

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.

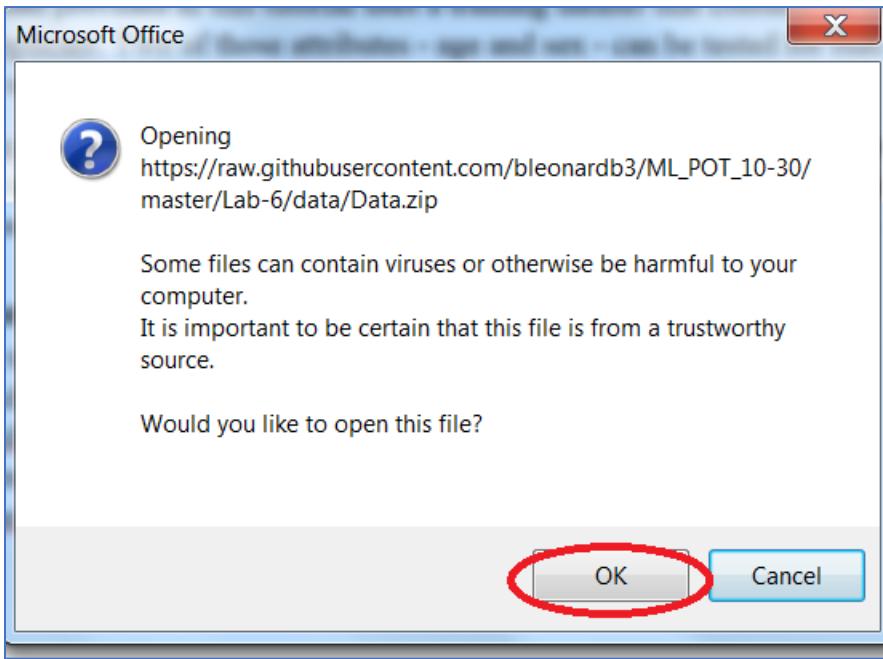
The credit risk model provided in this tutorial uses a training dataset that contains 20 attributes about each loan applicant. Two of those attributes - age and sex - can be tested for bias. For this tutorial, the focus will be on bias against sex and age.

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](#).

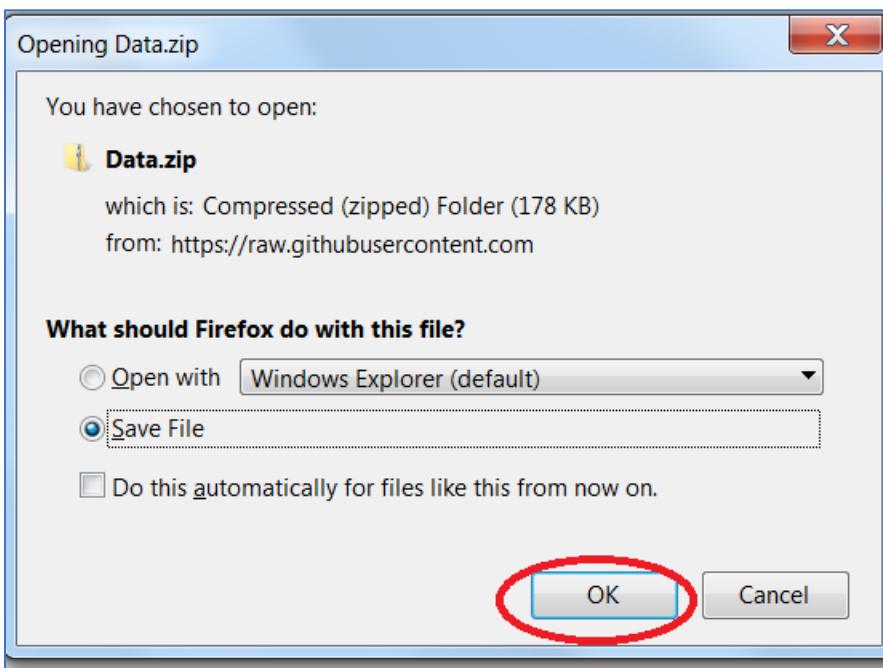
Download the Lab Files

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

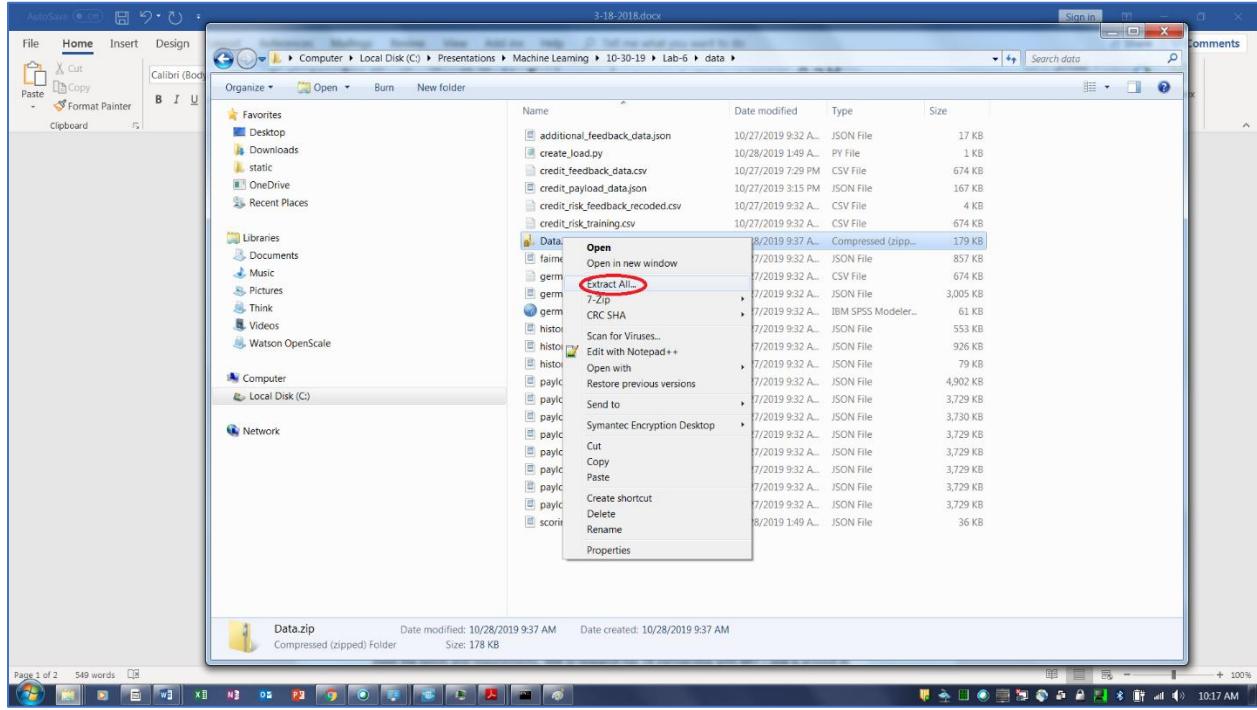
2. Click **OK**. Note your browser may not prompt this message.



3. Click **OK**.



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

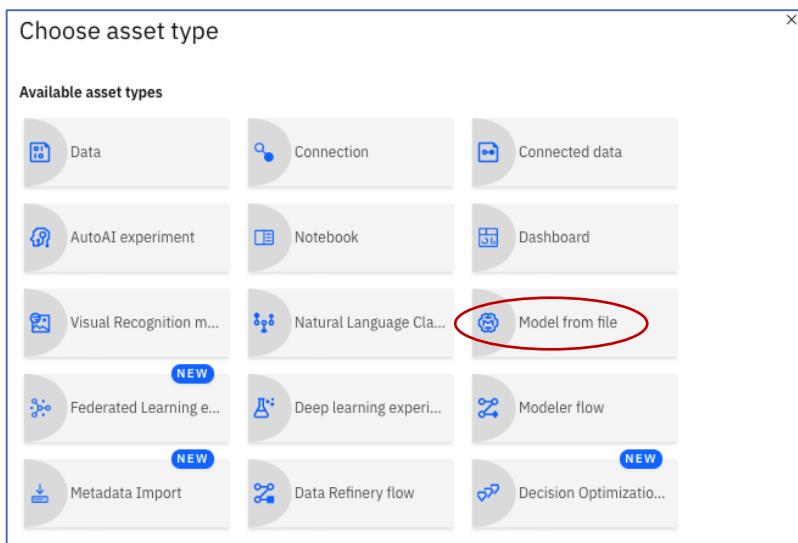


Import the Credit Risk Model

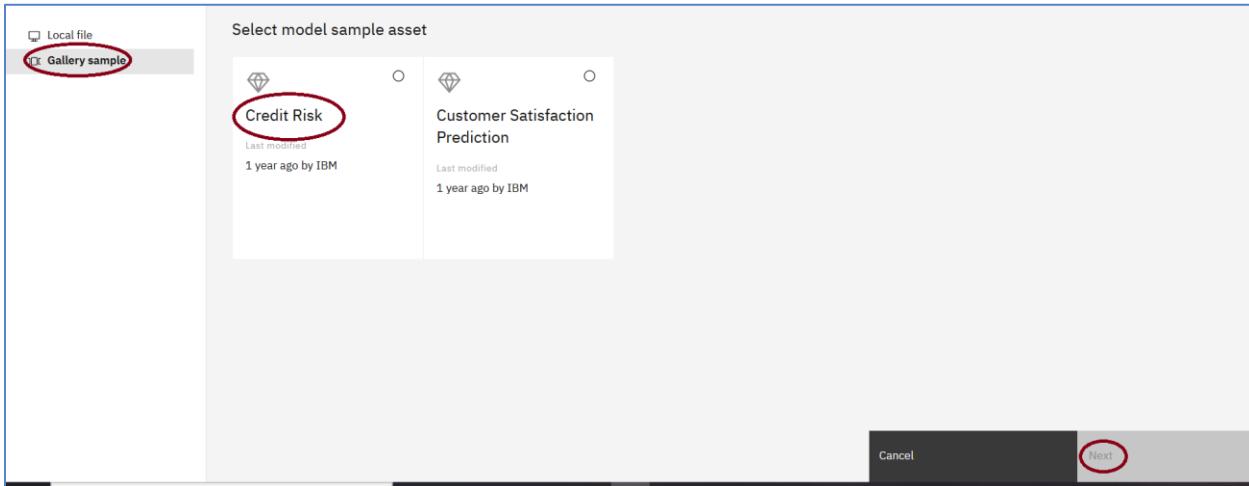
- From the Watson Studio project, click on **Add to project**.



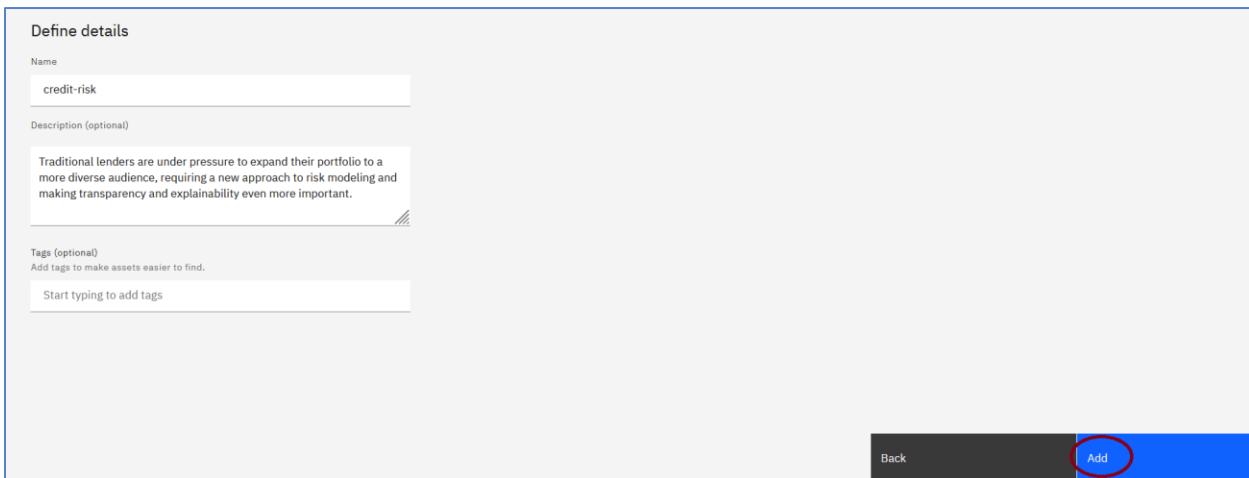
- Click on **Model from file**.



3. From the **Add asset Model** page, click on **Gallery sample**, click on **Credit Risk**, click on **Next**.

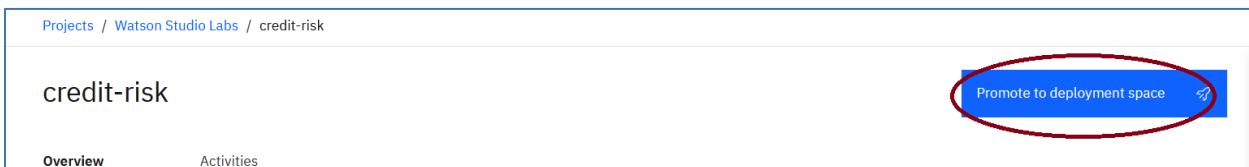


4. Click **Add**.



Deploy the Credit Risk Model

1. Click **Promote to deployment space**.



2. Click on **AutoAI Deployment Space** for the Target space, check “**Go to the model in the space after promoting it**,” and click **Promote**.

Target space

AutoAI Deployment Space

Why don't I see all of my spaces? ⓘ

Go to the model in the space after promoting it

Selected assets (1)

Asset name	Format
credit-risk	Model

Description (optional)

Description of assets

Cancel Promote

3. Click New deployment.

Deployments / AutoAI Deployment Space /

credit-risk

New deployment

Deployments Model details

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

Create a deployment

Associated asset
credit-risk

Deployment type

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

Batch
Run the model against data as a batch process.

Name

credit-risk-deploy

Description

Deployment description

Tags

Add tags to make assets easier to find.

Cancel Create

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

credit-risk

Create deployment ⚙

Deployments Schema

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

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

credit-risk

Create deployment ⚙

Deployments Schema

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

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

Deployments / Watson Studio Labs / credit-risk / credit-risk-deploy

credit-risk-deploy Deployed Online

API reference Test

Direct link

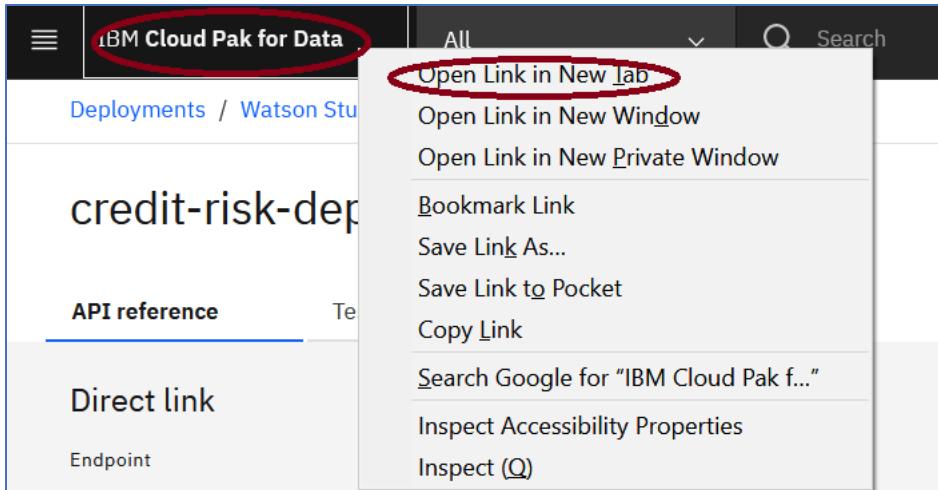
Endpoint <https://us-south.ml.cloud.ibm.com/ml/v4/deployments/f38f4e1c-faf7-46c7-b4b1-2c3a6b502f39/predict> Bearer <token> ⓘ

Code snippets

CURL Java JavaScript Python Scala

Begin OpenScale Configuration

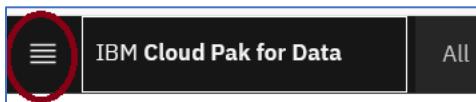
1. Right-click on **IBM Cloud Pak for Data**. Click on **Open Link in New Tab**.



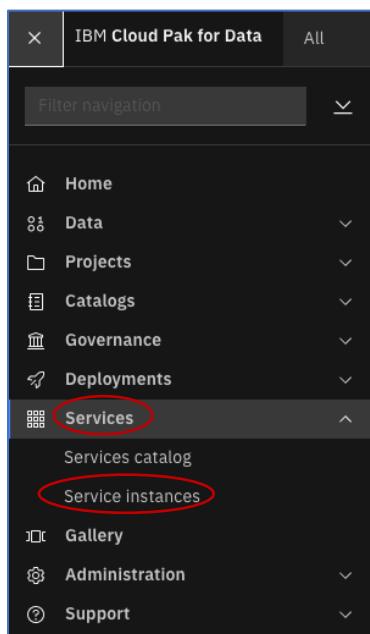
2. Click on the new **IBM Cloud Pak for Data** browser tab.



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



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



5. Click the box to the right of your OpenScale instance. Login again if required.

Service instances

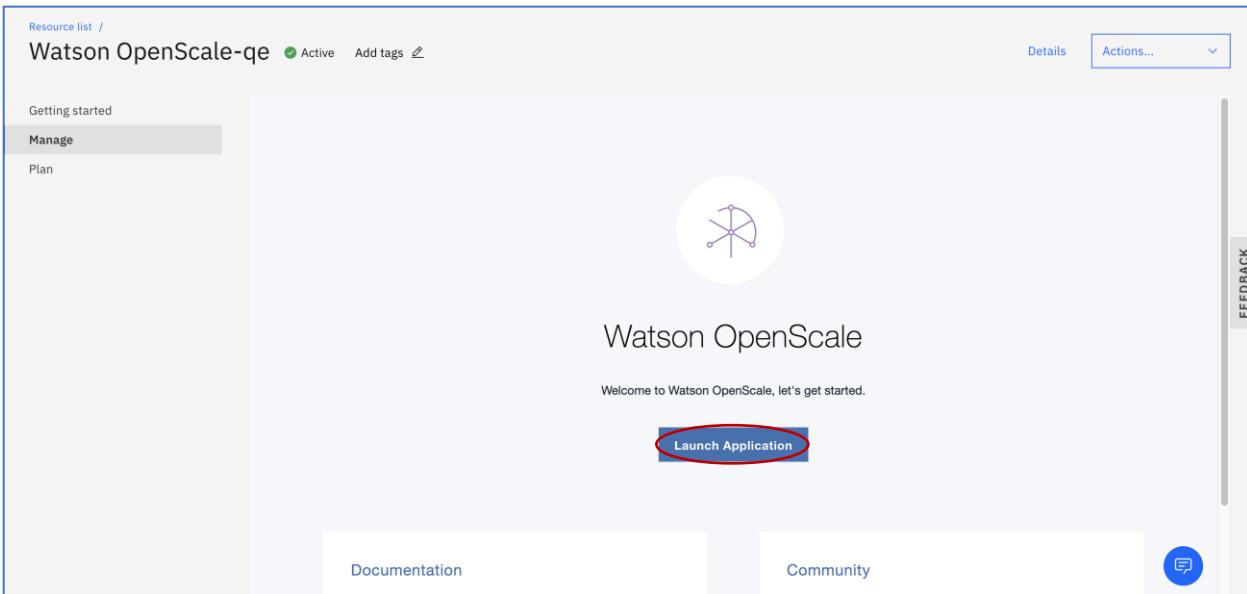
To upgrade a service plan, first [upgrade](#) your IBM Cloud account. Then choose **Upgrade service** or **Manage in IBM Cloud** from the menu in the service's row.

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

Find service instances

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

6. Click on **Launch Application**.



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 

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

Model evaluation

Maintain the health of AI models in preproduction and production environments by measuring model quality, fairness, and drift in both data and accuracy.

Increase AI model transparency by explaining model transactions

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

Manual setup Auto setup

Setup System

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

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

System setup

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

Database	Required	Database type
Machine learning providers		
Integrations (optional)		
	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>	
		<input type="button" value="Choose an option"/> Free lite plan database Compose for PostgreSQL Databases for PostgreSQL Db2

4. Click Save.

System setup

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

Database	Required	Database type
Machine learning providers		
Integrations (optional)		
	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>	
		<input type="button" value="Free lite plan database"/> Purchase a database
		<input type="button" value="Cancel"/> <input type="button" value="Save"/> <input type="button" value="Help"/>

5. Click on Machine learning providers.

System setup

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

Database	Required	Database
<input checked="" type="checkbox"/> Machine learning providers		
Integrations (optional)		
	Database	
	Description	
	The Watson OpenScale database stores your model transactions and model evaluation results.	
		<input type="button" value="Database"/> Database type Free lite plan database Database Internal database Schema public

6. Click on Add machine learning provider.

System setup

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

Database	Required
Machine learning providers	Watson OpenScale connects to deployed models stored in a machine learning environment.
Integrations (optional)	

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	Required
Machine learning providers	Back to all providers
Integrations (optional) <i>beta</i>	

New provider

Description [Edit](#)

Click edit to enter the provider description.

Connection

Click edit to enter the connection information.

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

Service provider

Watson Machine Learning (V2)

Deployment space

AutoAI Deployment Space

Adding a Watson Machine Learning (V2) service?
If you experience a failure trying to add a new Watson Machine Learning (V2) service instance, visit our [Support channel](#) or [Stack Overflow](#) for help.

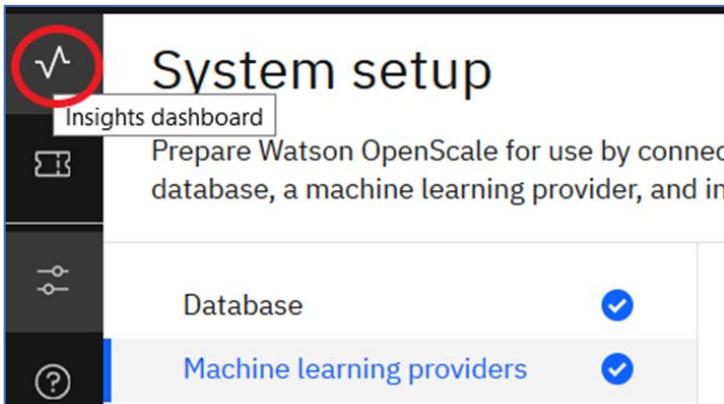
Environment type

Pre-production Production

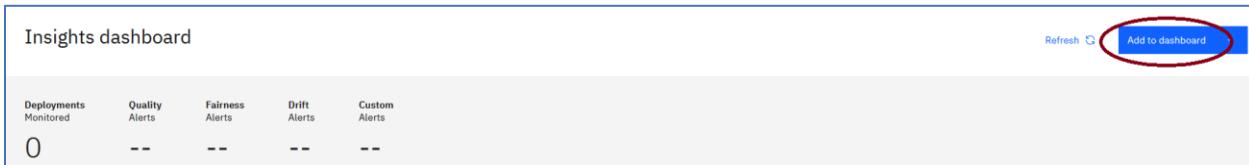
Missing a deployment space?
Ask the deployment space administrator to add you as a collaborator. Only spaces associated with a Watson Machine Learning (V2) instance will appear. Need to connect to a Watson Machine Learning (V1) instance? Use the [API](#).

Cancel **Save**

9. Click on the  icon.

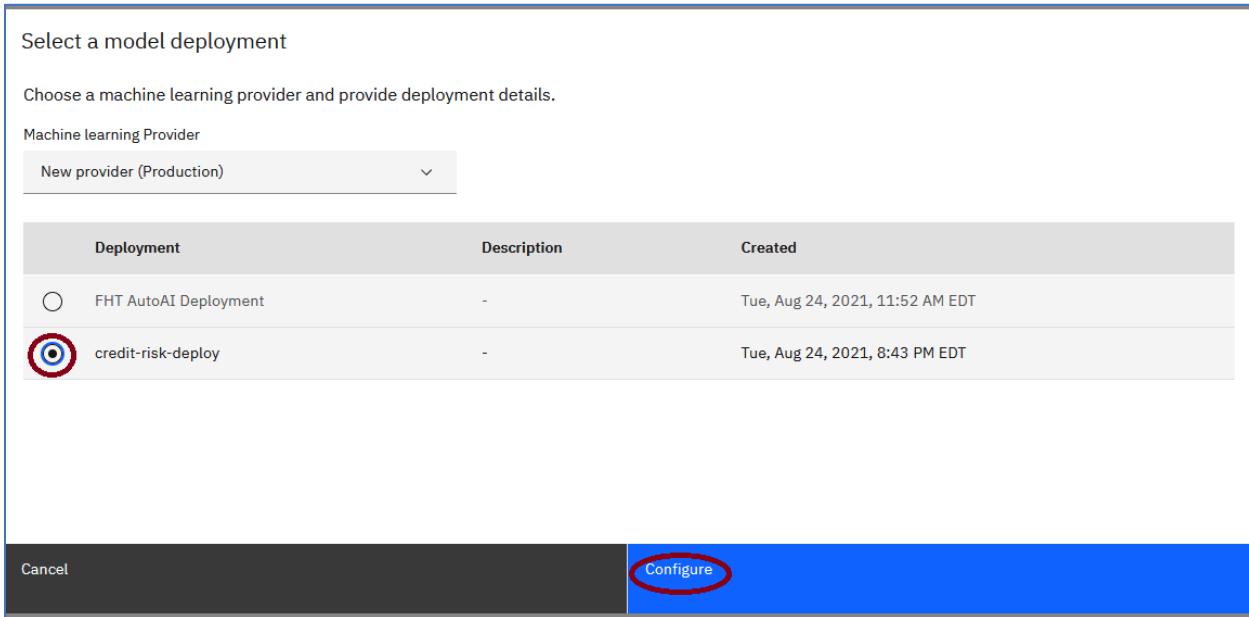


10. Click on **Add to dashboard** to add a deployment to monitor.



The screenshot shows the 'Insights dashboard' page. At the top right is a red circle with a blue 'Add to dashboard' button. Below it is a table with columns: Deployments Monitored, Quality Alerts, Fairness Alerts, Drift Alerts, and Custom Alerts. The first column shows 0 monitored deployments.

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

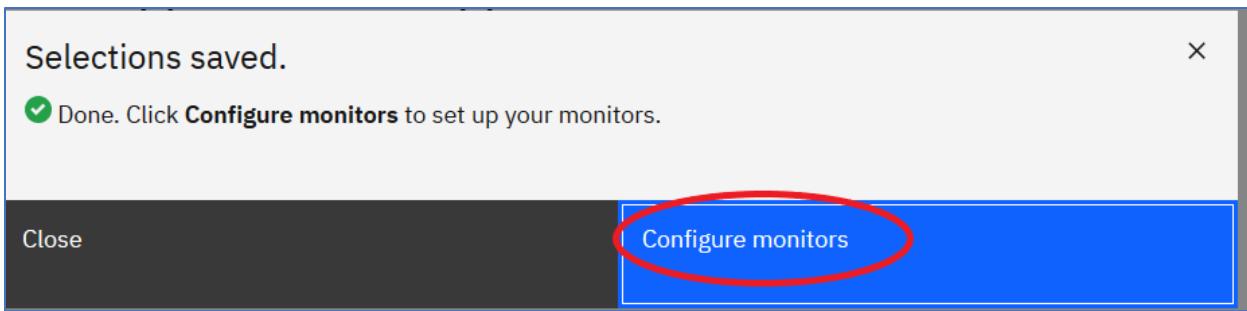


The screenshot shows a modal dialog titled 'Select a model deployment'. It asks to choose a machine learning provider and provides a dropdown menu with 'New provider (Production)'. Below is a table listing two deployments:

Deployment	Description	Created
FHT AutoAI Deployment	-	Tue, Aug 24, 2021, 11:52 AM EDT
credit-risk-deploy	-	Tue, Aug 24, 2021, 8:43 PM EDT

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

12. Click on **Configure monitors**.



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

Score Data

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

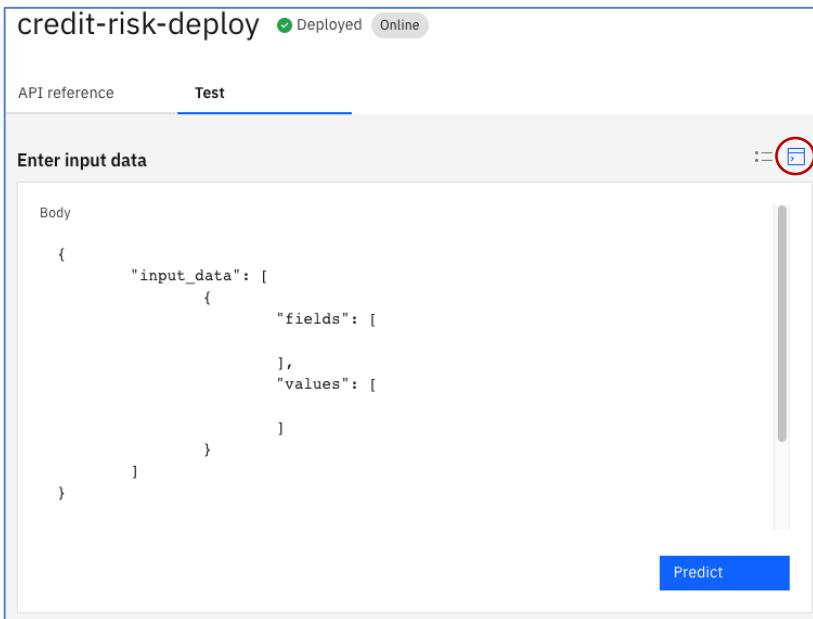
1. Return to the tab from earlier that shows your deployed credit-risk model.

A screenshot of the Watson Studio deployment details page for "credit-risk-deploy". It shows the endpoint URL: `https://us-south.ml.cloud.ibm.com/ml/v4/deployments/f38f4e1c-faf7-46c7-b4b1-2c3a6b502f39/predict`. The "Test" tab is highlighted with a red circle.

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

A screenshot of the Watson Studio deployment test page for "credit-risk-deploy". The "Test" tab is highlighted with a red circle. The endpoint URL is shown again: `https://us-south.ml.cloud.ibm.com/ml/v4/deployments/f38f4e1c-faf7-46c7-b4b1-2c3a6b502f39/predict`.

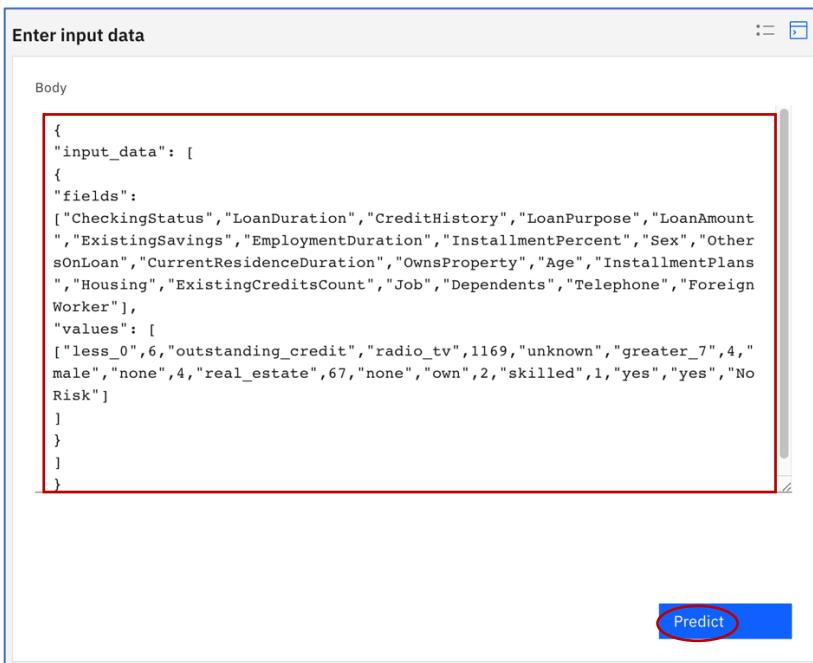
3. Click on the  icon to accept input as JSON.



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

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

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



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

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

5. The results should appear as below.

The screenshot shows the 'Test' tab of the 'credit-risk-deploy' API interface. On the left, under 'Enter input data', there is a code editor window containing a JSON object. The 'Body' section of the JSON is as follows:

```
Body
{
  "input_data": [
    {
      "fields": [
        "CheckingStatus", "LoanDuration", "CreditHistory", "LoanPurpose", "LoanAmount",
        "ExistingSavings", "EmploymentDuration", "InstallmentPercent", "Sex", "OthersOnLoan",
        "CurrentResidenceDuration", "OwnsProperty", "Age", "InstallmentPlans",
        "Housing", "ExistingCreditsCount", "Job", "Dependents", "Telephone", "ForeignWorker"
      ],
      "values": [
        ["less_0", 6, "outstanding_credit", "radio_tv", 1169, "unknown", "greater_7", 4, "male", "none", 4, "real_estate", 67, "none", "own", 2, "skilled", 1, "yes", "yes", "NoRisk"]
      ]
    }
  ]
}
```

Below the code editor is a blue 'Predict' button. To the right, under 'Result', is a code editor window displaying the JSON response. The response is a single object with a 'predictions' key containing an array of fields:

```
0 {
  "predictions": [
    {
      "fields": [
        "CheckingStatus",
        "LoanDuration",
        "CreditHistory",
        "LoanPurpose",
        "LoanAmount",
        "ExistingSavings",
        "EmploymentDuration",
        "InstallmentPercent",
        "Sex",
        "OthersOnLoan",
        "CurrentResidenceDuration",
        "OwnsProperty",
        "Age",
        "InstallmentPlans",
        "Housing",
        "ExistingCreditsCount",
        "Job",
        "Dependents",
        "Telephone",
        "ForeignWorker",
        "CheckingStatus_IX",
        "CreditHistory_IX"
      ]
    }
  ]
}
```

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' section of the Watson OpenScale configuration interface. It includes a 'Model details' summary, a 'Description' section with a note about training data and model output, and a 'Model input' section with an edit icon circled in red.

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.

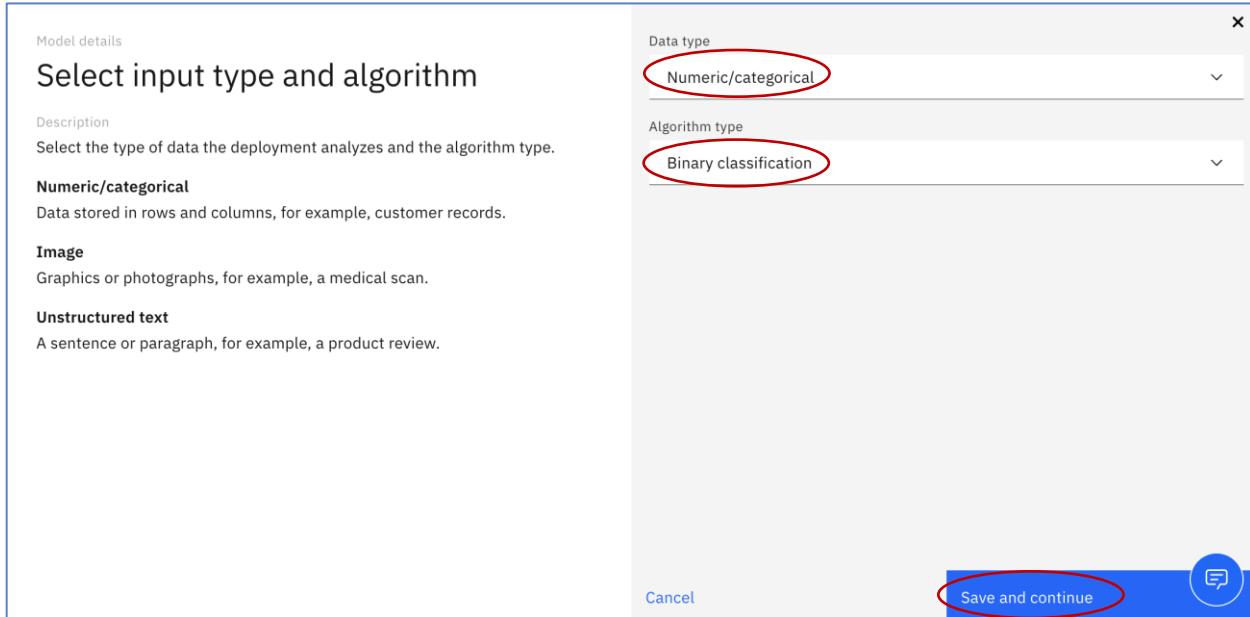
Model input

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

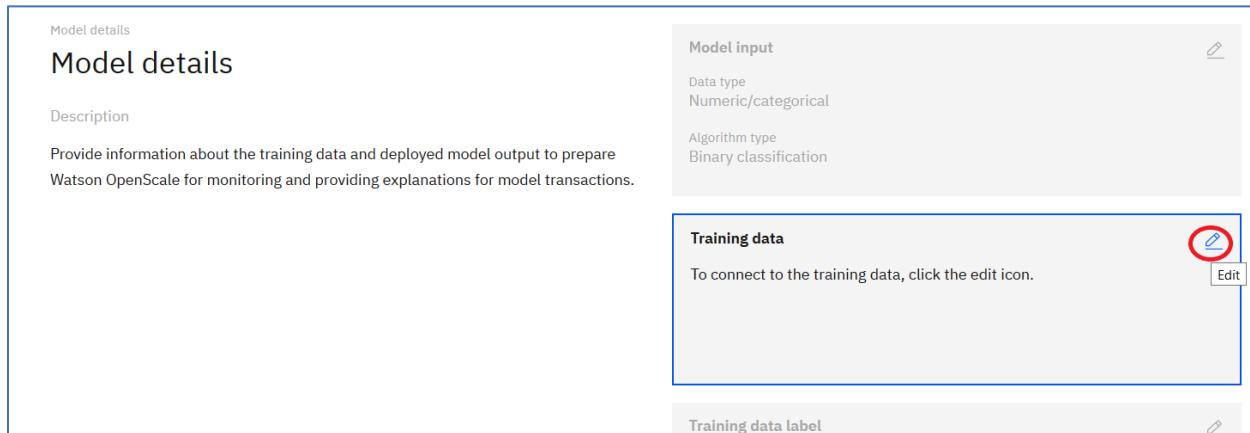
Model transaction

Model transaction
Successful

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



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



- Select **Database or Cloud Storage** as the **Storage type**, click **Cloud Object Storage** as the **Location**.
- Copy and paste the following text as the **resource_id**:

43bf01a8-03e1-4a1e-8c1a-1cc77e31657f

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

U79XrAvJ6HUBBfmmFo_0_CjdhfRW3Qr5D9-ygfZ-kq5n

8. Click **Connect**

Storage type
Database or cloud storage

Location
Cloud Object Storage

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

API key
.....

Connect

9. Select **a3-trainingdata** as the bucket, select **german_credit_data_biased_training.csv** as the Data set, and click **Next**.

Storage type: Database or cloud storage

Location: Cloud Object Storage

Resource instance ID: 43bf01a8-03e1-4a1e-8c1a-1cc77e31657f

API key: [REDACTED]

Bucket: a3-trainingdata

Data set: german_credit_data_biased_training.csv

Cancel Next

10. 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.

Select the label column

Features (1)	Type
Risk	[REDACTED]

Cancel Back Next

11. 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

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

Model details

Examining model output

Description

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

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

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

Scoring method

Automatic logging

Logging is active Click Next

Cancel Back Next

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

Model details

Specify model output details

Description

Select the prediction column

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

Select the prediction probability column

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

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

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

Cancel Back Save

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

Configure Quality

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

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

Dashboard / Configure

credit-risk-deploy

Model info	
Model details	<input type="radio"/>
Endpoints	<input checked="" type="radio"/>
Evaluations	<input type="radio"/>
Fairness	<input type="radio"/>
Quality	<input checked="" type="radio"/>
Drift	<input type="radio"/>
Explainability	<input type="radio"/>
Import settings	
Go to model summary	

Model details

Description

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

Model input

Data type: Numeric/categorical
Algorithm type: Binary classification

Training data

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

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

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

Description

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

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

Quality threshold

To select quality threshold values, click the edit icon.

Sample size

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

Feedback icon

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

Quality

Quality threshold

Description

Area under ROC

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

Additional quality metrics captured for this model include:

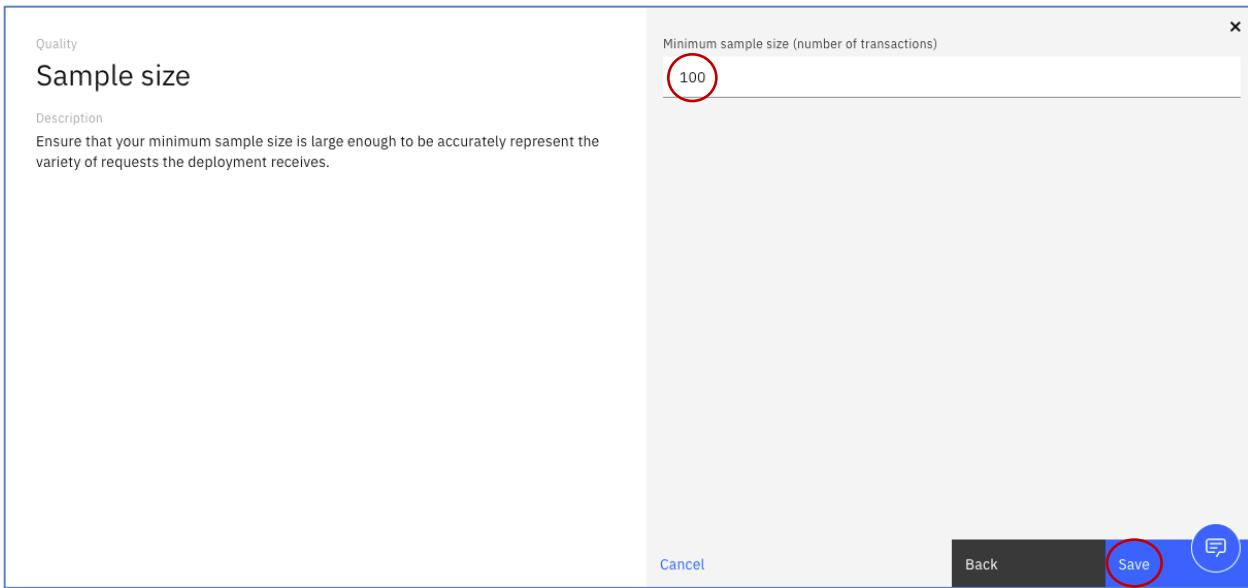
- Area under PR
- Accuracy
- True positive rate (TPR)
- False positive rate (FPR)
- Recall
- Precision
- F1-Measure
- Logarithmic loss

Threshold value: Area under ROC

0.9

Cancel Next Feedback icon

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.

A screenshot of the "Model info" page for a deployment named "credit-risk-deploy". On the left, there is a sidebar with sections like "Model details", "Endpoints", "Evaluations" (which is expanded), and "Import settings". Under "Evaluations", the "Fairness" option is selected and circled in red. The main content area shows two configurations: "Quality" and "Sample size". The "Quality" section has a threshold of 0.9 and a sample size of 100. The "Sample size" section has a minimum of 100 and a maximum of 10,000. A message icon is at the bottom right.

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**. 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	A ↗	<input checked="" type="checkbox"/>
<input type="checkbox"/> OthersOnLoan	A ↗	
<input type="checkbox"/> CurrentResidenceDuration	80	
<input type="checkbox"/> OwnsProperty	A ↗	
<input checked="" type="checkbox"/> Age	80	<input checked="" type="checkbox"/>
<input type="checkbox"/> InstallmentPlans	A ↗	
<input type="checkbox"/> Housing	A ↗	

Cancel Back Next

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

Fairness

Specify the monitored groups for [Age]

Description

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

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

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

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

Recommended groups

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

Select the groups to monitor [Age]

Minimum value: 19	Maximum value: 74	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]

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	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]

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
<input type="button" value="Add value"/>	

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

- 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]

<input type="text" value="Enter a value"/>	<input type="button" value="Add value"/>
--	--

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

- 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 like ones that the model was not able to accurately evaluate in the training data.

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

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

The screenshot shows the 'credit-risk-deploy' configuration page. On the left, under 'Evaluations', the 'Fairness' checkbox is checked, while 'Drift' is circled with a red circle and has an unselected radio button next to it. The main panel displays the 'Fairness' monitor configuration, which includes a 'Description' section and a 'Favorable outcomes' section. The 'Favorable outcomes' section lists 'No Risk' and 'Risk'. A 'Sample size' section indicates a minimum sample size of 200. The top navigation bar shows 'Dashboard / Configure'.

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

The screenshot shows the 'credit-risk-deploy' configuration page. Under 'Evaluations', the 'Drift' checkbox is unselected and circled with a red circle. The main panel displays the 'Drift' monitor configuration, which includes sections for 'Drop in accuracy' (structured binary and multi-class classification models only) and '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 'Drift model' section is present with a note: 'To select a drift model training option, click the edit icon.' A red circle highlights the edit icon in this section. A 'Drift threshold' section and a 'Sample size' section are also shown. The top navigation bar shows 'Dashboard / Configure'.

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

Drift

Train a drift model

Description

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

Train in Watson OpenScale

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

Train in a data science notebook

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

Training option

Train in Watson OpenScale

Train in a data science notebook

Cancel Next ?

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

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 ?

5. 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

200

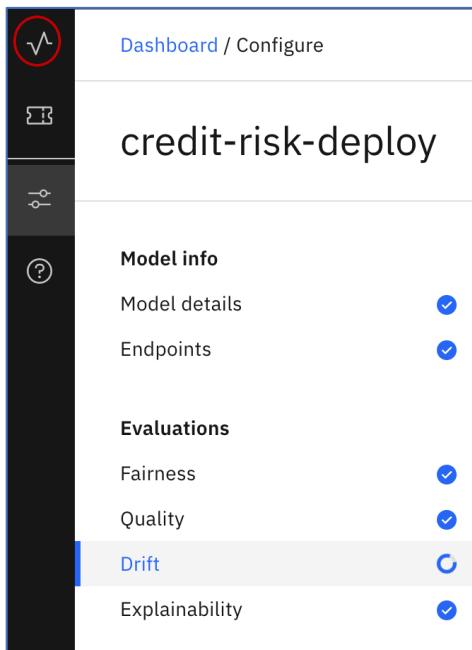
Cancel Back Save 

6. This completes the Drift configuration. A drift model will be created. You can move onto the next section while the drift model is being created.

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**.



Dashboard / Configure

credit-risk-deploy

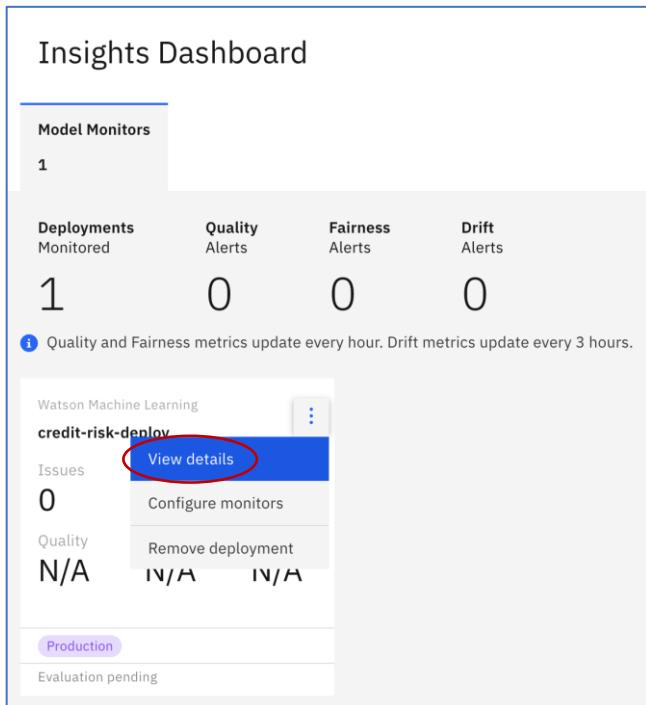
Model info

- Model details
- Endpoints

Evaluations

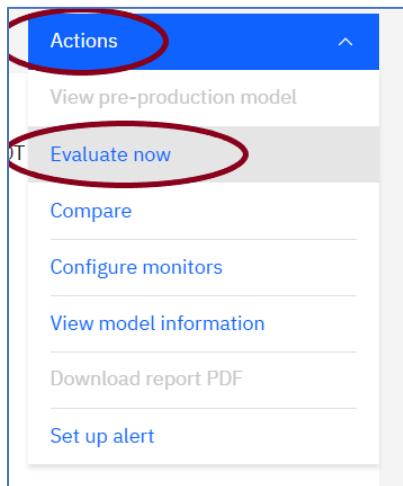
- Fairness
- Quality
- Drift
- Explainability

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



The screenshot shows the Watson OpenScale Insights Dashboard. At the top left, it says "Insights Dashboard". Below that is a "Model Monitors" section with a count of 1. Underneath 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 content area displays a deployment named "credit-risk-deploy". It shows 0 Issues and N/A Quality. There are two "N/A" status indicators. Below the deployment card, there are buttons for "Production" and "Evaluation pending". A vertical ellipsis icon is located at the top right of the deployment card, with a red circle around it.

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 on the Evaluations page. The menu items are: Actions (highlighted with a red circle), View pre-production model, Evaluate now (highlighted with a red circle), 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

Import test data

Description

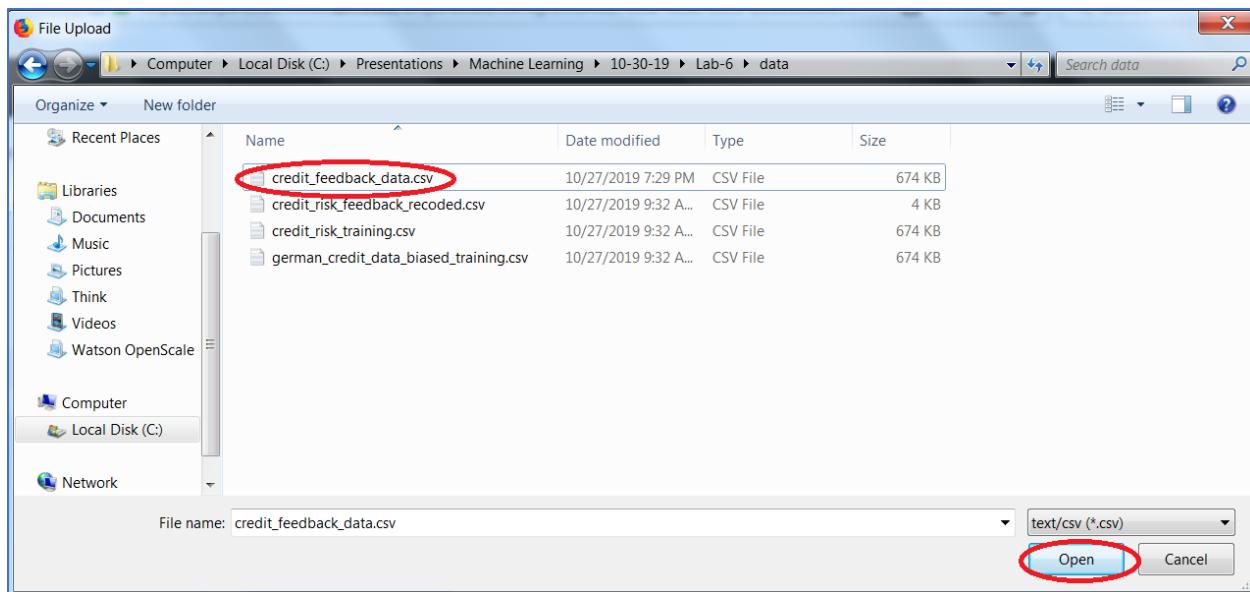
Watson OpenScale evaluates production models for fairness and drift using logged scoring requests received by the model. Scoring requests are logged using the payload logging endpoint. Watson OpenScale evaluates production models for quality using labeled test data. Labeled test data is provided using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

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

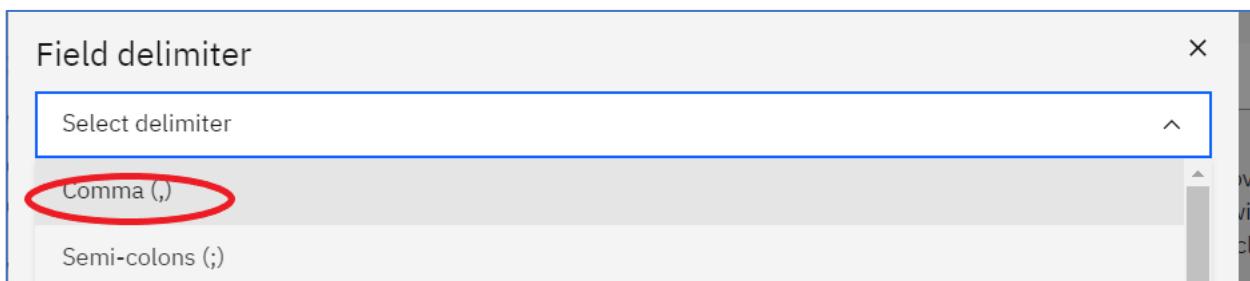
Total records [\(i\)](#) [↻](#)

Scoring requests	1
Feedback records	0

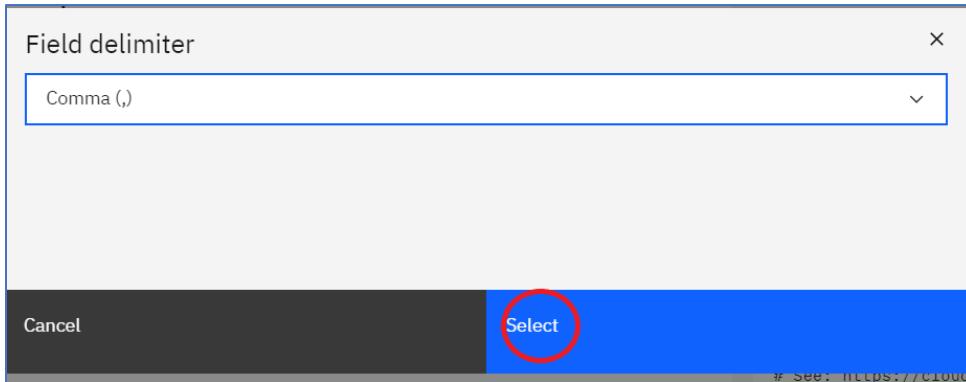
5. Navigate to the feedback file **credit_feedback_data.csv**. Click on **Open**.



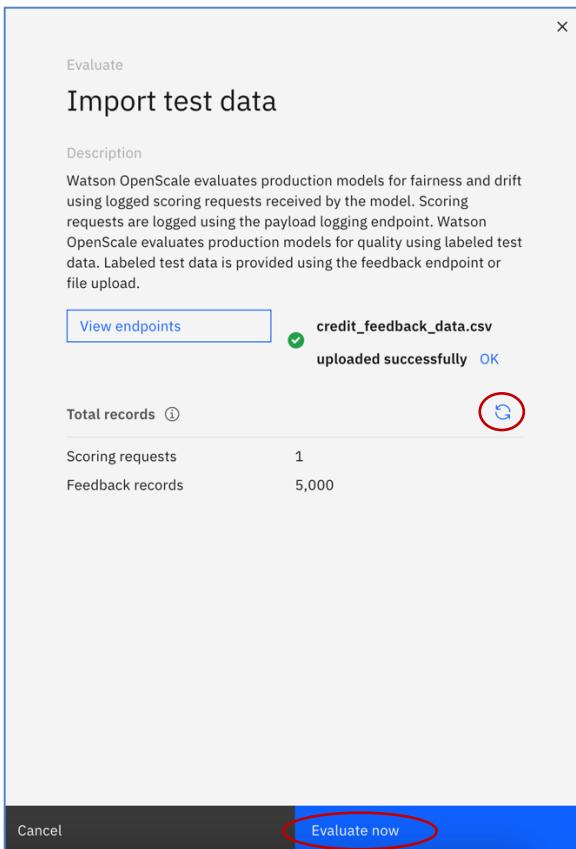
6. Select **Comma** as the **Delimiter**.



7. Click Select.



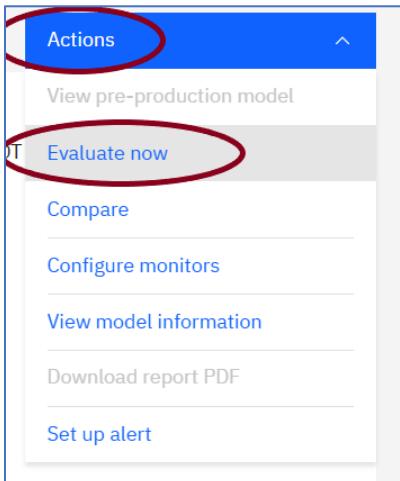
8. After the file is successfully uploaded, click on the refresh button to see the Feedback records increment, then click on the **Evaluate now**.



9. Please wait about 3-5 minutes until the evaluation is done. The quality results are displayed. The quality test failed because the Area under the ROC curve is below the quality threshold. The Fairness and drift are not evaluated yet because we only had 1 entry in the credit_payload_data.json file.

Quality		
Alerts triggered		
Alerts		
1		
Metric	Score	Violation
True positive rate (TPR)	0.55	--
Area under ROC	0.74	0.16
Precision	0.78	--
F1-Measure	0.64	--
Accuracy	0.80	--
Logarithmic loss	0.44	--
False positive rate (FPR)	0.08	--
Area under PR	0.68	--
Recall	0.55	--
5,000 records evaluated		

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



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

Score Transactions and View Fairness and Drift Metrics

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

1. Return to Cloud Pak for Data by clicking on the **Cloud Pak for Data** browser tab.



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

A screenshot of the "credit-risk-deploy" API test interface. The "Test" tab is selected. On the left, under "Enter input data", there is a "Body" section containing a JSON object. On the right, under "Result", the response is shown as a JSON object. A "Predict" button is located at the bottom left of the input area.

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

```
0 {
  "predictions": [
    {
      "fields": [
        "CheckingStatus",
        "LoanDuration",
        "CreditHistory",
        "LoanPurpose",
        "LoanAmount",
        "ExistingSavings",
        "EmploymentDuration",
        "InstallmentPercent",
        "Sex",
        "OthersOnLoan",
        "CurrentResidenceDuration",
        "OwnsProperty",
        "Age",
        "InstallmentPlans",
        "Housing",
        "ExistingCreditsCount",
        "Job",
        "Dependents",
        "Telephone",
        "ForeignWorker",
        "CheckingStatus_IX",
        "CreditHistory_IX"
      ]
    }
  ]
}
```

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

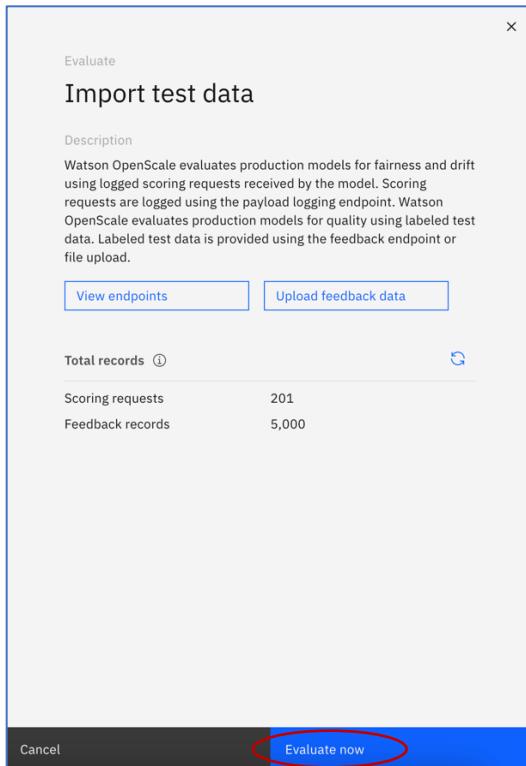
A screenshot of the "credit-risk-deploy" API test interface. The "Test" tab is selected. The "Enter input data" section shows a large JSON object. The "Predict" button at the bottom is circled with a red marker.

```
"credits_paid_to_date", "radio_tv", 5980, "less_100", "1_to_4", 4,
"male", "none", 4, "car_other", 37, "none", "own", 2, "skilled", 1,
"yes", "yes"], ["no_checking", 27, "prior_payments_delayed", "business",
5493, "500_to_1000", "greater_7", 4, "male", "none", 3, "car_other", 46,
"none", "free", 2, "skilled", 1, "yes", "yes"], ["0_to_200", 23,
"credits_paid_to_date", "car_new", 2954, "greater_1000", "4_to_7", 3,
"male", "none", 2, "real_estate", 30, "none", "own", 1, "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"]]
]
```

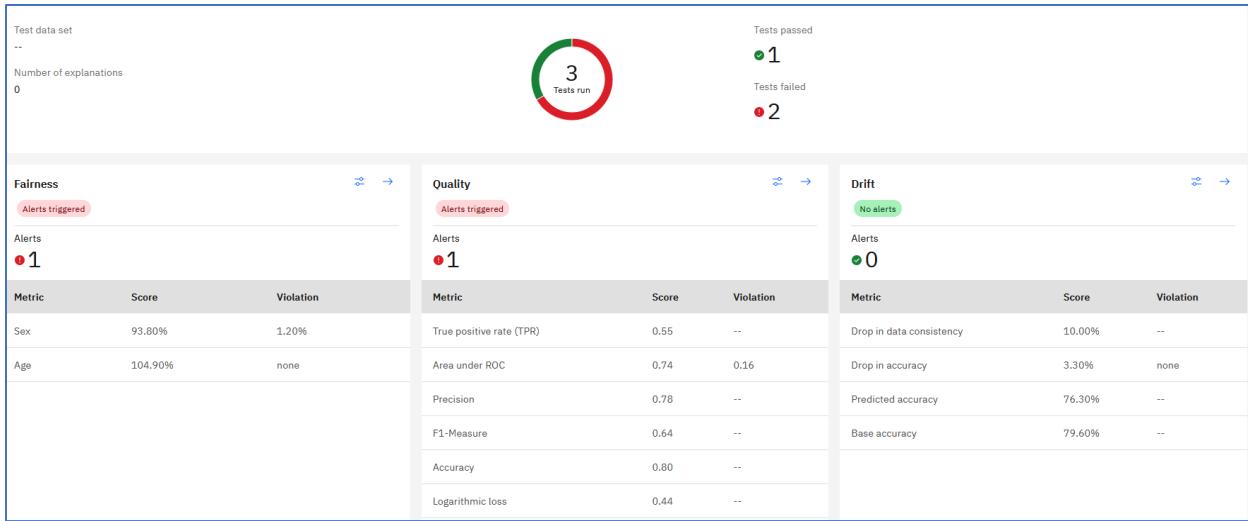
5. Return to Watson OpenScale by clicking on the **Watson OpenScale** browser tab.



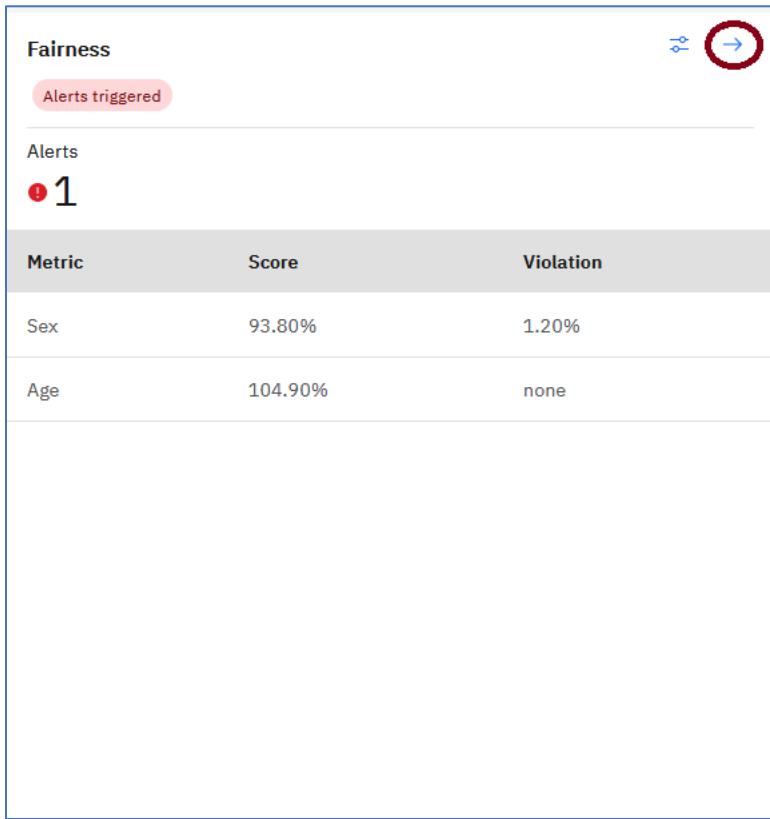
6. Click **Evaluate now**.



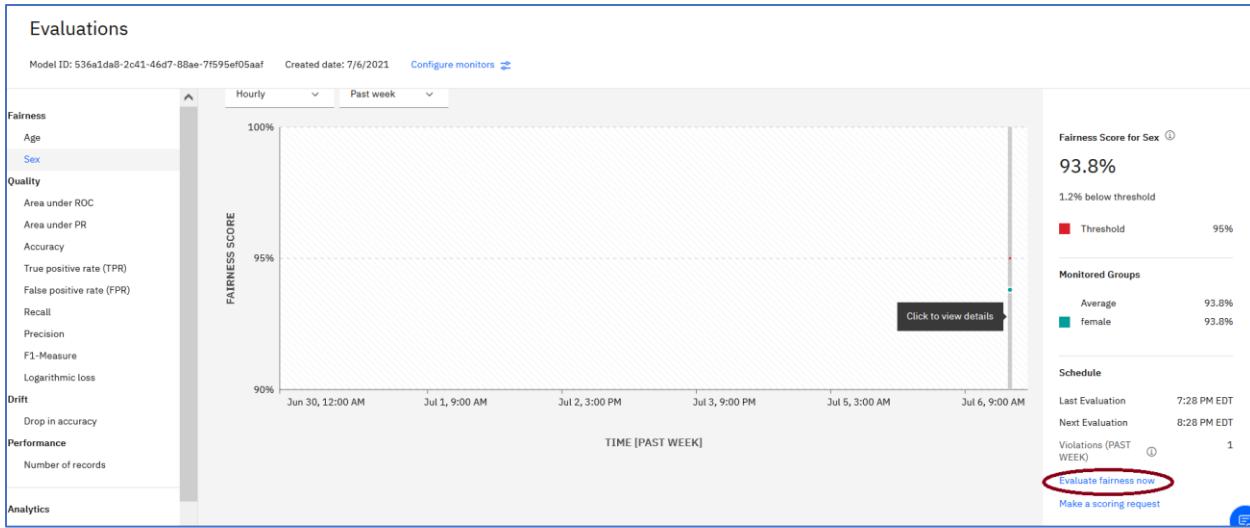
7. Please wait 3-5 minutes for the Evaluations page to display the metrics. Three tests have now been run. The quality test from before, and two new tests. One for fairness, and one for Drift. The fairness test has failed because 93% fairness is lower than our threshold of 95% for the sex attribute. The Drift metric (drift accuracy) passed as the 3-4% 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.



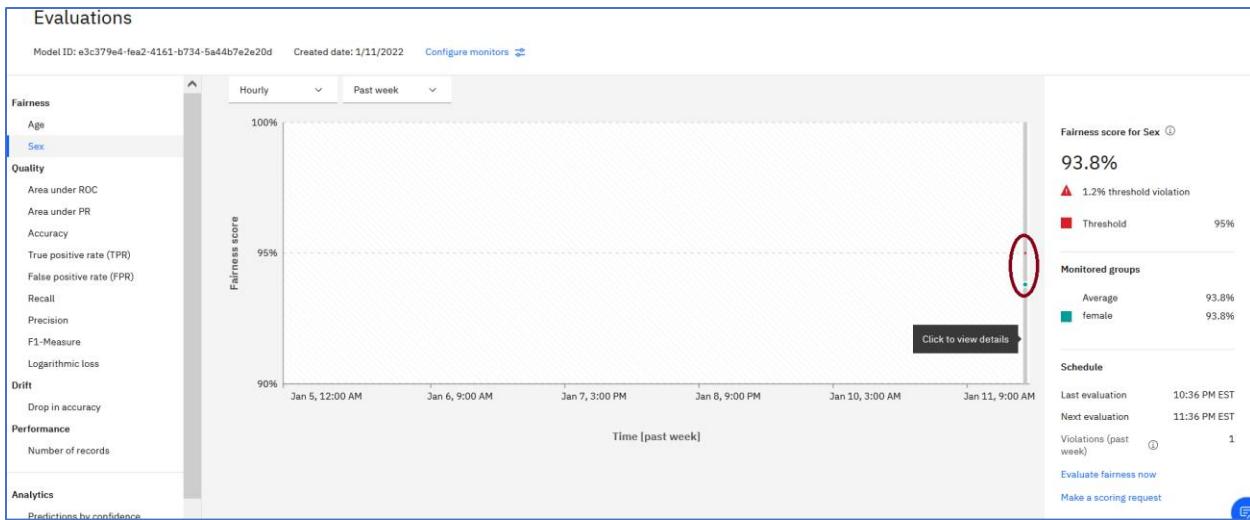
8. Click on the **Fairness** metric.



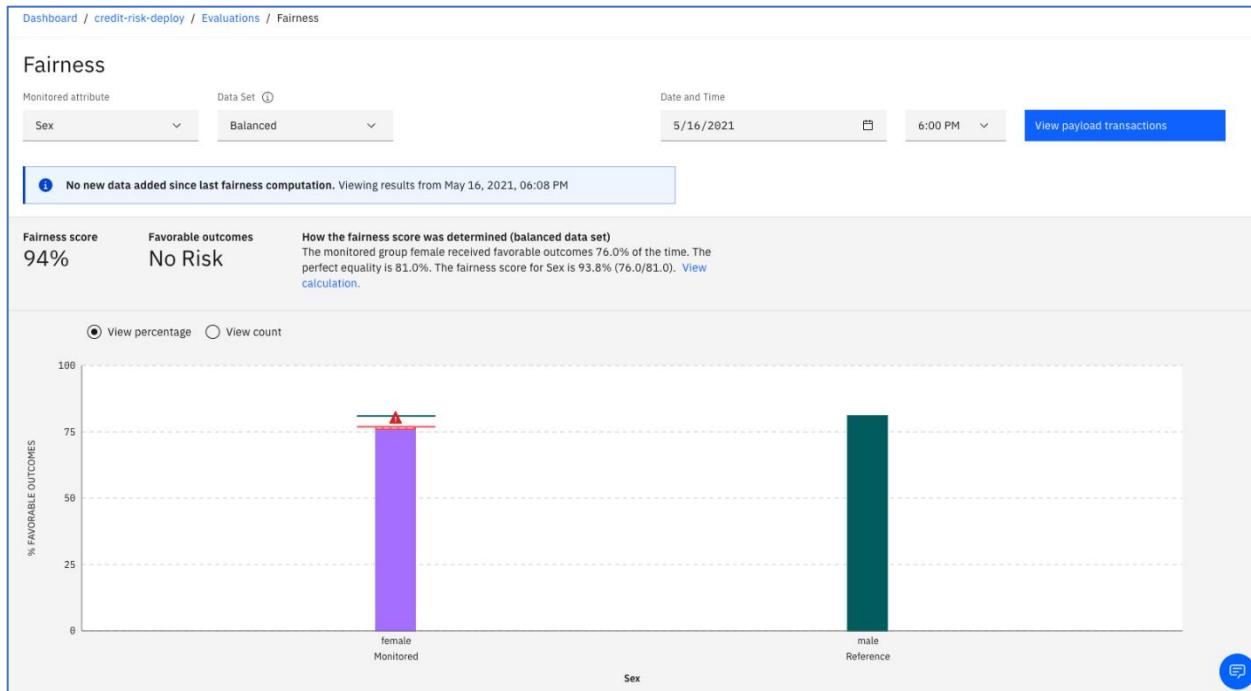
9. A time-series display for the Sex metric is shown. Currently, we have only run one evaluation. **Scroll down** and click on **Evaluate fairness now**.



- Click on the timeline and move the vertical line to align with the two dots. Notice the fairness value at the right.

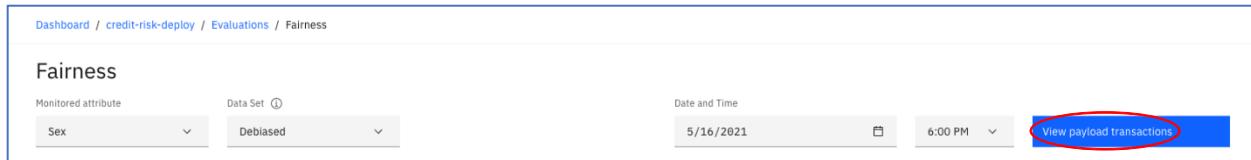


- Once the vertical line is aligned with the dots, click to view details.



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

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



13. 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

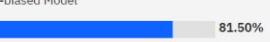
Review the transactions that were received for the selected time period. Click an Explain link to determine the features that contributed to each outcome.

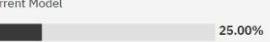
Transaction ID	Sex	Bias Detected	Outcome	Action
61a034fa736dabc57626b399cb139d38-1	male		No Risk	Explain
61a034fa736dabc57626b399cb139d38-10	female		No Risk	Explain
61a034fa736dabc57626b399cb139d38-100	male		No Risk	Explain
61a034fa736dabc57626b399cb139d38-101	male		No Risk	Explain
61a034fa736dabc57626b399cb139d38-102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

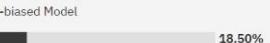
Payload Table ⓘ
Payload_a2fe6bb3-9439-4ef9-b8e8-4372cf05f...

Corrected Records ⓘ
-

No Risk : Favorable Outcome
Current Model
 75.00%

De-biased Model
 81.50%

Risk : Unfavorable Outcome
Current Model
 25.00%

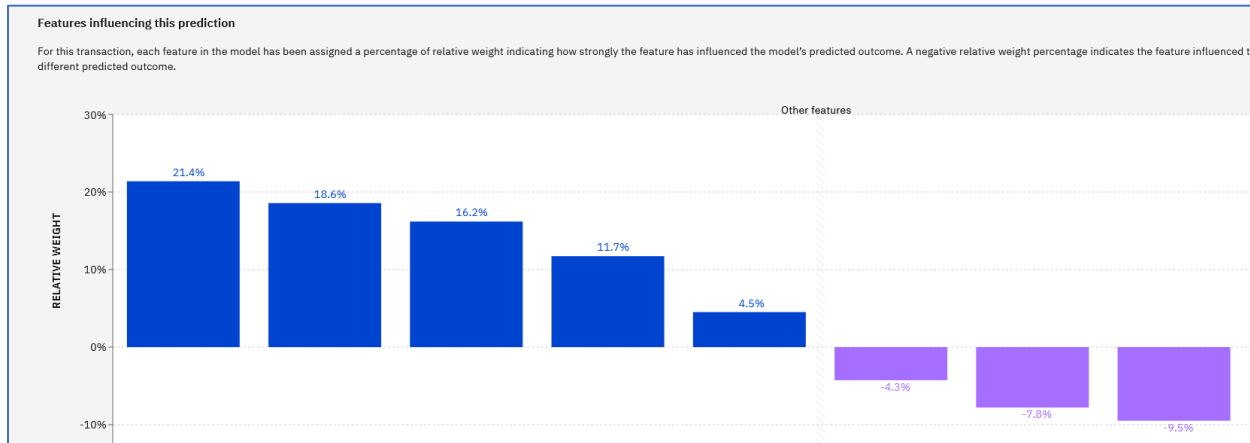
De-biased Model
 18.50%

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

f724856002cd4d1a475837e1799ef987-105 Aug 24, 2021, 09:54:58 PM EDT credit-risk-deploy Production Not applicable

Predicted outcome ⓘ	How this prediction was determined
Risk	The credit-risk model has 56.49% confidence that the outcome of this transaction would be Risk. The top three features influencing the model's predicted outcome are EmploymentDuration, Age, and LoanAmount. The top three features CheckingStatus, OthersOnLoan, and Telephone are influencing the model toward a predicted outcome of No Risk.
Confidence level	56.49%

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



16. Click on the Dashboard icon .

The screenshot shows the IBM Watson OpenScale interface. At the top, it says "IBM Watson OpenScale". Below that is a navigation bar with three icons: a red circle with a white checkmark, a grey square with a white line, and a grey square with a white double arrow. To the right of the first icon is the deployment ID "f724856002cd4d1a475837e1799ef987-105" and the timestamp "Aug 24, 2021, 09:54:58 PM EDT". The main content area has a title "Predicted outcome" with a dropdown arrow, followed by "Risk". To the right, there's a section titled "How this prediction was determined" which includes the text: "The credit-risk model has 56.49% confidence in predicting a positive outcome based on the features: LoanAmount. The top three features are: LoanAmount, Coapplicant, and Age.".

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

The screenshot shows the Insights dashboard. At the top, it says "Insights dashboard". Below that is a summary table with columns: Deployments Monitored, Quality Alerts, Fairness Alerts, Drift Alerts, and Custom Alerts. The values are 1, 1, 1, 0, and -- respectively. Below the table are filters: "Filter by Tags", "Alert type", and "Machine learning provider". A search bar says "Which deployment are you looking for?". Below the search bar is a detailed view for the deployment "credit-risk-deploy". It shows "Issues" (2), "Quality" (1), "Fairness" (1), "Drift" (0), and "Custom" (--). It also shows a "Production" status and was "Evaluated 8 minutes ago".

Congratulations! You have completed the Lab!!!

- ✓ Imported a machine learning model
- ✓ Deployed the model
- ✓ Provisioned Watson OpenScale
- ✓ Configured the payload logging database and Machine Learning provider
- ✓ Scored Data

- ✓ Prepared the Deployed Model for Monitoring
- ✓ Configured Payload Logging
- ✓ Configured Quality Monitoring
- ✓ Configured Fairness Monitoring
- ✓ Configured Drift Monitoring
- ✓ Submitted Feedback and Viewed Quality Metrics
- ✓ Scored Data and Viewed Fairness and Drift Metrics
- ✓ Explained a Transaction.