

Operating AI with Trust and Transparency

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Step 1: Create a Watson OpenScale service.

1. Open up a new tab and access bluemix.net
2. Click on Create resource.

The screenshot shows the IBM Cloud Dashboard. At the top, there's a navigation bar with 'IBM Cloud', 'Catalog', 'Docs', 'Support', and 'Manage'. A search bar and a user profile 'John Doe's Account' are on the right. Below the navigation bar, the 'Dashboard' section has filters for 'Resource Group', 'Cloud Foundry Org', 'Cloud Foundry Space', 'Location', and 'Category'. A 'Filter by resource name...' input field is also present. On the right side of the dashboard, a red circle highlights the 'Create resource' button. Below the filters, a table lists existing services:

Name	Location	Resource Group	Plan	Details	Service Offering
Watson OpenScale-y2	Dallas	Default	Lite	Provisioned	Watson OpenScale
cloud-object-storage-as	global	Default	Lite	Provisioned	Cloud Object Storage
data-science-experience-gu	Dallas	Default	Lite	Provisioned	Watson Studio
pm-20-zm	Dallas	Default	Lite	Provisioned	Machine Learning

3. Along the left side, click on AI.
4. Scroll down (if necessary) and click on Watson OpenScale.

The screenshot shows the IBM Cloud AI catalog. On the left, a sidebar lists categories: 'All Categories (60)', 'Compute (10)', 'Containers (1)', 'Networking', 'Storage (1)', 'AI (15)', 'Analytics (4)', 'Databases (3)', 'Developer Tools (8)', 'Integration (3)', 'Internet of Things (1)', 'Security and Identity (4)', 'Starter Kits (2)', 'Web and Mobile (2)', and 'Web and Application (6)'. The 'AI (15)' category is circled in red. The main area displays various AI services in a grid. The 'Watson OpenScale' service is circled in red. It is described as an enterprise-grade environment for AI infused applications.

5. Once the Watson OpenScale page opens, keep the defaults and click Create.

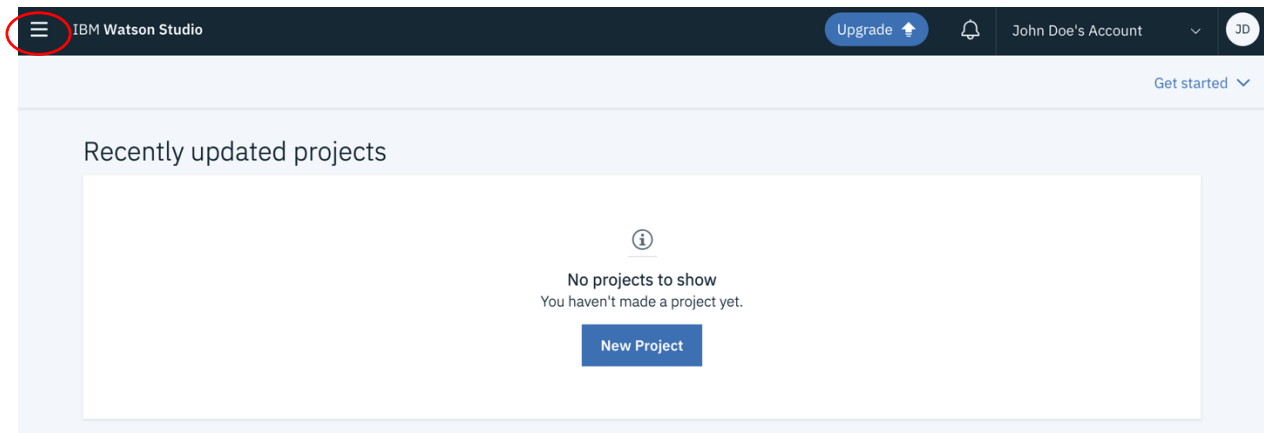
The screenshot shows the Watson OpenScale service configuration page. The top navigation bar is the same as the previous screenshots. The page title is 'Watson OpenScale' with a 'View all' link. Below the title, there's a description of the service. On the right, there are configuration options: 'Service name' (Watson OpenScale-xy), 'Choose a region/location to deploy in:' (Dallas), and 'Select a resource group:' (Default). Below these, there's a 'Features' section with several bullet points: 'Open', 'Bias detection and mitigation', 'Explainable AI recommendations', 'NeuNet5 - Neural Network Synthesis (Beta)', 'Payload logging', 'Trust and Transparency in AI', and 'AI health monitoring'. At the bottom, there's an 'Images' section. A red circle highlights the 'Create' button at the bottom right of the page.

Step 2: Create a Watson Studio Project.

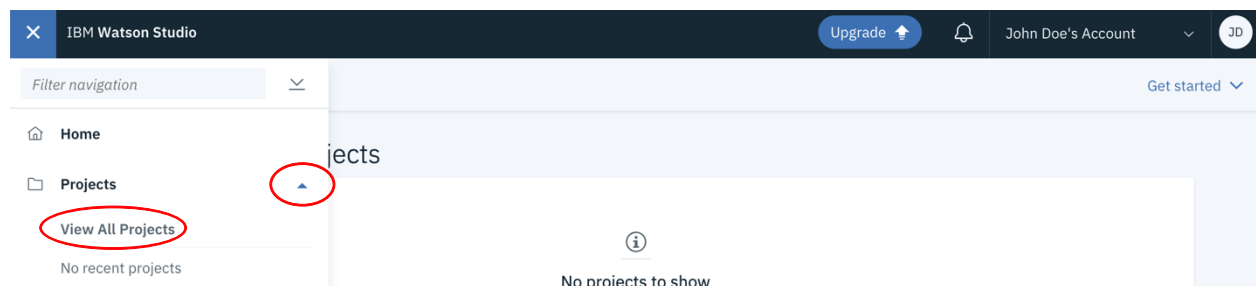
Watson OpenScale connects to a deployed machine learning model. We will use Watson Studio (a data science workbench) and Watson Machine Learning (a machine learning deployment engine). Note, Watson Machine Learning is not required to create and deploy a machine learning model for Watson OpenScale. OpenScale also supports Azure ML, AWS Sagemaker, as well as custom models.

Before we begin, we need to create a Watson Studio Project. A Watson Studio Project is a collection of assets geared towards a specific data science goal. These assets can include machine learning models, runtimes, data files, and connections to 3rd party/open source databases.

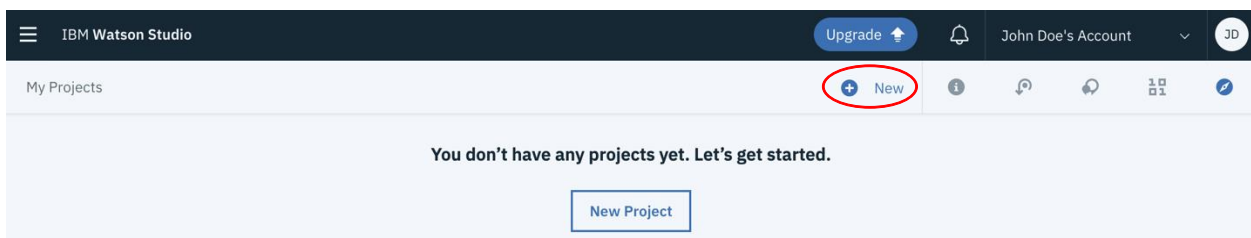
1. Access dataplatform.cloud.ibm.com.
2. Click on the Hamburger menu located in the top left of the screen.



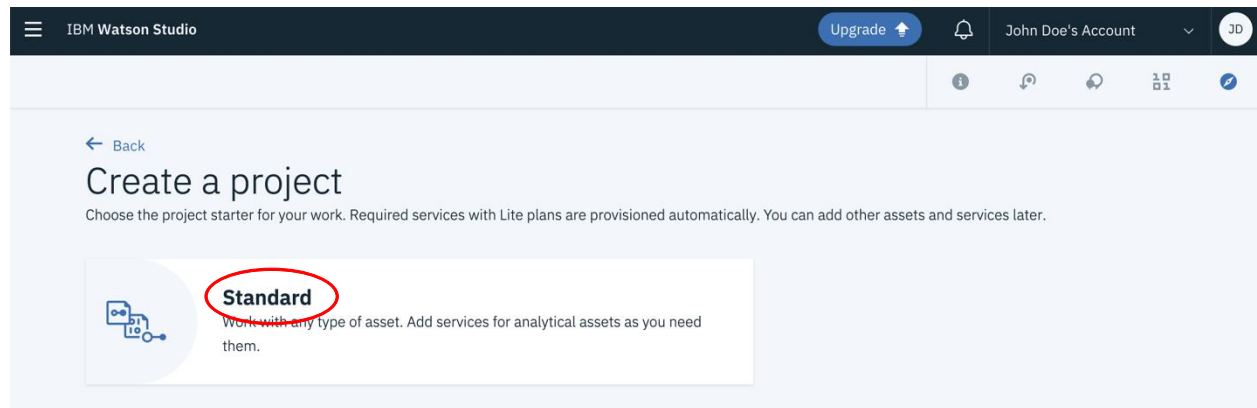
3. Click on Projects -> View all Projects.



4. Click on New.



5. Click on Standard.



6. Give your project a Name, a Description (optional), and click Create.

New project

Define project details

Name

Trusted AI Project

Description

Trusted AI Demo

Choose project options

☐ Restrict who can be a collaborator ⓘ

Project will include integration with [Cloud Object Storage](#) for storing project assets.

Define storage

① Select storage service

[Add](#)

Add an object storage instance and then return to this page and click Refresh.

② Refresh

Cloud object storage is the default store for basic project assets. We will requisition a small instance for our project.

7. On the right side of the screen, click on Add under Define storage.

New project

Define project details

Name

Trusted AI Project

Description

Trusted AI Demo

Choose project options

☐ Restrict who can be a collaborator ⓘ

Project will include integration with [Cloud Object Storage](#) for storing project assets.

Define storage

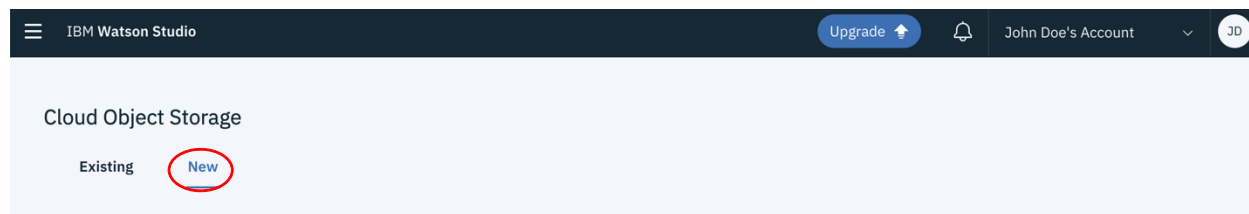
① Select storage service

[Add](#)

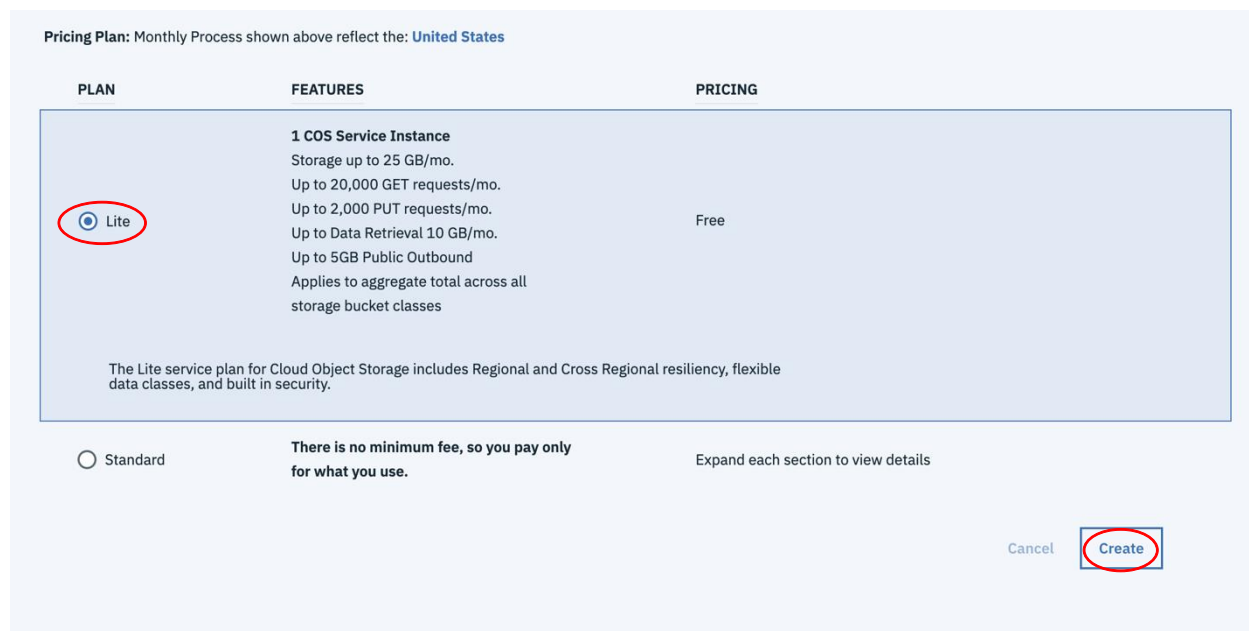
Add an object storage instance and then return to this page and click Refresh.

② Refresh

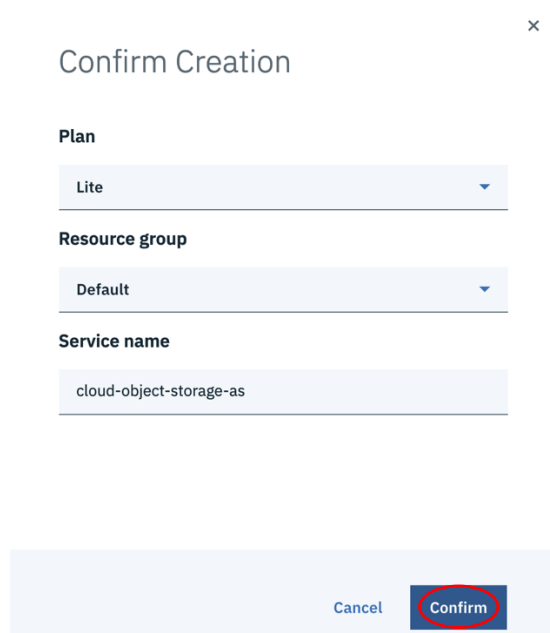
8. Click on New.



9. Scroll down, click on Lite, and click Create.



10. Click on Confirm.



11. Once you are brought back to the New project page, click Refresh.

Define storage

① Select storage service

Add

Add an object storage instance and then return to this page and click Refresh.

② **Refresh**

The name of the storage service you have just created should appear under Storage.

Storage

cloud-object-storage-as

12. Click Create.

IBM Watson Studio Upgrade John Doe's Account

New project

Define project details

Name

Trusted AI Project

Description

Trusted AI Demo

Choose project options

☐ Restrict who can be a collaborator ⓘ

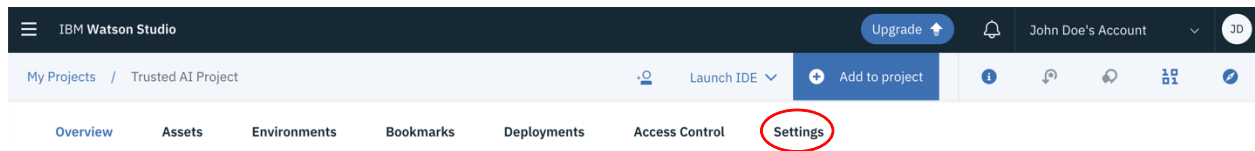
Project will include integration with Cloud Object Storage for storing project assets.

Storage

cloud-object-storage-as

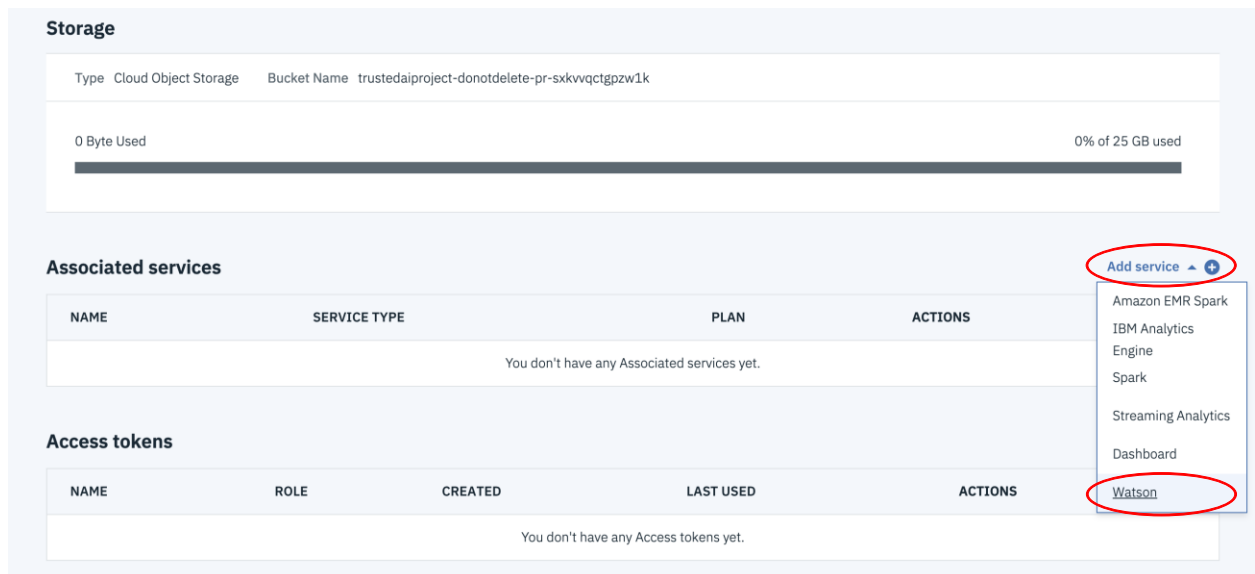
Cancel **Create**

13. Click on the Settings tab.

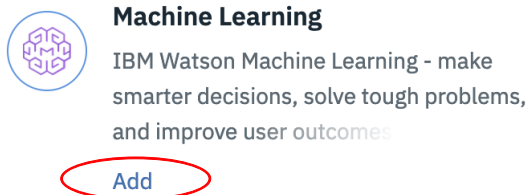


14. Scroll down and click on Add a service for Associated services.

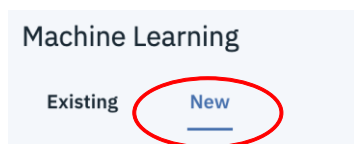
15. Click on Watson.



16. Click on Add under Machine Learning.



17. Ensure that the New tab is selected.



18. Scroll down and click on Lite.

PLAN	FEATURES	PRICING
<input checked="" type="radio"/> Lite	Service instance (5 models per instance) 5,000 predictions 50 capacity unit-hours: Compute Tier: k80 = 2 capacity units for 1 training hour Compute Tier: k80x2 = 4 capacity units for 1 training hour Compute Tier: k80x4 = 8 capacity units for 1 training hour Otherwise 1 capacity unit for 1 computation hour Max 8 k80 GPUs (Deep Learning Training)	Free
<small>The lite plan instance of the IBM Watson Machine Learning service provides you with a maximum of 5 deployed models, 5,000 predictions per month, and 50 capacity unit-hours per month during which model can be trained, evaluated, and deployed to be available to accept prediction events, with a minimum of 1 minute per training job.</small>		

19. Click on Create.

Compute Tier: v100 = 8 capacity units for 1 training hour
Compute Tier: v100x2 = 16 capacity units for 1 training hour
Otherwise 1 capacity unit for 1 computation hour
HIPAA readiness option available in Dallas

[Cancel](#) [Create](#)

20. Keep the defaults and Click Confirm.

Confirm Creation

Region

US South

Plan

Lite

Resource group

Default

Service name

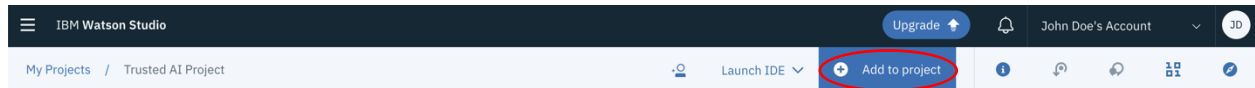
pm-20-zm

[Cancel](#) [Confirm](#)

Step 3: Set up Jupyter Notebooks and Configure Watson OpenScale.

A Jupyter Notebook is a self-contained environment that combines documentation and code. This allows us to walk through code and document each step. We will use one Jupyter Notebook to build and deploy a machine learning model and then configure OpenScale to monitor that deployed model. A second notebook will be used to automatically feed data to OpenScale to monitor for bias.

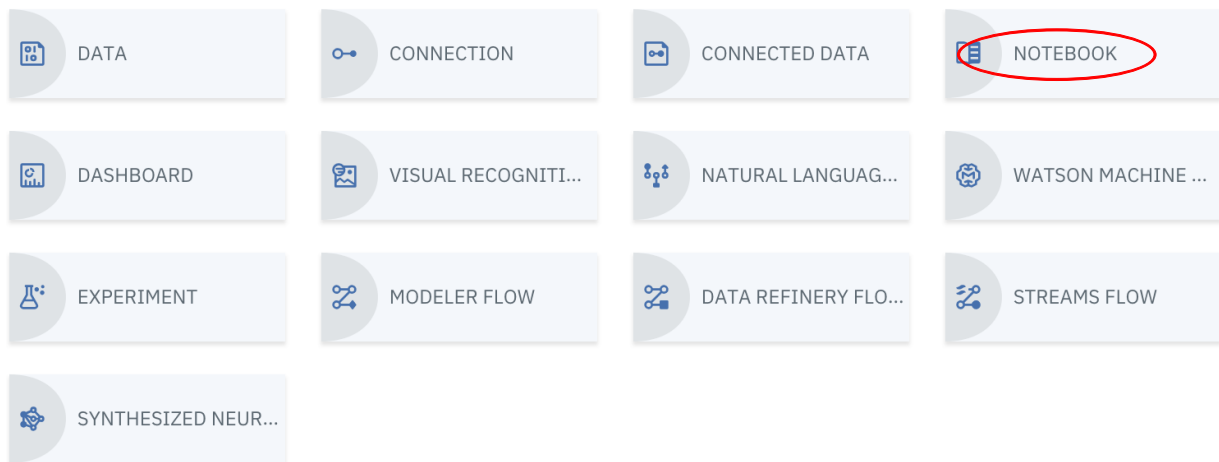
1. Click on Add to project.



2. Click on Notebook.

Choose asset type

AVAILABLE ASSET TYPES



3. Click on the From URL tab.
4. Enter a Name and Description (optional) for your notebook.
5. Under Notebook URL, enter:

https://raw.githubusercontent.com/Mcronk/ThinkGov2019_TrustedAI/master/german_credit_lab.ipynb

My Projects / Trusted AI Project / Add Notebook

New notebook

Blank From file **From URL**

Name*
german_credit_lab
33 Characters Remaining

Description
Trusted AI demo
485 Characters Remaining

Notebook URL*
https://raw.githubusercontent.com/Mcronk/ThinkGov2019_TrustedAI/master/german_credit_lab.ipynb

Select runtime* Includes notebook environments ⓘ
Default Spark Python 3.5 XS (Driver with 1 vCPU and 4 GB RAM, 2 executors) ▼

The selected runtime uses one driver with 1 vCPU and 4 GB RAM, and 2 executors each with 1 vCPU and 4 GB RAM.
This runtime consumes 1.5 capacity units per hour.
[Learn more](#) about capacity unit hours and Watson Studio pricing plans.

Cancel Create Notebook

6. Under Select runtime, click on the dropdown menu.

My Projects / Trusted AI Project / Add Notebook

New notebook

Blank From file **From URL**

Name*
german_credit_lab
33 Characters Remaining

Description
Trusted AI demo
485 Characters Remaining

Notebook URL*
https://raw.githubusercontent.com/Mcronk/ThinkGov2019_TrustedAI/master/german_credit_lab.ipynb

Select runtime* Includes notebook environments ⓘ
Default Spark Python 3.5 XS (Driver with 1 vCPU and 4 GB RAM, 2 executors) ▼

The selected runtime uses one driver with 1 vCPU and 4 GB RAM, and 2 executors each with 1 vCPU and 4 GB RAM.
This runtime consumes 1.5 capacity units per hour.
[Learn more](#) about capacity unit hours and Watson Studio pricing plans.

Cancel Create Notebook

7. Choose Default Spark Python 3.5 XS

Services

Environments

- ✓ Default Spark Python 3.5 XS (Driver with 1 vCPU and 4 GB RAM, 2 executors with 1 vCPU and 4 GB RAM each)
- Default Spark Scala 2.11 (Driver with 1 vCPU and 4 GB RAM, 2 executors with 1 vCPU and 4 GB RAM each)
- Default Spark R 3.4 (Driver with 1 vCPU and 4 GB RAM, 2 executors with 1 vCPU and 4 GB RAM each)
- Default Python 3.5 Free (1 vCPU and 4 GB RAM)
- Default Python 3.5 XS (2 vCPU and 8 GB RAM)
- Default Python 3.5 XS + Beta of DO (2 vCPU and 8 GB RAM)
- Default R 3.4 XS (2 vCPU and 8 GB RAM)
- Default Python 3.5 S (4 vCPU and 16 GB RAM)
- Default R 3.4 S (4 vCPU and 16 GB RAM)

8. Click Create Notebook.

My Projects / Trusted AI Project / Add Notebook

New notebook

Blank From file From URL

Name*

german_credit_lab

33 Characters Remaining

Description

Trusted AI demo

485 Characters Remaining

Notebook URL*

https://raw.githubusercontent.com/Mcronk/ThinkGov2019_Trusted/

Select runtime* Includes notebook environments ⓘ

Default Spark Python 3.5 XS (Driver with 1 vCPU and 4 GB RAM, 2 executors each with 1 vCPU and 4 GB RAM, 2 executors each with 1 vCPU and 4 GB RAM) ▼

The selected runtime uses one driver with 1 vCPU and 4 GB RAM, and 2 executors each with 1 vCPU and 4 GB RAM.

This runtime consumes 1.5 capacity units per hour.

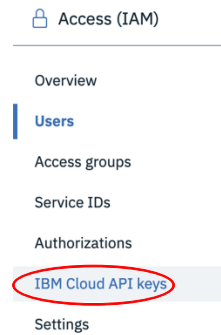
[Learn more about capacity unit hours and Watson Studio pricing plans.](#)

Cancel Create Notebook

Our notebook will create and deploy a machine learning model then configure Watson OpenScale and connect it to our cloud machine learning service. Before running our notebook, we need to enter credentials for the IBM Cloud API and our machine learning service.

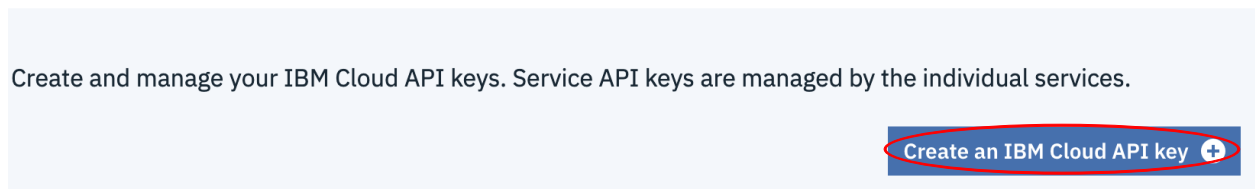
9. Open up a new browser tab and access <https://cloud.ibm.com/iam#/users>

10. On the left side of the screen, click on IBM Cloud API keys.

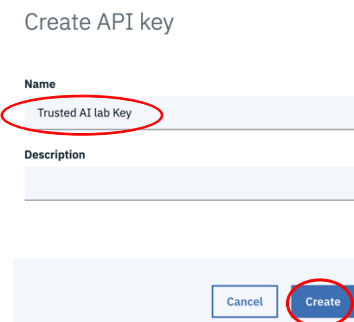


11. Along the center of your screen, click on Create a Cloud API Key.

IBM Cloud API Keys



12. Give the API key a name and click Create.



13. Click on Copy.

API key successfully created

Copy the API key or click download to save it. You won't be able to see this API key again, so you can't retrieve it later.



14. Back in your notebook under Provision service and configure credentials (next to CLOUD_API_KEY = , replace “PASTE HERE” with the key you just copied.

Your notebook should match the image below (with a different key between the quotes).

Provision services and configure credentials

If you have not already, provision an instance of IBM Watson OpenScale using the [OpenScale link in the Cloud catalog](#).

Your Cloud API key can be generated by going to the [Users section of the Cloud console](#). From that page, click your name, scroll down to the **API Keys** section, and click **Create an IBM Cloud API key**. Give your key a name and click **Create**, then copy the created key and paste it below.

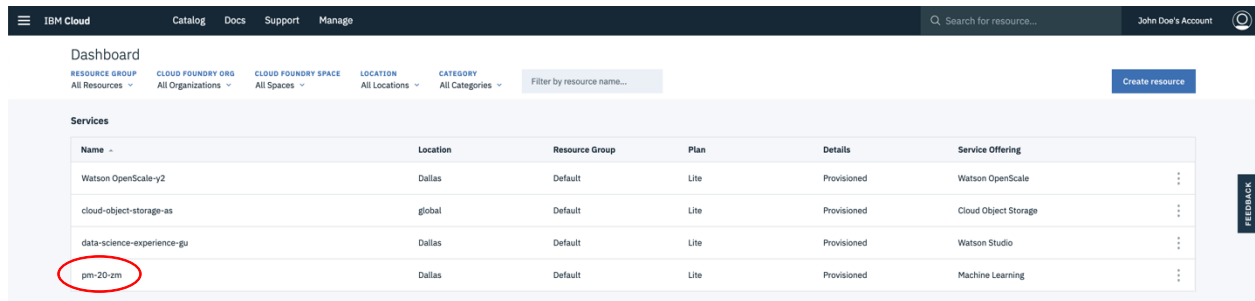
```
In [ ]: CLOUD_API_KEY = "qU178mU-C1kqYrm3RIwXU_ofb3vJSh19DxmewRpY0dgx"
```

15. Open up a new browser tab and access bluemix.net



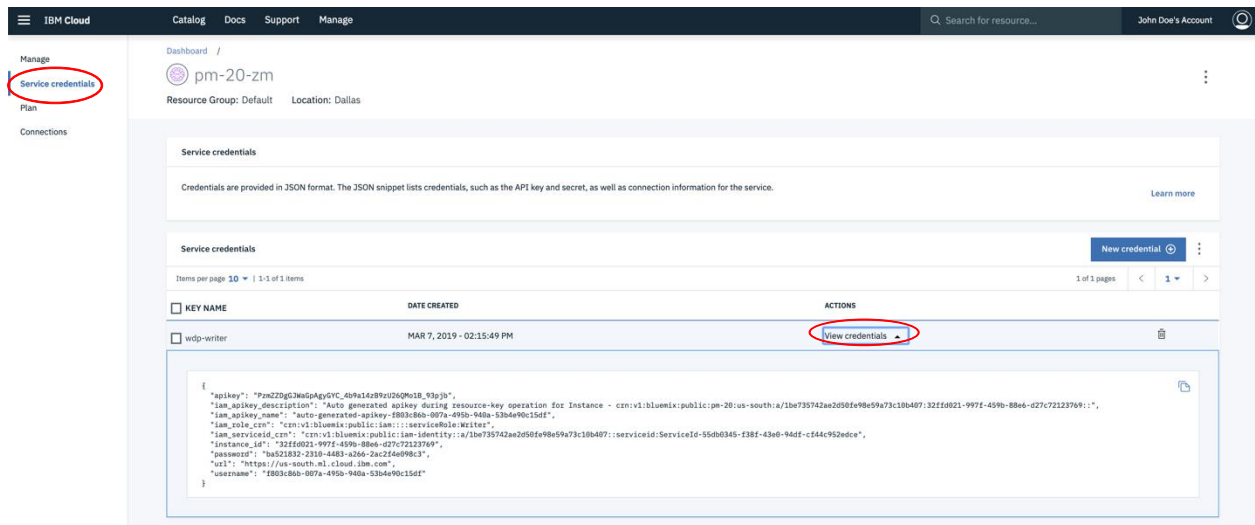
You will be brought to your dashboard page for Cloud resources.

16. Click on the Machine Learning service (the example in these instructions is called “pm-20-zm”)

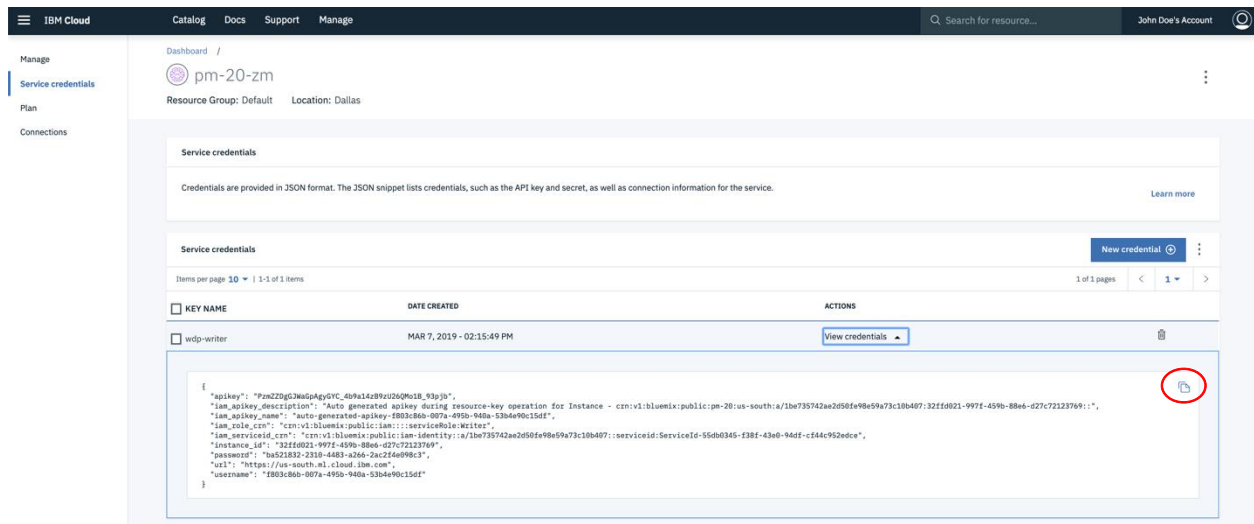


17. Click on Service Credentials along the left side.

18. Then click on View Credentials along the center.



19. Click on the pages icon to copy the credentials.



The screenshot shows the IBM Cloud console interface. On the left, there's a sidebar with 'Manage' selected, and 'Service credentials' is highlighted under the 'Plan' section. The main area shows the 'Dashboard' for a resource named 'pm-20-zm'. Below this, the 'Service credentials' section is expanded, displaying a table with one entry: 'wdp-writer' created on 'MAR 7, 2019 - 02:15:49 PM'. To the right of the table, a 'View credentials' button is visible. Below the button, the JSON credentials are displayed. A red circle highlights the 'Copy' icon (two overlapping sheets) in the top right corner of the credentials details panel.

25. Back in your notebook, under Provision services and configure credentials, replace the WML_CREDENTIALS = brackets with what you have just copied. WML stands for Watson Machine Learning.

Provision services and configure credentials

If you have not already, provision an instance of IBM Watson OpenScale using the [OpenScale link in the Clou](#)

Your Cloud API key can be generated by going to the [Users section of the Cloud console](#). From that page, click **Create**, then copy the created key and paste it below.

```
In [ ]: CLOUD_API_KEY = "qUi7SmU-CikqYrm3RIwXU_ofbJvJSh19DxmewRpY0dqx"
```

Next you will need credentials for Watson Machine Learning. If you already have a WML instance, you may use it. Once your instance is created, click the **Service Credentials** link on the left side of the screen. Click the **New credentials** button. Copy and paste your WML credentials into the cell below.

```
In [ ]: WML_CREDENTIALS = {
    "apikey": "key",
    "iam_apikey_description": "description",
    "iam_apikey_name": "auto-generated-apikey",
    "iam_role_crn": "crn:v1:bluemix:public:iam::::serviceRole:Writer",
    "iam_serviceid_crn": "crn:v1:bluemix:public:iam-identity::",
    "instance_id": "instance_id",
    "password": "password",
    "url": "https://us-south.ml.cloud.ibm.com",
    "username": "username"
}
```

Your notebook should match the image below (with different credentials).

Provision services and configure credentials

If you have not already, provision an instance of IBM Watson OpenScale using the [OpenScale link in the Cloud catalog](#)

Your Cloud API key can be generated by going to the [Users section of the Cloud console](#). From that page, click your name, then click **Create**, then copy the created key and paste it below.

```
In [ ]: CLOUD_API_KEY = "qUi7SmU-CikqYrm3RIwXU_ofbJvJSh19DxmewRpY0dqx"
```

Next you will need credentials for Watson Machine Learning. If you already have a WML instance, you may use credentials from that instance. Once your instance is created, click the **Service Credentials** link on the left side of the screen. Click the **New credentials** button. Copy and paste your WML credentials into the cell below.

```
In [ ]: WML_CREDENTIALS = {
    "apikey": "PzmZZDgGJWaGpAgyGYC_4b9a14zB9zU26QMolB_93pjb",
    "iam_apikey_description": "Auto generated apikey during resource-key operation for InstanceID=f803c86b-007a-495b-940a-53b4e90c15df",
    "iam_apikey_name": "auto-generated-apikey-f803c86b-007a-495b-940a-53b4e90c15df",
    "iam_role_crn": "crn:v1:bluemix:public:iam::::serviceRole:Writer",
    "iam_serviceid_crn": "crn:v1:bluemix:public:iam-identity::a/1be735742ae2d50fe98e59a73c101",
    "instance_id": "32ffd021-997f-459b-88e6-d27c72123769",
    "password": "ba521832-2310-4483-a266-2ac2f4e098c3",
    "url": "https://us-south.ml.cloud.ibm.com",
    "username": "f803c86b-007a-495b-940a-53b4e90c15df"
}
```

Our notebook now has all the required credentials.

20. Select each cell in the notebook and hit SHIFT+ENTER to run.

Run your notebook cell by cell. Read through the notebook and observe the output. With the exception of the first cell installing packages, there should be no error output.

Identify transactions for Explainability

Transaction IDs identified by the cells below can be copied and pasted into the Explainability tab of the OpenScale dashboard.

```
In [64]: payload_data = subscription.payload_logging.get_table_content(limit=60)
payload_data.filter(items=['scoring_id', 'predictedLabel', 'probability'])
```

Out[64]:

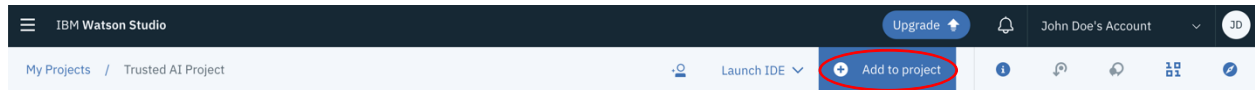
	scoring_id	predictedLabel	probability
0	e42459305c0c44dc185c6bc144d74806-423	No Risk	[0.8128085875806539, 0.18719141241934611]
1	e42459305c0c44dc185c6bc144d74806-567	No Risk	[0.9576935217341755, 0.0423064782658244]
2	e42459305c0c44dc185c6bc144d74806-951	No Risk	[0.9509147179413443, 0.04908528205865579]
3	e42459305c0c44dc185c6bc144d74806-663	No Risk	[0.9565610290260815, 0.04343897097391844]
4	e42459305c0c44dc185c6bc144d74806-424	No Risk	[0.81396200025809, 0.18603799974191007]
5	e42459305c0c44dc185c6bc144d74806-568	No Risk	[0.5729289479961321, 0.4270710520038678]
6	e42459305c0c44dc185c6bc144d74806-1	No Risk	[0.7093257286263136, 0.29067427137368634]
7	e42459305c0c44dc185c6bc144d74806-807	No Risk	[0.5765253746425008, 0.42347462535749925]
8	e42459305c0c44dc185c6bc144d74806-425	No Risk	[0.7136291870129947, 0.28637081298700523]
9	e42459305c0c44dc185c6bc144d74806-569	No Risk	[0.5485131522852063, 0.4514868477147938]
10	e42459305c0c44dc185c6bc144d74806-952	Risk	[0.09948668541411484, 0.9005133145858851]

Once the last cell has run successfully, continue with the steps below.

We will now run a notebook that will automatically feed data to our deployed ML model to showcase transaction-level bias mitigation.

21. Return to your project dashboard.

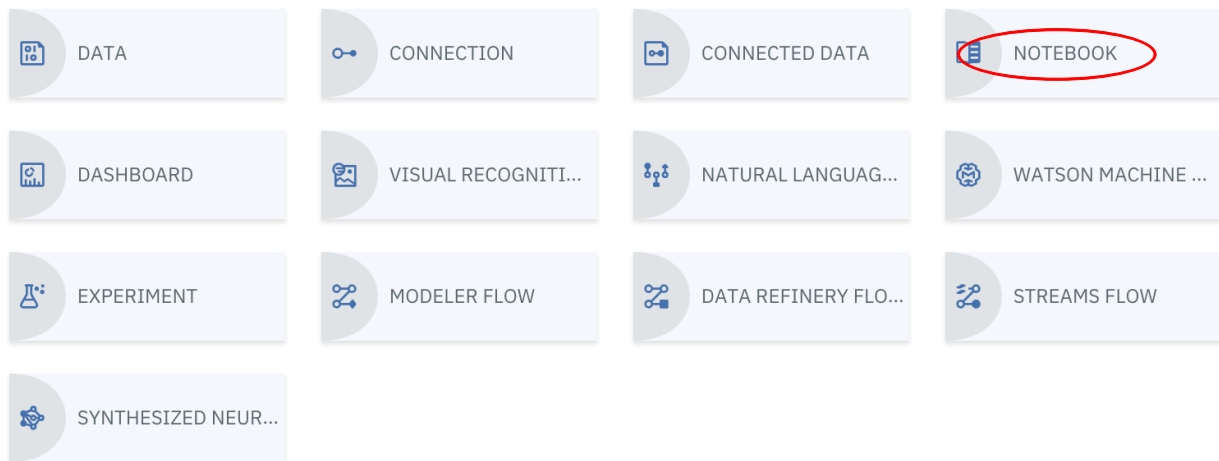
22. Towards the top of your screen, click on Add to project.



23. Click on Notebook.

Choose asset type

AVAILABLE ASSET TYPES



24. Enter a Name and Description for your notebook.

25. Under Notebook URL, enter:

https://raw.githubusercontent.com/emartensibm/german-credit/master/german_credit_scoring_feed.ipynb

My Projects / Trusted AI Project / Add Notebook

New notebook

Blank From file From URL

Name*
german_credit_lab_feed 28 Characters Remaining

Description
Type your Description here

Notebook URL*
https://raw.githubusercontent.com/emartensibm/german-credit/master/german_credit_scoring_feed.ipynb

Select runtime* Includes notebook environments ⓘ
Default Spark Python 3.5 XS (Driver with 1 vCPU and 4 GB RAM, 2 executors each with 1 vCPU and 4 GB RAM, and 2 executors each with 1 vCPU and 4 GB RAM. This runtime consumes 1.5 capacity units per hour. [Learn more](#) about capacity unit hours and Watson Studio pricing plans.

Cancel Create Notebook

26. Under Select runtime, click on the dropdown menu.

My Projects / Trusted AI Project / Add Notebook

New notebook

Blank From file From URL

Name*
german_credit_lab_feed 28 Characters Remaining

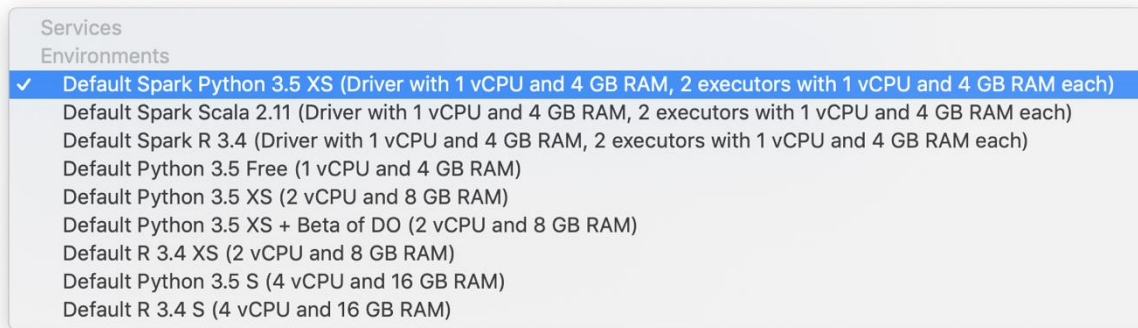
Description
Type your Description here

Notebook URL*
https://raw.githubusercontent.com/emartensibm/german-credit/master/german_credit_scoring_feed.ipynb

Select runtime* Includes notebook environments ⓘ
Default Spark Python 3.5 XS (Driver with 1 vCPU and 4 GB RAM, 2 executors each with 1 vCPU and 4 GB RAM, and 2 executors each with 1 vCPU and 4 GB RAM. This runtime consumes 1.5 capacity units per hour. [Learn more](#) about capacity unit hours and Watson Studio pricing plans.

Cancel Create Notebook

27. Choose Default Spark Python 3.5 XS



28. Click Create Notebook.

My Projects / Trusted AI Project / Add Notebook

New notebook

Blank From file From URL

Name*
german_credit_lab_feed
28 Characters Remaining

Description
Type your Description here

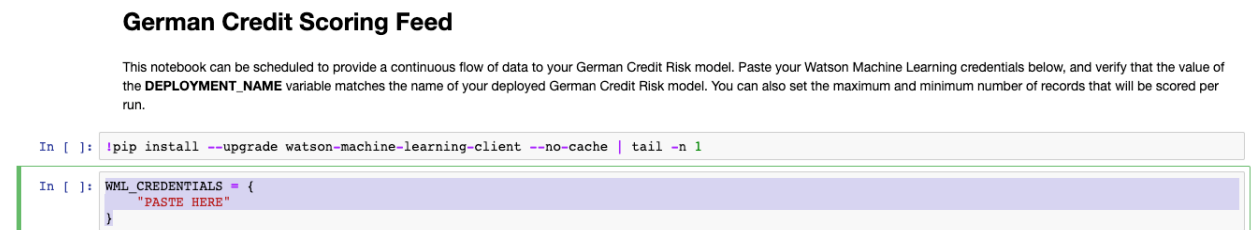
Notebook URL*
<https://raw.githubusercontent.com/emartensibm/german-credit/ma:>

Select runtime* Includes notebook environments ⓘ
Default Spark Python 3.5 XS (Driver with 1 vCPU and 4 GB RAM, 2 ex) ▼

The selected runtime uses one driver with 1 vCPU and 4 GB RAM, and 2 executors each with 1 vCPU and 4 GB RAM.
This runtime consumes 1.5 capacity units per hour.
[Learn more](#) about capacity unit hours and Watson Studio pricing plans.

Cancel **Create Notebook**

29. As in the previous notebook, enter your Watson Machine Learning (WML) credentials in the second code box.



German Credit Scoring Feed

This notebook can be scheduled to provide a continuous flow of data to your German Credit Risk model. Paste your Watson Machine Learning credentials below, and verify that the value of the **DEPLOYMENT_NAME** variable matches the name of your deployed German Credit Risk model. You can also set the maximum and minimum number of records that will be scored per run.

```
In [ ]: !pip install --upgrade watson-machine-learning-client --no-cache | tail -n 1
```

```
In [ ]: WML_CREDENTIALS = {
    "apikey": "gfVRg_Oyq19DpzmeH9101z1kN02qi3FbyVg5iwZbDTf7",
    "iam_apikey_description": "Auto generated apikey during resource-key operation for Instance - crn:v1:bluemix:public:pm-20:us-south:a/1be735742a",
    "iam_apikey_name": "auto-generated-apikey-9d67e9ea-2f9c-408f-b738-513e65618c8c",
    "iam_role_crn": "crn:v1:bluemix:public:iam:::serviceRole:Writer",
    "iam_serviceid_crn": "crn:v1:bluemix:public:iam-identity:a/1be735742ae2d50fe98e59a73c10b407::serviceid:ServiceId-9311cb91-d07b-457c-ad1e-8fe81",
    "instance_id": "a04620c8-926c-480c-9e8f-563e74c4481a",
    "password": "16befb2e-c614-4d01-be64-efdc9554601b",
    "url": "https://us-south.ml.cloud.ibm.com",
    "username": "9d67e9ea-2f9c-408f-b738-513e65618c8c"
}
```

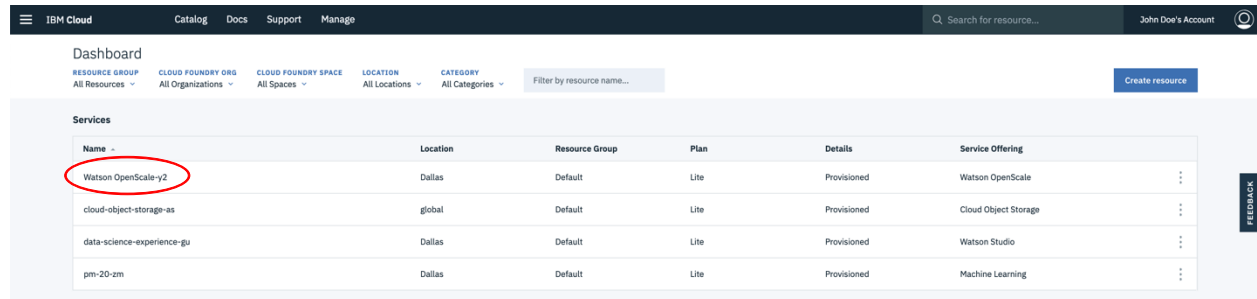
30. Run the notebook cell by cell.

Once the notebook has completed, move on to the next step.

Step 4: Explore Watson OpenScale.

For the purpose of this lab we have used notebooks to showcase the API and speed along the configuration process. For documentation and tutorials on manual configuration, please visit <https://cloud.ibm.com/docs/services/ai-openscale?topic=ai-openscale-crt-ov#crt-ov>

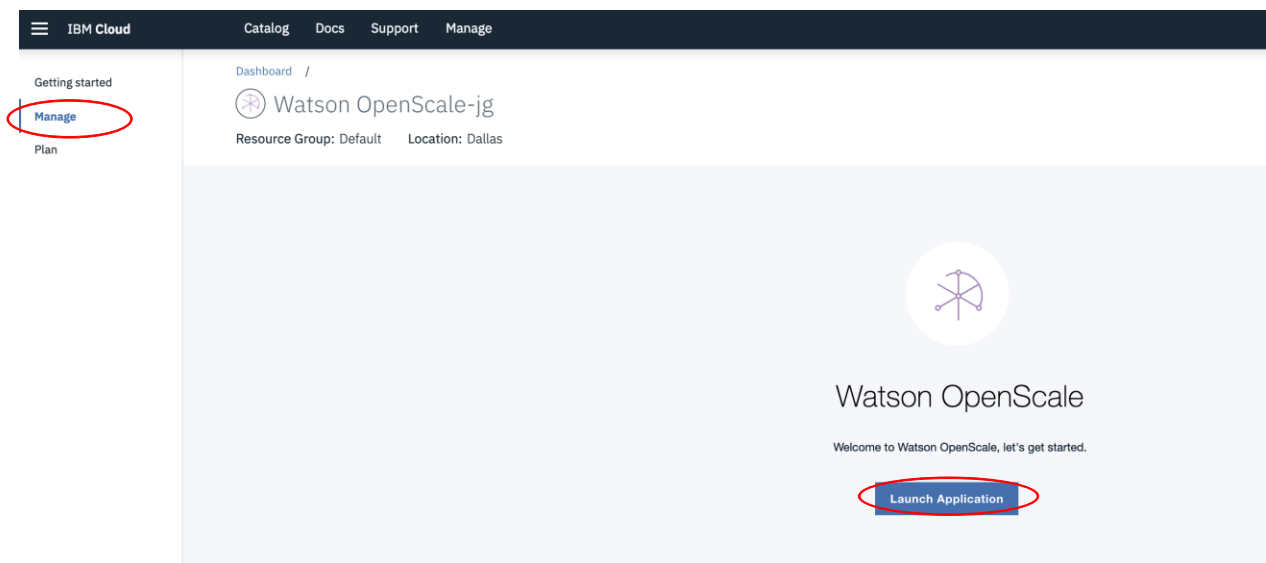
1. Return to <https://console.bluemix.net/dashboard/apps>
2. Click on the name of your Watson OpenScale service.



The screenshot shows the IBM Cloud Dashboard. At the top, there's a navigation bar with 'IBM Cloud', 'Catalog', 'Docs', 'Support', and 'Manage'. Below this, there's a search bar and a user profile. The main content area is titled 'Dashboard' and shows a list of services. The first service, 'Watson OpenScale-y2', is highlighted with a red circle. The table below shows the details of the services.

Name	Location	Resource Group	Plan	Details	Service Offering
Watson OpenScale-y2	Dallas	Default	Lite	Provisioned	Watson OpenScale
cloud-object-storage-as	global	Default	Lite	Provisioned	Cloud Object Storage
data-science-experience-gu	Dallas	Default	Lite	Provisioned	Watson Studio
pm-20-2m	Dallas	Default	Lite	Provisioned	Machine Learning

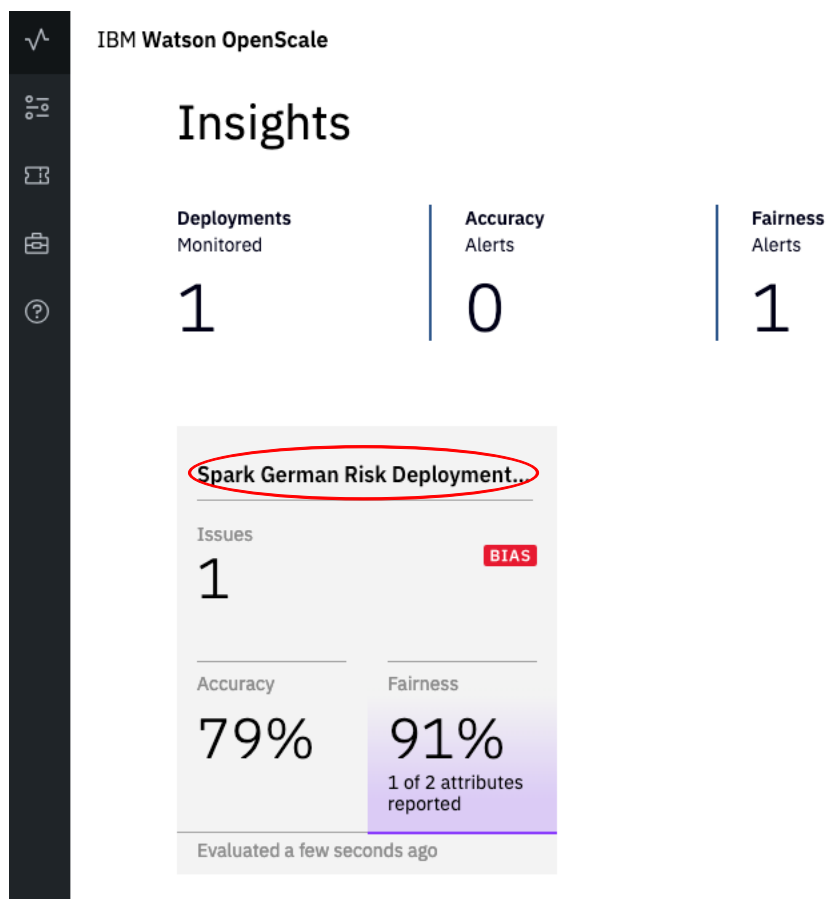
3. Click on Manage along the bar on the left side.
4. Click on Launch Application.



The screenshot shows the Watson OpenScale service page. On the left, there's a sidebar with 'Getting started', 'Manage', and 'Plan'. The 'Manage' link is highlighted with a red circle. The main content area shows the service details: 'Watson OpenScale-jg', 'Resource Group: Default', and 'Location: Dallas'. Below this, there's a large section with the Watson OpenScale logo and the text 'Welcome to Watson OpenScale, let's get started.' At the bottom of this section, there's a 'Launch Application' button, which is also highlighted with a red circle.

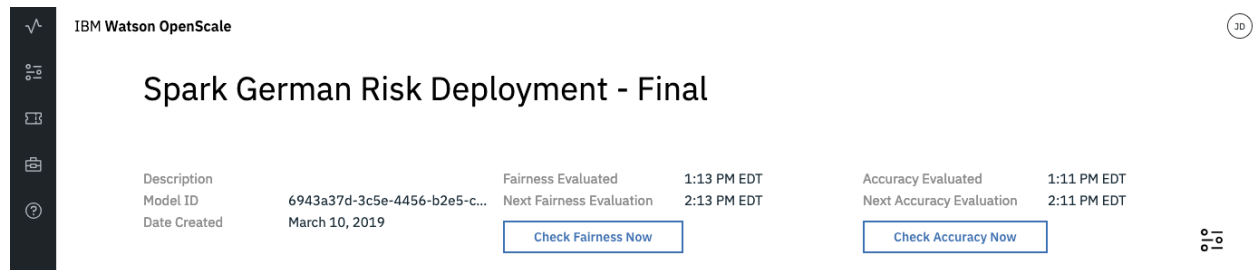
You will be brought to your Watson OpenScale dashboard. This is meant to show summary information on all models connected to this instance of Watson OpenScale. At a glance we are able to check all our models for accuracy, fairness, and if there is any bias detected.

5. Click on your model card.



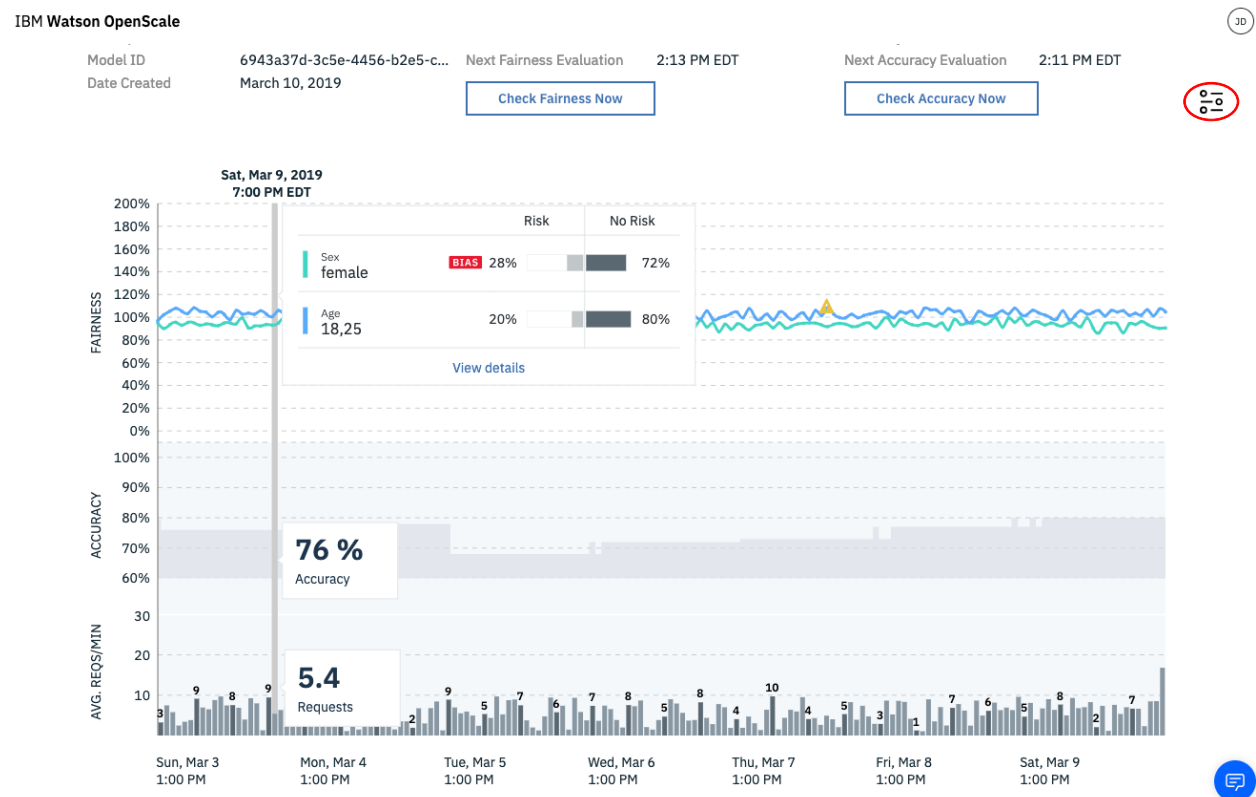
You will be brought to a model page.

The top of the screen shows model information and has buttons to immediately recalculate fairness and accuracy.



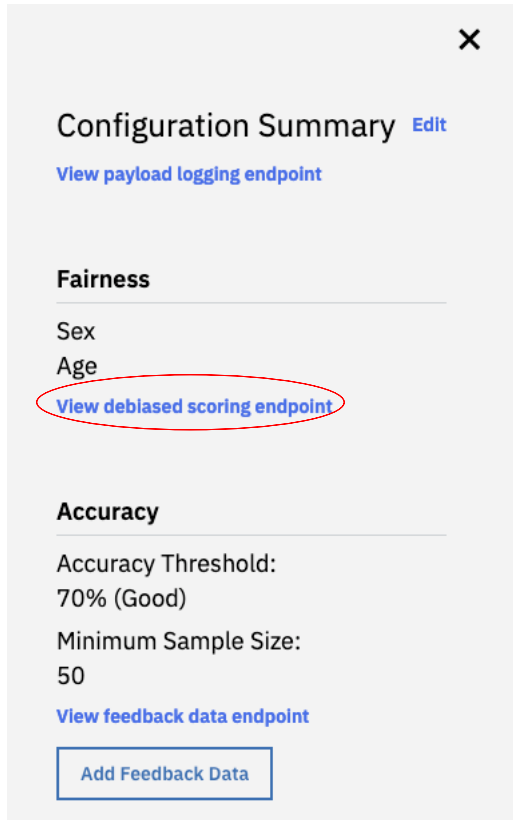
The lower half of the screen shows a time based graph tracking average requests per minute, accuracy, and fairness. Hovering over any part of the graph will allow you to drill down and see details for that set of transactions.

6. Click on the three dots to the far right of the screen.



A sidebar will open up that has links to manually configure Watson OpenScale fairness/bias thresholds and tracked features/inputs as well as links to the debiased scoring endpoint for your model.

7. Click on View debiased scoring endpoint.



The screenshot shows a sidebar titled "Configuration Summary" with a close button (X) in the top right corner. Below the title is a link "View payload logging endpoint". The sidebar is divided into two main sections: "Fairness" and "Accuracy". Under "Fairness", there are links for "Sex", "Age", and "View debiased scoring endpoint", with the latter being circled in red. Under "Accuracy", there are labels for "Accuracy Threshold: 70% (Good)" and "Minimum Sample Size: 50", followed by a link "View feedback data endpoint" and a button "Add Feedback Data".

Configuration Summary [Edit](#)

[View payload logging endpoint](#)

Fairness

Sex

Age

[View debiased scoring endpoint](#)

Accuracy

Accuracy Threshold:
70% (Good)

Minimum Sample Size:
50

[View feedback data endpoint](#)

[Add Feedback Data](#)

This provides API specifications and calls for an endpoint that automatically mitigates any bias detected in your machine learning model. This allows external systems to use an unbiased version of a deployed machine learning model on a transaction by transaction basis.

8. Click on OK to return to your model graph.

IBM Watson OpenScale

3D

Spark German Risk Deployment - Final : Fairness

Implementation of debiased scoring endpoint

Use the code snippet provided to get debiased responses from your deployed model.

Details

View API Specification | Download

Deployment Name	Spark German Risk Deployment - Final
Datamart ID	90dacaf5-5647-4a01-88e4-34631fc2c678
Feedback Table Name	Feedback_6943a37d-3c5e-4456-b2e5-ccc45ed4eb09
Deployment ID	eb12030e-73ec-4c5e-bb7e-91772bba10c5
Subscription ID	6943a37d-3c5e-4456-b2e5-ccc45ed4eb09
Binding ID	a04620c8-926c-480c-9e8f-563e74c4481a

Debiased Endpoint Code Snippet: Spark German Risk Deployment - Final ⓘ

cURL

Java

Python

Copy to clipboard

Replace "fields" - list of features column from payload logging - replace sample values with proper ones

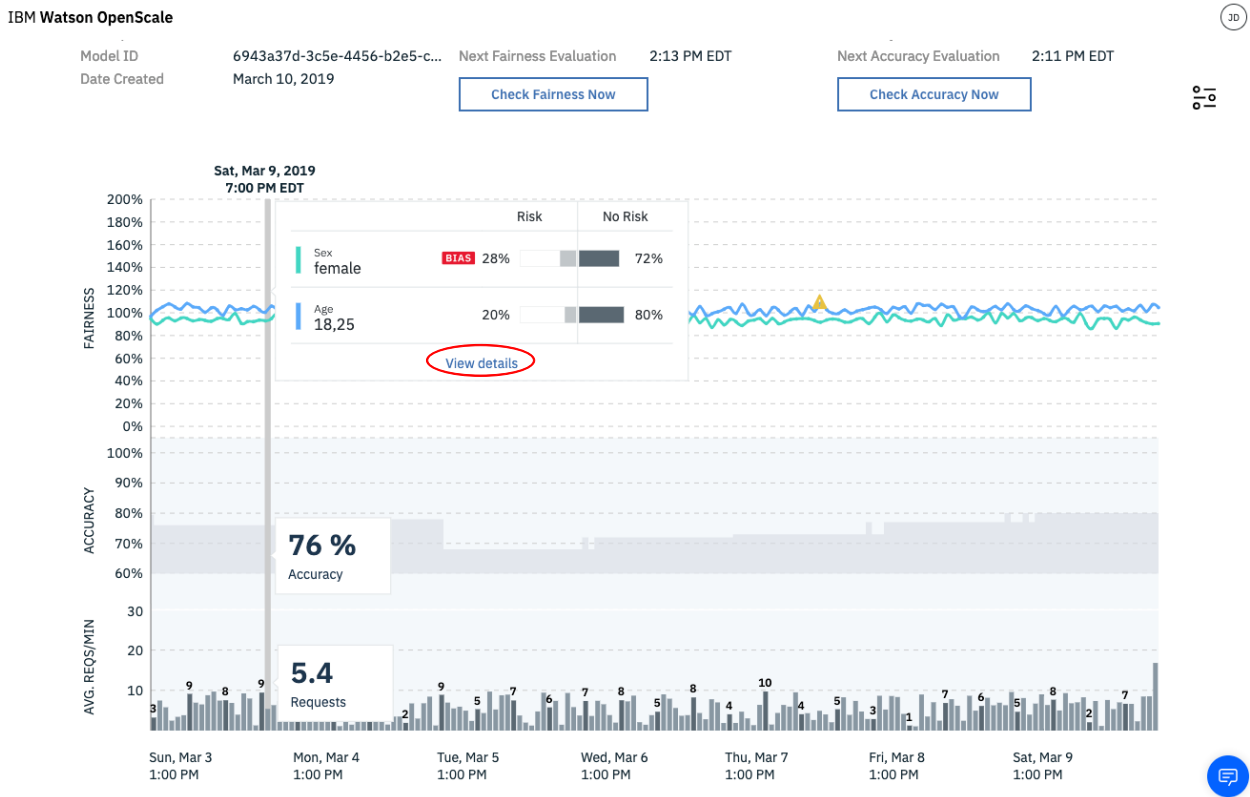
Replace "values" - payload logging data records - replace sample values with proper ones

curl -X POST "https://api.aiopenscale.cloud.ibm.com/v1/data_marts/90dacaf5-5647-4a01-88e4-34631fc2c678/service_bindings/a04620c8-926c-480c-9e8f-5

OK

28

9. Hover over a more recent transaction and click View details.

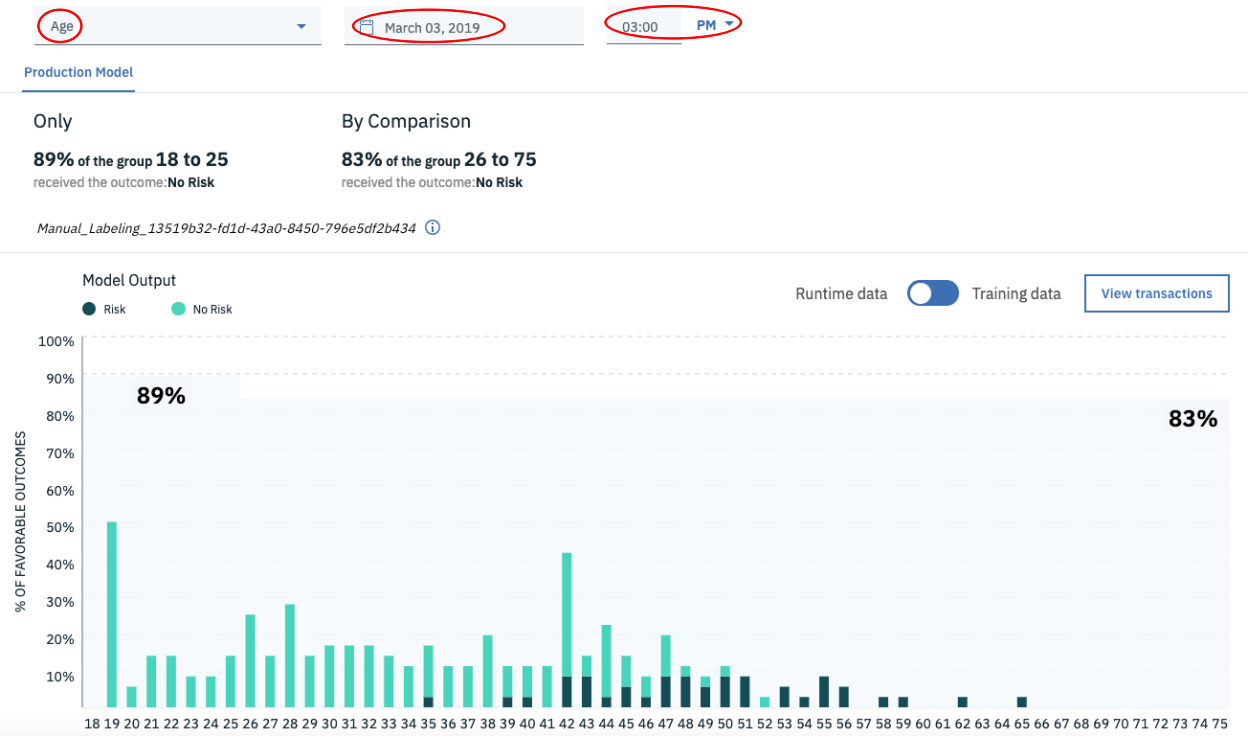


This page allows us to focus on fairness for a specific input feature (in this case we have set OpenScale to track the fairness of Age and Sex). Favorable outcomes were also set by our notebook with No Risk as the favorable outcome. A threshold can be configured to flag bias if fairness falls below that threshold.

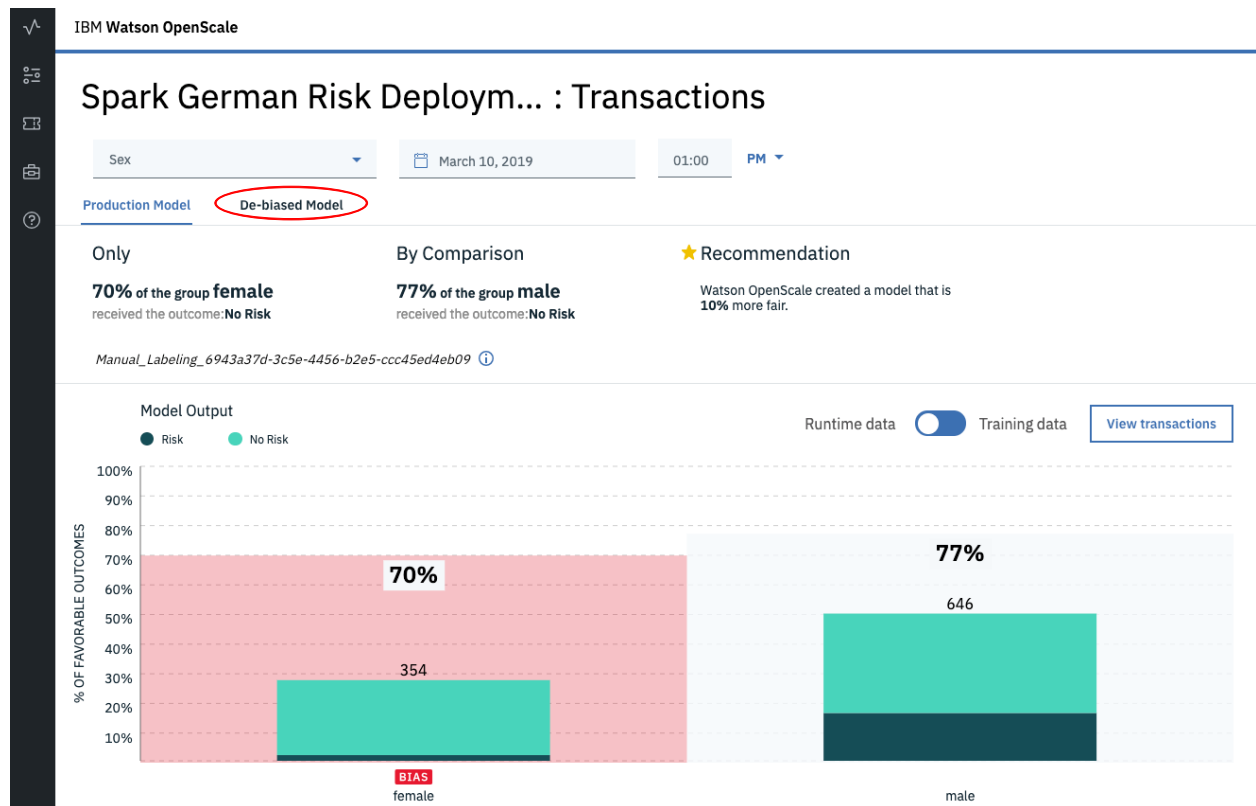
Note that it may take 15 minutes time for the de-biased model to appear the first time.

- 10. After waiting for 15 minutes, change Age to Sex.
- 11. Switch the date and time as close as possible to your current day and time.

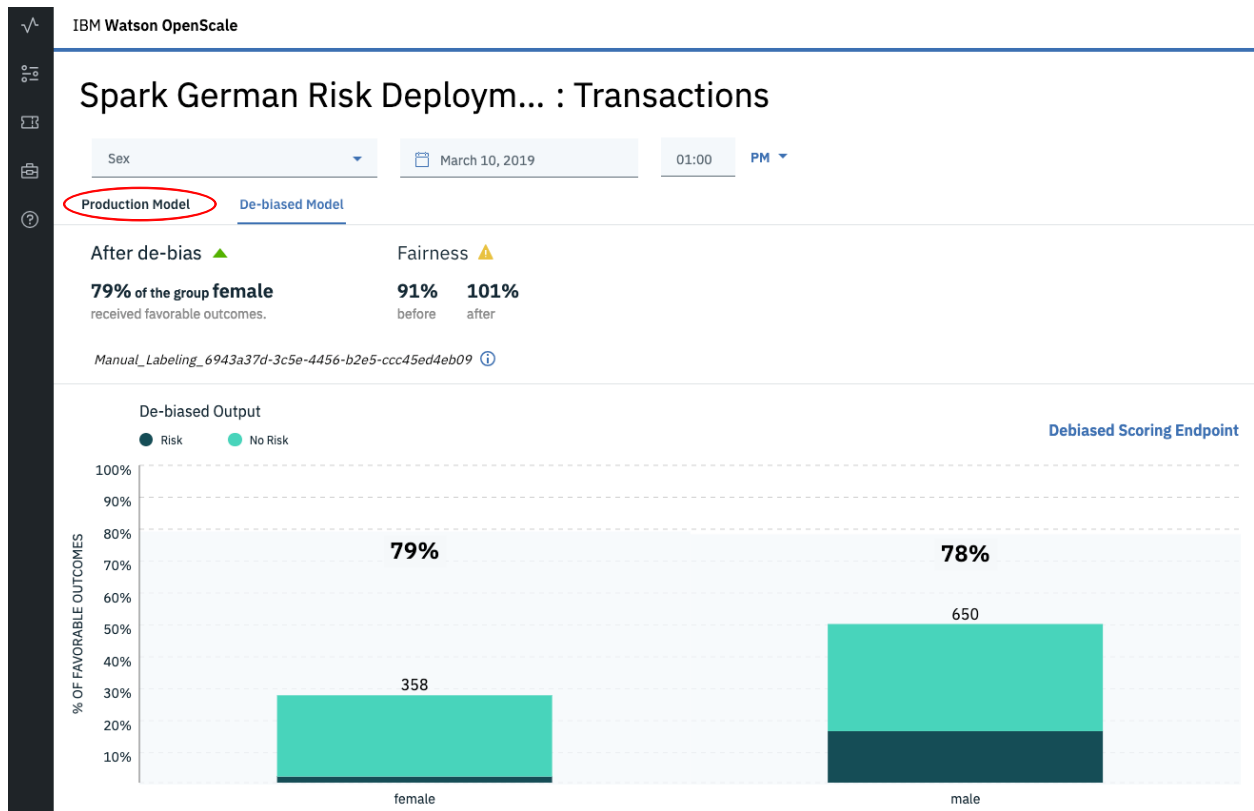
Spark German Risk Deploy... : Transactions



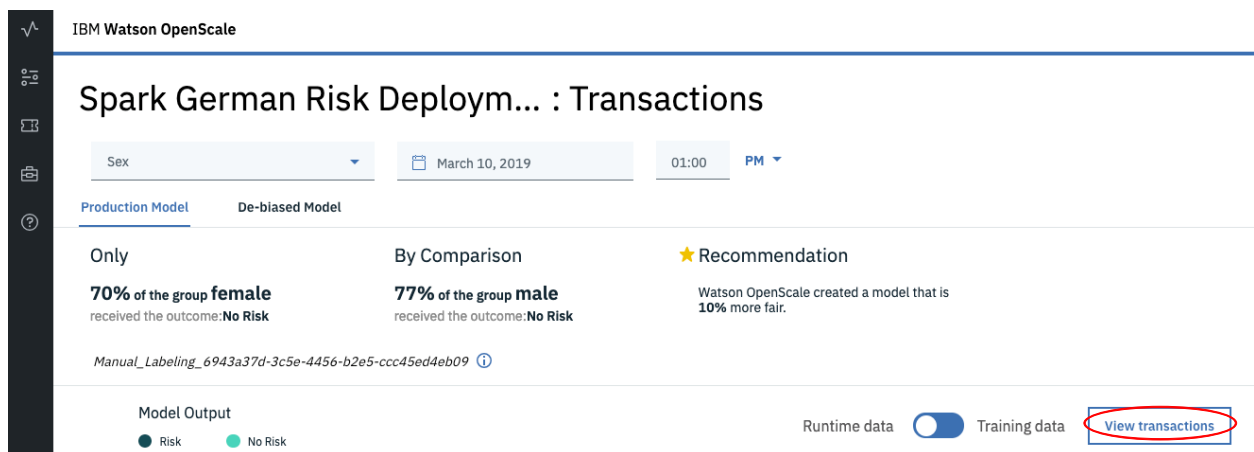
12. Switch to the De-biased model tab to observe the model OpenScale created to mitigate bias.



13. Once you have observed the change, click on the Production Model tab.



14. Click on View transactions.



This page allows us to observe transaction-by-transaction lists on the left side of the screen and aggregate Payloads on the right with comparisons between the current model and de-biased models.

15. Click on Explain next to a transaction.

IBM Watson OpenScale

JD

←

Spark German Risk Deployment - Final: Transactions

March 10, 2019 01:00 PM

Sex

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
c304f74f62cc1193c6747c3c6eb1d7c0-159	female		0	Explain
c304f74f62cc1193c6747c3c6eb1d7c0-1	male		0	Explain
c304f74f62cc1193c6747c3c6eb1d7c0-160	male		1	Explain
c304f74f62cc1193c6747c3c6eb1d7c0-22	female		0	Explain
c304f74f62cc1193c6747c3c6eb1d7c0-161	female		1	Explain

Payload Table ⓘ

Payload_6943a37d-3c5e-4456-b2e5-ccc45ed4eb09

Corrected Records

No Risk : Favorable Outcome

Current Model

De-biased Model

69.9%

79.3%

Risk : Unfavorable Outcome

Current Model

De-biased Model

30.1%

20.7%

This shows how our model made a decision based on how different input features were weighted and lists the minimum changes necessary to switch the model decision.

IBM Watson OpenScale

JD

✓

Explain a transaction

🔍

f6346cb26edf4fc10b4... x

Details ⓘ

Transaction

Deployment

Model Name

f6346cb26edf4fc10b45a8cea4e7a4ad-930

Spark German Risk Deployment - Final

Spark German Risk Model - Final

Minimum factors supporting this outcome ⓘ

LoanDuration

InstallmentPlans

Job

43

bank

unemployed

Risk

45%

CONFIDENCE

55%

No Risk

Factors contributing to Risk confidence level

Factors contributing to No Risk confidence level

LoanDuration: 43.00

25%

11%

OthersOnLoan: none

33

You have completed base lab.

For training on topics including machine learning, data science, and blockchain, please visit: <https://www.ibm.com/industries/federal/analytics>

For an additional optional lab, continue on to step 4 on the next page.

Step 5: Synthesize a Neural Network. (Optional)

Watson OpenScale and Watson Studio are able to automatically synthesize Neural Networks with a high a degree of performance.

1. Click on the briefcase icon.

The screenshot shows the IBM Watson OpenScale interface. On the left sidebar, the briefcase icon is circled in red. The main content area is titled 'Explain a transaction' and displays details for a specific transaction. Below the details, a risk analysis bar shows 'Risk' at 45% and 'No Risk' at 55%. Factors contributing to the risk level are listed below, including 'LoanDuration: 43.00' at 25% and 'OthersOnLoan: none' at 11%.

Details ⓘ		Minimum factors supporting this outcome ⓘ	
Transaction	f6346cb26edf4fc10b45a8cea4e7a4ad-930	LoanDuration	43
Deployment	Spark German Risk Deployment - Final	InstallmentPlans	bank
Model Name	Spark German Risk Model - Final	Job	unemployed

Risk		CONFIDENCE		No Risk	
45%		55%			
Factors contributing to Risk confidence level		Factors contributing to No Risk confidence level			
LoanDuration: 43.00		25%		OthersOnLoan: none	
		11%			

2. Click on Synthesize a model.

Try NeuNetS

NeuNetS (beta) allows you to synthesize models using Watson OpenScale technology in Watson Studio.

[Sign up for the free Watson Studio Lite plan](#)



3. Click on Synthesize a model.

IBM Watson Studio

NeuNetS

NeuNetS : Neural Network Synthesis BETA

Automatically design and train neural network models without code.

- 1 Upload your data**
Upload images/text and labels to Cloud Object Storage. NeuNetS can handle millions of text or image samples.
- 2 NeuNetS does the rest**
A variety of neural networks architectures are automatically synthesized and tested to find which works best for your data. The resulting model is evaluated and optimized for maximum accuracy, precision and recall.

Getting Started

[Synthesize a Model](#) [View Documentation](#)

4. Under Trained model connection, click Select.

Define classifier details

Name
Type your name

Description
Type your description here

Project
Trusted AI Project

Add synthesized text or image classifier to an existing project.

Machine Learning Service Instance
pm-20-ez

Data type

☐ Image ☐ Text ☒ From sample

TEXT

SMS Spam Classification

The Text SMS Spam Classification data set includes SMS messages that are classified as spam or legitimate messages.

Download Share

IMAGE

CIFAR-10

CIFAR-10 is a labeled subset of the 80 million tiny images dataset, referenced in the technical report "Learning Multiple Layers of Features from Tiny Images", Alex Krizhevsky, 2009

Download Share

Trained model connection

[Select](#)

☐ Your training data will be used by IBM for research, testing, and offering development related to Watson OpenScale. If you do not want IBM to use your training data, check the box, and IBM will not use the training data associated with this submission.

5. Click on the new connection tab.
6. Under Cloud Object Storage instance select your cloud storage form the dropdown.
7. Under Bucket Containing results data enter “neunets-XXXX-results” where the Xs are your initials in lowercase (e.g. neuneuts-mpc-results).
8. Click Create.

Existing connections **New connection**

Connection name

New COS connection - 7 Mar 2019

Connection name is restricted to upper and lowercase letters, numbers, underscores, dashes, periods and spaces. Once created, the new connection will be visible as a data asset in your project.

☐ Restrict connection access to selected bucket

⚠ Unrestricted connections have access to buckets beyond the selected bucket. Be careful not to delete any buckets that may be used for project or catalog storage.

Cloud Object Storage instance

cloud-object-storage-as

Bucket containing results data

☐ Existing ☒ **New**

neunets-mpc-results

Bucket name is restricted to lowercase letters from a to z, numbers, or dashes, between 3 and 64 characters in length.

Cancel **Create**

9. Back on the Synthesize text or image classifier page, enter a name and description.
10. Select your Machine Learning service under Machine Learning Service Instance.

Define classifier details

Name

CIFAR_10_Model

Description

CIFAR NeuNet

Project

Trusted AI Project

Add synthesized text or image classifier to an existing project.

Machine Learning Service Instance

pm-20-ez

Data type

☐ Image

☐ Text

☒ From sample

TEXT

SMS Spam Classification

The Text SMS Spam Classification data set includes SMS messages that are classified as spam or legitimate messages.

↓ ↗

IMAGE

CIFAR-10

CIFAR-10 is a labeled subset of the 80 million tiny images dataset, referenced in the technical report "Learning Multiple Layers of Features from Tiny Images", Alex Krizhevsky, 2009

↓ ↗

Trained model connection

Results: New COS connection - 7 ... / neuronets-mpc-results

Update

☐ Your training data will be used by IBM for research, testing, and offering development related to Watson OpenScale. If you do not want IBM to use your training data, check the box, and IBM will not use the training data associated with this submission.

Cancel

Begin Synthesis

11. Select from Sample along the right side and click CIFAR 10.
12. Click Begin Synthesis.

Synthesize text or image classifier BETA

Define classifier details

Name

CIFAR_10_Model

Description

CIFAR NeuNet

Project

Trusted AI Project

Add synthesized text or image classifier to an existing project.

Machine Learning Service Instance

pm-20-ez

Data type

☐ Image

☐ Text

☒ From sample

TEXT

SMS Spam Classification

The Text SMS Spam Classification data set includes SMS messages that are classified as spam or legitimate messages.

↓ ↗

IMAGE

CIFAR-10

CIFAR-10 is a labeled subset of the 80 million tiny images dataset, referenced in the technical report "Learning Multiple Layers of Features from Tiny Images", Alex Krizhevsky, 2009

↓ ↗

Trained model connection

Results: New COS connection - 7 ... / neuronets-mpc-results

Update

☐ Your training data will be used by IBM for research, testing, and offering development related to Watson OpenScale. If you do not want IBM to use your training data, check the box, and IBM will not use the training data associated with this submission.

Cancel

Begin Synthesis

13. Click Create.

Location to store trained model


Existing connections [New connection](#)

Connection name

New COS connection - 7 Mar 2019

Connection name is restricted to upper and lowercase letters, numbers, underscores, dashes, periods and spaces. Once created, the new connection will be visible as a data asset in your project.

☐ Restrict connection access to selected bucket

 Unrestricted connections have access to buckets beyond the selected bucket. Be careful not to delete any buckets that may be used for project or catalog storage.

Cloud Object Storage instance

cloud-object-storage-as

Bucket containing results data

☐ Existing ☒ New

NeuNets_JDII_Results

Bucket name is restricted to lowercase letters from a to z, numbers, or dashes, between 3 and 64 characters in length.

[Cancel](#) [Create](#)

Your model may take a long time to synthesize.

14. Click on Confusion matrix and observe further results.

IBM Watson Studio

Upgrade

John Doe's Account

My Projects / Trusted AI Project / CIFAR_10_Model

CIFAR_10_Model

Associated Service : pm-20-ez

Job accepted Preprocessing Synthesizing Completed

[Download model](#) [Deploy model to Watson Machine Learning](#)

Status

Synthesizing complete. You can download or deploy your model.

Performance

Accuracy	Precision	Recall
90.8%	0.907	0.908

Training data

Content type	image
Source bucket	synthesized-neural-network-sample-cifar10
Number of classes	10

[Label statistics](#) [Confusion matrix](#)

Total training samples
48000

Total classes
10

Enter label filter value(s)

☐ View validation samples
☐ Sort highest to lowest

Lowest training samples per class

	1000	2000	3000	4000	5000
Aeroplane					4800
Automobile					4800
Birds					4800
Cats					4800
Deer					4800

Showing 5 of 10 total classes
[Show full training data](#) [Download all](#)

15. Click on Deploy model to Watson Machine Learning

The screenshot shows the IBM Watson Studio interface for a project named 'CIFAR_10_Model'. The top navigation bar includes 'My Projects / Trusted AI Project / CIFAR_10_Model', an 'Upgrade' button, and a user profile 'John Doe's Account'. Below the navigation bar, a progress bar indicates the model's status: 'Job accepted', 'Preprocessing', 'Synthesizing', and 'Completed'. To the right of the progress bar are two buttons: 'Download model' and 'Deploy model to Watson Machine Learning', which is circled in red. The main content area is divided into two panels. The left panel, titled 'Status', shows 'Synthesizing complete. You can download or deploy your model.' Below this, the 'Performance' section displays 'Accuracy 90.8%', 'Precision 0.907', and 'Recall 0.908'. The 'Training data' section shows 'Content type: image', 'Source bucket: synthesized-neural-network-sample-cifar10', and 'Number of classes: 10'. The right panel, titled 'Label statistics' and 'Confusion matrix', provides a detailed view of the model's performance. It includes a search bar for 'Enter label filter value(s)', a toggle for 'View normalized data', and a toggle for 'Sort highest to lowest'. The confusion matrix table shows the following data:

Predicted \ Actual	Truck	Automobile	Ship	Horse	Frog	Actual totals
Truck	0.97	0.01	0.01	0.00	0.00	1200
Automobile	0.02	0.96	0.01	0.00	0.00	1200
Ship	0.01	0.01	0.96	0.00	0.00	1200
Horse	0.00	0.00	0.01	0.94	0.00	1200
Frog	0.00	0.00	0.00	0.00	0.93	1200
Predicted totals	1244	1200	1214	1265	1201	12000

This is now a Watson Machine Learning Model and can be deployed and monitored using all the techniques shown during the first session today as well as the Watson OpenScale session.

You completed the optional lab.