

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.

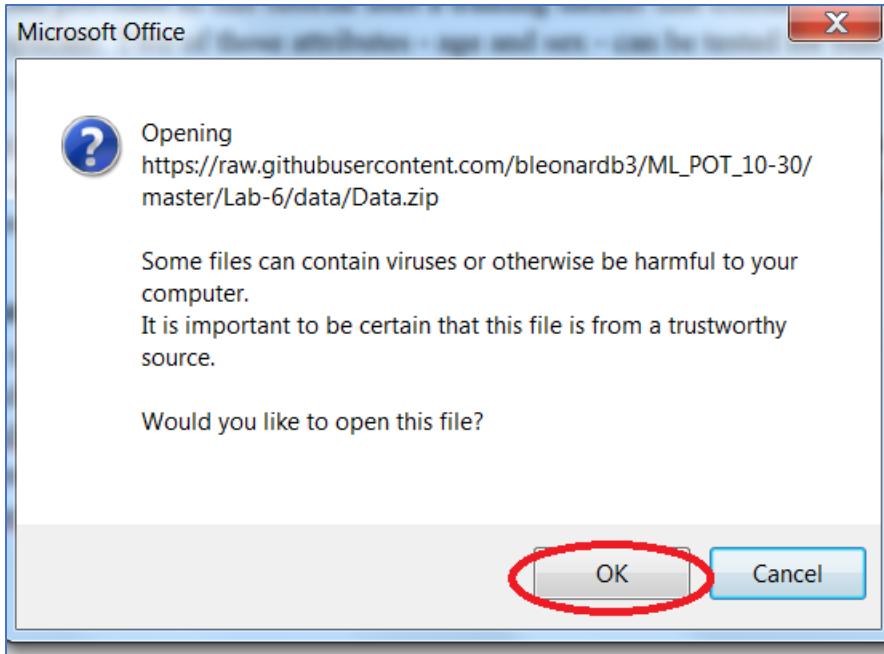
The data science techniques most suited to these diverse datasets, such as gradient boosted trees and neural networks, can generate highly accurate risk models, but at a cost. Such "black box" models generate opaque predictions that must somehow become transparent, to ensure regulatory approval such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

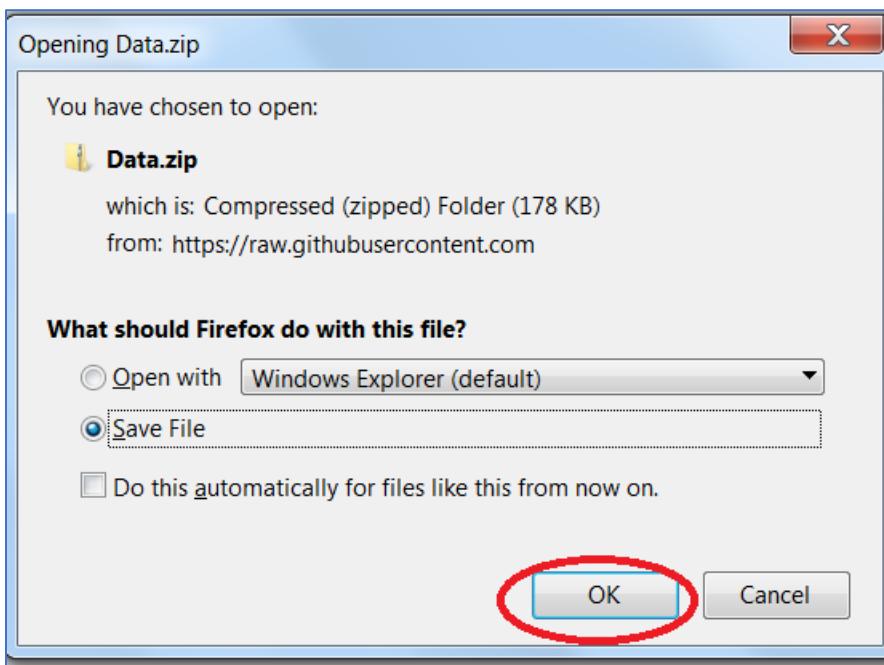
Watson OpenScale will monitor the deployed model's propensity for a favorable outcome ("No Risk") for one group (the Reference Group) over another (the Monitored Group). In this tutorial, the Monitored Group for sex is Female, while the Monitored Group for age is 19 to 25.

Download the Lab Files

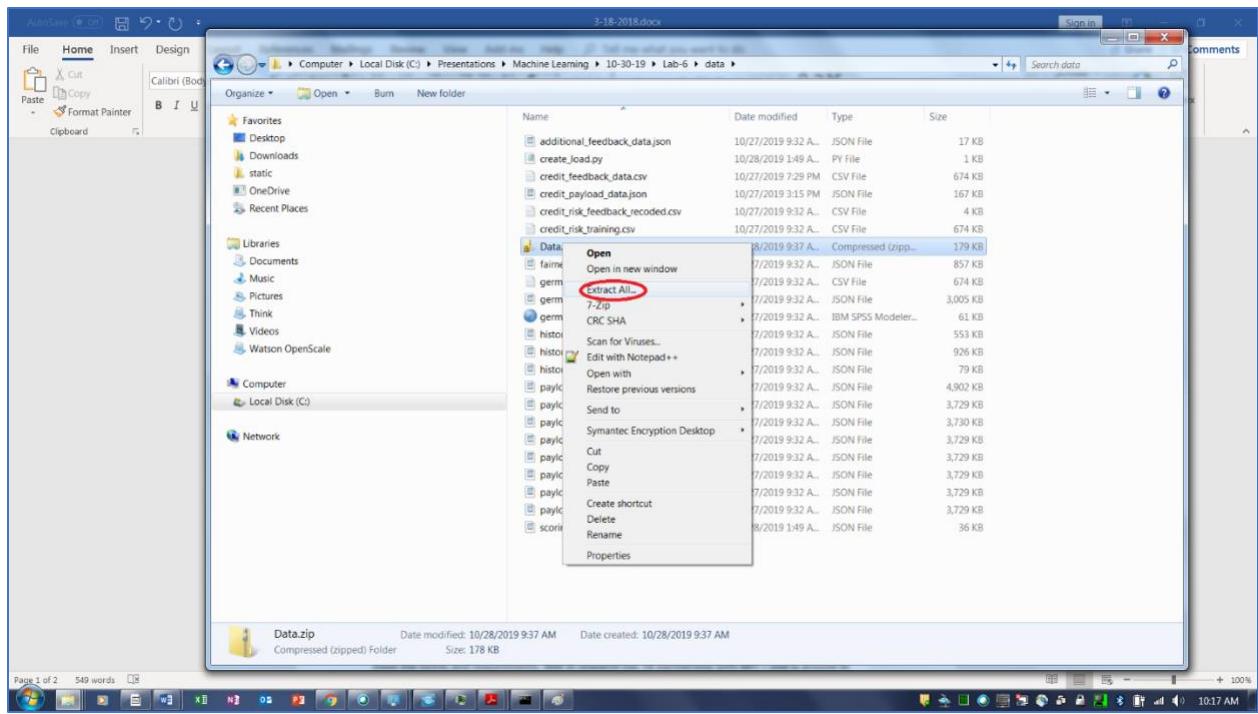
1. Click [here](#) to download the Data.zip file.
 1. credit_feedback_data.csv
 2. credit_payload_data.json
 3. german_credit_data_biased_training.csv
 4. scoring.json
2. Click **OK**. Note your browser may not prompt this message.



3. Click **OK**.



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

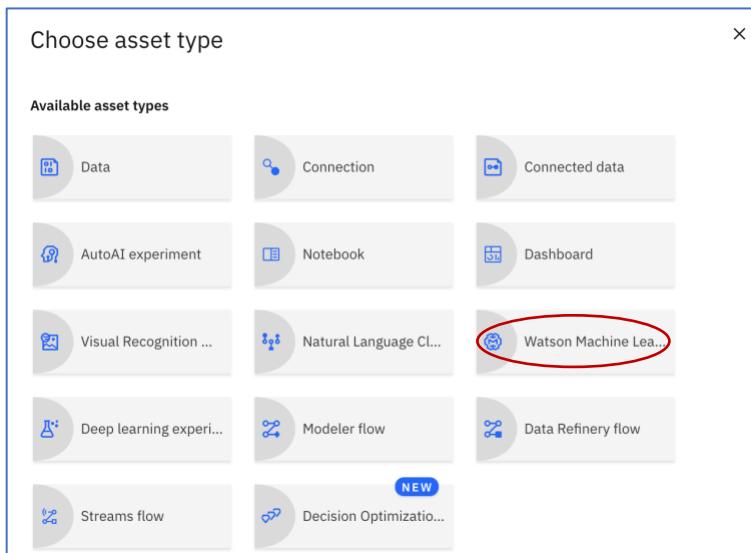


Import the Credit Risk Model

- 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 **Associate a Machine Learning service instance**.

Import model

Define model details

Name
credit-risk

Description
Model description

Machine Learning Service
No Machine Learning service instances associated with your project.
[Associate a Machine Learning service instance](#) with your project on the project settings page, then click the reload button below to refresh the instances available for association with your new model builder instance.

Reload

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 making 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
Help

4. Select **WatsonMachineLearning** from the **Existing Service Instance** list. Click **Select**.

Machine Learning

Existing
New

Filter by: 1 × Default 1 × Dallas 1 × fctolabs91@gmail.com

Existing Service Instance

WatsonMachineLearning

Select
Cancel

5. Click **Reload**.

Import model

Define model details

Name

credit-risk

Description

Model description

Machine Learning Service

No Machine Learning service instances associated with your project.

[Associate a Machine Learning service instance](#) with your project on the project settings page, then click the reload button below to refresh the instances available for association with your new model builder instance.

Reload

6. Click Import.

Import model

Define model details

Name

credit-risk

Description

Model description

Machine Learning Service

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 making 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.

The screenshot shows the 'credit-risk' model page. The 'Deployments' tab is highlighted with a red oval. Below the tabs, there's a 'Summary' section with various model details:

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**.

The screenshot shows the 'Deployments' page for the 'credit-risk' model. The 'Add Deployment' button is highlighted with a red oval. The table below shows no deployments:

NAME	STATUS	TYPE	ACTIONS
Your model is not deployed			

- 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

credit-risk-deploy

Description

Deployment description

Deployment type

- Web service
- Batch prediction

Cancel

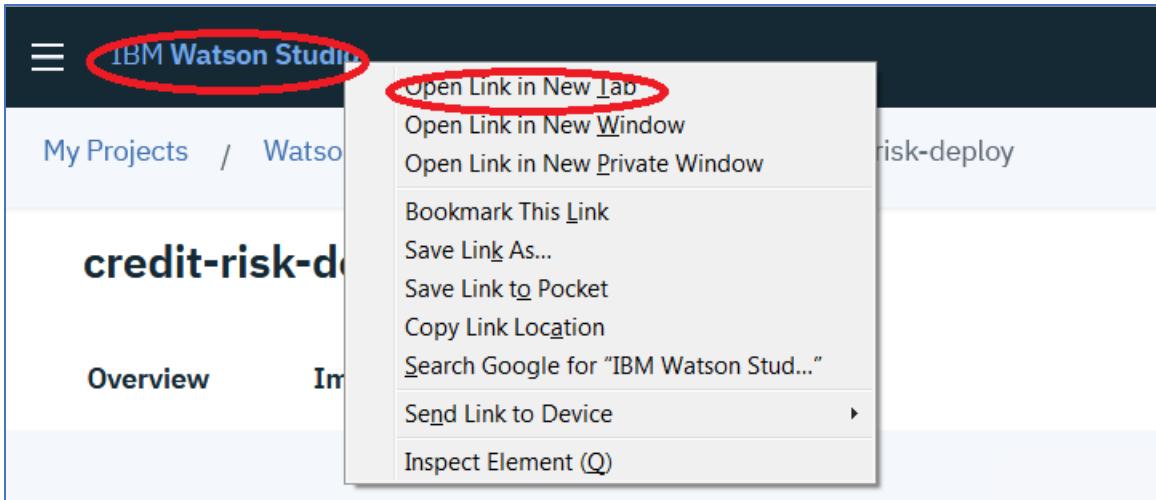
Save

- 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.

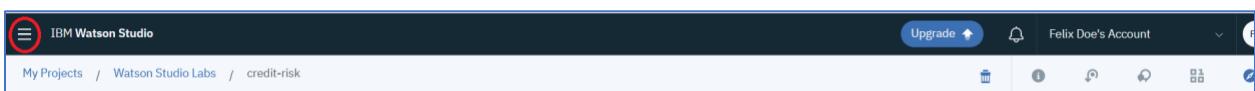
1. Right-click on the **IBM Watson Studio** label and click on **Open link in New Tab**.



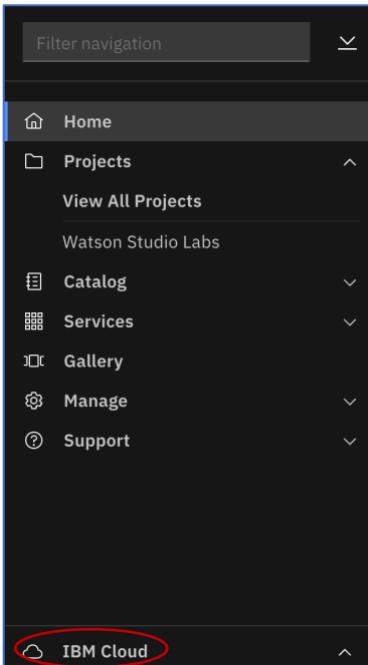
2. Click on the new **Watson Studio** browser tab.



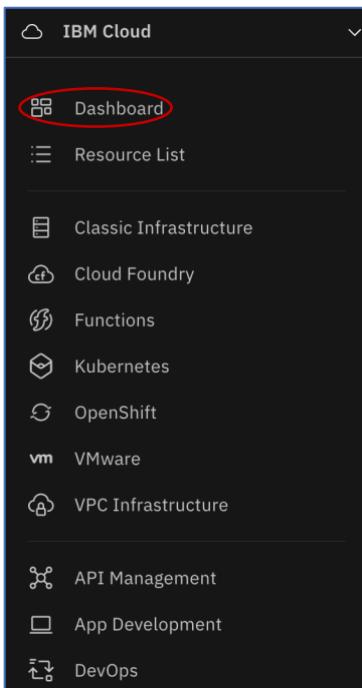
3. Click on the hamburger icon  in the top left corner.



4. Click on **IBM Cloud**.

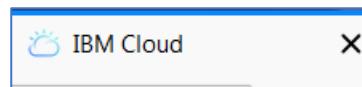


5. Click on **Dashboard**.



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

7. Click on **Catalog**



A screenshot of the IBM Cloud dashboard. The dashboard has a dark header with the "IBM Cloud" logo and a search bar. Below the header is a "Dashboard" section with a "Create resource" button. The "Create resource" button is circled with a red oval.

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

A screenshot of the IBM Cloud Catalog page. The catalog has a dark header with the "IBM Cloud" logo and a search bar. A message at the top says "Try the best of the Catalog for free with no time restrictions with Lite plans. The Lite filter is enabled. Remove the filter to see the full Catalog." On the left is a sidebar with "Catalog" selected. The main area is titled "IBM Cloud products" and says "Over 190+ products available for you to customize and build the solutions that you need for your business". In the search results, the "Watson OpenScale" entry is circled with a red oval.

9. Click on **Watson OpenScale**.

Search results for 'Watson OpenScale' 1 result

Filters: Lite X [Clear all](#)

 **Watson OpenScale**
IBM Watson - 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 Maximum 50,000 transactions per second Maximum 50,000 deployed models	Free

Create Add to estimate View terms

11. Click on **Manage**.

IBM Cloud Search resources and offerings... Catalog Docs Support Manage IBM

Resource list / Watson OpenScale-qe Active Add tags Details Actions...

Getting started Manage Plan

Getting started tutorial Last Updated: 2020-05-18

IBM® Watson OpenScale tracks and measures outcomes from your AI models, and helps ensure they remain fair, explainable, and compliant wherever your models were built or are running. Watson OpenScale also detects and helps correct the drift in accuracy when an AI model is in production

Enterprises use IBM® Watson OpenScale to automate and operationalize AI lifecycle in business applications. This approach ensures that AI models are free from bias, can be easily explained and understood by business users, and are auditable in business transactions. Watson OpenScale supports AI models built and run in the tools and model serve frameworks of your choice.

Overview

Get a quick overview of Watson OpenScale by watching the following video.

12. Click on **Launch Application**.

Resource list / Watson OpenScale-qe Active Add tags Details Actions...

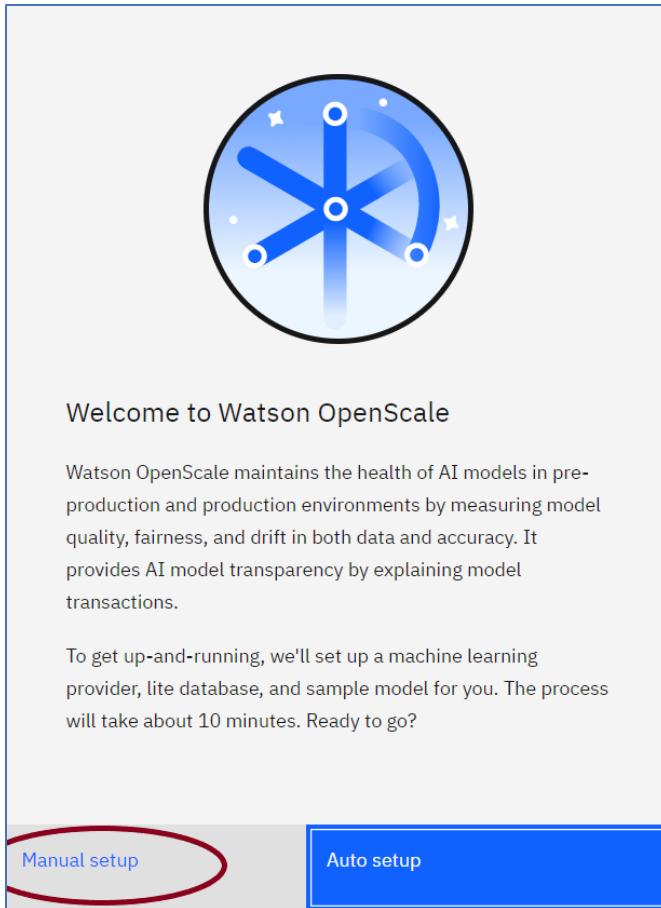
Getting started Manage Plan

Watson OpenScale Welcome to Watson OpenScale, let's get started.

Launch Application

Documentation Community

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

A screenshot of the "System setup" dialog box. The left side has a sidebar with "Database" selected. The main area shows a "Database" section with a "Required" label, a "Description" paragraph, and a note about GDPR compliance. On the right, a "Database type" dropdown menu is open, showing options like "Choose an option", "Free lite plan database" (which is circled in red), "Compose for PostgreSQL", "Databases for PostgreSQL", and "Db2".

System setup

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

Database

Required

Machine learning providers

Integrations (optional)

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.

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](#).

Database type

Choose an option

Free lite plan database

Compose for PostgreSQL

Databases for PostgreSQL

Db2

3. 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
Cancel Save		

4. 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 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
---	--	--

5. 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 Integrations (optional)	Required Machine learning providers Description Watson OpenScale connects to deployed models stored in a machine learning environment.	Add machine learning provider
---	--	---

6. 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.

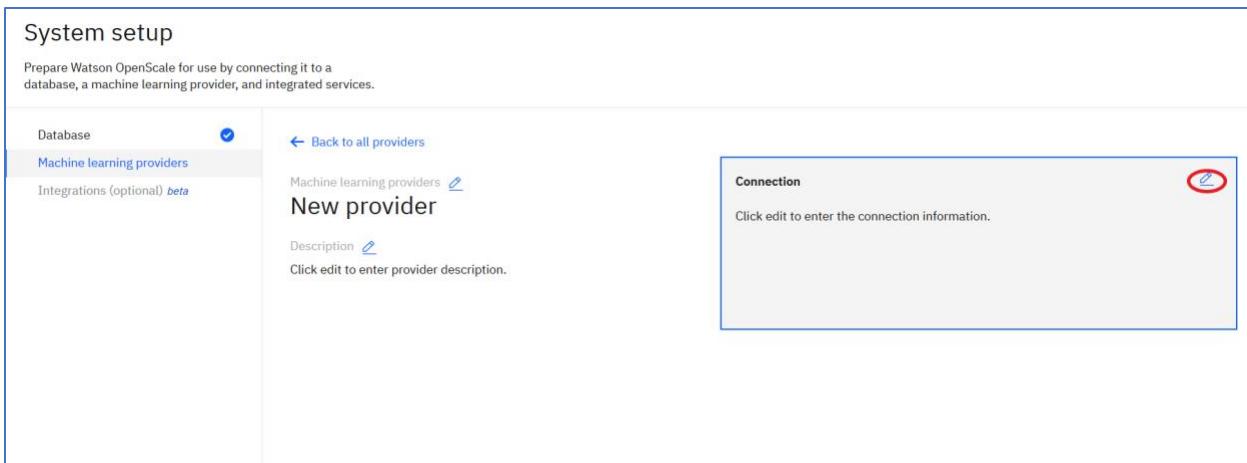
Database Machine learning providers Integrations (optional) [beta](#)

[← Back to all providers](#)

Machine learning providers [🔗](#) **New provider**

Description [🔗](#)
Click edit to enter provider description.

Connection [🔗](#)
Click edit to enter the connection information.



7. 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 Integrations (optional) [beta](#)

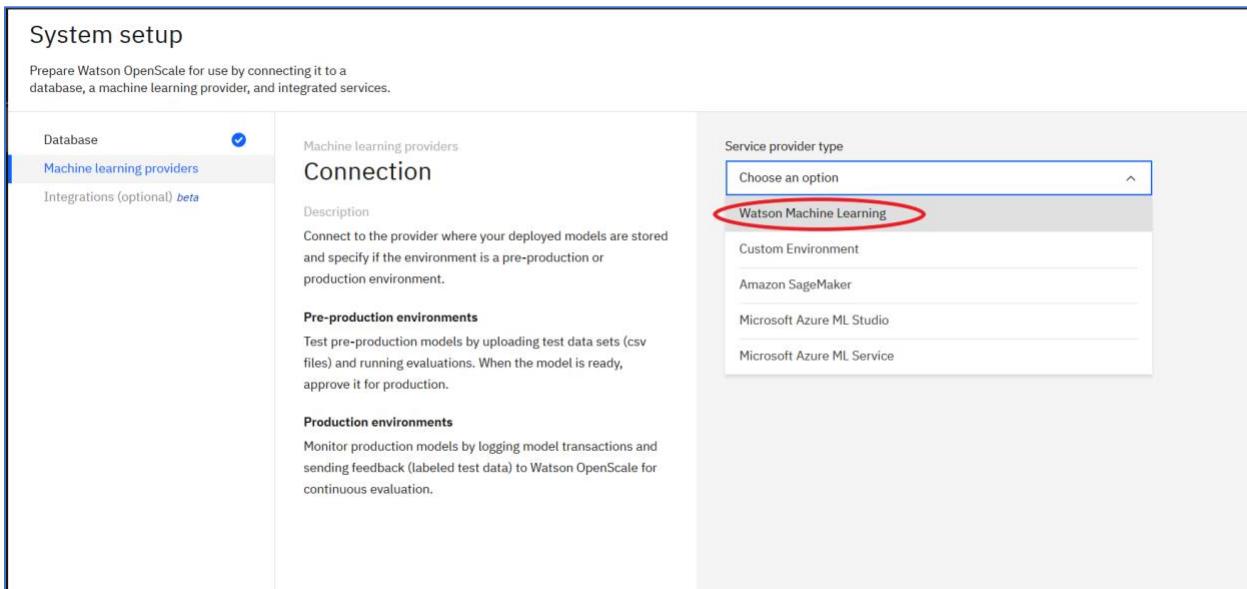
Connection

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](#) [Custom Environment](#) [Amazon SageMaker](#) [Microsoft Azure ML Studio](#) [Microsoft Azure ML Service](#)



8. Click on **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 <input checked="" type="radio"/> Machine learning providers <input type="radio"/> Integrations (optional)	Machine learning providers 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.	Service provider type Watson Machine Learning Watson Machine Learning service WatsonMachineLearning Environment type <input type="radio"/> Pre-production <input checked="" type="radio"/> Production <small>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.</small>
--	---	---

Cancel **Save**

9. Click on the icon.

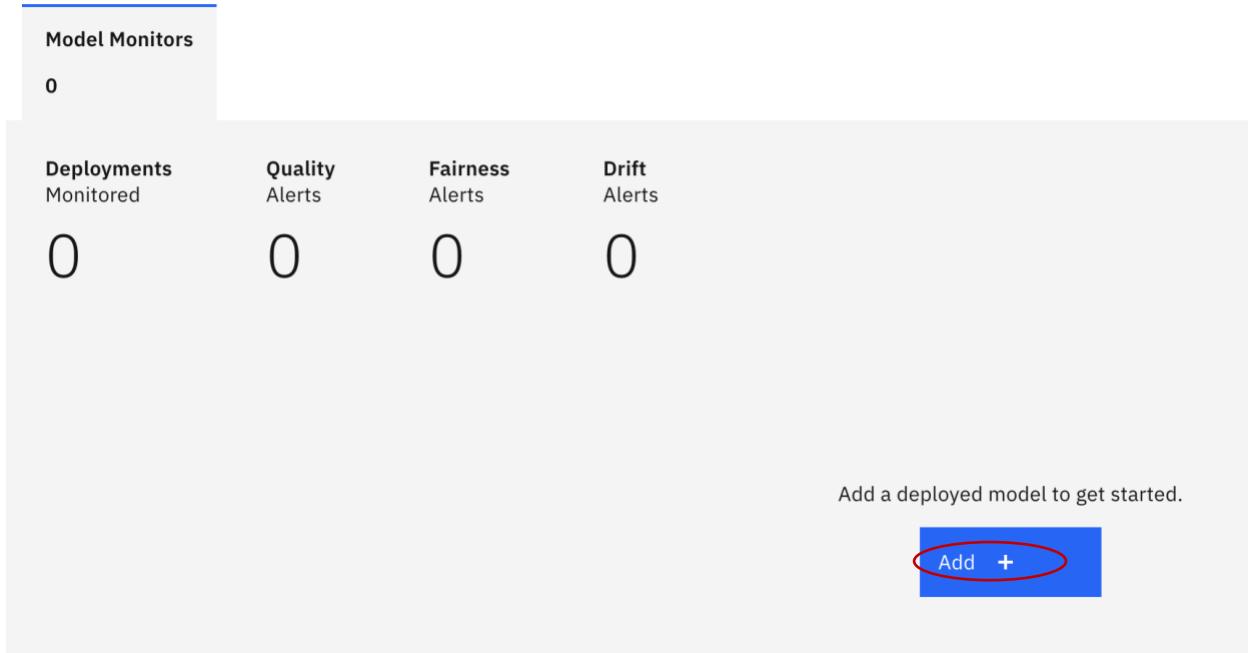
System setup

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

- Database**
- Machine learning providers**

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

Insights Dashboard



11. 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-header 'Machine learning Provider' with a dropdown menu set to 'New provider (Production)'. Below this is a table with three columns: 'Deployment', 'Description', and 'Created'. A single row is listed: 'credit-risk-deploy' (Description) and 'Tue, Mar 24, 2020, 11:52 AM EDT' (Created). The 'credit-risk-deploy' entry is circled in red. At the bottom of the dialog are two buttons: 'Cancel' and 'Configure', with 'Configure' also circled in red.

Deployment	Description	Created
credit-risk-deploy		Tue, Mar 24, 2020, 11:52 AM EDT

Cancel Configure

12. Click on **Configure monitors**.

Selections saved.

X

✓ Done. Click **Configure monitors** to set up your monitors.

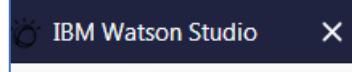
Close

Configure monitors

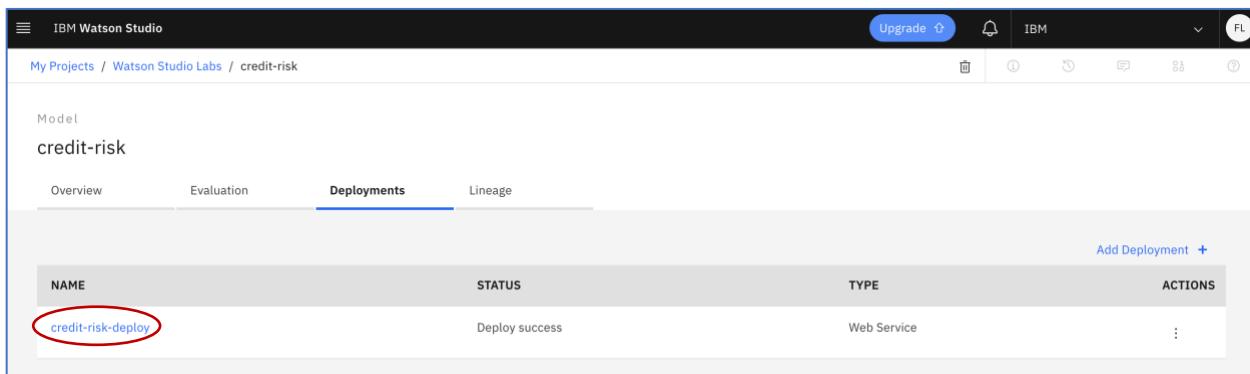
13. Setup is now complete. Do not proceed until you do the scoring step below.

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.

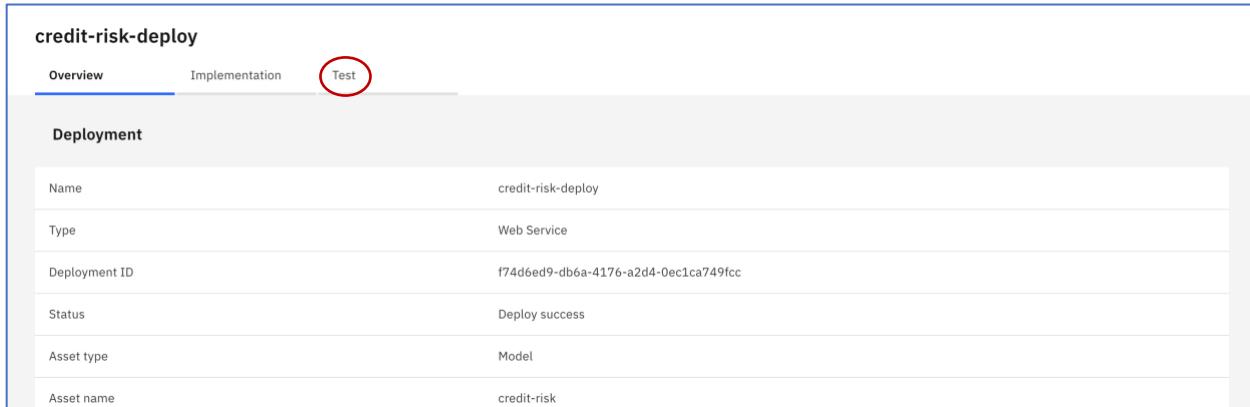


1. Click on the **Watson Studio** Browser tab
2. You should be back at the **credit-risk Model** page. Click on **credit-risk-deploy**.



A screenshot of the Watson Studio interface showing the "credit-risk" model page. The "Deployments" tab is selected. A deployment named "credit-risk-deploy" is listed, with its name circled in red. The deployment status is "Deploy success" and the type is "Web Service".

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



A screenshot of the "credit-risk-deploy" test page. The "Test" tab is selected. The deployment details are listed as follows:

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**

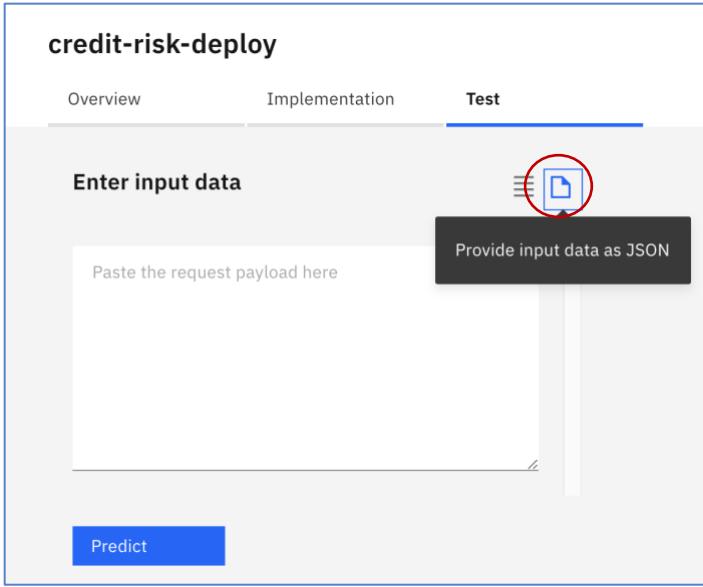
Enter input data

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

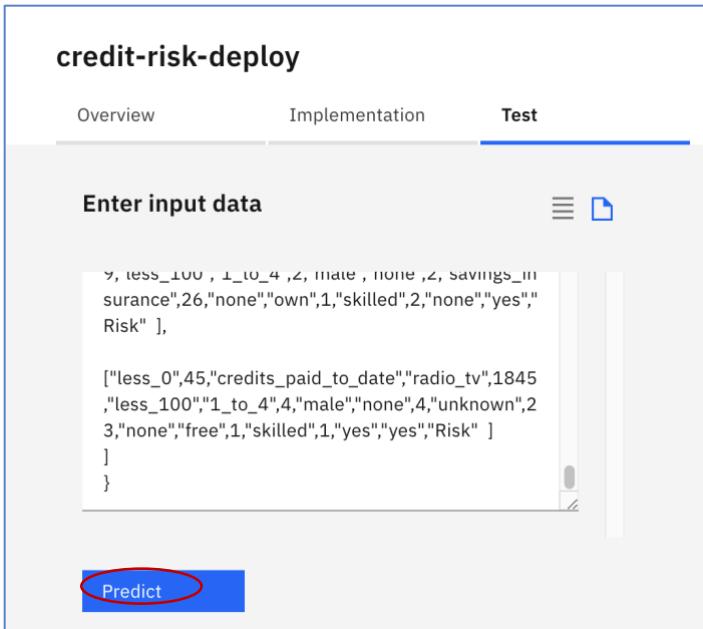
Overview Implementation **Test**

Enter input data



```
..., less_100 , 1_to_4 ,2, male , none ,2, savings_insurance",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



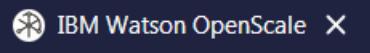
6. The results should appear as below.

The screenshot shows the Watson OpenScale interface with the 'Test' tab selected. On the left, there's a section titled 'Enter input data' containing two code snippets. The first snippet is a list of feature values: 'l_no_overdue', 'l_no_overdue', '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'. The second snippet is a list of feature names: '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 these snippets is a blue 'Predict' button. To the right, there's a large JSON schema for the model:

```
{
  "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' configuration page. On the left, there's a 'Model details' section with a 'Description' field containing the text: 'Provide information about the training data and deployed model output to prepare Watson OpenScale for monitoring and providing explanations for model transactions.' To the right, there are two sections: 'Model input' and 'Model transaction'. The 'Model input' section has a red circle around its edit icon (a pencil icon). The 'Model transaction' section also has an edit icon.

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

Model details

Select input type and algorithm

Description

Select the type of data the deployment analyzes and the algorithm type.

Numeric/categorical

Data stored in rows and columns, for example, customer records.

Image

Graphics or photographs, for example, a medical scan.

Unstructured text

A sentence or paragraph, for example, a product review.

Data type

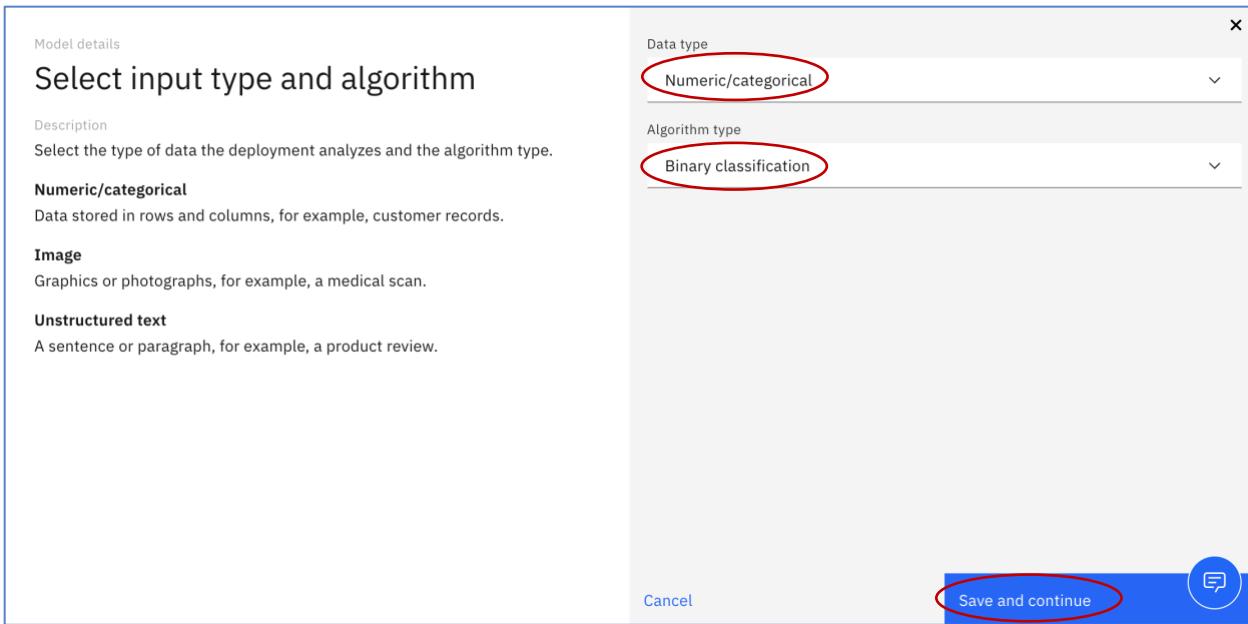
Numeric/categorical

Algorithm type

Binary classification

Cancel

Save and continue



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

Model details

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

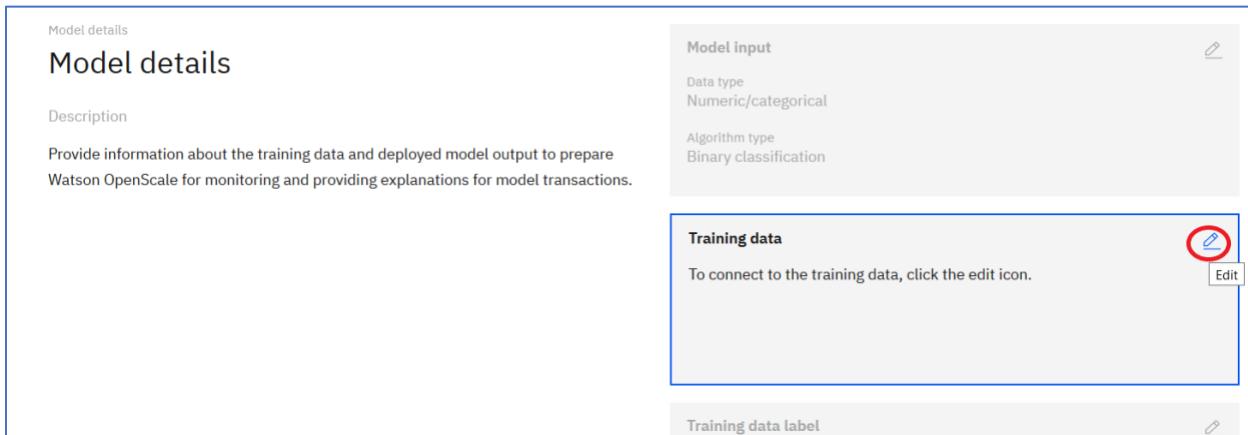
Algorithm type
Binary classification

Training data

To connect to the training data, click the edit icon.

Edit

Training data label



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

credit-risk-deploy

Model info	Db2 database or cloud object storage.
Model details	<input type="radio"/>
Endpoints	<input checked="" type="radio"/>
Evaluations	
Fairness	<input type="radio"/>
Quality	<input type="radio"/>
Drift	<input type="radio"/>
Explainability	<input type="radio"/>
Import settings	
Go to model summary	
<div style="border: 1px solid #ccc; padding: 5px; margin-top: 10px;"> dasnode-txn-spox-yp-daiuy-u.s.services.dai.duemix.net SSL port 50001 Database BLUDB Username cmb91569 Password Schema CMB91569 Table CREDIT_RISK_TRAIN_DATA </div>	
Cancel Next ?	

6. 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

7. 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	<input type="button" value="▼"/>

Cancel Back Next

8. 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).

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

Cancel Back Next

9. 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.

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**

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.

Dashboard / Configure

credit-risk-deploy

Model info

- [Model details](#)
- [Endpoints](#)
- Evaluations**
- Fairness
- Quality**
- 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: 50001

Database: BLUDB

Username: cmb91569

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

Dashboard / Configure

credit-risk-deploy

Model info

Model details	<input checked="" type="checkbox"/>
Endpoints	<input checked="" type="checkbox"/>

Evaluations

Fairness	<input type="radio"/>
Quality	<input type="radio"/>
Drift	<input type="radio"/>
Explainability	<input checked="" type="checkbox"/>

Import settings

Go to model summary

Quality

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.

Sample size

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

Feedback icon

3. Enter .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 Feedback icon

4. Set minimum and maximum values for the sample size to be analyzed for quality. 100 is chosen for the minimum sample size, and 10000 is chosen for the maximum. 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. Set the maximum sample size to limit the volume of data analyzed.

Minimum sample size (number of transactions)
100

Maximum sample size (number of transactions)
10000

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.

Model info		Quality	Quality threshold
Model details	<input checked="" type="radio"/>	Description	Threshold value: Area under ROC 0.9
Endpoints	<input checked="" type="radio"/>		
Evaluations			
Fairness	<input type="radio"/>	Description	
Quality	<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 .	
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**.

Dashboard / Configure

credit-risk-deploy

Model info

- Model details
- Endpoints

Evaluations

- Fairness
- Quality
- 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

To select the favorable outcomes, click the edit icon.

Sample size

To select the minimum sample size, click the edit icon.

Features to evaluate (0)

Add feature +

?

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

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

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

[Cancel](#) **Next**

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**.

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	Value	Action
<input type="checkbox"/> Sex	88	<input checked="" type="checkbox"/>
<input type="checkbox"/> OthersOnLoan	88	<input type="checkbox"/>
<input type="checkbox"/> CurrentResidenceDuration	81	<input type="checkbox"/>
<input type="checkbox"/> OwnsProperty	88	<input type="checkbox"/>
<input checked="" type="checkbox"/> Age	81	<input checked="" type="checkbox"/>
<input type="checkbox"/> InstallmentPlans	88	<input type="checkbox"/>
<input type="checkbox"/> Housing	88	<input type="checkbox"/>

Cancel Back Next

Fairness

Select the features to monitor

Feature	Value	Action
<input type="checkbox"/> Sex	88	<input checked="" type="checkbox"/>
<input type="checkbox"/> OthersOnLoan	88	<input type="checkbox"/>
<input type="checkbox"/> CurrentResidenceDuration	81	<input type="checkbox"/>
<input type="checkbox"/> OwnsProperty	88	<input type="checkbox"/>
<input checked="" type="checkbox"/> Age	81	<input checked="" type="checkbox"/>
<input type="checkbox"/> InstallmentPlans	88	<input type="checkbox"/>
<input type="checkbox"/> Housing	88	<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.

Select the groups to monitor [Age]

Minimum value: 19 Maximum value: 74

19 25 Add value

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

- 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.

Select the groups to monitor [Age]

Minimum value: 19 Maximum value: 74

26 74 Add value

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

- 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**.

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.

Select the groups to monitor [Age]

Minimum value: 19 Maximum value: 74

26	▼	74	▼	Add value
----	---	----	---	------------------

Set fairness alert threshold [Age]

95

Cancel Back **Next**

- 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**.

Fairness

Specify the monitored groups for [Sex]

Description

Select the groups to monitor.

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.

Select the groups to monitor [Sex]

Enter a value **Add value**

Set fairness alert threshold [Sex]

95

Cancel Back **Save**

- 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 'Fairness' monitor configuration page. On the left, under 'Evaluations', the 'Drift' option is selected and highlighted with a red circle. The main panel displays the 'Fairness' monitor details, including its description and configuration options like 'Favorable outcomes' and 'Sample size'. A 'Features to evaluate' section lists 'Age' with a monitored group of '19-25' and a fairness threshold of '95%'. A blue message icon is visible in the bottom right corner.

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

The screenshot shows the 'Drift' monitor configuration page. Under 'Evaluations', the 'Drift' option is selected and highlighted with a red circle. The main panel displays the 'Drift' monitor details, including its description and configuration options like 'Drift model' (with a red circle around the edit icon) and 'Drift threshold'. A 'Sample size' section is also present. A blue message icon is visible in the bottom right corner.

- 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

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

Drift

Drift threshold

Description

Watson OpenScale will track the degree of change in model accuracy when compared to the accuracy at training time.

For example, if the accuracy of the model tested against the training data is 90% and the drift threshold is set to 5%, the estimated accuracy of the model on incoming transactions must be 85% or greater to avoid a threshold violation.

Testing the model on a sample of the training data set determines the baseline for measuring change. The drift measure will be reported as an estimated value with a specified margin of error. The drift threshold must be 5% or greater.

Drift threshold

10 %

Cancel

Back

Next

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

Drift

Sample size

Description

Ensure that your sample size is large enough to be representative of the requests the deployment receives.

Records are evaluated every three hours. If the number of new records received within three hours exceeds the sample size, the additional records are evaluated as well. If the number of new records received within three hours falls below the sample size, additional records from previous hours are added to meet the required sample size.

Sample size

X

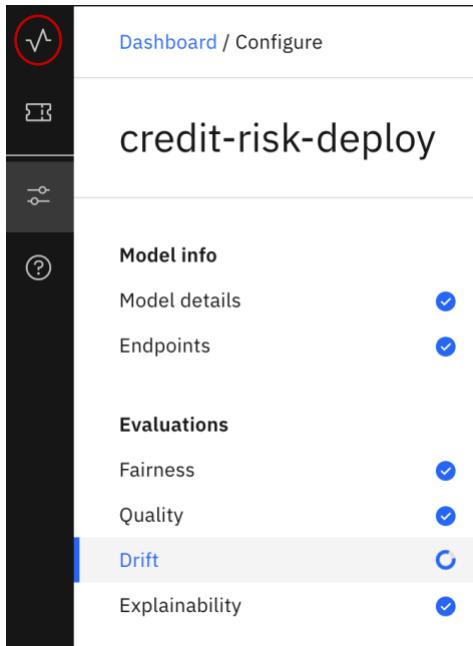
Cancel
Back
Save
Comment

6. This completes the Drift configuration.

Submit Feedback and View Quality Metrics

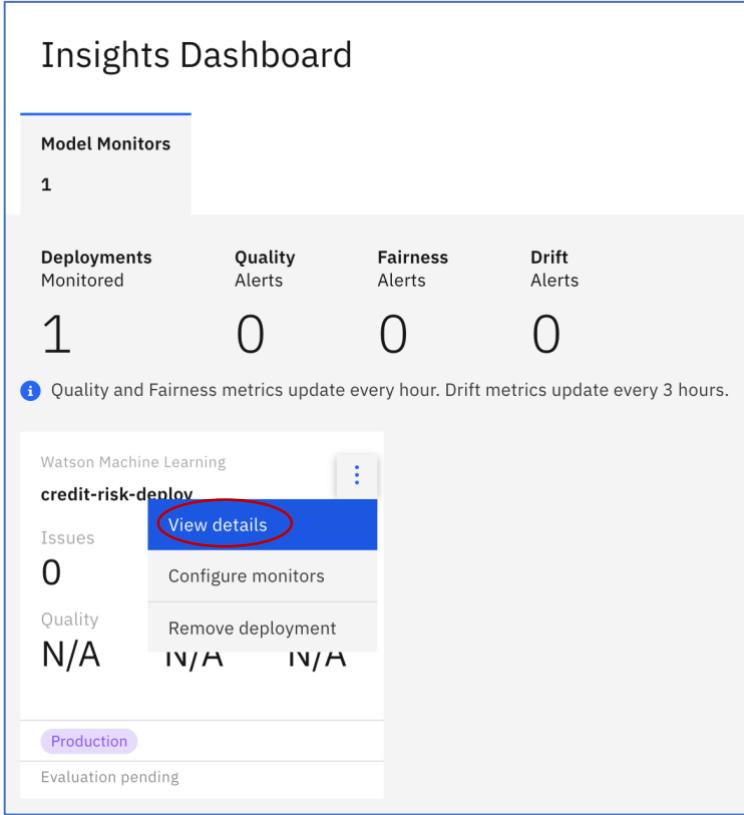
In order to measure quality, scored transactions including human labeled feedback must be provided.

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



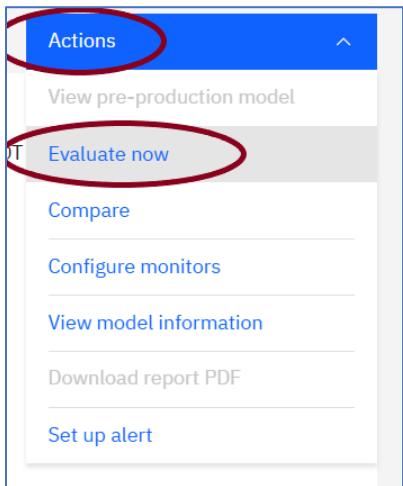
The screenshot shows the Insights Dashboard interface for a model named "credit-risk-deploy". On the left is a sidebar with icons for Dashboard, Model info, Evaluations, Drift, and Explainability. The "Drift" icon is highlighted with a blue bar at the bottom. The main area displays "Model info" with "Model details" and "Endpoints" checked. Under "Evaluations", "Fairness", "Quality", and "Explainability" are listed, while "Drift" is currently selected. The top navigation bar includes "Dashboard / Configure" and a "credit-risk-deploy" title.

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



The screenshot shows the Insights Dashboard with the title "Insights Dashboard". Under "Model Monitors", it says "1". Below that, there are four metrics: Deployments Monitored (1), Quality Alerts (0), Fairness Alerts (0), and Drift Alerts (0). A note below states: "Quality and Fairness metrics update every hour. Drift metrics update every 3 hours." The main section displays deployment details for "Watson Machine Learning credit-risk-deploy". It shows 0 Issues and 0 Quality alerts. Buttons for "View details" (circled in red), "Configure monitors", "Remove deployment", and "Evaluation pending" are present. A "Production" button is also visible.

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**.



The screenshot shows the "Actions" menu. The "Actions" button is highlighted with a red circle. Below it, the "Evaluate now" button is also circled in red. Other options in the menu include "View pre-production model", "Compare", "Configure monitors", "View model information", "Download report PDF", and "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**.

Evaluate now

Description

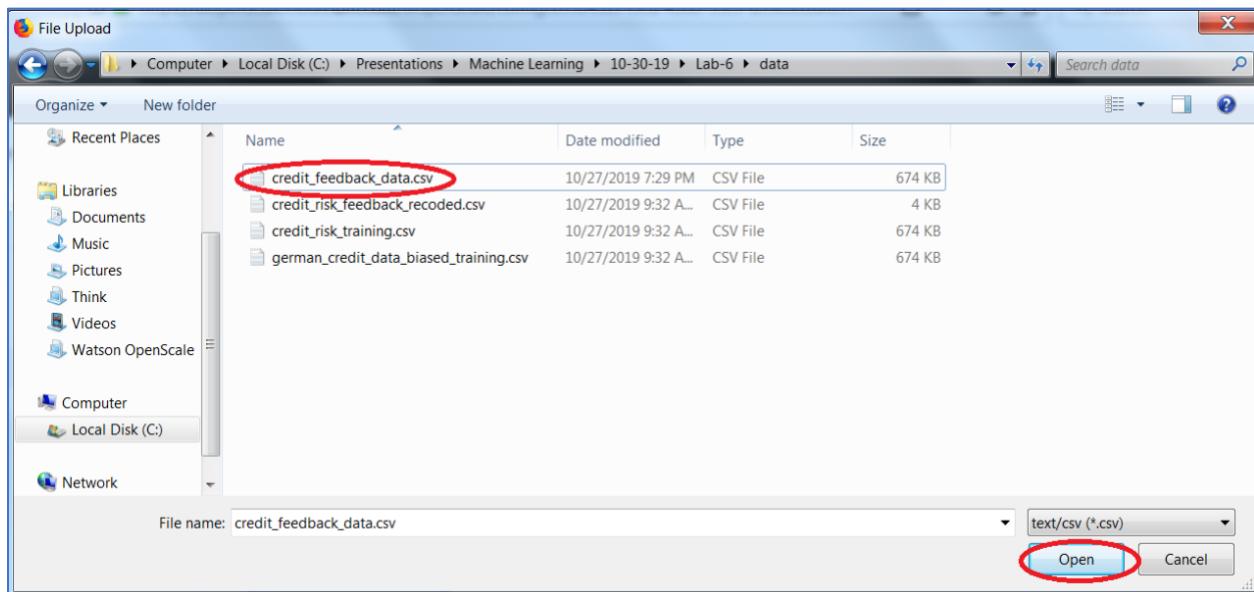
Watson OpenScale evaluates production models for fairness and drift using logged scoring requests received by the model. Scoring requests are logged using the payload logging endpoint. Watson OpenScale evaluates production models for quality using labeled test data. Labeled test data is provided using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

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

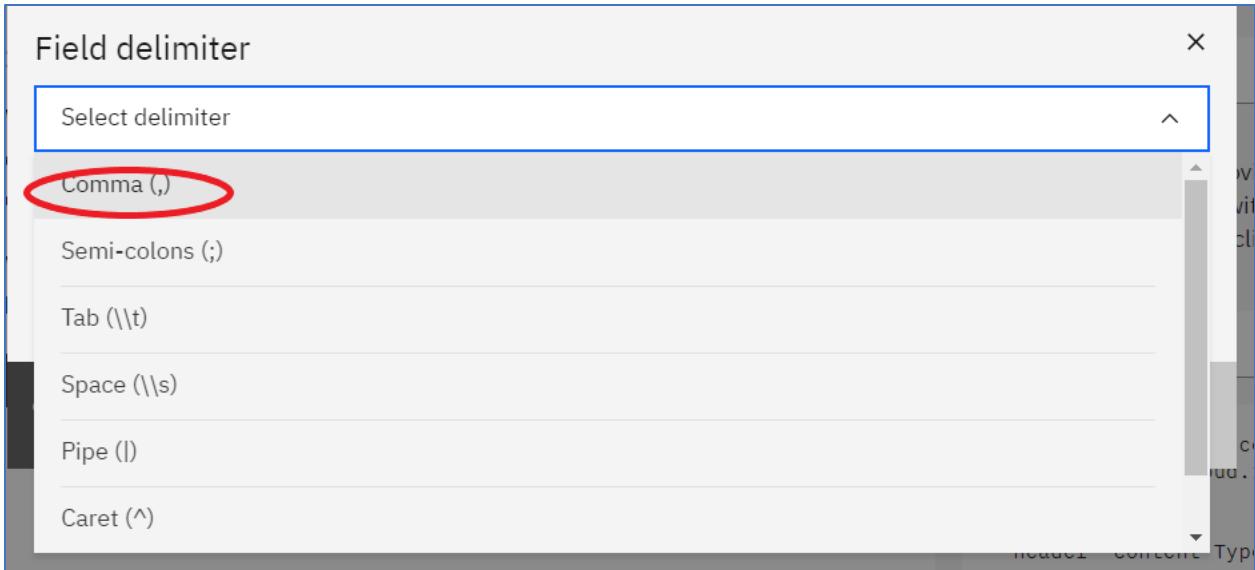
Total records 

Scoring requests	0
Feedback records	0

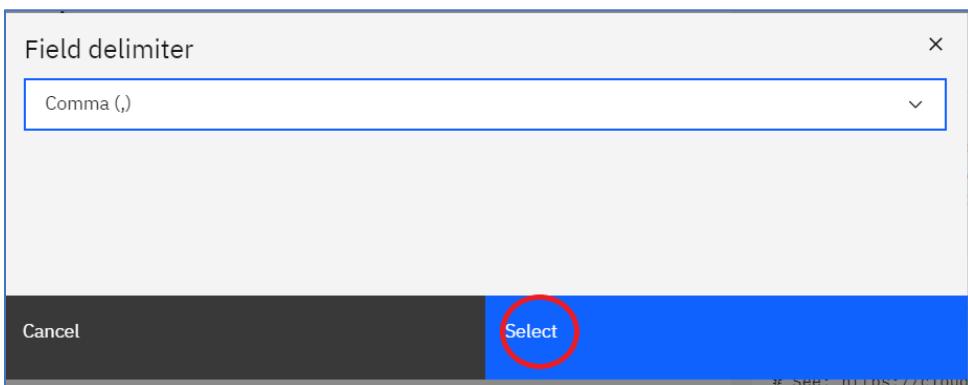
5. Navigate to the feedback file **credit_feedback_data.csv**. Click on **Open**.



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



7. Click Select.



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

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.

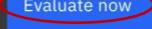
[View endpoints](#)

credit_feedback_data.csv
uploaded successfully [OK](#)

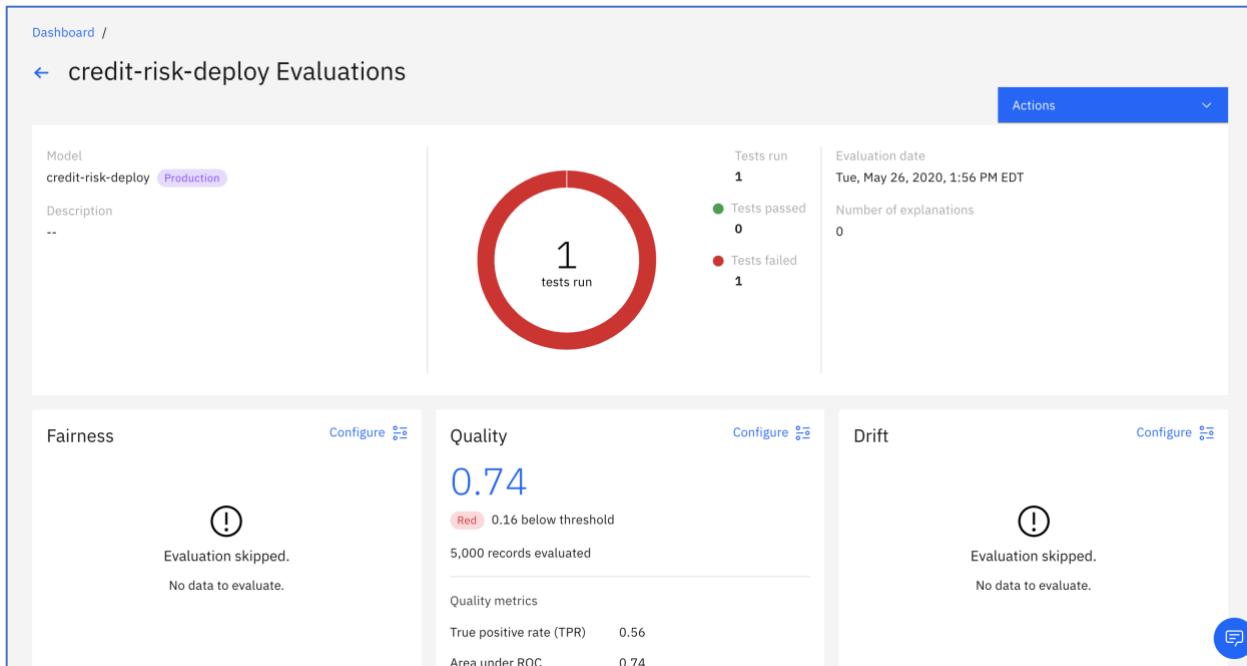
Total records

Scoring requests	0
Feedback records	140

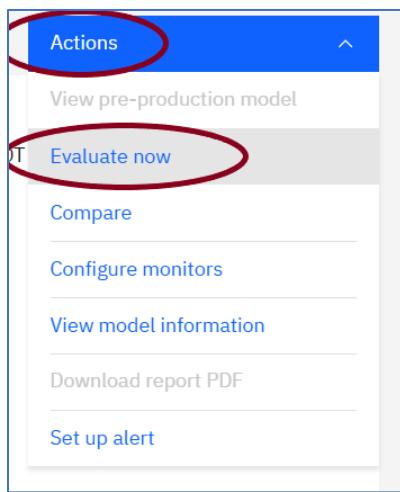
[Cancel](#) **Evaluate now**



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.

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	0
Feedback records	5,000

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

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.

credit-risk-deploy

Overview Implementation **Test**

Enter input data

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

Paste

Predict

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**

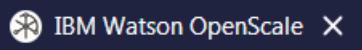
Enter input data

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

Paste

Predict

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.

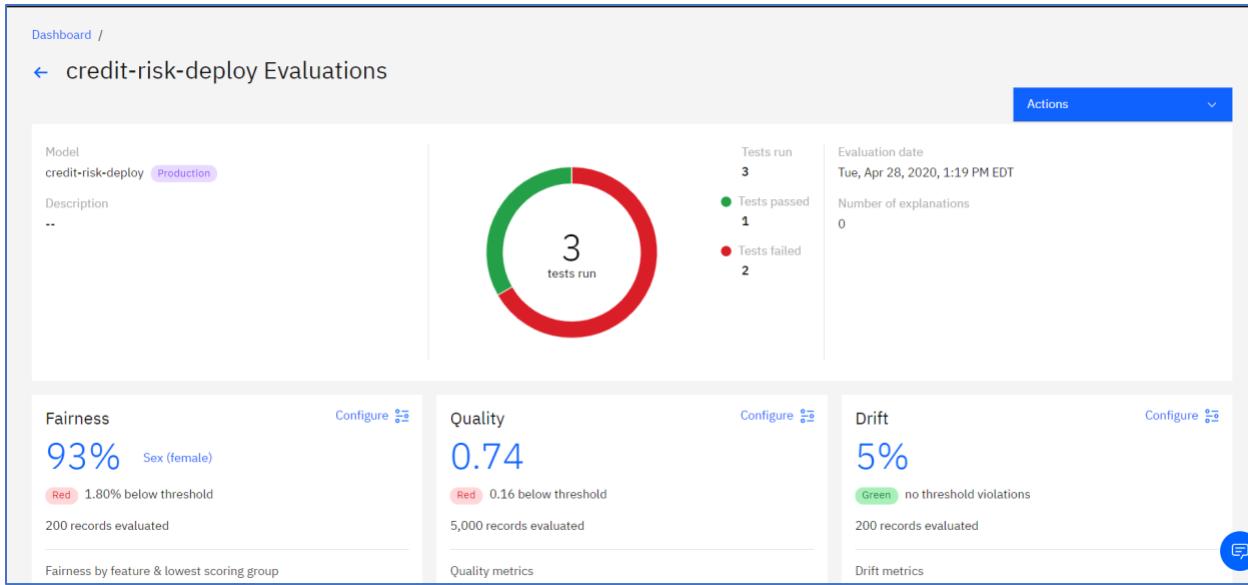
[View endpoints](#) [Upload feedback data](#)

Total records 

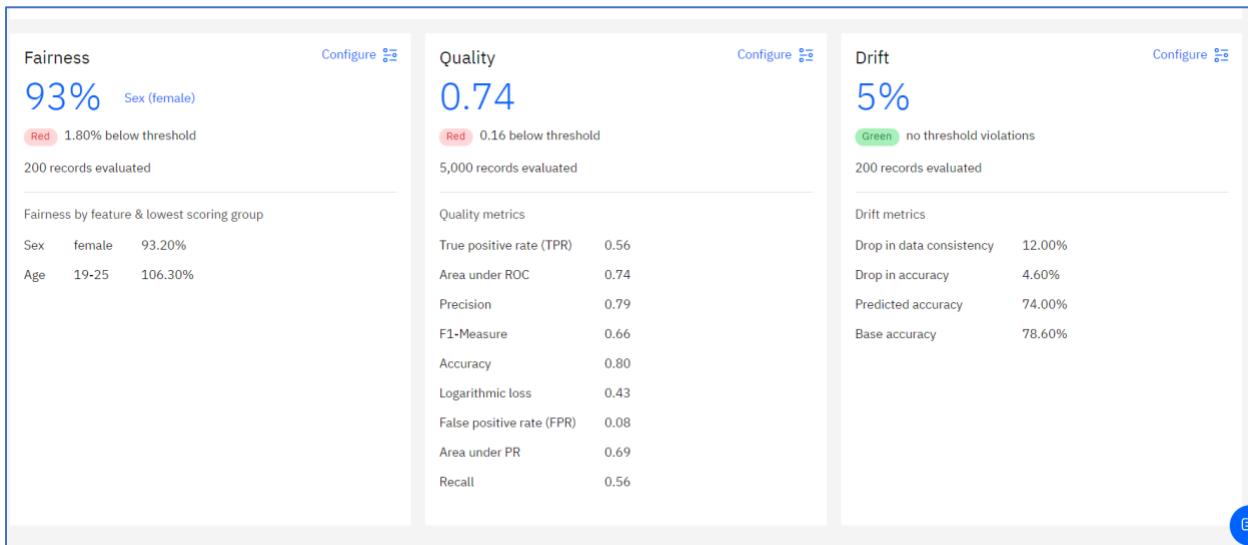
Scoring requests	200
Feedback records	5,000

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

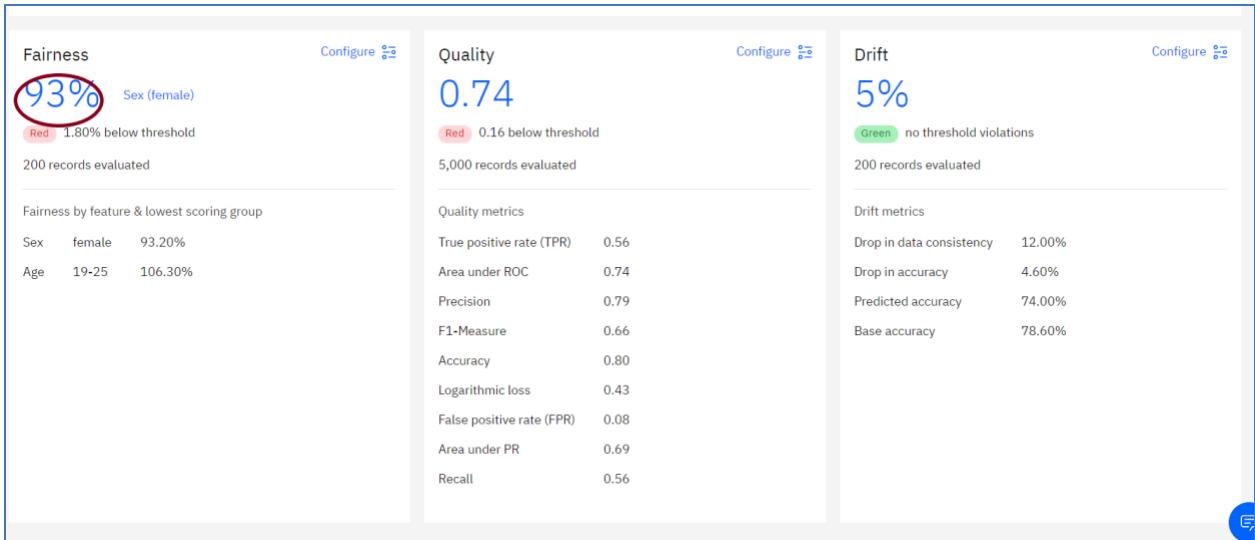
8. Please wait 3-5 minutes for the Evaluations page to display the metrics. Three tests have now been run. The quality test from before, and two new tests. One for fairness, and one for Drift. The fairness test has failed because 93% fairness is lower than our threshold of 95%. The Drift metric passed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



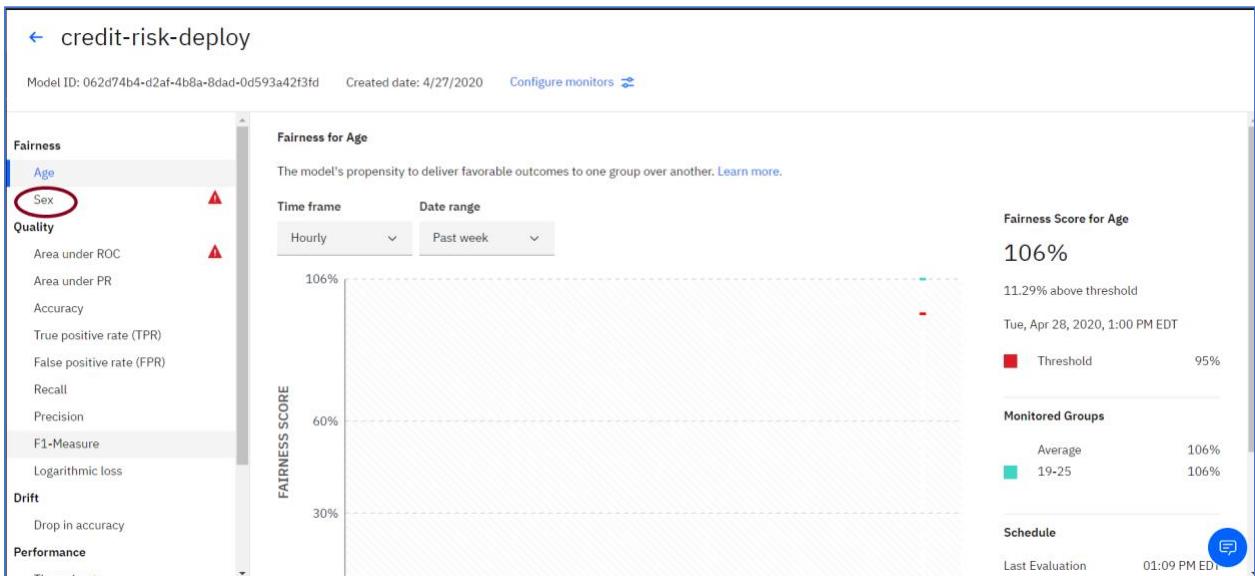
9. Scroll down to see the metric details.



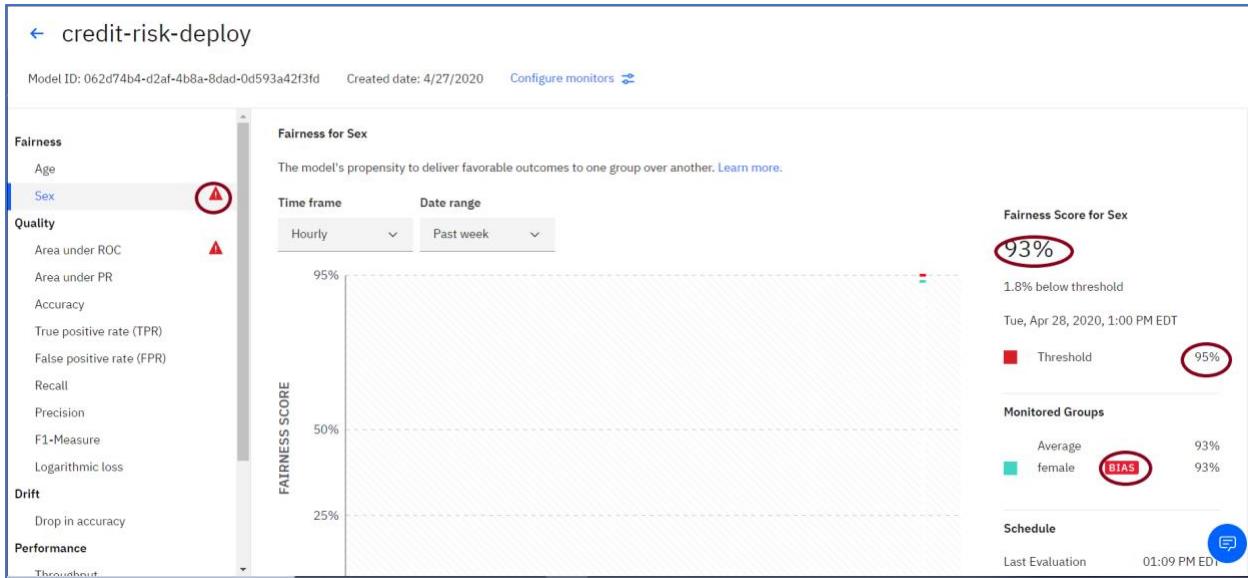
10. Click on the **Fairness** metric.



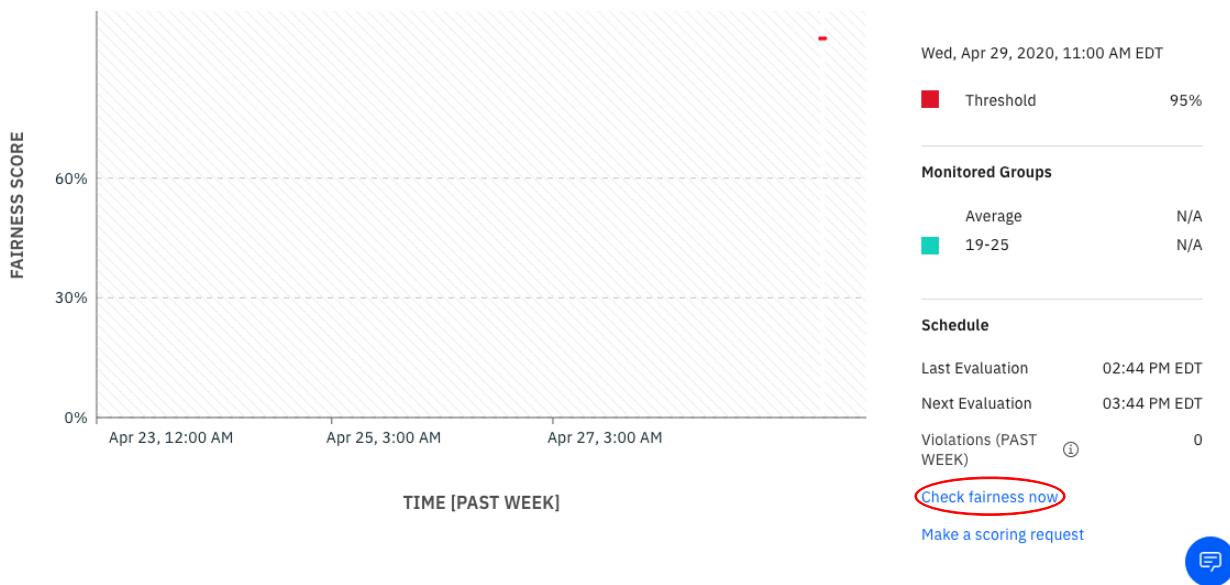
11. The time-series view is displayed. Click on **Sex**.



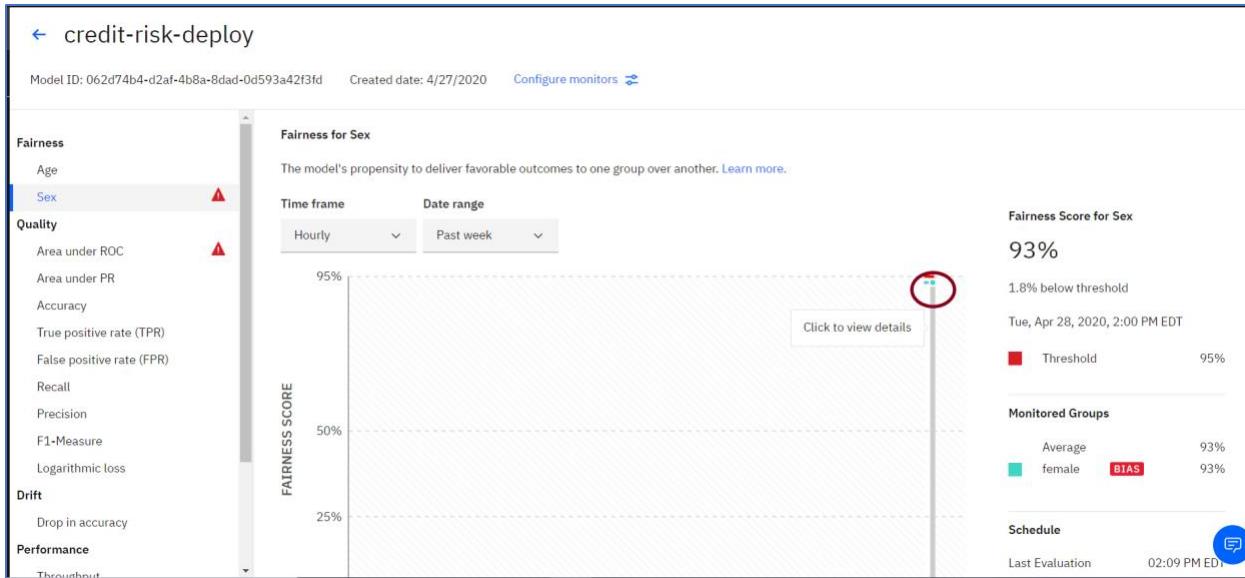
12. A time-series display for the Sex metric is shown. Currently, we have only run one evaluation. We can see the red triangle indicating an alert next to Sex. The Fairness score is listed at 93% which is less than the threshold of 95%.



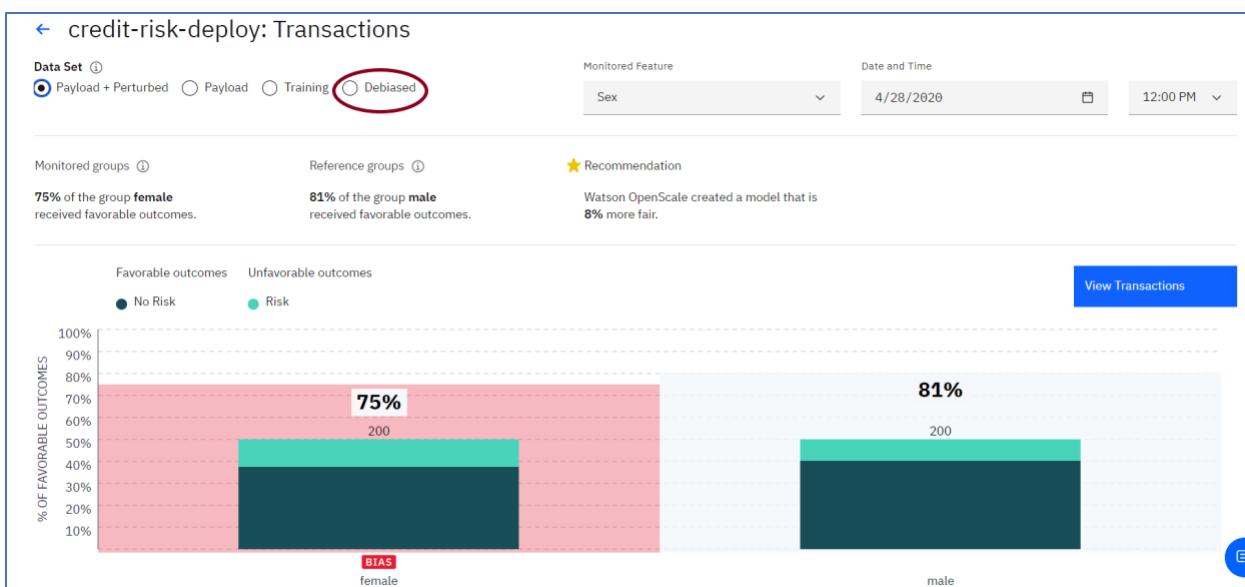
13. Scroll down and click on **Check fairness now**.



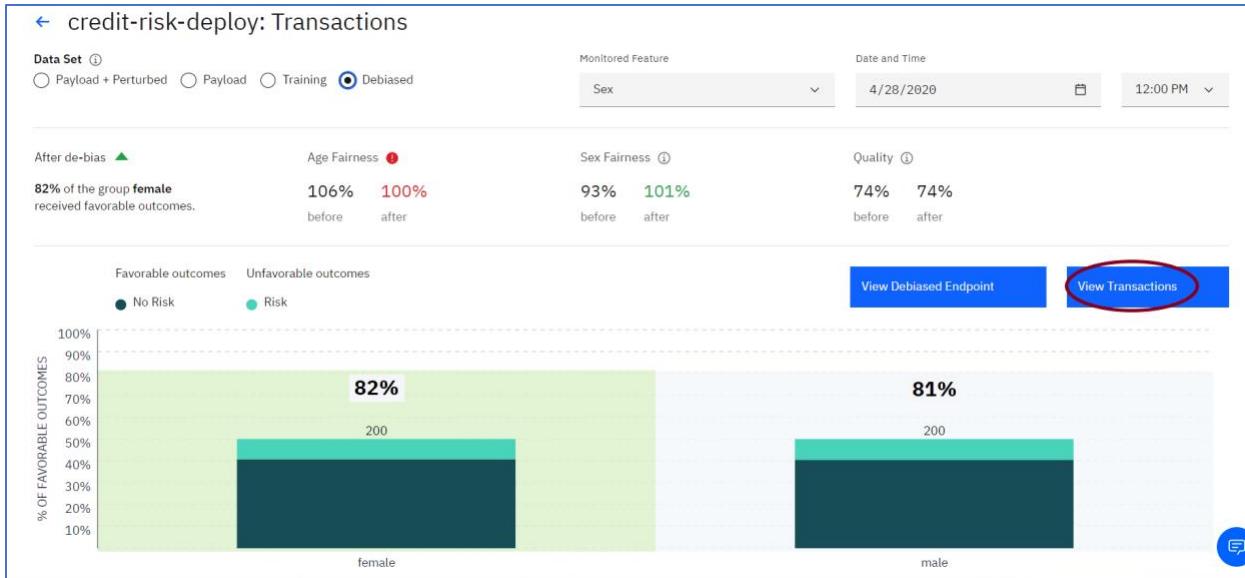
14. Click on the timeline to view details.



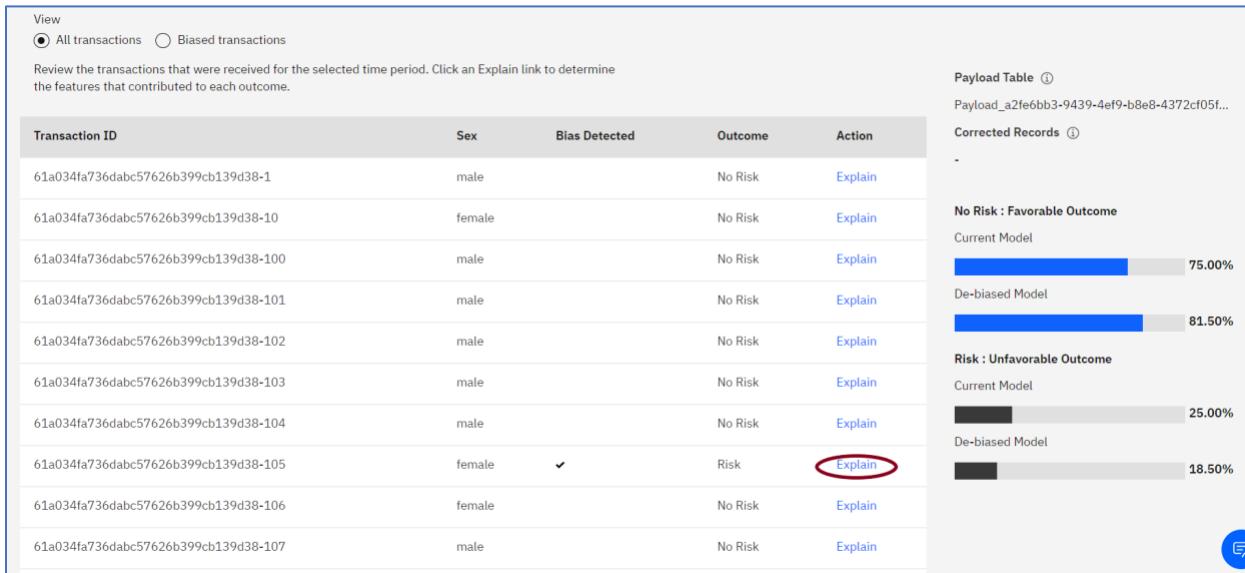
15. The discrepancy between Male and Female results are sufficient to trigger a bias alert.
Click on **Debiased**.



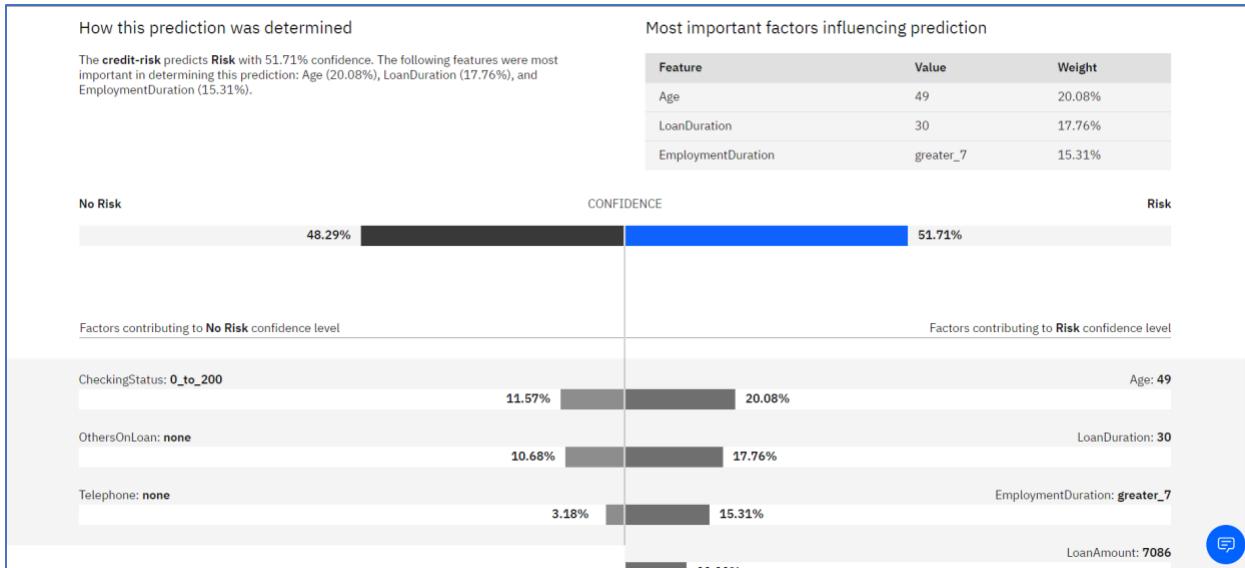
16. The results show that applying a debiasing scheme will reduce the bias to close to zero.
The endpoint for invoking the debiasing algorithm can be obtained by clicking on View Debiased Endpoint. For now, click on **View Transaction** to display a list of transactions.



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.



18. The results show two ways of explaining the prediction. One is using a LIME approach that provides factors “for” and “against” the decision. The second method is called **Contrastive Explanation**. It provides the minimum changes in features that would result in a different decision. It also provides the maximum changes in features that would leave the result the same.
19. The Lime results are shown below.



20. The Contrastive Explanation results are shown below.

← Explain a transaction

61a034fa736dabc57...

Details

Transaction: 61a034fa736dabc57626b399cb139d38-105
Deployment: credit-risk-deploy
Model Name: credit-risk
Type: Original

Minimum changes for No Risk outcome

ExistingCreditsCount: 1.0
LoanAmount: 3238.5
Age: 36.0

Maximum changes allowed for the same outcome

CheckingStatus: 0_to_200
LoanDuration: 30.0
CreditHistory: credits_paid_to_date

21. Click on the Dashboard icon

IBM Watson OpenScale

Need help?

✓ ← Explain a transaction

61a034fa736dabc57...

Details

Transaction: 61a034fa736dabc57626b399cb139d38-105
Deployment: credit-risk-deploy
Model Name: credit-risk
Type: Original

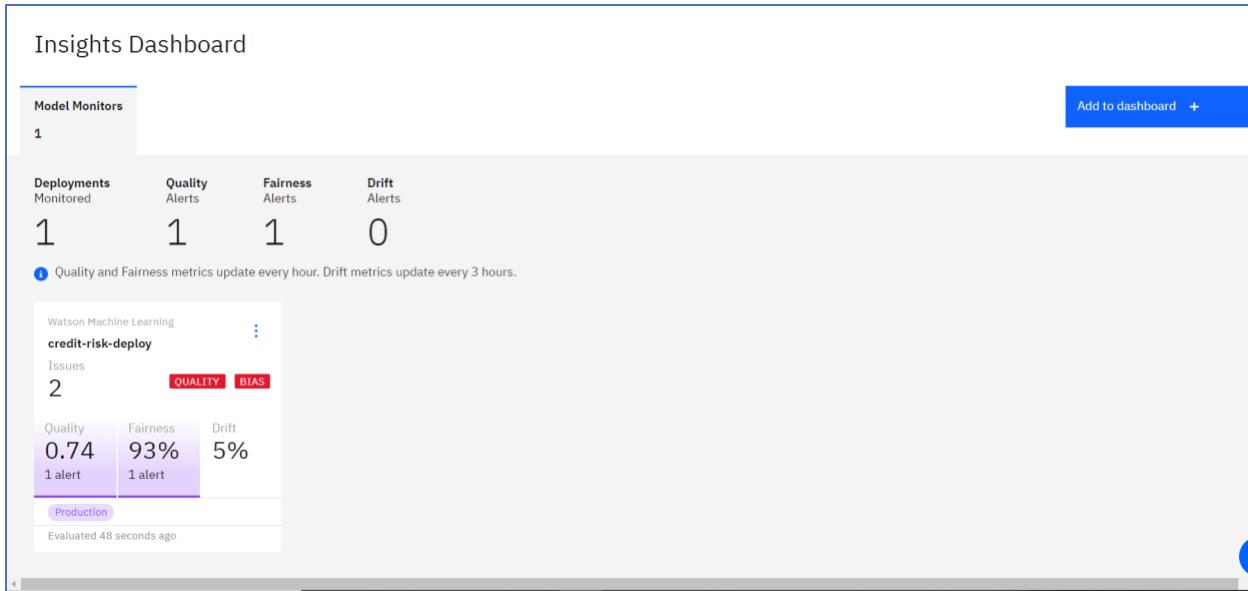
Minimum changes for No Risk outcome

ExistingCreditsCount: 1.0
LoanAmount: 3238.5
Age: 36.0

Maximum changes allowed for the same outcome

CheckingStatus: 0_to_200
LoanDuration: 30.0
CreditHistory: credits_paid_to_date

22. 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.



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.