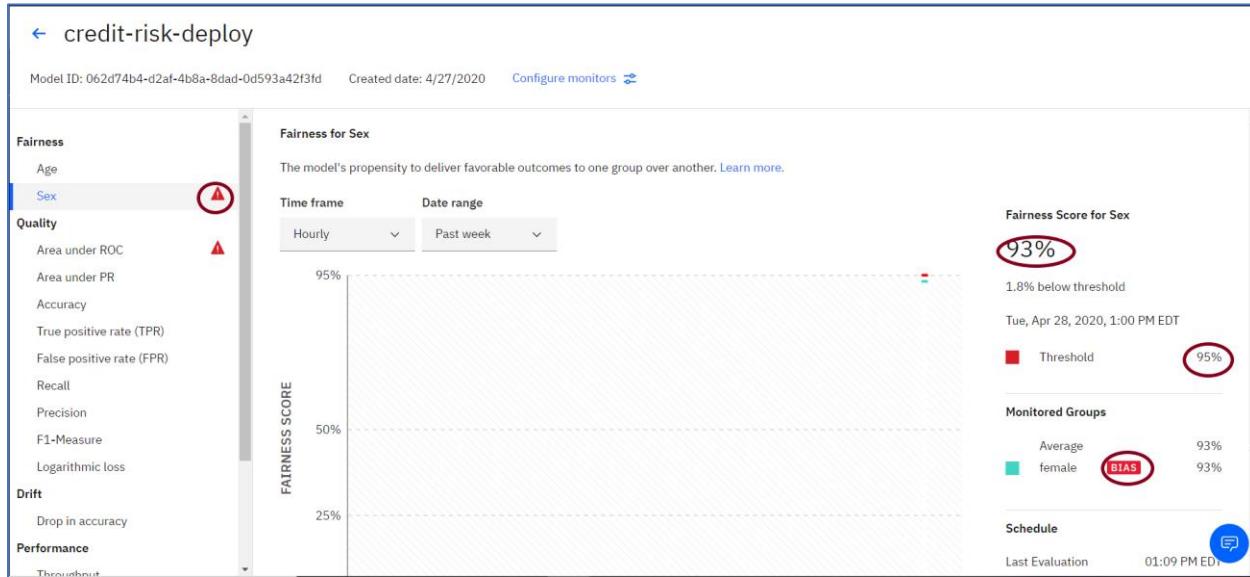
10. Click on the Fairness metric.



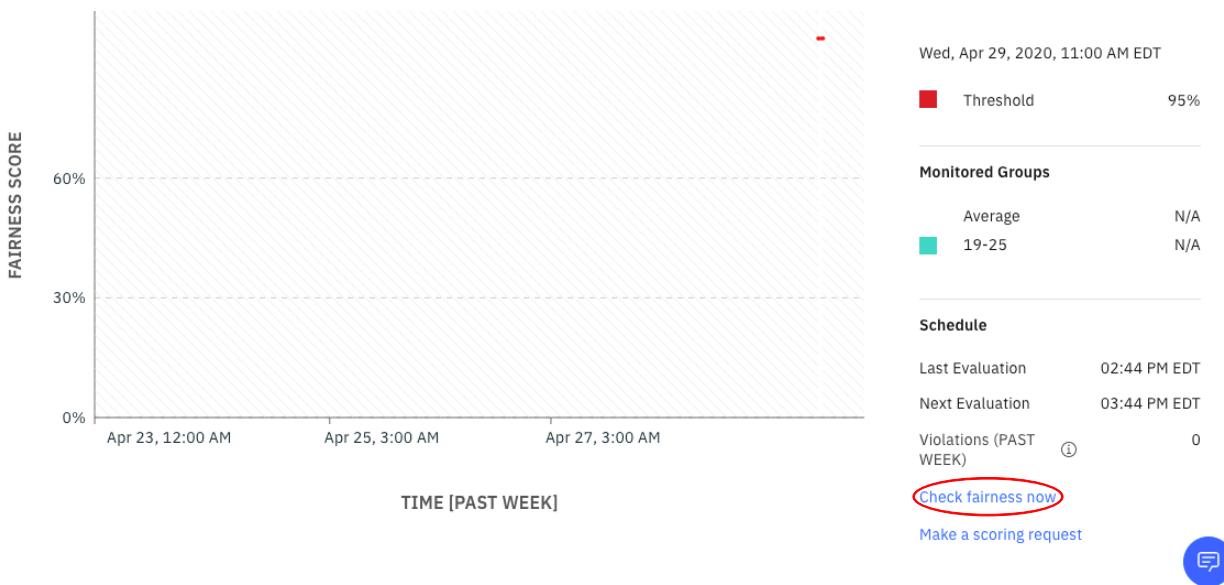
11. The time-series view is displayed. Click on Sex.



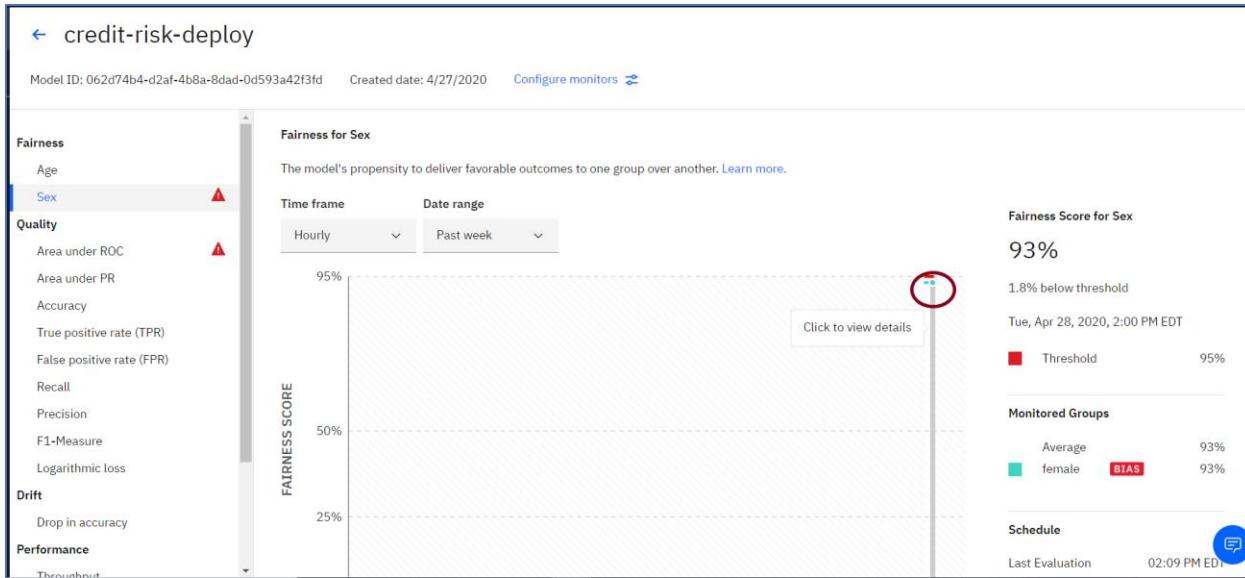
12. A time-series display for the Sex metric is shown. Currently, we have only run one evaluation. We can see the red triangle indicating an alert next to Sex. The Fairness score is listed at 93% which is less than the threshold of 95%.



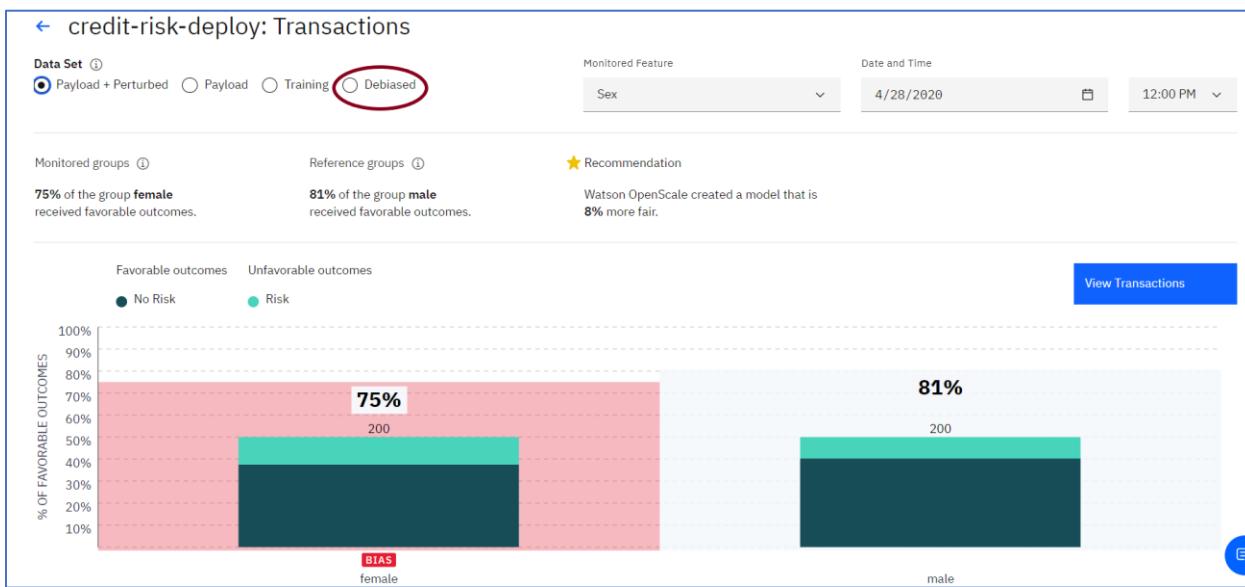
13. Scroll down and click on **Check fairness now**.



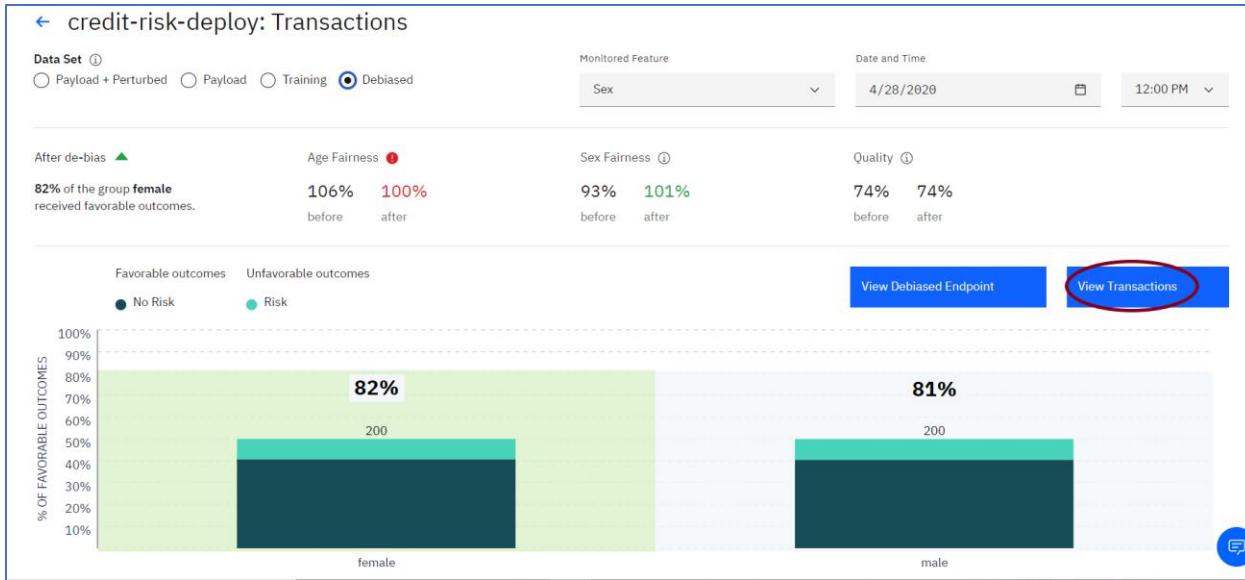
14. Click on the timeline to view details.



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.



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 Transaction** to display a list of transactions.



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.

View All transactions Biased transactions

Review the transactions that were received for the selected time period. Click an Explain link to determine the features that contributed to each outcome.

Payload Table ⓘ Payload_a2fe6bb3-9439-4ef9-b8e8-4372cf05f...

Corrected Records ⓘ -

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	
61a034fa736dabc57626b399cb139d38-106	female	No Risk	Explain	
61a034fa736dabc57626b399cb139d38-107	male	No Risk	Explain	

No Risk : Favorable Outcome
Current Model: 75.00%
De-biased Model: 81.50%

Risk : Unfavorable Outcome
Current Model: 25.00%
De-biased Model: 18.50%

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

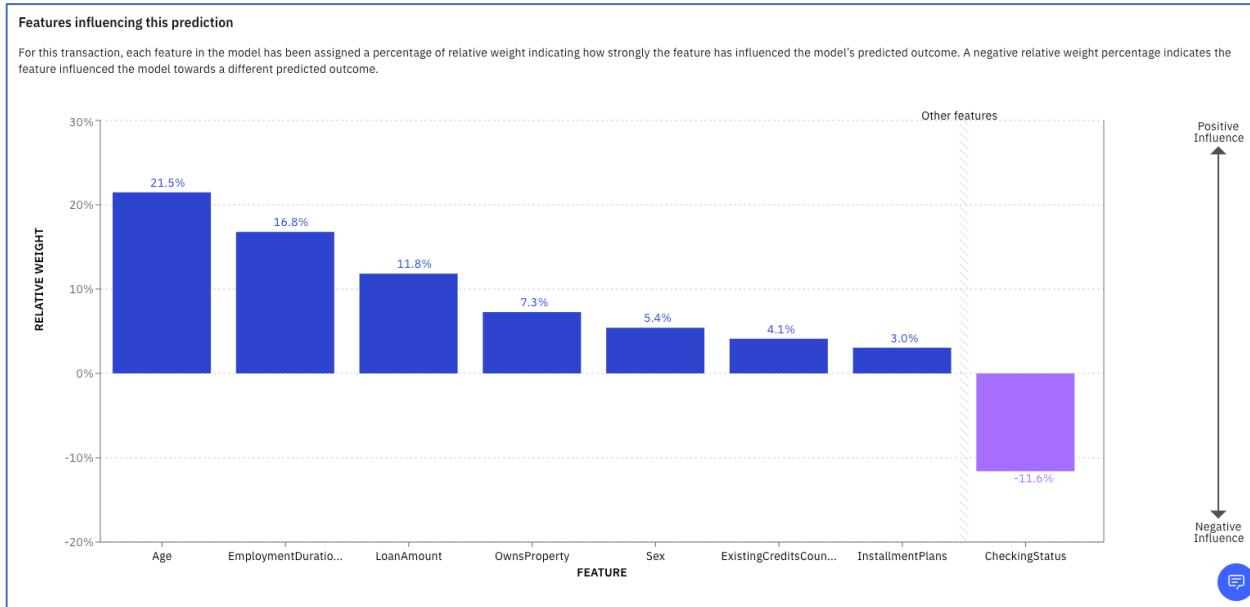
Search by Transaction ID

Predicted outcome: Risk (50.74% confidence)

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%

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

Need help?

Explanations / e6c3f89cd6eeecb79faed2696ea53408e-129

Transaction details

Search by Transaction ID

Explain

Transaction: e6c3f89cd6eeecb79faed2696ea53408e-129 | Received on: Jul 21, 2020, 03:47:01 PM EDT | Deployed model: credit-risk-deploy (production) | Language: Not applicable

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.

Insights Dashboard

Model Monitors 1 Add to dashboard +

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

1 Quality and Fairness metrics update every hour. Drift metrics update every 3 hours.

Watson Machine Learning credit-risk-deploy Issues 2

Quality 0.74 Fairness 93% Drift 5%

1 alert 1 alert 1 alert

Production Evaluated 48 seconds ago

The dashboard displays monitoring statistics for one deployment. It shows 1 deployment monitored, 1 quality alert, 1 fairness alert, and 0 drift alerts. A note indicates that quality and fairness metrics update hourly while drift metrics update every 3 hours. Below this, a detailed view for the 'credit-risk-deploy' model shows two issues: a Quality issue (0.74, 1 alert) and a Fairness issue (93%, 1 alert). The Drift metric is at 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.