

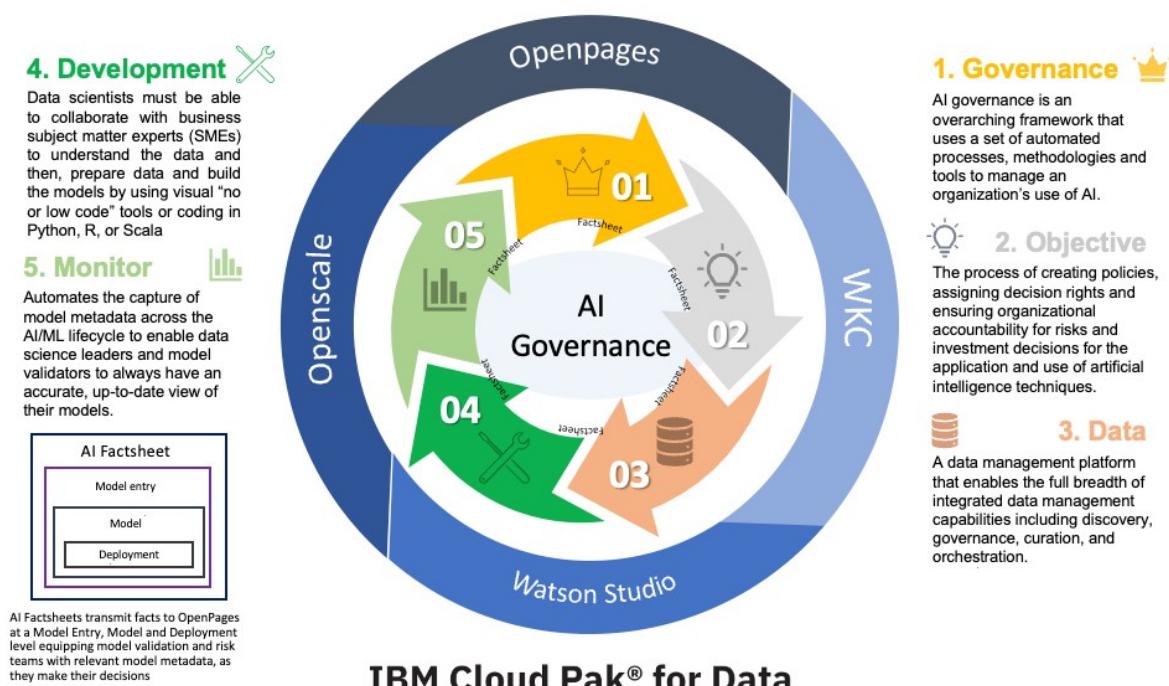
Lab - AI GOVERNANCE

Concept

AI Governance is a framework for organizations can manage AI through a set of automated processes and tools in accordance with that organization's standardized regulations and requirements. Organizations use AI Governance to track machine-learning models from request to production and to evaluate models to meet thresholds for fairness and accuracy. Using consistent principles throughout the model design, model development, model deployment, and model monitoring is critical for organizations to uphold responsible and trustworthy AI. IBM AI Governance is built on three crucial principles: -

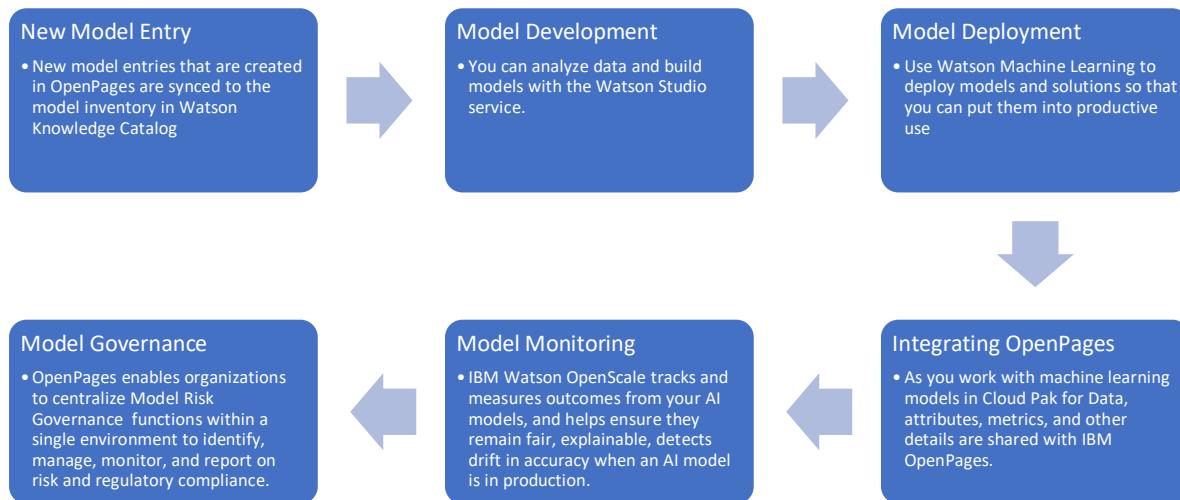
1. **Lifecycle Governance:** Monitor, catalog, and govern AI models from anywhere and throughout the AI lifecycle.
 2. **Risk Management:** Manage risk and compliance according to business standards and through automated facts and workflow management.
 3. **Regulatory Compliance:** Proactively help to ensure compliance with current and future regulations proactively.

IBM's Cloud Pak for Data is a modern data and AI platform that addresses the need for AI Governance through its integrated solution set. The chart below provides a summary of an AI model lifecycle through the structure of IBM's AI Governance. By following the number designations represented in the multicolor inner circle, we will first see how a model's lifecycle begins as a governable artifact. This artifact becomes a governed asset as it progresses through the AI Governance maturity cycle. The outer circle represents the cohesive set of IBM's technologies that accomplishes IBM's AI Governance methodology. In addition, we will see how AI [Factsheets](#) carry metadata throughout this lifecycle to operationalize, automate, and prove trustworthy outcomes.



Lab Workflow

Please refer to the graph below to review the activities within this AI Governance lab.



Steps & Technology

For AI projects to be successful, organizations need to focus on these fundamental approaches:

- 1) Focus on the right business case.
- 2) Realize that AI projects should be metadata driven.
- 3) Build a strong governance foundation.
- 4) Bridge gaps between all layers of organizational inputs.

The methodology of AI Governance seeks to resolve challenges organizations can have with successful AI implementation by leveraging the IBM technology stack. This lab begins with the model entry process in [OpenPages](#). From [OpenPages](#), we will define a business case and persona roles as part of that model input. We will then review various model development options, and for this lab, we will use IBM's AutoAI solution. Next, we will deploy the model and review how to manage these deployments within Cloud Pak for Data. We will build monitoring meters for that model using [OpenScale](#). Finally, we will return to [OpenPages](#) to see how AI Governance performs as a solution set.

[OpenPages](#) – Provides governance, risk, and compliance tools to help organizations manage risk and regulatory compliance.

[Watson Knowledge Catalog](#) - Catalogs curated assets to be accessible by other IBM technologies.

[FactSheets](#) - A Factsheet is a collection of relevant information (facts) about the creation and deployment of an AI model or service. Facts could range from information about the purpose and criticality of the model to measured characteristics of the dataset, model, or service, or actions taken during the creation and deployment process of the model or service.

[Watson Studio](#) - Provides data science tools for AI development.

[OpenScale](#) – Monitors AI models for bias, fairness, and trust with added transparency on how your AI models make decisions.

1.1 Lab Overview

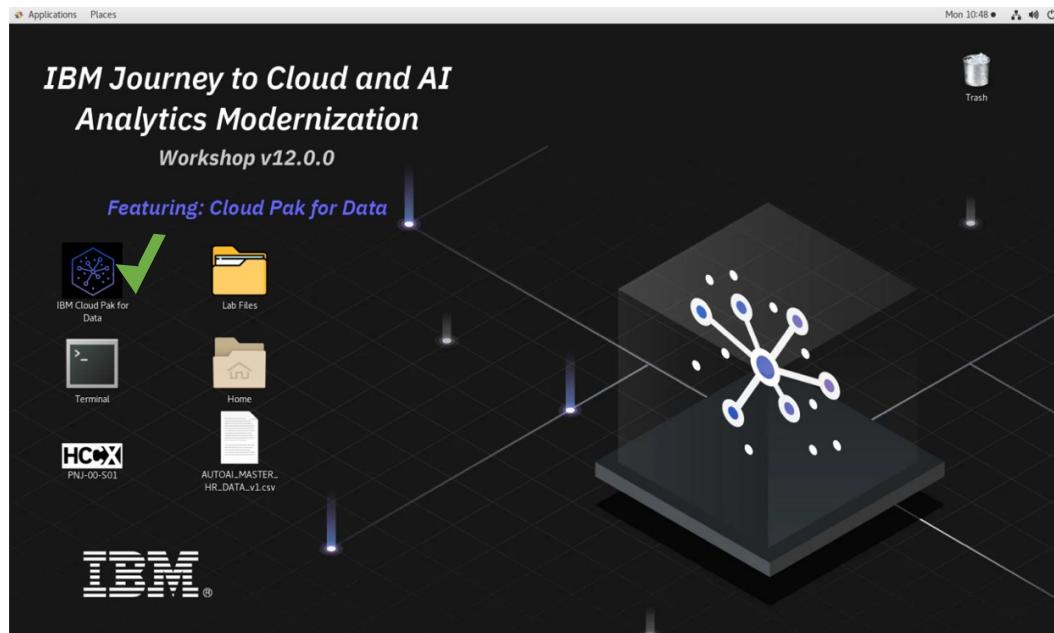
Throughout this lab, you will explore the practice known as AI Governance. This lab will demonstrate how IBM's Cloud Pak for Data platform applies governance tools to enable trust in AI-powered systems at every step of the AI development process. Each component of Cloud Pak for Data will show a solution set that ensures transparency and explainability throughout an organization's AI governance practice.

1.2 Personas represented in this lab.

Persona (Role)	Capabilities
 Administrator	<p>Administrators set up and maintain the CPD environment itself.</p> <p>Note: while some of the Admin work can be done in the CPD web client, most of the Admin work on the cluster would be done in OpenShift which is outside the scope of this workshop.</p> <p>The exercises in this first lab represent some typical CPD Administrator activities.</p>

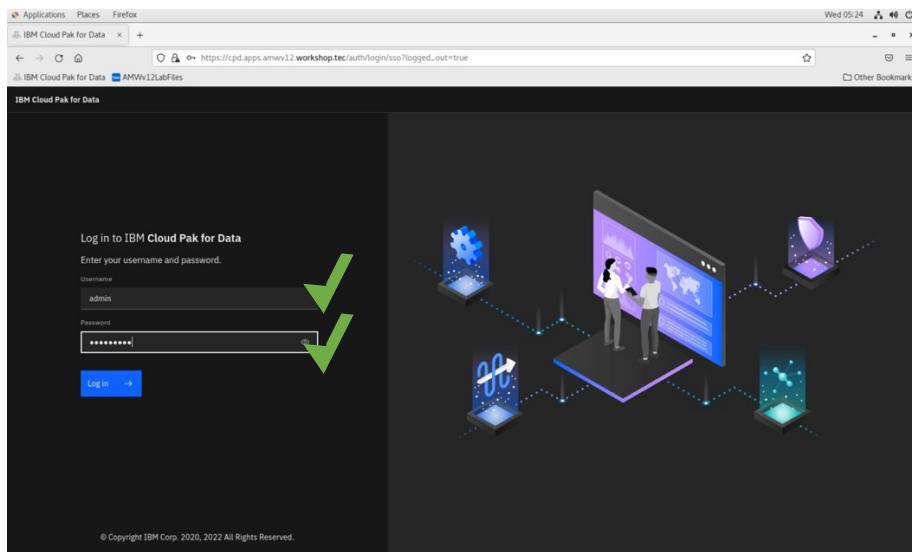
1.3 Navigate to the Cloud Pak for Data Home Page

1. Double-click the [IBM Cloud Pak for Data](#) icon to access Cloud Pak. *Please note there is a “Lab files” folder on the desktop which contains assets for later activity.*



2. Enter the following credentials when you at the [IBM Cloud Pak for Data](#) home screen.

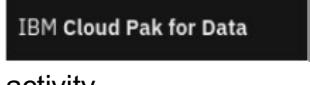
Username: admin
Password: cpdaccess

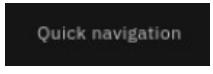


Click the blue **Login** button to enter the platform.

3. Here are some navigation pointers.

1)  the “Hamburger Menu” references the **IBM Cloud Pak for Data** main navigation menu.

2)  may be used to access the home screen at any point within an activity.

3)  use the quick navigation list to return to a favorite asset.

4)  use the ellipsis icon to view the menu for an asset.

1.4 OpenPages – Model Use Case

FOUNDATION

OpenPages brings together essential stakeholders, who often work independently on siloed and duplicate data. For the model developer, owner, validator, and business unit executive, OpenPages Model Risk Governance combines a flexible data model with overall document management, powerful workflow capabilities, and business intelligence. This supports a greater level of engagement and transparency in the overall model risk management processes.

OpenPages Model Risk Governance provides a configurable and customizable solution with key features that include:

Comprehensive model inventory - Creates and maintains a comprehensive model inventory. Organizes, documents, and maintains an enterprise-wide record of models and their usage.

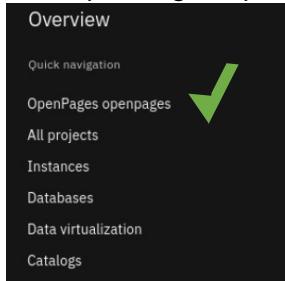
Model metrics - Documents and tracks issues and metrics associated with models.

Workflow management - Enables workflow management of the model and validation of life cycles.

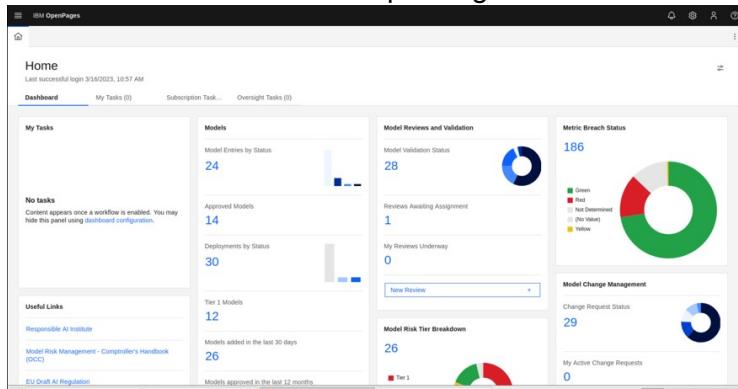
Model risk assessments - Conduct periodic model attestations and model risk assessments.

Audit and resource management - Provides the ability to monitor and manage the execution of the audit and the assignment and tracking of resources.

1. From the [IBM Cloud Pak for Data](#) homepage, navigate to the “Quick Navigation” section and click on OpenPages openpages

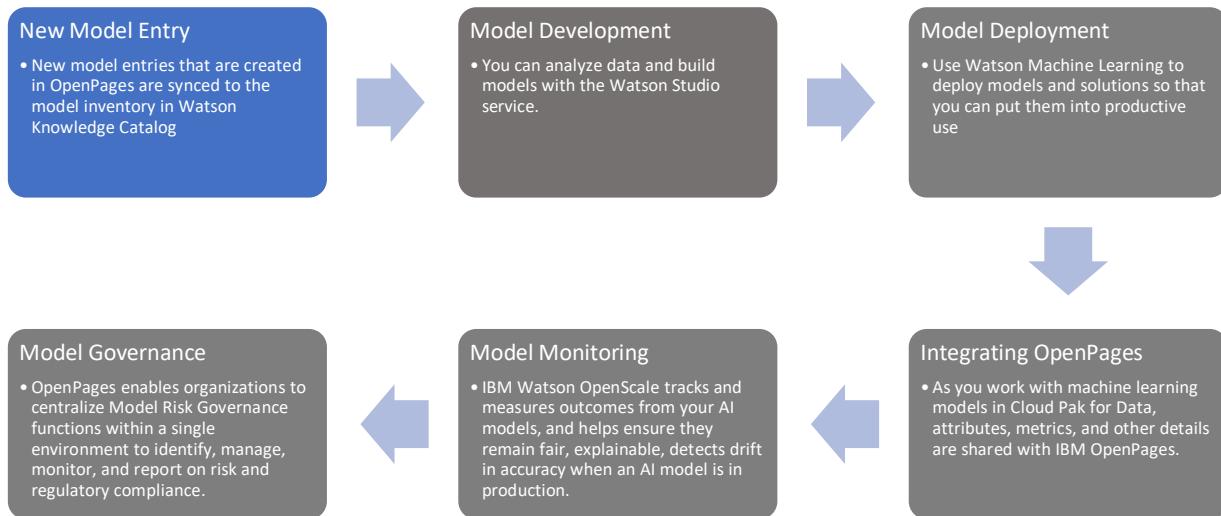


2. You will now land on the OpenPages home screen.



Read more here: <https://www.ibm.com/downloads/cas/5N39ZO2X>

3. The life of an AI model within AI Governance first begins as a business initiative. By using OpenPages, a model owner will collaborate with developers, validators, and business executives to develop inputs for this business initiative. This collaboration occurs within a [New Model Entry](#).



4. From the OpenPages home screen, scroll down and select [New Model Entry](#)

The screenshot shows the IBM OpenPages dashboard. On the left, there's a sidebar with 'Useful Links' including 'Responsible AI Institute', 'Model Risk Management - Comptroller's Handbook (OCC)', 'EU Draft AI Regulation', 'SR 11-7 Information', and 'E-23 Information'. The main dashboard area has several sections: 'Tier 1 Models' (12), 'Models added in the last 30 days' (26), 'Models approved in the last 12 months' (10), a 'New Review' button, a 'Model Risk Tier Breakdown' chart (with segments for Tier 1, Tier 2, Tier 3, and (No Value)), a 'Model Change Management' section with 'Change Request Status' (29), 'My Active Change Requests' (0), and 'Change Requests in Process' (10), and a 'Models by Provider' chart showing counts for IBM, AWS SageMaker, Azure, and DataRobot.

5. A [New Model Entry](#) window will appear. Now that the collaborative business definitions for this model have been defined, some basic elements of this model will be inserted in the model entry.

For this lab, we will focus on an HR Attrition use case. Our goal is to create an AI model which can predict attrition based on employee demographics, survey data, and organizational structure.

The screenshot shows the 'Model Entry' dialog box titled 'New Model Entry'. It includes fields for 'Name' (Attrition Prediction Model - HR), 'Purpose' (To predict attrition within ABC Organization), and 'Description' (Developed by Admin, HR Executive, DS Department, and Risk Officer). A green checkmark is placed over the 'Add' button at the bottom right of the dialog.

Name: Attrition Prediction Model – HR

Purpose: To predict attrition within ABC Organization

Description: Developed by Admin, HR Executive, DS Department and Risk Officer

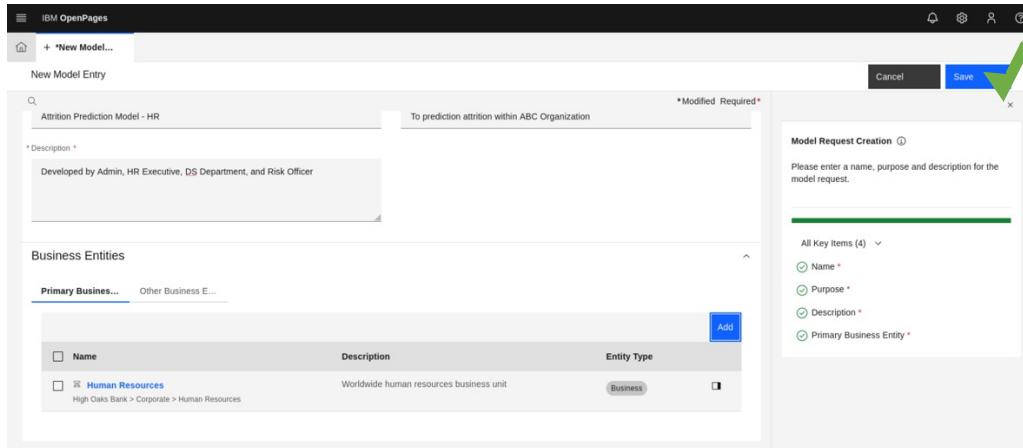
6. Assign a Business Entity to this model entry. Select [Add](#).

The screenshot shows the 'Business Entities' list page. It has tabs for 'Primary Business...' and 'Other Business E...'. Below is a table with columns 'Name', 'Description', and 'Entity Type'. A green checkmark is placed over the 'Add' button in the top right corner of the list area.

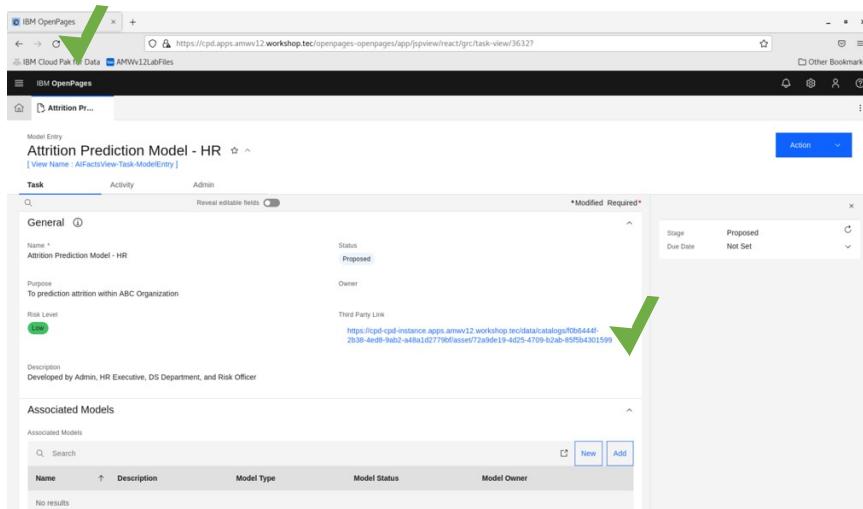
7. In the Add window, type “Human” and select enter. Select the Human Resource option which appears. Then select [Done](#).

The screenshot shows the 'Add' dialog box. It lists one result for 'Human'. The 'Human Resources' option is selected, indicated by a blue checkmark. A green checkmark is placed over the 'Done' button at the bottom right of the dialog.

8. Now that we have filled in specifics within our New Model Entry, select Save in the top right.



9. After 30 seconds, refresh the window. You will now see the Third-Party Link populated within the Model Entry. This link will be used by all other corresponding AI Governance technologies as we continue to build our Attrition Prediction Model.

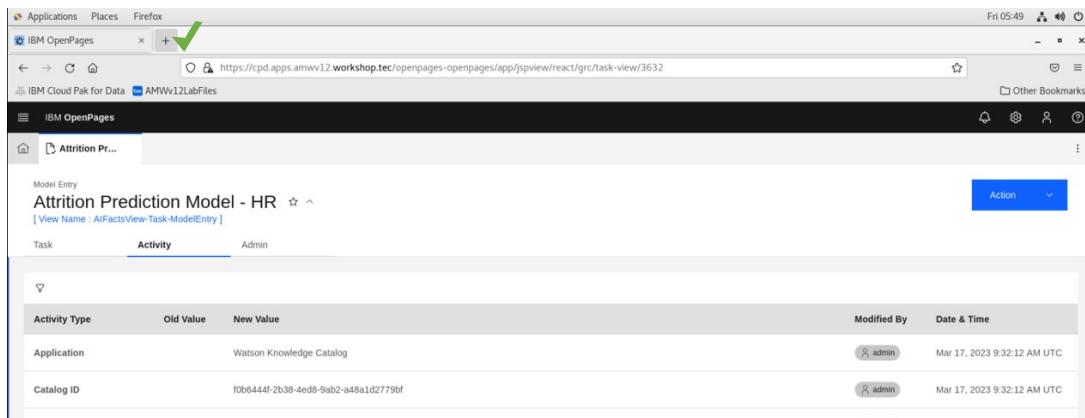


10. Select the Activity tab, where we will see how the captured metadata of this model will automatically be saved in a model repository. Watson Knowledge Catalog has created a model entry within its Model Inventory and all model development work that occurs in Watson Studio will be associated with this model through a unique model ID.

The screenshot shows the 'Activity' tab for 'Attrition Prediction Model - HR'. A table lists activity details:

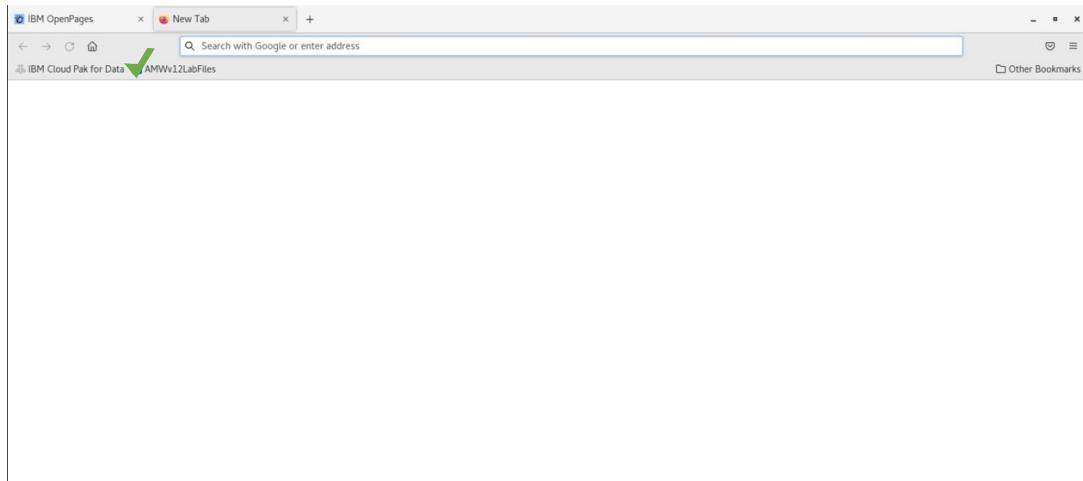
Activity Type	Old Value	New Value	Modified By	Date & Time
Application	Watson Knowledge Catalog		[User]	Mar 17, 2023 9:32:12 AM UTC
Catalog ID	f0b644af-2b38-4ed8-9ab2-a48a1d2779bf		[User]	Mar 17, 2023 9:32:12 AM UTC
External ID	72a9de19-4d25-4709-b2ab-85f5b4301599		[User]	Mar 17, 2023 9:32:12 AM UTC
Last Update	3/17/23		[User]	Mar 17, 2023 9:32:12 AM UTC
Third Party Link	https://cpd.apps.amwv12.workshop.tec/data/catalogs/f0b644af-2b38-4ed8-9ab2-a48a1d2779bfasset/72a9de19-4d25-4709-b2ab-85f5b4301599		[User]	Mar 17, 2023 9:32:12 AM UTC
Workflow Stage (Status)	Proposed		[User]	Mar 17, 2023 9:32:00 AM UTC

11. Select the “+” sign from the browser window.



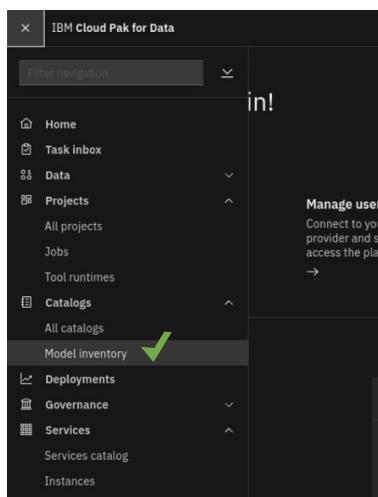
The screenshot shows a Firefox browser window with the title bar "IBM OpenPages". The address bar displays the URL <https://cpd.apps.amwv12.workshop.tec/openpages-openpages/app/jspview/react/grc/task-view/3632>. The main content area is titled "Attrition Prediction Model - HR" and shows a table of activity history. A green checkmark is placed over the "+" icon in the top-left corner of the browser window frame.

12. When a new browser window opens, select the **IBM Cloud Pak for Data** bookmark.



The screenshot shows a Firefox browser window with a single tab labeled "New Tab". The address bar contains the placeholder "Search with Google or enter address". In the bookmarks bar, there is a bookmark for "IBM Cloud Pak for Data" with a green checkmark next to it. The main content area is blank.

13. When the **IBM Cloud Pak for Data** home screen appears, select the Hamburger Menu, and select Model inventory.



The screenshot shows the IBM Cloud Pak for Data home screen. On the left, a Hamburger menu is open, showing various navigation options like Home, Task inbox, Data, Projects, Catalogs, Deployments, Governance, and Services. Under the Catalogs section, the "Model inventory" option is highlighted with a green checkmark. The main content area on the right shows a "Manage user" section with a "Connect to your provider and sign in" button.

- 14.** You will see an “Attrition Prediction Model – HR” tile created within the Model Inventory window. This screen will typically be accessible to the roles of model developer and validator. As users compile model details, associated assets, and business-relevant terminology to this model entry, this information will be viewable to the model owner in OpenPages.

The screenshot shows the IBM Cloud Pak for Data Platform Assets Catalog interface. A model named "Attrition Prediction Model - HR" is selected. The "Overview" tab is active, showing the following sections:

- Governance artifacts:**
 - Business terms:** No business terms added yet.
 - Classifications:** No classifications added yet.
- Details:**
 - Model purpose:** To predict attrition within ABC Organization.
 - Supporting documentation:** No supporting documentation added yet.
 - Risk level:** Low.
- About this asset:**
 - Description:** Developed by Admin, HR Executive, DS Department, and Risk Officer.
 - Asset owner:** System Unavailable.
 - Privacy:** Public.
 - Asset details:** Size: -, Columns: -, Rows: -.
 - Source:** Connection: -, Source type: -, Path: -.
 - Tags:** No tags added yet.
 - Created by:** System, Mar 17 2023.
 - Modified by:** System, Mar 17 2023.

Summary: This section illustrated how we have integrated a model inventory and [Factsheets](#) with [OpenPages](#) so that you can review machine learning models and related activity as part of enterprise risk and compliance monitoring. We have also demonstrated how persona collaboration and model lineage capture begin with [OpenPages](#). Now that we have established a business use case and created a compartment to contain AI assets, we will continue by creating an AI model and inputting that into this space.

In the next section, we will understand how AutoAI builds AI models, and how [Factsheets](#) assists in promoting transparency.

1.5 Create an AI Governance Project

FOUNDATION

A project is a workspace where you can collaborate with others to create a data science project. From a project, you can add assets, prescriptive and predictive tools, and define a workspace to derive value through Data Science.

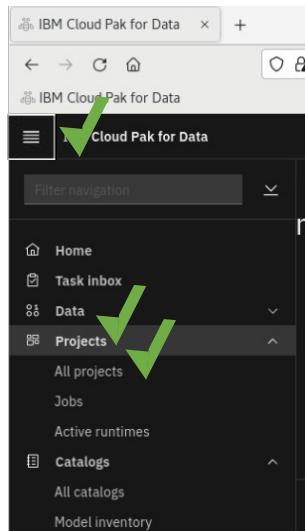
1. Select the [IBM Cloud Pak for Data](#) link at the top. This will place you on the home screen for Cloud Pak for Data.



A screenshot of the IBM Cloud Pak for Data home screen. It features a dark-themed dashboard with various sections: "Discover services", "Manage users", and "Stay informed". Below these are sections for "Overview", "Recent projects" (listing "JA Project - Watson Query, WKC, DataStage Assets" from Sep 13, 2022, 01:53 PM), "Requests" (0 data requests), and "Notifications" (two entries about publishing metadata enrichment results). A large central graphic shows a 3D cube with data points and a bar chart.

Projects are where the user develops assets – access Operational assets, Configuration assets, Environments, Jobs, Asset storage, Integrations, and on and on are all housed within a project during development.

2. Select the [Hamburger Menu](#) (top left), then select “[Projects](#)”, and then “[All Projects](#)”.



3. In the Projects window, select the “[New Project](#)” Button

The screenshot shows the 'IBM Cloud Pak for Data' interface with the 'Projects' tab selected. A single project, 'IA Project - Watson Query, WKC, DataStage Assets', is listed with a creation date of '1 week ago' and an 'Admin' role. On the right side of the screen, there is a prominent blue button labeled 'New project' with a green checkmark icon above it.

4. Select “[Create an empty project](#)”.

The screenshot displays the 'Create a project' dialog box. It offers three choices: 'Create an empty project' (selected), 'Create a project from a file', and 'Create a project integrated with a Git repository'. Each choice includes a brief description and a 'USE TO' section with specific applications. A large green checkmark is placed next to the first choice, 'Create an empty project'.

5. Select the Name box and type “[AI Governance](#)”, then select the “[Create](#)” button (lower right).

The screenshot shows the 'New project' dialog. In the 'Define details' section, the 'Name' field is filled with 'AI Governance'. Below this, there is a 'Description' section with a 'Project description' input field. At the bottom, under 'Choose project options', there are two checkboxes: 'Mark as sensitive' and 'Log all project activities'. The 'Create' button at the bottom right is highlighted with a large green checkmark.

Now that the project has been created, we will add a dataset to the AI Governance project for an AutoAI process.

Data fabric is an architectural approach that simplifies data access in an organization and facilitates self-service data consumption. [IBM Cloud Pak for Data](#) predicts outcomes faster using a platform built with the data fabric architecture. In this section, you will see how a modern data architecture ensures that data is accessible to relevant data users based on their unique workflows.

6. Select the “Assets” tab, then select “New Asset”.

The screenshot shows the 'Assets' tab selected in the top navigation bar. On the right, there's a prominent 'New asset' button with a green checkmark icon. A green arrow points directly at this button. The interface includes sections for 'Import assets' and 'Data in this project'.

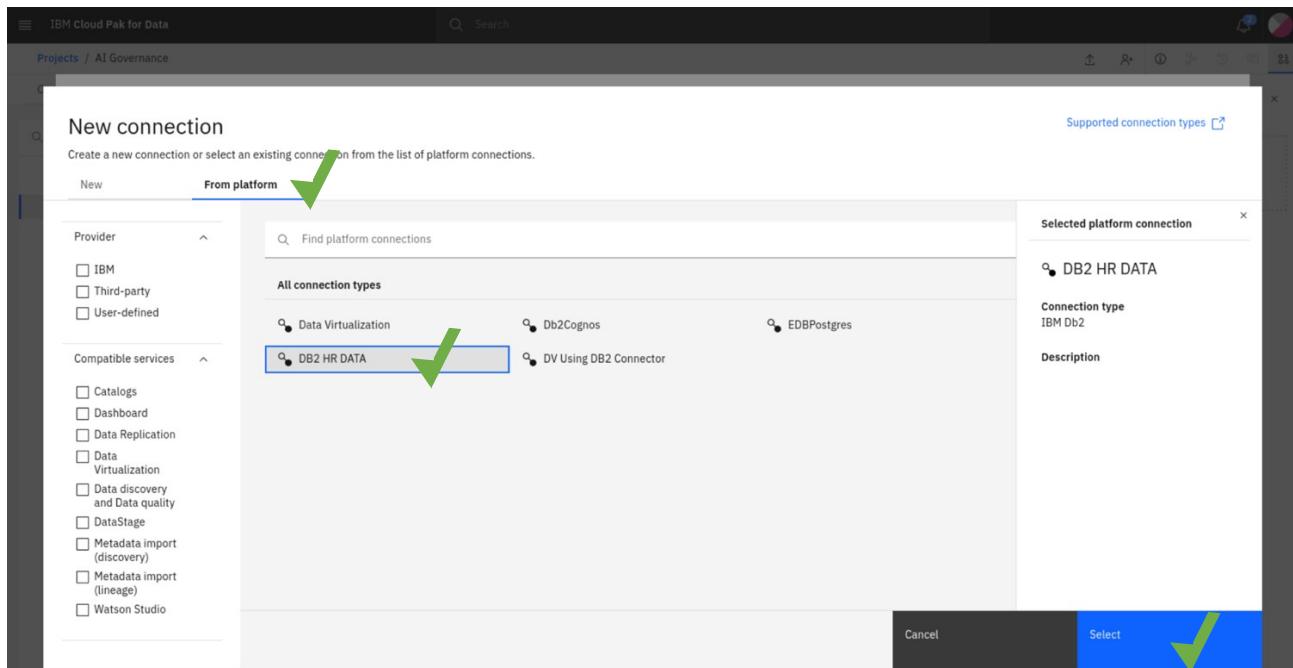
7. Scroll to the bottom and select the “Connection” tile.

The screenshot shows the 'New asset' dialog box. The 'Connection' tile is highlighted with a green arrow. Other tiles include 'Metadata Import' and 'Model'. A message at the top left says 'Connected data moved. To add connected data, close this dialog and click Import assets.'

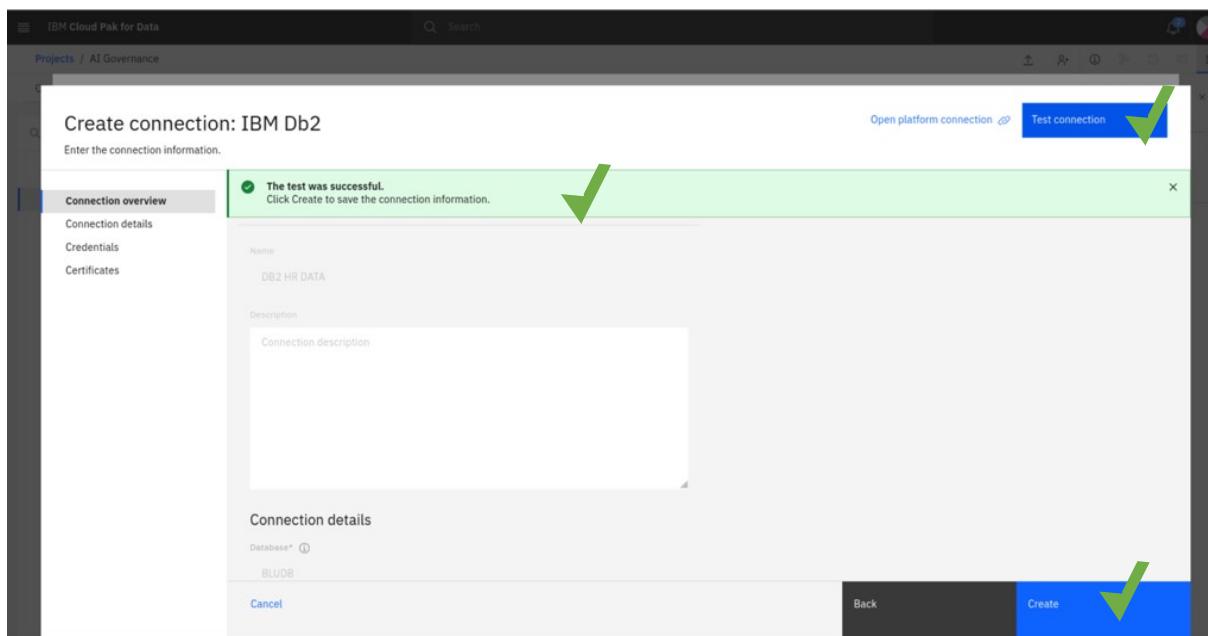
8. You can add connections to a broad array of data sources, which are listed below. If you need to create a connection to an unsupported data source, you can do so by using JDBC drivers. Some services can use connections that are defined at the platform level, while other services use connections that are specific to the service.

The screenshot shows the 'New connection' dialog box. The 'All connection types' section is expanded, listing various data sources. A green arrow points to the 'Amazon RDS for MySQL' entry. Other entries include 'Google Cloud Pub/Sub', 'IBM Db2 Warehouse', 'ODATA', 'ODBC', 'Oracle', 'Oracle (optimized)', 'PostgreSQL', 'Salesforce.com', 'Salesforce.com (optimized)', 'SAP ASE', and 'SAP Bulk Extract'.

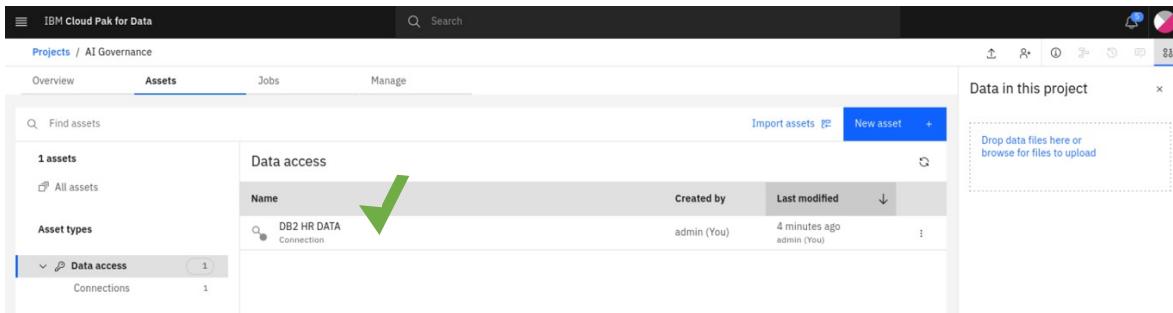
9. In general, platform-level connections simplify the process of creating and maintaining connections throughout your governance process. Once we create the connection, and then multiple services can refer to the connection. If you update a connection, the changes are automatically picked up by the analytics projects that use that connection. In this lab we will be using a dataset from IBM's Db2 Warehouse. Select “From Platform”, then select “DB2 HR DATA”, and click “Select”.



10. Click “Test Connection” to check if the connection to the warehouse is successful. Then click “Create.”



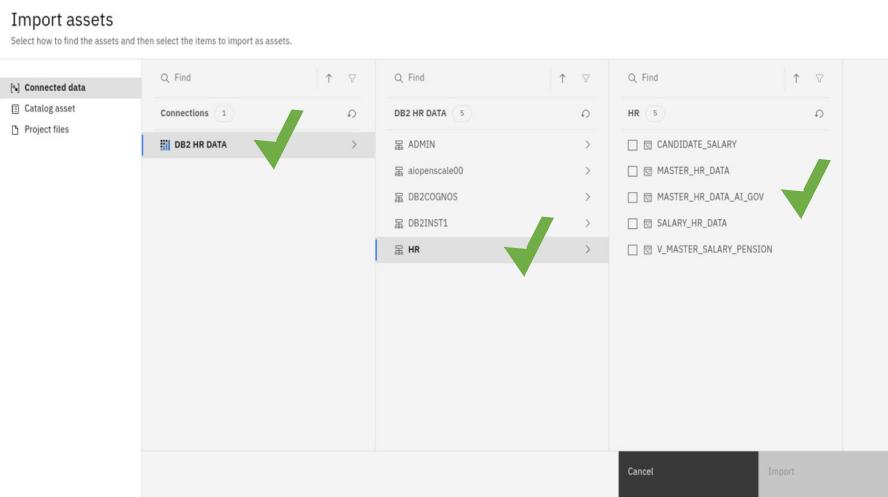
11. Within your “AI Governance” project you will see a connection “DB2 HR DATA” in the Assets tab.



The screenshot shows the 'Assets' tab in the IBM Cloud Pak for Data interface. On the left, there's a sidebar with 'Overview', 'Assets' (which is selected), 'Jobs', and 'Manage'. Below this is a search bar and a 'Find assets' input field. The main area is titled 'Data access' and lists one asset: 'DB2 HR DATA Connection'. The asset details show it was created by 'admin (You)' 4 minutes ago. To the right, there's a 'Data in this project' section with a placeholder 'Drop data files here or browse for files to upload'.

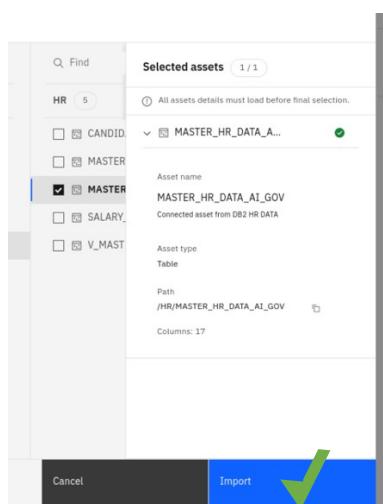
12. To access data from this connection, select “Import assets”. Follow this path to retrieve the dataset for this section.

DB2 HR DATA > HR > MASTER_HR_DATA_AI_GOV



The screenshot shows the 'Import assets' dialog. It has three tabs: 'Connected data', 'Catalog asset', and 'Project files'. The 'Connected data' tab is selected, showing 'Connections' (1) and 'DB2 HR DATA' (5). A green checkmark is on 'DB2 HR DATA'. The 'Catalog asset' tab shows 'HR' (5) and a list of datasets: ADMIN, aiopenscale00, DB2COGNOS, DB2INST1, and HR. A green checkmark is on 'HR'. The 'Project files' tab is empty. At the bottom are 'Cancel' and 'Import' buttons, with a green checkmark on 'Import'.

13. Now that MASTER_HR_DATA_AI_GOV is selected. Select the “Import” button.



The screenshot shows the 'Selected assets' dialog. It lists 'MASTER_HR_DATA_AI_GOV' (1/1) with a checked checkbox. Below it are details: Asset name 'MASTER_HR_DATA_AI_GOV', Asset type 'Table', Path '/HR/MASTER_HR_DATA_AI_GOV', and Column: 17. At the bottom are 'Cancel' and 'Import' buttons, with a large green checkmark on 'Import'.

14. Select the “Data” tab, you will now see the MASTER_HR_DATA_AI_GOV dataset ready to be used for your subsequent task.

The screenshot shows the IBM Cloud Pak for Data interface. The top navigation bar has 'IBM Cloud Pak for Data' and a search bar. Below it, the 'Projects / AI Governance' section has tabs for 'Overview', 'Assets' (which is selected), 'Jobs', and 'Manage'. On the left, there's a sidebar with '2 assets' (All assets) and 'Asset types' (Data access, Data, Connections). The main area shows a table for 'Data' assets, with one entry: 'MASTER_HR_DATA_AI_GOV' (application/x-ibm-rel-table). The 'Last modified' column shows 'Now' and 'admin (You)'. A green arrow points to the 'Data' link under 'Asset types'.

Summary: You have successfully created a project and added a dataset to begin your attrition analysis. We will now use [AutoAI](#) to create a Machine Learning Model within our project and use the assets we just added to our project.

About the Data

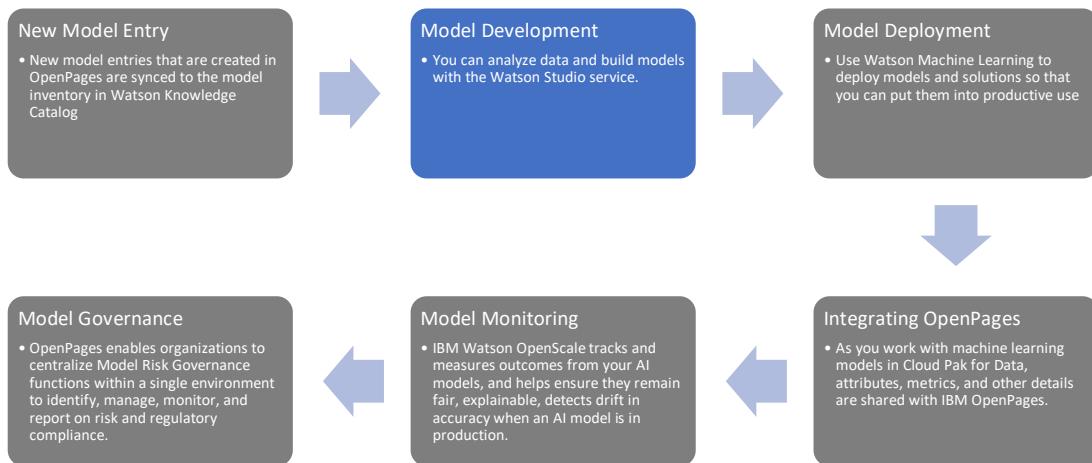
This screenshot is similar to the previous one, showing the 'Assets' tab selected. The 'Data' section is highlighted with a green arrow. The dataset 'MASTER_HR_DATA_AI_GOV' is listed in the table, showing it was last modified '2 hours ago' by 'admin (You)'.

Data Refinery is a data-wrangling tool within [IBM Cloud Pak for Data](#). To access Data Refinery, click on the dataset while in a project. You can learn more about this tool here ~ <https://www.ibm.com/docs/en/cloud-paks/cp-data/4.6.x?topic=services-data-refinery>

The screenshot shows the Data Refinery interface for the 'MASTER_HR_DATA_AI_GOV' dataset. The top navigation bar includes 'Projects / AI Governance / MASTER_HR_DATA_AI_GOV', 'Preview asset' (selected), 'Profile', and 'Visualization'. The 'Profile' tab is active, showing a preview of 17 columns with sample data. To the right, there are sections for 'About this asset' (Name: MASTER_HR_DATA_AI_GOV, Description: 'What's the purpose of this asset?', Tags: 'connected-data'), 'Asset details' (Version: 2, Attachment: 'MASTER_HR_DATA_AI_GOV'), and 'Last modified' (3 hours ago by admin, Created on Mar 17, 2023 by admin).

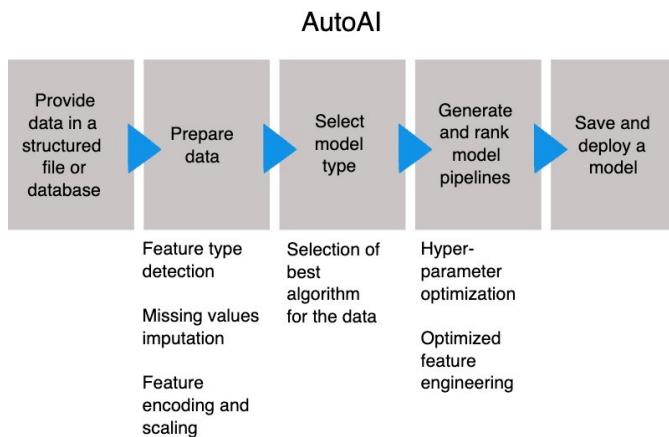
*You can discover more about the data through a data profile job within Data Refinery. Select the Profile tab and run a profile job. It may take up to 3 minutes.

1.6 Model Development



FOUNDATION

The AutoAI graphical tool in Watson Studio performs data analysis and discovers data transformations, algorithms, and parameter settings that work best for your predictive modeling problem. AutoAI displays the results as model candidate pipelines ranked on a leaderboard for your selection.



This section will showcase the AutoAI functionality in [Cloud Pak for Data](#) using the data assets we connected to predict employee attrition for the Human Resources department. [AutoAI](#) automates the entire machine learning model-building process. This solution allows organizations to accelerate their time to value in building and deploying effective AI models. For this activity, you will be using the provided dataset to predict the

[VIRTUAL_MASTER_HR_DATA_STATUS](#) feature. This feature denotes if an employee is active or terminated from the organization.

[AutoAI](#) will develop a model pipeline, at which point, we will select the best-performing model for this use case. The goal is to have an AI model which will accept HR data, process employee-related changes (performance, demographic, survey), and predict attrition.

- Now that we have added our data asset to the AI Governance project, we will create an AutoAI experiment by selecting the “New asset” button. In the New asset window, Select the “AutoAI” tile.

The screenshot shows the IBM Cloud Pak for Data interface. At the top, there's a navigation bar with 'Projects / AI Governance'. Below it, a table lists '2 assets' under the 'Data' category. A blue button labeled 'New asset' with a checkmark is highlighted. Below the table, a modal window titled 'New asset' is open. The modal has a sidebar on the left listing 'Tool type' categories: 'All types', 'Data access tools', 'Automated builders', 'Graphical builders', 'Code editors', and 'Component editors'. The 'All types' section is selected. The main area of the modal shows four tool options: 'Connection' (greyed out), 'Metadata import' (greyed out), 'Model' (greyed out), and 'AutoAI'. The 'AutoAI' option is highlighted with a green checkmark. A note above the 'AutoAI' section says 'Connected data moved. To add connected data, close this dialog and click Import assets.' A 'Show descriptions' link is at the bottom of the sidebar.

- When the “Create an AutoAI experiment” window appears, enter the information as shown in the image below.

Name = “Attrition Prediction”,

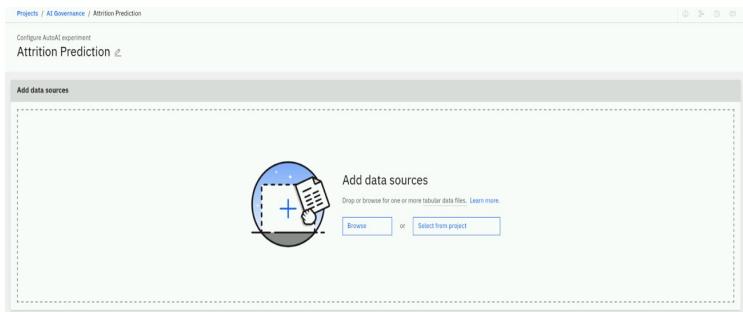
Description = “To predict employee attrition within the enterprise”,

Tags = “Attrition”. Select the “+” sign after typing in “Attrition” to assign the tag. Tags will allow you to quickly identify projects, assets, or inputs later.

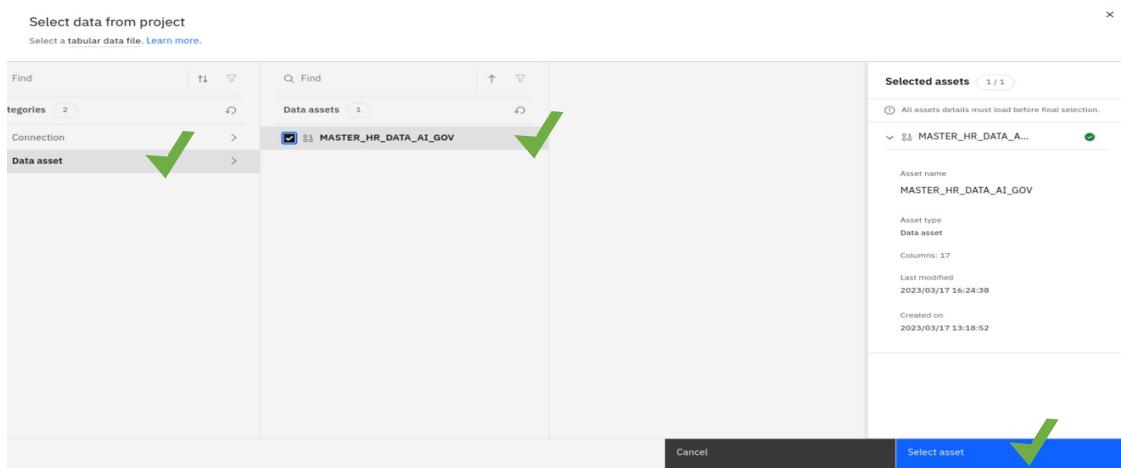
Then select “Create”.

The screenshot shows the 'Create an AutoAI experiment' dialog box. It has two main sections: 'Define details' on the left and 'Define configuration' on the right. In the 'Define details' section, the 'Name' field contains 'Attrition Prediction' with a green checkmark. The 'Description (optional)' field contains 'To predict employee attrition within the enterprise' with a green checkmark. The 'Tags (optional)' field has a placeholder 'Start typing to add tags' and a 'Attrition' tag listed, also with a green checkmark. In the 'Define configuration' section, the 'Environment definition' dropdown is set to '4 vCPU and 16 GB RAM'. At the bottom right of the dialog box is a 'Create' button with a green checkmark.

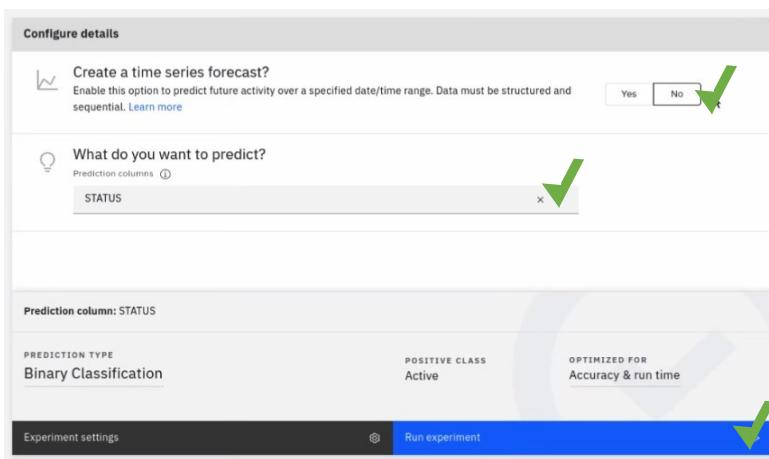
3. Select the “[Select from Project](#)” button to add the data source for this AutoAI experiment. We will use connected data from the section above.



4. Select the right of “[Data asset](#)” to open the path to the MASTER_HR_DATA_AI_GOV dataset. Select the [radio button](#) then select “[Select asset](#)”.



5. Select “[No](#)” in the “Create a time series forecast?” area. Then, select the drop-down arrow in the “What do you want to predict” section and select “[VIRTUAL_MASTER_HR_DATA_STATUS](#)”. Then, select the “[Run experiment](#)” button.



6. When “**VIRTUAL_MASTER_HR_DATA_STATUS**” is selected as the prediction column, AutoAI will determine that a “Binary Classification” approach is appropriate for this analysis. To see this feature in action, you can try selecting different columns for prediction. Depending on the data type, AUTOAI automatically selects the appropriate prediction type.

In addition, AUTOAI selects the positive class which is “Active” in this case, and the optimized evaluation metric which is “**Accuracy & run time**”. We can see how AutoAI performs automated parametric tuning to progress the model development process.

Now that our prediction column is selected, we can further customize this model by selecting “**Experiment Settings**”.

*If you intend to explore AutoAI setting further, select “**Experiment Settings**”. If not, select “**Run Experiment**”.

***If you decide to explore “**Experiment Setting**”, here are the steps to follow:

Select “**Prediction**” on the left navigation menu.

In “[Prediction](#)” settings, you can override the standard AutoAI settings made. For example, if you would like to experiment with Multiclass Classification based on your data science activity, you can change that setting here.

Additionally, you can specify the optimized metric for your activity. Select the metric which is pertinent to your data science activity.

There are many other options to fine-tune AutoAI experiments within these “[Prediction](#)” settings. This includes a feature in AutoAI where you can specify which specific algorithms to include in the experiment. As we can see, there are eleven different binary classification models that are supported within AutoAI.

The screenshot shows the 'Optimized algorithm selection' section. It includes a radio button for 'Score only' and one for 'Score and run time' (which is selected). Below this is a table titled 'Algorithms to include' with 11 rows. The columns are 'Algorithm' and 'Enable incremental learning'. The algorithms listed are: Decision Tree Classifier (checked), Extra Trees Classifier (checked), Gradient Boosting Classifier (unchecked), and LGBM Classifier (checked). A search bar at the top says 'Search by algorithm or pipeline'.

Algorithm	Enable incremental learning
Decision Tree Classifier	
Extra Trees Classifier	On
Gradient Boosting Classifier	
LGBM Classifier	On

During the experiment, [AutoAI](#) will process the selected algorithms, until it arrives at the best-fit algorithm for the data set provided.

For this activity, it was defaulted to “2”, indicating that the [AutoAI experiment](#) will choose the top two algorithms from your preselected list, create four different variations of each of those algorithms, and generate eight different models to choose from.

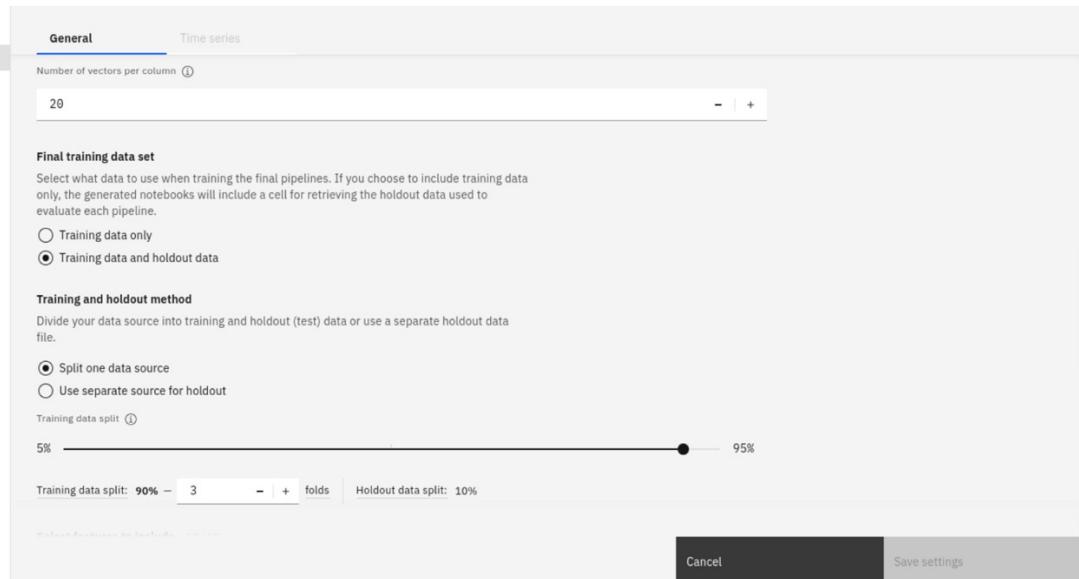
The screenshot shows the 'Algorithms to use' section. It lists eight checked algorithms: Logistic Regression, Random Forest Classifier, Snap Boosting Machine Classifier, Snap Decision Tree Classifier, Snap Logistic Regression, Snap Random Forest Classifier, Snap SVM Classifier, and XGB Classifier. Each algorithm has a toggle switch next to it, which is turned on for all. Below this is a table titled 'Algorithms to use' with 4 rows. The first row is highlighted in black. The table has columns for 'Algorithms' and 'Count'. The data is as follows:

Algorithms	Count
Logistic Regression	1
Random Forest Classifier	2
Snap Boosting Machine Classifier	3
Snap Decision Tree Classifier	4

A note below the table states: "AutoAI will test the specified algorithms and use the top performers to create model pipelines. Choose how many top algorithms to apply. Each algorithm generates 4-5 pipelines and more algorithms increase the runtime."

The next settings that can be changed are the Data source settings. We have the option to choose a subsample of rows and columns to be included for analysis. This could be particularly useful for large data sets where all the data is not necessary to gain accurate insights. Additionally, we can specify the holdout data split. Right now, it defaults to a 90:10 split, meaning 90% of the data will be used to train the model and 10% will be held back to test the model.

We can specify the columns to be included in our analysis, Columns which do not add value to the experiment can be excluded. We can see how different personas (business, executive, etc.) can provide input in the model development process and add value to [AutoAI](#).

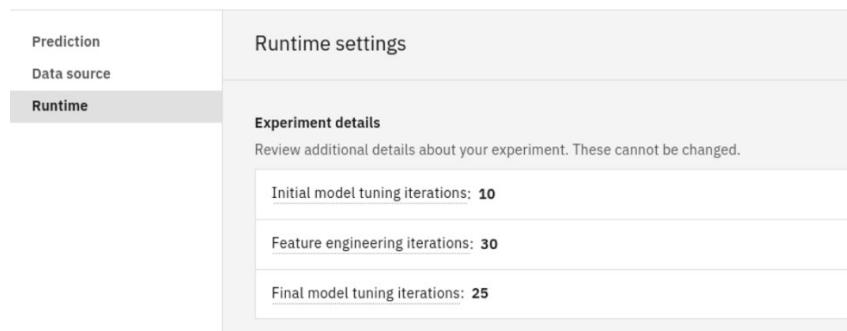


We can review runtime settings, where [AutoAI](#) provides insight into the various iterations that are processed as AutoAI engages in automated feature engineering and hyperparameter optimization.

Now that we are satisfied with the specific settings, we can save and re-run the experiment.

Click “[Save Setting](#)”, “[Run Experiment](#)”

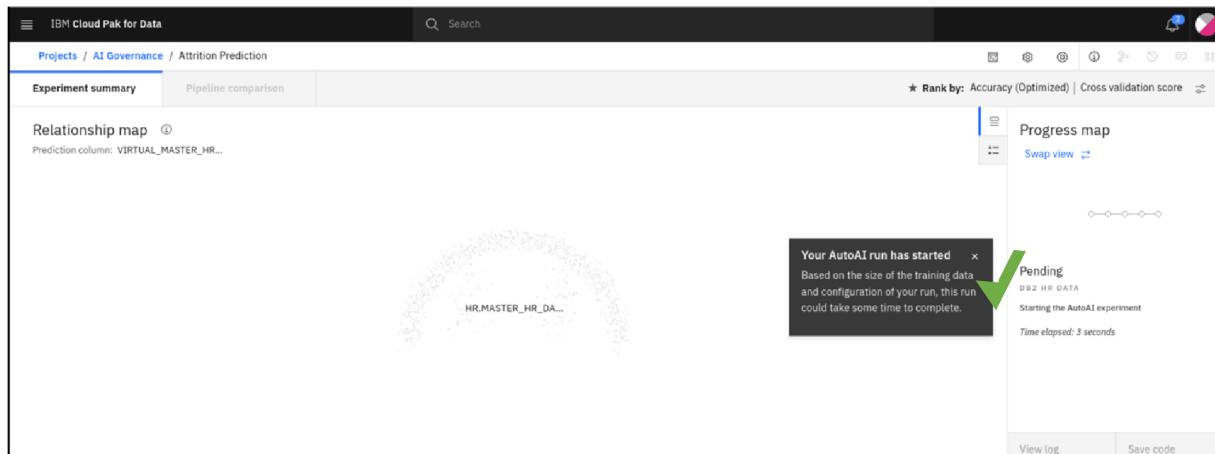
Experiment settings



If you decided to explore “[Experiment Settings](#)”, the steps end here

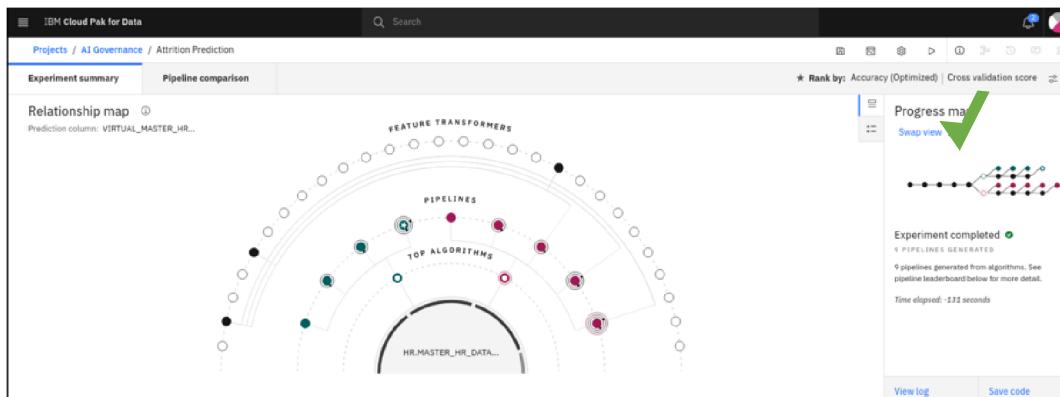
Continuation Step 6

7. **AutoAI** requires some time to process the experiment. During this time, **AutoAI** produces several pipelines including training/test data split, data preprocessing, feature engineering, model selection, and hyperparameter optimization. You can delve into any of the pipelines to better understand feature importance, the resulting metrics, the selected model, and any applied feature transformation. While waiting for **AutoAI**'s run to complete, review IBM's Documentation on the [AutoAI's web page](#).



8. When the experiment completes, **AutoAI** displays the results as model candidate pipelines ranked on a leaderboard for your selection. Note that **AutoAI** has found multiple algorithms which we can use for our attrition prediction. We will focus on the top 2.

The “[Relationship map](#)” provides a visual representation of all the feature transformations that took place and how all pipelines were affected. By scrolling down, we can see the Pipeline leaderboard. In this experiment, Pipeline 4 is the top algorithm selected based on metrics. This pipeline stems from a “[Snap Decision Tree Classifier](#)” and scored 0.893. To get a better understanding of this pipeline, we can select the “Swap view” button on the “[Progress map](#)” on the right.

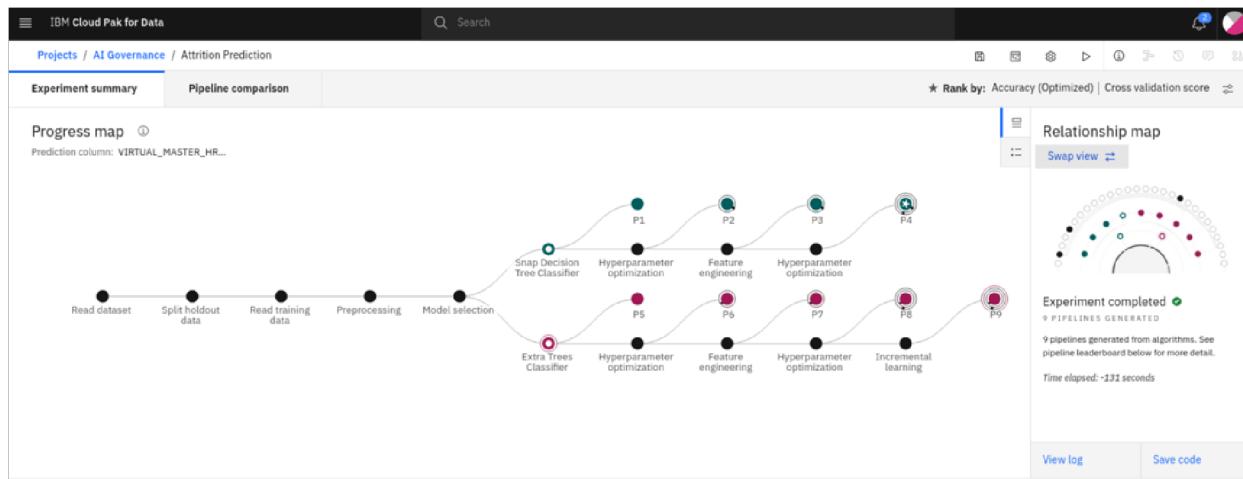


9. This is a visual representation of all the different steps that AutoAI took to arrive at the best-fit model for the data provided.

AutoAI Summary

- 1) Data inputted into an AutoAI experiment.
- 2) AutoAI splits the holdout data into testing and training data based on a 90-10 split.
- 3) AutoAI preprocesses data.
- 4) Model selection occurs.

AutoAI processes eleven algorithm options and produces a “Pipeline leaderboard”.



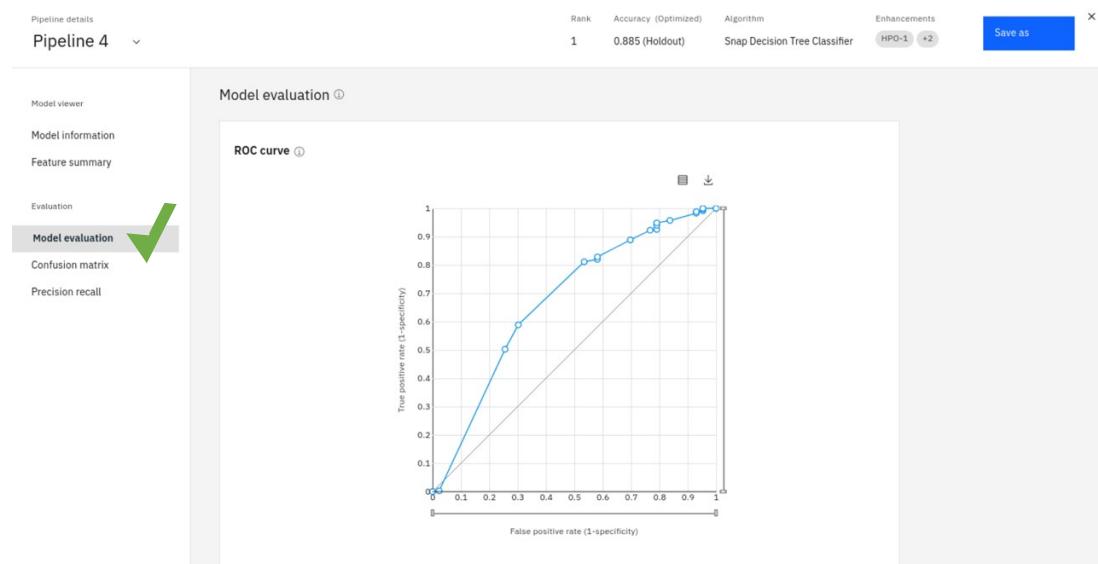
Leaderboard:

Pipeline leaderboard ▾

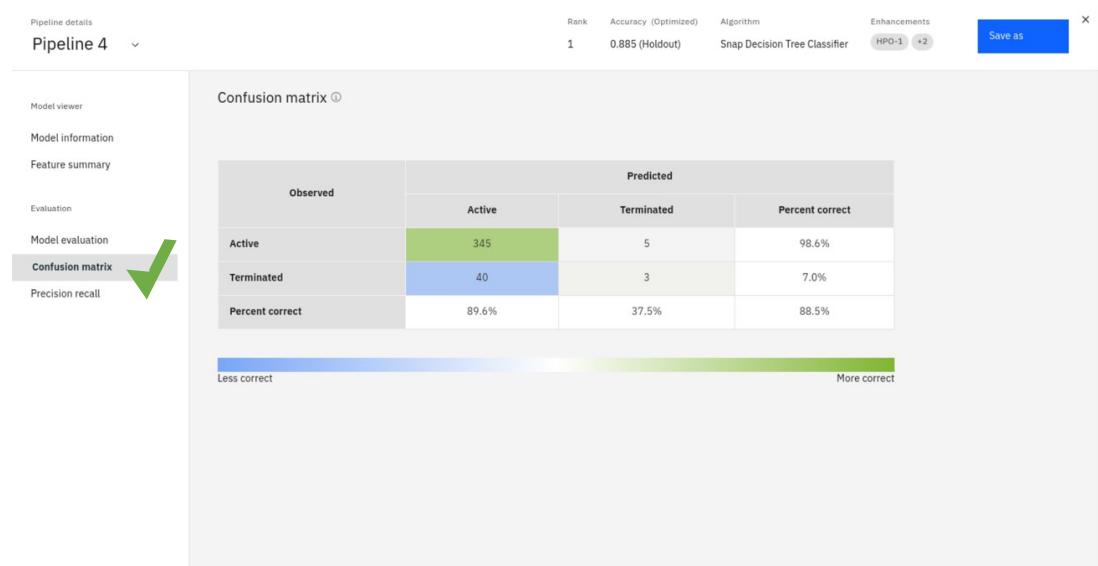
	Rank	Name	Algorithm	Specialization	Accuracy (Optimized) Cross Validation	Enhancements	Build time
★	1	Pipeline 4	Snap Decision Tree Classifier	✓	0.893	HPO-1 FE HPO-2	00:00:18
	2	Pipeline 3	Snap Decision Tree Classifier		0.893	HPO-1 FE	00:00:16
	3	Pipeline 2	Snap Decision Tree Classifier		0.893	HPO-1	00:00:02
	4	Pipeline 9	Batched Tree Ensemble Classifier (Extra Trees Classifier)	INCR	0.849	HPO-1 FE HPO-2	00:00:39
	5	Pipeline 8	Extra Trees Classifier		0.849	HPO-1 FE HPO-2	00:00:37
	6	Pipeline 7	Extra Trees Classifier		0.849	HPO-1 FE	00:00:20
	7	Pipeline 1	Snap Decision Tree Classifier		0.839	None	00:00:01
	8	Pipeline 6	Extra Trees Classifier		0.830	HPO-1	00:00:03
	9	Pipeline 5	Extra Trees Classifier		0.830	None	00:00:19

10. Select the top pipeline to review the leader model details. AutoAI reports multiple valuable evaluation criteria, such as several performance metrics (Accuracy, Area under ROC, Precision, Recall, and F1), a confusion matrix, Precision-Recall Curve, and feature importance. You can select these performance metrics on the left.

ROC Curve:



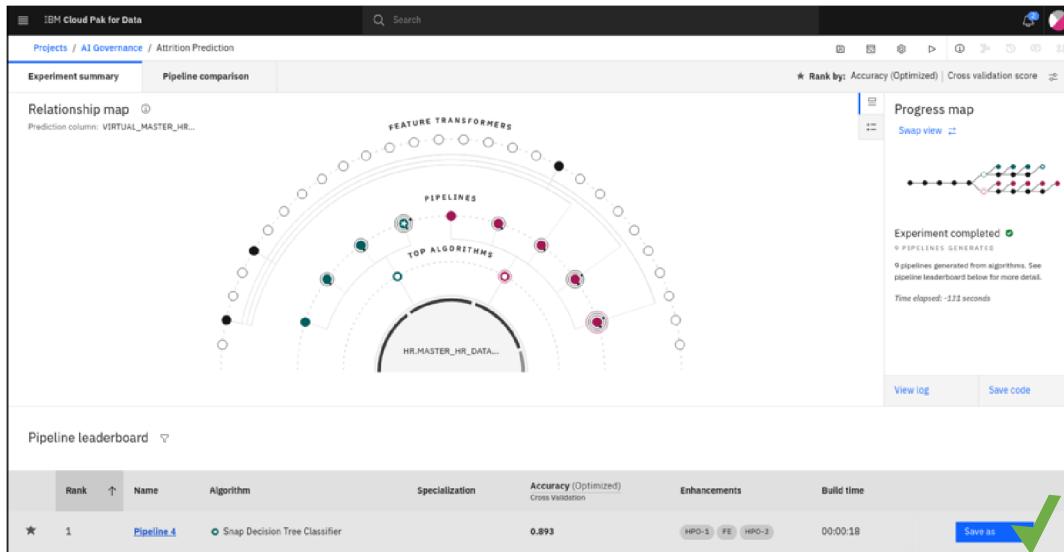
Confusion Matrix:



If this pipeline included feature engineering (or feature transformation) steps, the pipeline details will explain those transformations here.

Close the pipeline details window by clicking the X in the upper right of the window.

11. Select the first model in the “Pipeline leaderboard” list and Select “Save as”.



NOTE: Your Pipeline champion may differ from the above image

12. You can either save this model as a Cloud Pak Model asset or as a Jupyter notebook. The option to accelerate model development or to create a foundational model for further development represents where AutoAI can jumpstart AI initiatives.

Save as

Select asset type

Model

Create a Watson Machine Learning model asset that you can test with new data, deploy to generate predictions, and trace lineage activity.

Notebook

Create a notebook if you want to view the code that created this model pipeline or interact with the model programmatically.

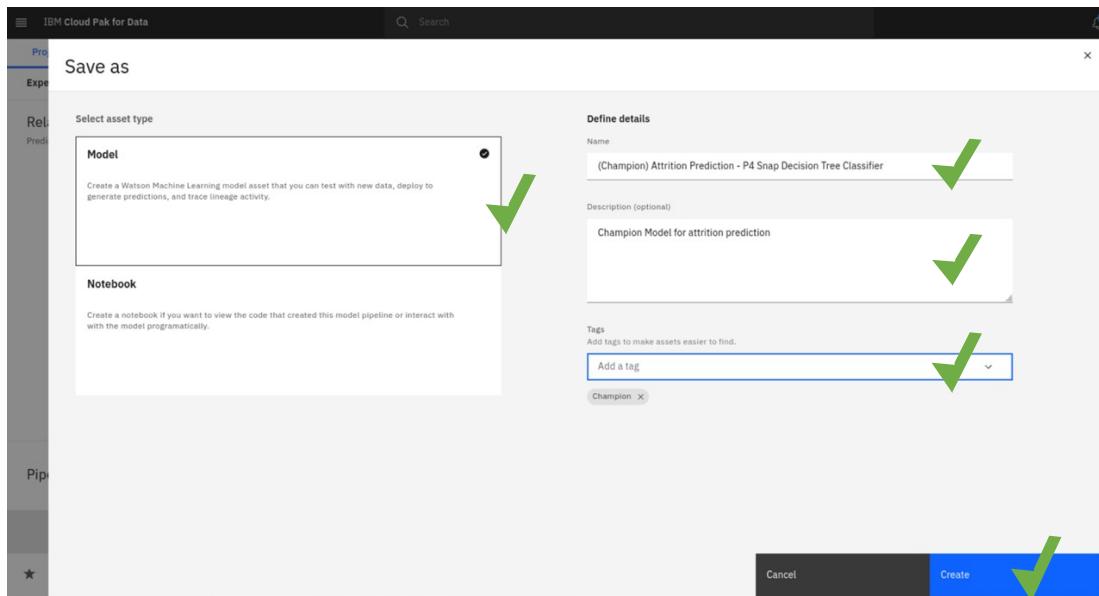
13. AutoAI accelerates the time that it takes to create effective machine-learning models. Additionally, there are other model-building tools within Watson Studio that allow us to build models regardless of model building experience.

14. Select the “Name” field and insert “**(Champion)**” in front of “Attrition Prediction – P3 Snap Decision Tree Classifier”.

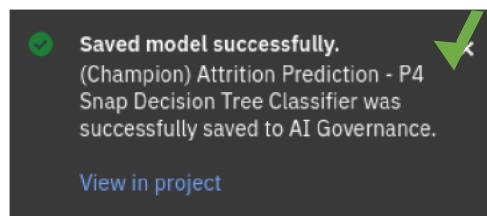
“Description” - **“Champion Model for attrition prediction”**.

“Tags” - **“Champion”**

Lastly, Select the **“Create”** button to save your model as a model asset in [IBM Cloud Pak for Data](#).



Note: Select the “X” in the upper right corner of the “Saved model successfully” pop-up window

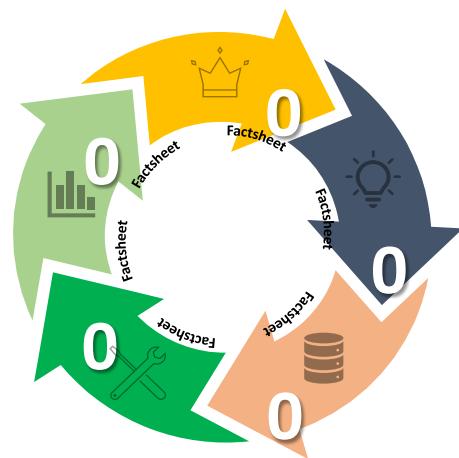


Summary: We have successfully created an AI model and will continue with deploying the model within [IBM Cloud Pak for Data](#). The [AutoAI](#) graphical tool in [Watson Studio](#) analyzes data and uses data algorithms, transformations, and parameter settings to create the best predictive model. AutoAI displays various potential models as model candidate pipelines and ranks them on a leaderboard. Note that all processing steps are crucially documented as metadata and consumed by [Factsheets](#).

[IBM Cloud Pak for Data](#) provides other options to create AI models through tools such as SPSS Modeler and Jupyter notebooks. These products are packaged within [IBM Cloud Pak for Data](#) and can be accessed through the Asset button.

1.7 FactSheets

FOUNDATION



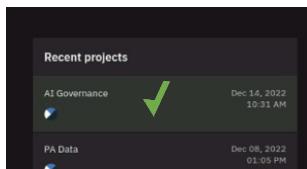
Proposals for higher quality and more consistent AI documentation have emerged to address ethical and legal concerns and the general social impacts of such systems. However, little is known about the needs of those who would produce or consume these new forms of documentation, as well as how to create this documentation. This is where IBM's **Factsheets** addresses gaps in current model development processes, and its purpose is to:

- Define the scope for policy creation which includes what information is collected on models, who can use the model and for what purpose, and the way it should operate.
- Automatically capture the model facts as detailed in the **Factsheets** template throughout the AI lifecycle.
- Offer extended knowledge on unapparent AI model development metrics in multiple formats depending on the preferences of the user and external audience.

1. Return to the “[IBM Cloud Pak for Data](#)” home screen *“if you are still within the model, go to step 3”*



2. Select the “[AI Governance](#)” project folder to review our saved models.



3. Select the “[Assets](#)” tab and then Select the “(Champion) Attrition Prediction – xxx” asset.



- Review the AI [Factsheet](#) for your model. AI [Factsheets](#) capture model metadata across the model development lifecycle, facilitating subsequent enterprise validation or external regulation. AI [Factsheets](#) enable model validators and approvers to get an accurate, up-to-date view of the model lifecycle details. In this example, we have retrieved the training scores of our model.

Projects / AI Governance / (Champion) Attrition Prediction - ...

(Champion) Attrition Prediction - P2 XGB Classifier

Promote to deployment space

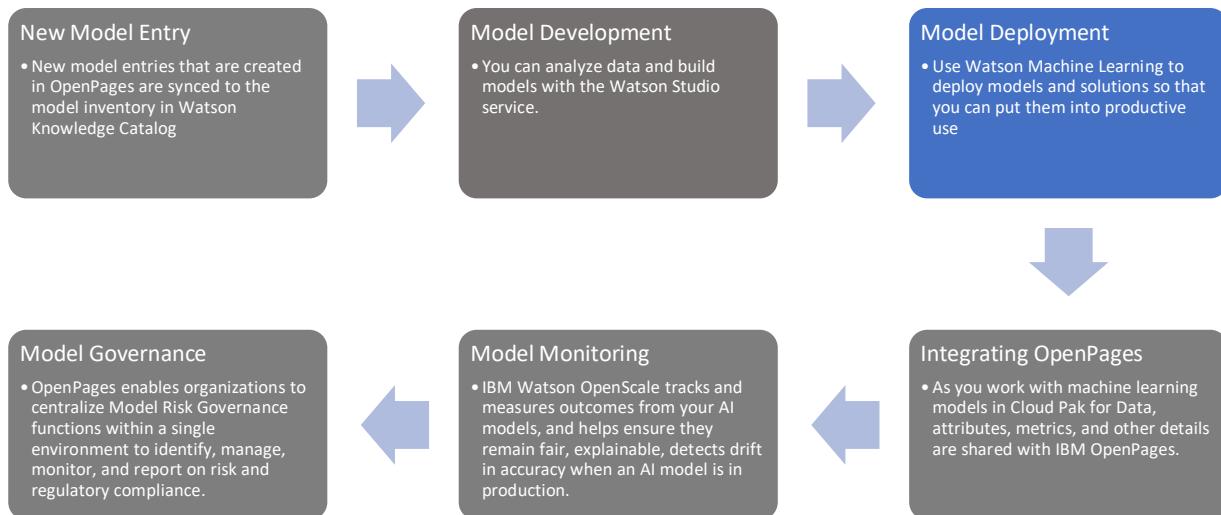
Metric	Training data	Holdout data
Accuracy	0.8965906	0.8810127
Average precision	0.9611343	0.8037983
Balanced accuracy	0.555334	0.53514796
F1	0.9447205	0.9360544
Log loss	-0.28834936	-0.29009596
Precision	0.90116274	0.89811723
Recall	0.99271923	0.97727275
Roc auc	0.78383374	0.7994186

^ Input schema

Feature	Data type	Description
---------	-----------	-------------

Note: This integration with [Watson Machine Learning](#) and [OpenScale](#) results in the capture of deployment metadata and introduces critical monitors for bias detection and quality in the subsequent steps of IBM's AI Governance capabilities.

1.8 Deployments



FOUNDATION

IBM Cloud Pak for Data enables the deployment of models, scripts, functions, deployment management, and preparing your assets for model production. [Watson Machine Learning](#) is used to manage deployment spaces so that you can put models into production, then monitor these models for fairness and explainability.

Deployment spaces contain deployable assets such as deployments, deployment jobs, associated input and output data, and the associated environments. You can use this space to deploy models and manage your deployments. The deployments dashboard is an aggregate view of deployment activity available to you across spaces.

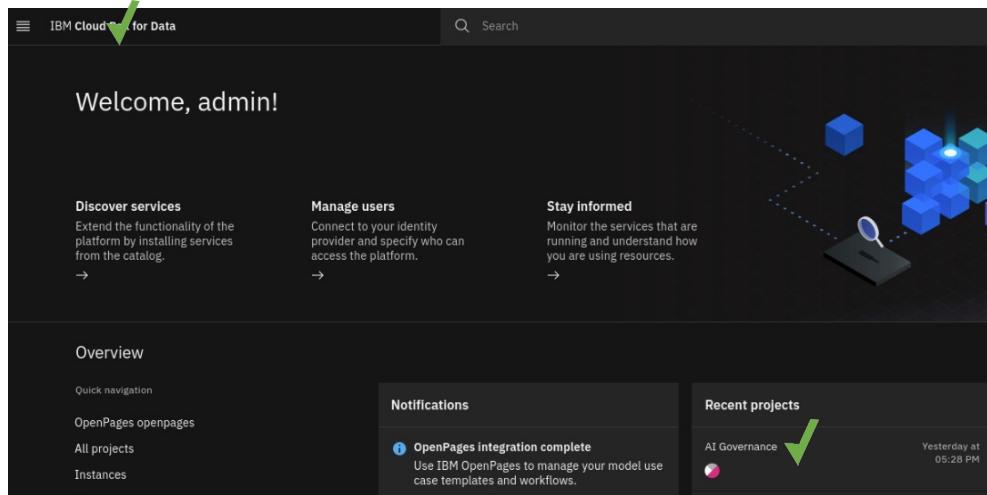
A deployment space is not associated with a project. You can deploy assets from multiple projects to a space, and you can deploy assets to more than one space. For example, you might have a test space for evaluating deployments, and a production space for deployments that you want to deploy in business applications.

In the previous section, you performed steps to prepare and train an [AutoAI](#) model to predict employee attrition. This section will take you through the steps to deploy that Champion model.

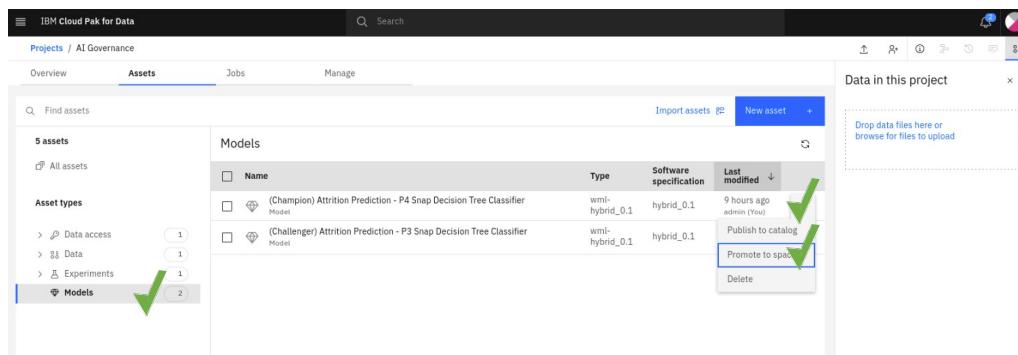
Deployment is the final stage of the lifecycle of a model or script, which is where you run your models and code. When you deploy your AI models, the models become available for applications to use for scoring and prediction all of which help drive actions.

1.8.1 Add the model into a Deployment space.

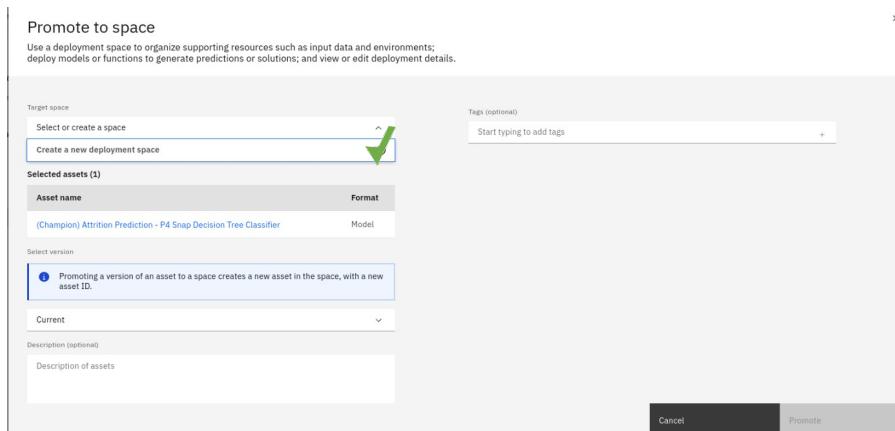
1. Begin at the Home Screen by Selecting “IBM Cloud Pak for Data” in the upper left of the window. Select the “AI Governance” Project by selecting it in the Recent projects area.



2. From the left pane of the project's Assets tab, select “Models”, then click the vertical ellipsis icon beside the Champion model and select “Promote to space”.



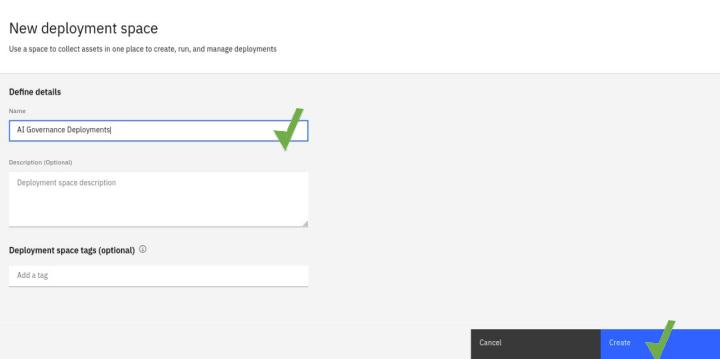
3. Create a new deployment space by selecting “Create a new deployment space” from the drop-down menu within the Target Space area.



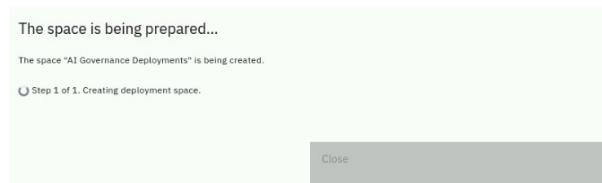
You can manage deployments in accordance with business requirements and can have multiple deployment spaces which may be segregated by the scope of deployment e.g., pre-production, production, or different line of business in your organization.

In this scenario, you want to create a deployment space for governed AI assets.

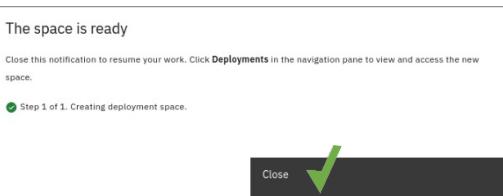
4. Name the space “AI Governance Deployments” and select the “Create” button.



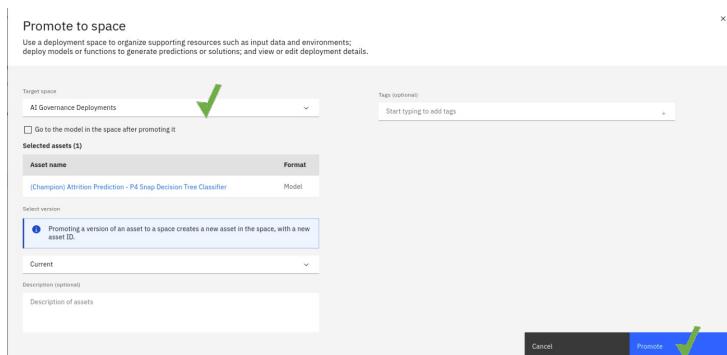
This notification window will appear.



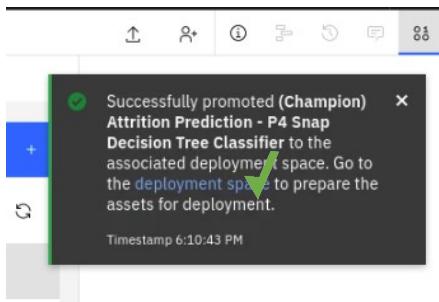
5. Close the “This space is ready” notification window. Select “Close”



6. Select the “Promote” button.

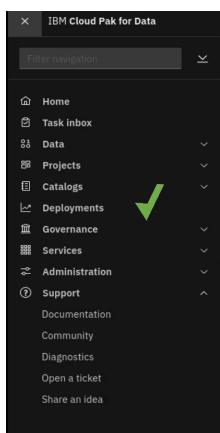


- Upon completion – select the “Deployment space” link from the notification window.

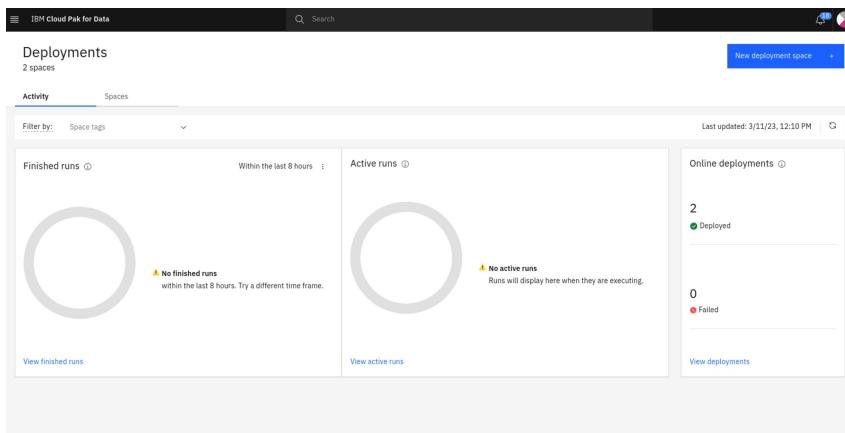


1.8.2 Manage Deployments

- Navigate to “Deployments” by clicking on the Hamburger menu located at the upper left corner of the window.



- This will give you a view of the deployment dashboard. The deployments dashboard is an aggregate view of deployment activity available to you, across spaces. You can get a broad view of deployment activity such as the status of job runs or a list of online deployments. You can also use filters and views to focus on specific job runs or categories of runs such as failed runs. ModelOps or DevOps users can review and monitor the activity of an organization.



- Select the Spaces tab to view all the active deployment spaces then select AI Governance Deployments to view the deployment space you just created.

The screenshot shows the 'Deployments' interface with the 'Spaces' tab selected. There are two spaces listed: 'AI Governance Deployments' and another unnamed one. A green arrow points to the 'AI Governance Deployments' row, which includes columns for Name, Last modified, Your role, Collaborators, Tags, Online deployments, and Jobs.

- Returning to the “AI Governance” deployment space, select the Asset tab. To deploy your model, select the vertical ellipsis button and then select “Deploy”.

The screenshot shows the 'AI Governance Deployments' page with the 'Assets' tab selected. It displays a single asset named '(Champion) Attrition Prediction - P4 Snap Decision Tree Classifier'. On the right, there is a context menu with options 'Import assets', 'Deploy' (which is highlighted with a green arrow), and 'Delete'.

Deployment spaces are divided into two categories: online deployments, and batch deployments. For this activity, let's focus on online deployments and the capabilities that are contained within an online deployment. When an online deployment is created (also called Web service), the deployment is used to load a model or Python code and generate predictions online, in real-time.

Note: If a ‘Welcome to your deployment space’ box pops up, select ‘Maybe later’.

- Select “Online” in the “Create a deployment” window, then, select the Name field and Name it “Attrition Prediction” and then select the “Create” button.

The screenshot shows the 'Create a deployment' dialog box. Under 'Associated asset', it shows '(Champion) Attrition Prediction - P4 Snap Decision Tree Classifier'. In the 'Deployment type' section, 'Online' is selected (indicated by a green arrow). The 'Name' field contains 'Attrition Prediction' (also indicated by a green arrow). At the bottom, there are 'Cancel' and 'Create' buttons, with 'Create' being highlighted by a green arrow.

- While it is being deployed, you will be directed back to your AI Governance Deployments. select the “Deployments” tab to see the status. This will take 2-4 minutes to complete and the status to update.

The screenshot shows the 'AI Governance Deployments' interface. The 'Deployments' tab is selected. A table lists one deployment:

Name	Type	Status	Asset	Last modified
Attrition Prediction	Online	Initializing	(Champion) Attrition Prediction - P4 Snap Decision Tree Classifier	10 seconds ago admin (You)

- (Champion) Attrition Prediction – P4 Snap Decision Tree Classifier model has been successfully deployed. Select the “Attrition Prediction” Name

The screenshot shows the 'AI Governance Deployments' interface. The 'Deployments' tab is selected. A table lists one deployment:

Name	Type	Status	Asset	Last modified
Attrition Prediction	Online	Deployed	(Champion) Attrition Prediction - P4 Snap Decision Tree Classifier	2 minutes ago admin (You)

- Select the “Test” tab.

The screenshot shows the 'Attrition Prediction' deployment details. The 'Test' tab is selected. It displays:

- API Reference:** Shows the endpoint URL: <https://cpd.apps.amwv12.workshop.tec/m1/v4/deployments/b43987b6-236c-4220-b1bc-1b790a18b854/predictions?version=2023-03-09>
- Code snippets:** Includes sections for CURL, Java, JavaScript, Python, and Scala. The CURL section contains a sample command:

```
# TODO: manually define and pass values to be scored below
curl -X POST -H "Content-Type: application/json" -H "Accept: application/json" -H "Authorization: Beearer $IAM_ACCESS_TOKEN" -B "$INPUT_GLOB" [{"fields": "$ARRAY_OF_INPUT_FILES"}, "values": "$ARRAY_OF_VALUES_TO_BE_SCORED", "another_array_of_values_to_be_scored": "https://cpd.apps.amwv12.workshop.tec/m1/v4/deployments/b43987b6-236c-4220-b1bc-1b790a18b854/predictions?version=2023-03-09"}]
```

Note: “Test” provides a place to test the AI model. In the form, you can enter data in one of these ways:

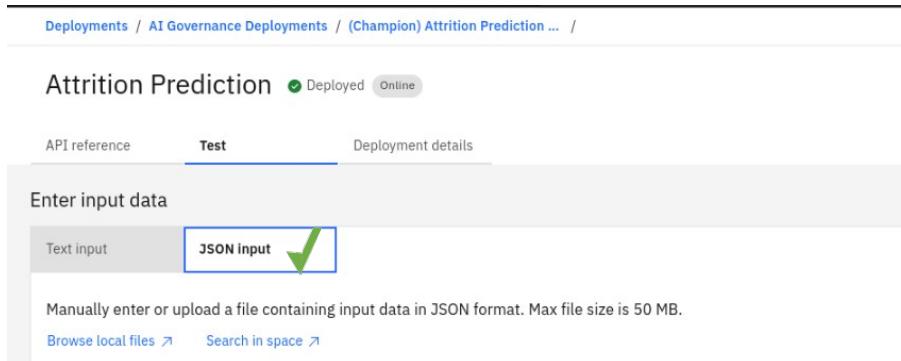
- You could enter data directly in the form – OR...

The screenshot shows the 'Enter input data' form for the 'Attrition Prediction' deployment. It includes:

- Text input:** A text input field labeled 'JSON input'.
- Instructions:** Text indicating to "Enter data manually or use a CSV file to populate the spreadsheet. Max file size is 50 MB." with links for "Download CSV template" and "Browse local files".
- Table:** A grid for entering data with columns: TITLE (other), VIRTUAL_MASTER_HR_DATA_DEPART (other), FUNCTION (other), DIVISION (other), UNION_STATUS (other), EMPLOYMENT_CATEGORY (other), AGE (Integer), and GENERATION (other). Row 1 is labeled "Star" and row 2 is labeled "Sta".
- Buttons:** "Predict" button at the bottom right.

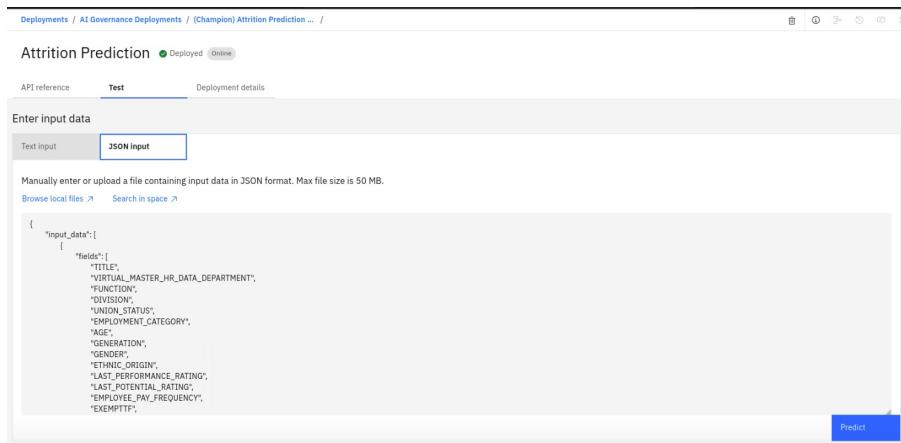
Select the JSON tab and enter your input data as JSON code. Regardless of method, the input data must match the schema of the model. Submit the input data via browsing the file or searching the deployment and get a score, or prediction, back. –OR...

2) You could enter data directly in the form – OR...



The screenshot shows the 'Attrition Prediction' test interface. At the top, there are tabs for 'API reference', 'Test' (which is selected), and 'Deployment details'. Below the tabs is a section titled 'Enter input data' with two options: 'Text input' and 'JSON input', with 'JSON input' being highlighted by a green arrow. A note below says 'Manually enter or upload a file containing input data in JSON format. Max file size is 50 MB.' There are also links for 'Browse local files' and 'Search in space'.

You can test the Attrition Prediction Model by inserting this JSON code chunk in the “Enter input data screen” and clicking on “Predict”. It will return a prediction and the probability of the prediction.



The screenshot shows the 'Attrition Prediction' test interface with the 'Test' tab selected. In the 'Enter input data' section, a large JSON code block is pasted into the 'JSON input' field. The JSON code defines an array of objects for 'input_data' with various fields like TITLE, VIRTUAL_MASTER_HR_DATA_DEPARTMENT, FUNCTION, DIVISION, UNION_STATUS, EMPLOYMENT_CATEGORY, AGE, GENERATION, GENDER, ETHNIC_ORIGIN, LAST_PERFORMANCE_RATING, LAST_POTENTIAL_RATING, EMPLOYEE_PAY_FREQUENCY, and EXEMPTIFT. A 'Predict' button is visible at the bottom right of the input area.

Open a new browser tab within your Firefox browser. Go to

<https://raw.githubusercontent.com/cwong79/CPD4.5.0Lab/main/model-payload.json>

Copy the JSON code from here and paste it into the “Enter input data” box (shown above).

- Once you have copy/pasted the code, select the “Predict” button



Results

Prediction results

Prediction type: Binary classification
Prediction percentage: 1 Record

Table view JSON view

```
{
  "fields": [
    "prediction",
    "probability"
  ],
  "values": [
    {
      "Active": [
        0.8863537907600403,
        0.11364620178937912
      ]
    }
  ]
}
```

Active
Confidence level distribution
Amount of records: 1

[Download](#)

The results will appear in the pop-up window. In this instance, the Attrition Model has predicted that this employee will leave the organization with 89% accuracy. Note that your results may differ from other participants in the workshop based on environmental variances.

Summary: In this deployment space, you can record a model’s production lifecycle and manage its interactions with its creator and contributors. Deployment spaces contain deployable assets, deployments, deployment jobs, associated input and output data, and the associated environments. You can use spaces to deploy models and manage your deployments.

As a best practice, all deployed models within an Enterprise should be effectively managed in a single location. This way all risk and governance guidelines can be applied to all AI usage within that Enterprise. CPD automatically packages models within a production space as an available API, eliminating the typical manual process of deploying a containerized model.

The advantages of deploying a model in CPD are primarily twofold.

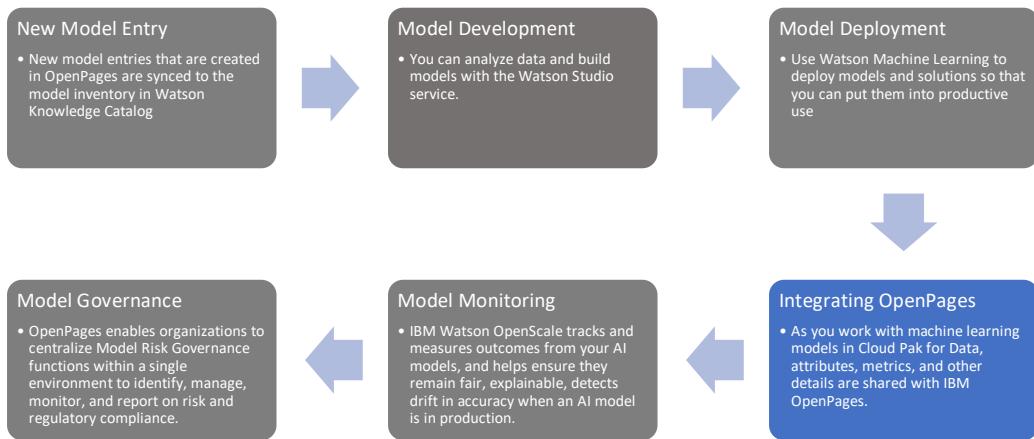
- Multiple data access points can be established in CPD through its data fabric capabilities. Therefore, removing manual processes around recording model training and testing metrics.
- In later steps, you will see how model performance decay impacts model deployment and allows the model owner to create guardrails to rectify the decay through mediation automation.

Thus far, you have:

- Created a collaborative working space.
- Created a model using an automated model creation tool.
- Created a deployment space to manage the model’s production.

We will now continue our journey by showing CPD’s AI Governance capabilities through [OpenScale](#).

2.0 Linking Deployment to a Model Use Case



FOUNDATION

By integrating a Model Use Case in [OpenPages](#) with an accompanying deployment space in Watson Knowledge Catalog, we can gather and share facts about model lineage through this machine learning pipeline. This mechanism provides a consistent approach to model provenance recording and complete metadata capture, improves process reliability, and maximizes operational efficiency in AI production.

- From the AI Governance Deployments window, select the Deployments tab. Select the “[\(Champion\) Attrition Prediction – P4 Snap Decision Tree Classifier](#)” previously deployed model.

The screenshot shows the AI Governance Deployments interface. The top navigation bar includes "IBM Cloud Pak for Data", a search bar, and tabs for "Deployments" (which is selected), "Assets", "Jobs", and "Manage". Below the tabs is a search bar and a table. The table has columns: Name, Type, Status, Asset, and Last modified. A green checkmark is visible next to the asset name "(Champion) Attrition Prediction - P4 Snap Decision Tree Classifier".

Name	Type	Status	Asset	Last modified
(Champion) Attrition Prediction	Online	Deployed	(Champion) Attrition Prediction - P4 Snap Decision Tree Classifier	35 minutes ago admin (You)

- Select “Model details” within the “[\(Champion\) Attrition Prediction – P4 Snap Decision Tree Classifier](#)” model window.

The screenshot shows the "Model details" view for the "(Champion) Attrition Prediction - P4 Snap Decision Tree Classifier" model. The top navigation bar includes "IBM Cloud Pak for Data", a search bar, and tabs for "Deployments" (selected) and "Model details". The main content area displays deployment information. At the top right is a "New deployment" button. Below it is a table with columns: DEPLOYMENT TYPES, Name, Status, and Last modified. One row is shown under "Online": Attrition Prediction, Deployed, Mar 19, 2023, 8:54 PM.

DEPLOYMENT TYPES	1 Online Deployment(s)		
Online	Name	Status	Last modified
Batch	Attrition Prediction	Deployed	Mar 19, 2023, 8:54 PM

- Select the “Track this model” button from the Model details screen.

(Champion) Attrition Prediction - P4 Snap Decision Tree Classifier

Deployments Model details

Track this model

The model will be added to your model inventory for activity tracking and model comparison.

Model tracking available

Track this model

Model inventory

Model use case	Track this model
Model use case status	Track this model

Model information

Model description	Description not added
Tags	
Model ID	74a1c696-dd5a-4904-9c9f-db04cacf5519
Last modified	Mar 19, 2023, 09:34 PM

Export report

- Select the “Attrition Prediction Model – HR” which was created as a “New Model entry” in OpenPages at the beginning of this workshop.

Track this model

Select the related model use case

Model use case	Description	Parent entity	Catalog	Status
Credit Risk Sagemaker Model	AI Model developed in Sagemaker and governed by Cloud Pak	Finance	Platform assets catalog	Approved
Attrition Prediction Model - HR	Developed by Admin, HR Executive, DS Department, and Risk Officer	Human Resources	Platform assets catalog	Proposed
Credit Risk Sagemaker	Credit Risk Dept	Finance	Platform assets catalog	Approved
Stressed period selection	Calibration of stressed period selection for VaR calculation	Investment Banking	Platform assets catalog	Rejected
Black model for IR derivatives	Black Linear-Nonlinear model on IR process	Investment Banking	Platform assets catalog	Approved
Commodity Options VaR	Stochastic VaR at 99.97%, Pricing model Mapping: Asian Commodities: Cost; ...	Investment Banking	Platform assets catalog	Approved
Banking book HTM corporate bond -...	ALM based income forecast for the HTM portfolio, initially for the CCAR 2013 ...	Corporate Banking	Platform assets catalog	Awaiting...
Simulation of event risk	Simulation of low-probability events and their impact into VaR model	Investment Banking	Platform assets catalog	Proposed
Taylor series expansion for equity st...	Delta/gamma approach for structured equities	Investment Banking	Platform assets catalog	Proposed

Cancel Back Next

- In the “Track this model” window, select “Create a new model record” and select “Track”.

Track this model

Create a new model record

Create a new model record

Select an existing model record

Back Track

6. In a few moments, “[\(Champion\) Attrition Prediction – P4 Snap Decision Tree Classifier](#)”, will be added as a new model record within the [OpenPages](#) model entry.



7. You will return to the “[\(Champion\) Attrition Prediction – P4 Snap Decision Tree Classifier](#)” window. Note that this model is now being tracked.

(Champion) Attrition Prediction - P4 Snap Decision Tree Classifier

Deployments Model details

Track this model
The model will be added to your model inventory for activity tracking and model comparison.

Model tracking is active [Deactivate](#)

[Open in model inventory](#)

[Export report](#)

Model inventory

Model use case: Attrition Prediction Model - HR
Model use case status: Proposed

Model information

Model description: Description not added
IBM OpenPages model: [\(Champion\) Attrition Prediction - P4 Snap Decision Tree Classifier](#)
IBM OpenPages model status: Proposed
Tags:
Model ID: 74a1c696-dd5a-4904-9c9f-db04cacf5519

8. All model metadata will automatically flow to the [OpenPages](#) through this synchronization that you have created. You can return to different states of this model by opening new browser windows and reviewing the deployment and [OpenPages](#) model entry.

- a) You will see that the model is being tracked across different lifecycle points.

Catalogs / Platform assets catalog

Attrition Prediction Model - HR

Remove Add to project

Overview Asset Access Review

Model tracking
Follow your model through each stage of the model lifecycle. Each row represents a unique champion or challenger model associated with the model use case.

Model use case status	IBM OpenPages model use case	Actions
Proposed	Attrition Prediction Model - HR	Export report <input checked="" type="checkbox"/> No

Develop → **Deploy** → **Validate** → **Operate**

No models developed. Add a model from a project. → AI Governance Deployments → No models promoted to a pre-production space. → No models promoted to a production space.

[\(Champion\) Attrition Prediction - P4 Snap Decision Tree Classifier](#)
[Attrition Prediction](#) [Pending Evaluation](#)

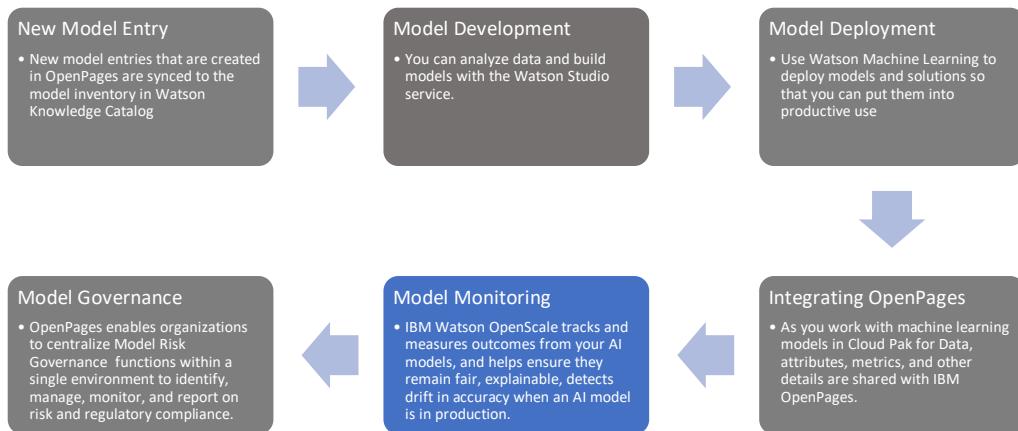
- b) You will see that the model is actively governed by OpenPages.

The screenshot shows the IBM OpenPages interface with the title "Attrition Prediction Model - HR". The top navigation bar includes "Model Entries" and "Attrition Pr...". Below the title, there are tabs for "Task", "Activity", and "Admin". A "Reveal editable fields" toggle is present. The main content area displays a "Description" section with a link to a Watson Knowledge Catalog entry: <https://cpd-cpd-instance.apps.amwv12.workshop.tec/data/catalogs/f0b6444f-2b38-4ed8-9ab2-a4ba1d2779bf/asset/72a9de19-4d25-4709-b2ab-85fb4301599>. It also shows "Associated Models" with a table listing one item:

Name	Description	Model Type	Model Status	Model Owner
(Champion) Attrition Prediction - P4 Snap Decision Tree Classifier	Proposed			

Summary: We have integrated AI Governance components (Watson Knowledge Catalog and Watson Studio) into your Attrition Prediction through the platform catalog. You have also enabled **Factsheets** to record metadata every all stages of a model lifecycle. This process will allow all model activity to be available to an AI Governor in **OpenPages**. We will continue this journey by setting **OpenScale** monitors for the next activity.

2.1 Openscale



FOUNDATION

Successful deployment of an ML model not only enables downstream applications/use cases but also empowers several personas (e.g. Data Science Managers) to monitor the performance of the deployed model(s).

Model monitoring is one of the essential steps to developing a successful and sustainable model operations lifecycle. Therefore, after models are deployed, it is important to monitor them to make sure that they are performing well. Data scientists and managers must watch for model performance and data consistency issues.

A key component of the [IBM Cloud Pak for Data](#) AI Governance solution is its ability to monitor M/L models for accuracy, fairness, explainability, and drift. Through OpenScale's operations console, users can track and measure AI outcomes allowing alignment with business outcomes and organizational KPI's, enabling users to adjust and respond to business changes.

The platform provides out-of-the-box metrics as well as the option of customized metrics for tracking model performance. Model outcomes are tracked and measured across its lifecycle, allowing adaptation to changing business needs. CPD detects and mitigates risk and harmful bias, providing businesses with actionable insights for business development and change planning.

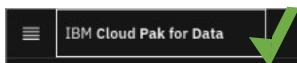
In the previous section, you successfully deployed the Attrition Prediction model into the AI Governance Deployment space.

In this section, we will monitor the deployed model by:

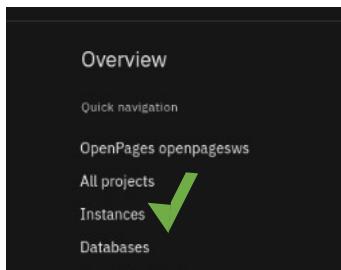
- Creating a service provider and subscription for the machine learning service.
- Fetch the model and deployments.
- Configure the explainability monitor.
- Configure the fairness monitor.
- Configure the quality monitor.
- Configure the drift monitor.
- Observe the model monitors.

Create the service provider and subscription for your machine learning service.

1. Return to the CPD Home screen.



2. Select Instances



3. Scroll down in the “Instances” window, find the “openscale-defaultinstance” and select the vertical ellipsis button and then Select “Open”. Note: wait for all Status indicators to turn green before proceeding.

A screenshot of the "Instances" table in the CPD interface. The table has columns: Name, Type, Created by, vCPU requests, Memory requests (GiB), Users, Status, and Created on. There are seven rows of data. The fifth row, which contains the entry "openscale-defaultinstance IBM Watson OpenScale", has a green arrow pointing to its vertical ellipsis button. A context menu is open over this button, with the "Open" option highlighted by a blue box and a green arrow. Other options in the menu are "Manage access" and "Delete".

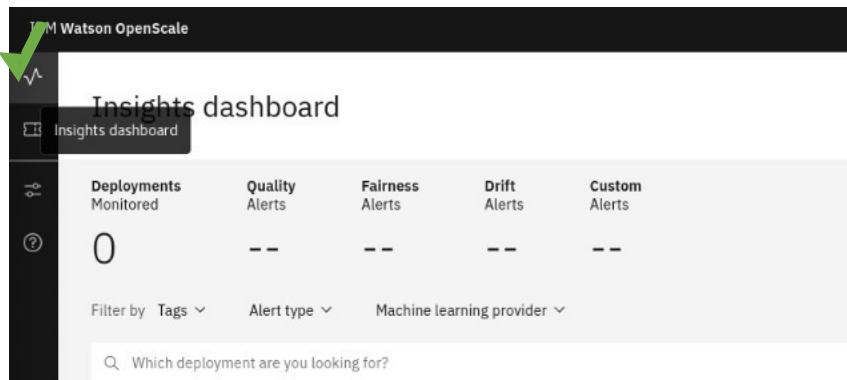
4. You are now in IBM Cloud Pak for Data OpenScale viewing your “Insights dashboard”.

A screenshot of the "Insights dashboard" in IBM Watson OpenScale. The dashboard has a dark header with "IBM Watson OpenScale". The main title is "Insights dashboard". Below the title, there is a summary section with five metrics: "Deployments Monitored" (0), "Quality Alerts" (--), "Fairness Alerts" (--), "Drift Alerts" (--), and "Custom Alerts" (--). There are also filters for "Tags", "Alert type", and "Machine learning provider". At the bottom, there is a search bar with the placeholder "Which deployment are you looking for?" and a green arrow pointing towards it.

Components of OpenScale

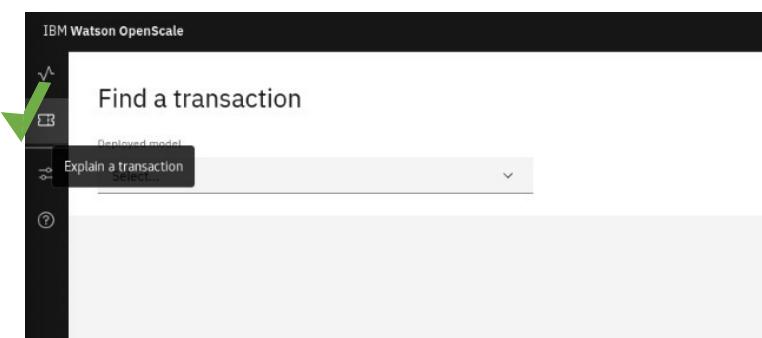
Insights Dashboard

The Insights dashboard displays the models that you are monitoring and provides status of model evaluation results.



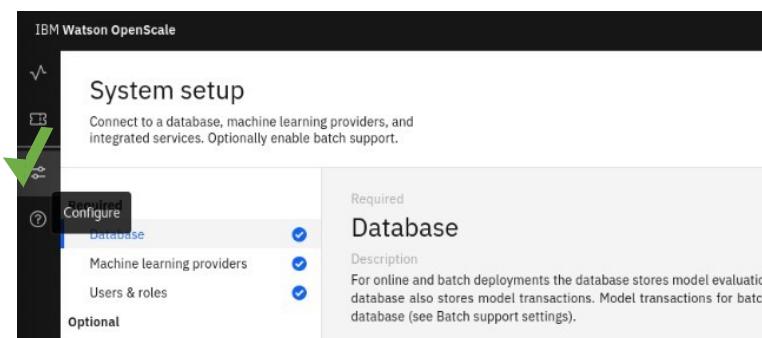
Explain a transaction

Explanations describe how the model determined a prediction. It lists model utilization on a transactional basis. This inventory contains important factors that led to the predictions, providing confidence in the AI Model.



Configure

You will use the “Configure” tab to configure storage, machine learning providers, and users.



- Select “Configure” from the menu on the left. Then Select “Machine learning providers”. Note the Database information is displayed in the box on the right. This database stores the information of every model run as a transaction capturing information on model payload, predictions, and calculated quality metrics. In this example, we see a Db2 database. However, the database type can be configured based on the database technologies you prefer.

The screenshot shows the 'System setup' page in IBM Watson OpenScale. On the left, a sidebar lists 'Required' and 'Optional' sections. Under 'Required', 'Database' is selected, indicated by a green checkmark. The 'Database' section details its purpose: "For online and batch deployments the database stores model evaluation results. For online deployments, the database also stores model transactions. Model transactions for batch deployments are stored outside the database (see Batch support settings)". To the right, a detailed configuration panel shows the following database settings:

Database	
Database type	Db2
Instance ID	worker2.amwv12.workshop.tec
Database	BLUDB
Schema	aiopenscale00
Hostname or IP address	worker2.amwv12.workshop.tec
Port	31953

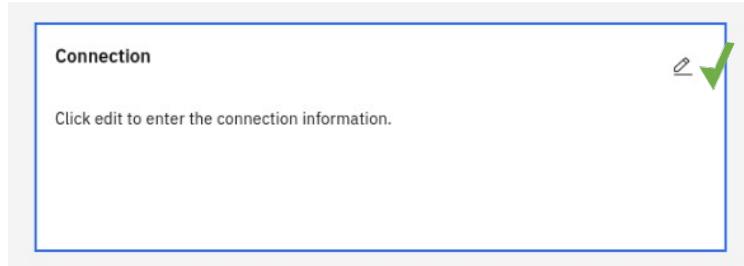
- Select the “Add machine learning provider” button.



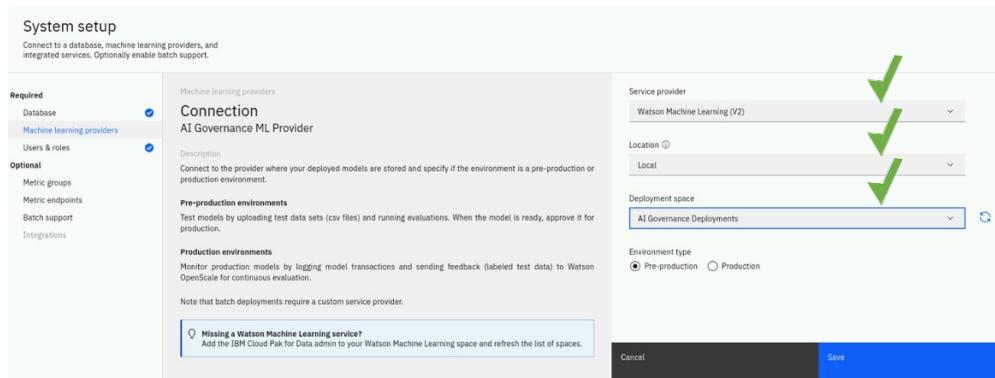
- In the **New Provider** screen select the Edit Pencil by Machine Learning providers. Name this instance “AI Governance ML Provider”. Select the “Apply” button.

The screenshot shows the 'New Provider' screen. At the top, there's a back arrow and the text 'Machine learning providers'. Below that, the provider name 'AI Governance ML Provider' is entered into a text input field, with an 'Edit' pencil icon to its right. There are 'Apply' and 'Cancel' buttons at the bottom. A note below says 'Click edit to enter provider description.'

- Select the “Edit pencil” in the “Connection” box to the right.



- Select the drop-down arrow in the “Service provider” and select “Watson Machine Learning (V2)”, then select the drop-down arrow in “Location” box and select “Local”. Then select the drop-down arrow in the “Deployment space” box and select “AI Governance Deployments”. Finally, click the “Save” button.



Machine Learning Providers

You have now created a Machine Learning provider access point which is now visible as a tile in the screen you are currently viewing (the “AI Governance ML Provider” tile)

The screenshot shows the 'System setup' page with the 'Machine learning providers' section expanded. A specific tile for "AI Governance ML Provider" is highlighted with a green border. The tile contains the following information:

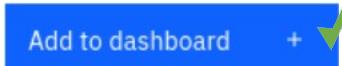
- Name:** Watson Machine Learning
AI Governance ML Prov...
- Description:** Watson OpenScale connects to deployed models stored in a machine learning environment.
- Environment type:** Pre-production

Machine learning providers incorporate artificial intelligence engines, pre-trained machine learning models, and a variety of ML tools designed to create and train custom ML models at scale. Examples of Machine Learning providers include IBM Watson Machine Learning, Amazon SageMaker, Microsoft Azure ML Studio, and Microsoft Azure ML Service. In the above activity, we used IBM's in-house Watson Machine Learning as the service provider.

10. Select the “[Insights dashboard](#)” icon on the left menu to begin building a Model Monitor for our Insights Dashboard.

The screenshot shows the IBM Watson OpenScale interface. At the top, a dark header bar displays the text "IBM Watson OpenScale". Below it, a sidebar on the left features a green checkmark icon followed by the text "Insights dashboard". The main content area is titled "Insights dashboard". It contains several summary metrics: "Deployments Monitored" (0), "Quality Alerts" (---), "Fairness Alerts" (---), "Drift Alerts" (---), and "Custom Alerts" (---). Below these metrics are three dropdown filters: "Filter by Tags", "Alert type", and "Machine learning provider".

11. Select the “[Add to dashboard](#)” button.



12. Select the drop-down arrow in the “Machine learning Provider” drop-down box select the “[AI Governance ML Provider](#)” option, then select the “[Attrition Prediction](#)” radio button. Finally, select “[Configure](#)”.

This screenshot shows a modal dialog box titled "Select a model deployment". The instructions inside say "Choose a machine learning provider and provide deployment details." A dropdown menu for "Machine learning Provider" is open, showing "AI Governance ML Provider (Pre-production)" as the selected option. Below the dropdown is a table with two columns: "Deployment" and "Description". The first row in the table has a green checkmark icon next to it. The second row, which is highlighted, also has a green checkmark icon next to it. The deployment name is "Attrition Prediction" and the description is "Created". At the bottom of the dialog are two buttons: "Cancel" and "Configure", with a green arrow pointing to the "Configure" button.

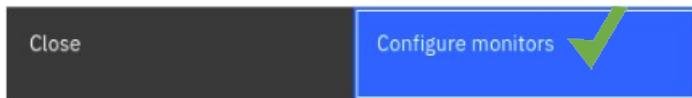
This message will appear:

Select a model deployment

Choose a machine learning provider and provide deployment details.

This screenshot shows a progress message box with a light gray background. It contains a circular loading icon and the text "Saving deployment selection...".

13. Upon completion, select the “Configure monitors” button in the bottom right of the window.



14. In the “Attrition Prediction” window select “Model input” then select pencil edit button

A screenshot of the "Attrition Prediction" window. On the left, there's a sidebar with sections like Model info, Evaluations, and Go to model summary. The main area has a "Model details" section with a "Model input" sub-section. This sub-section contains a text area with a small "Edit" button (represented by a pencil icon) which is highlighted with a green arrow. Below it are "Model transaction" and "Model output details" sections.

15. Select Numeric/categorical from the drop-down arrow listing under Data Type. Select Binary classification from the Algorithm type drop-down arrow listing. Select Save and continue.

A screenshot of the "Attrition Prediction" window. It shows the "Specify model input" section. Under "Data type", "Numeric/categorical" is selected. Under "Algorithm type", "Binary classification" is selected. At the bottom right of this section is a "Save and continue" button, which is highlighted with a green arrow.

16. After the model input selections are saved, select the Edit pencil in the Training data window.

A screenshot of the "Training data" window. It has a text area with the placeholder "To connect to the training data, click the edit icon." and an "Edit" button at the top right. A green arrow points to this "Edit" button.

17. Under the Storage Type drop down menu, Select Database or cloud storage. Then under Location select "Db2". Now enter the following information in the corresponding fields below:

- "Hostname": worker1.amwv12.workshop.tec
- "port": 31953
- "Database": BLUDB
- "username": admin
- "password": cpdaccess

Storage type
Database or cloud storage

Location
Db2

Credential values
Enter manually

Hostname or IP address
worker1.amwv12.workshop.tec

Use SSL

Port
31953

Database
BLUDB

Username
admin

Password

18. Scroll down and select "Connect".



19. When the connection is made, the drop-down arrow menu in the "Schema" box will become available. Scroll down within the select the schema drop-down list and select "HR".

Schema

Select the schema

ADMIN

aiopenscale00

DB2COGNOS

DB2INST1

HR

IBMCONSOLE

20. Select MASTER_HR_DATA_AI_GOV from the table list.

Hostname or IP address
worker1.amwv12.workshop.tec

Use SSL

Port
31953

Database
BLUDB

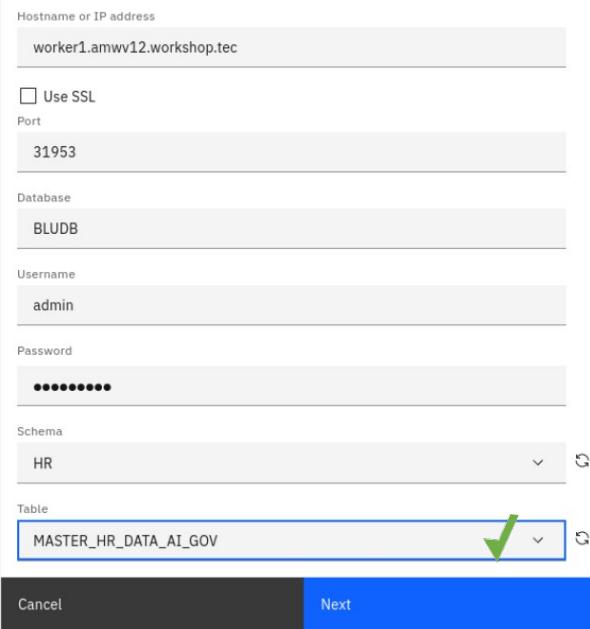
Username
admin

Password

Schema
HR

Table
MASTER_HR_DATA_AI_GOV

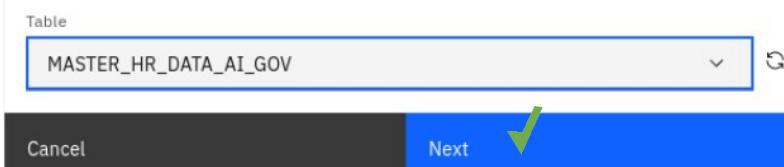
Cancel Next



21. Select the Next button.

Table
MASTER_HR_DATA_AI_GOV

Cancel Next



22. Scroll down and select the Label VIRTUAL_MASTER_HR_DATA_STATUS, then select the Next button.

ETHNIC_ORIGIN

EXEMPTTF

FUNCTION

GENDER

GENERATION

LAST_PERFORMANCE_RATING

LAST_POTENTIAL_RATING

MANAGER_ID

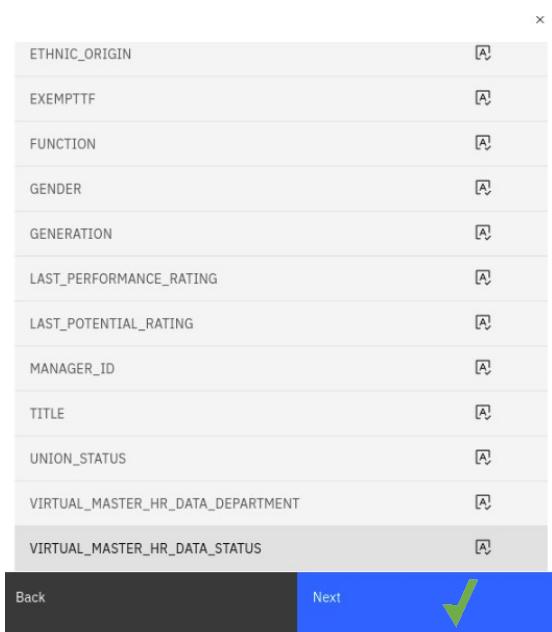
TITLE

UNION_STATUS

VIRTUAL_MASTER_HR_DATA_DEPARTMENT

VIRTUAL_MASTER_HR_DATA_STATUS

Back Next



23. In the “Select the training features” window, select the check box for all “Features (16)” to select all items in the list, then select the Next button.

Select the training features

Selected features 16

	Type	Categorical
<input checked="" type="checkbox"/> AGE	A	<input checked="" type="checkbox"/>
<input checked="" type="checkbox"/> DIVISION	A	<input checked="" type="checkbox"/>
<input checked="" type="checkbox"/> EMPLOYEE_PAY_BASIS	A	<input checked="" type="checkbox"/>
<input checked="" type="checkbox"/> EMPLOYEE_PAY_FREQUENCY	A	<input checked="" type="checkbox"/>
<input checked="" type="checkbox"/> EMPLOYMENT_CATEGORY	A	<input checked="" type="checkbox"/>
<input checked="" type="checkbox"/> ETHNIC_ORIGIN	A	<input checked="" type="checkbox"/>
<input checked="" type="checkbox"/> EXEMPTTF	A	<input checked="" type="checkbox"/>
<input checked="" type="checkbox"/> FUNCTION	A	<input checked="" type="checkbox"/>

Items per page: 25 1 - 16 of 16 items 1 of 1 page

Back Next

24. You will return to the Attrition Prediction window.

IBM Watson OpenScale

Attrition Prediction

Model Info

- Model details
- Model governance
- Endpoints

Evaluations

- Fairness
- Quality
- Drift
- Explainability

Go to model summary

Model details

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
- Use the payload logging API
- Send the model request and response from a data science notebook or API client using code snippets.

Scoring method

Automatic logging

Check now

25. Logging can only occur once the first transaction activates. We will perform this step in the next section.

Scoring method

Automatic logging

Scoring request required:
Send an initial scoring request to the model and try again.

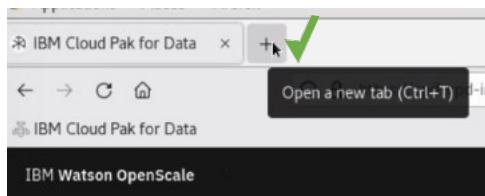
Feature columns not found in payload:
Please ensure that the payload contains feature columns. In case of WML this can be done by defining the model training schema when saving the model. [Learn more](#).

Check now

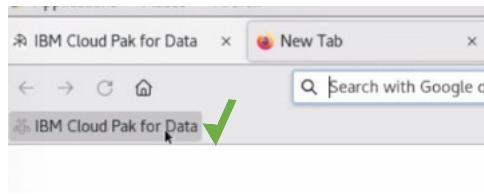
Fetching the model and deployments

Now that the WML service has been bound and the subscription has been created, you need to send a request to the model before you configure OpenScale monitors. This allows OpenScale to create a payload log in the datamart with the correct schema, so it can capture data coming into and out of the model. First, the code gets the model deployment's endpoint URL, and then sends sample records for predictions.

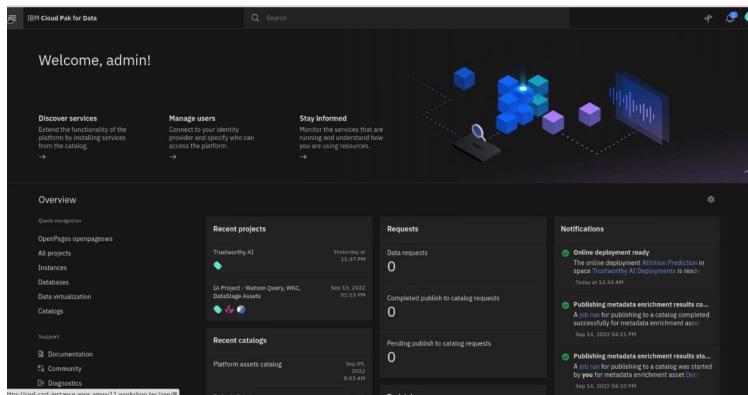
1. You will now open another instance of CPD. Go to the Firefox menu bar and select the + (plus) sign to open a new tab-instance on the browser in your image. Note: Do not open another Firefox tab on YOUR machine.



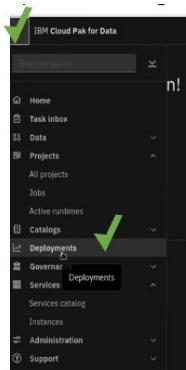
2. Select the Firefox bookmark link “IBM Cloud Pak for Data”.



3. A new “IBM Cloud Pak for Data” home screen appears.



4. Open the Hamburger menu and select “Deployments”.



5. Select “AI Governance Deployments”.

A screenshot of the 'Deployments' page. The top navigation bar shows '2 spaces'. Below it, there are tabs for 'Activity' and 'Spaces', with 'Spaces' being the active tab. A search bar says 'Which deployment space are you looking for?'. A table lists deployment spaces. The first row, 'AI Governance Deployments', is highlighted with a green box and a green checkmark. It shows 'Last modified' as Jan 4, 2023 1:38 PM, 'Your role' as Admin, 'Collaborators' as 2, 'Tags' as none, 'Online deployments' as 1, and 'Jobs' as 0. The second row shows 'Nov 21, 2022 11:41 AM', 'Admin', '2', 'none', '0', and '1' respectively.

6. Select the “Deployments” tab and then “Attrition Prediction”.

A screenshot of the 'AI Governance Deployments' page. The top navigation bar shows 'Deployments / AI Governance Deployments'. Below it, there are tabs for 'Overview', 'Assets', 'Deployment' (which is highlighted with a green box and a green checkmark), and 'Jobs'. A search bar says 'What deployments are you looking for?'. Below it, a table titled 'Deployments (1)' shows one entry: 'Attrition Prediction'. The table columns are Name, Type, Status, and Asset. The entry shows 'Attrition Prediction' as the name, 'Online' as the type, 'Deployed' as the status, and '(Champion) Attrition Prediction - P2 XGB Classifier' as the asset. A green box and a green checkmark highlight the 'Attrition Prediction' entry.

7. Select the “Test” tab.

The screenshot shows the 'Attraction Prediction' API interface with the 'Test' tab selected. The 'Text input' tab is active, showing a JSON input field containing the following code:

```
{  
  "input_data": [  
    {  
      "fields": [  
        "TITLE",  
        "VIRTUAL_MASTER_HR_DATA_DEPARTMENT",  
        "FUNCTION",  
        "DIVISION",  
        "UNION_STATUS",  
        "EMPLOYMENT_CATEGORY",  
        "AGE",  
        "GENERATION",  
        "GENDER",  
        "ETHNIC_ORIGIN",  
        "LAST_PERFORMANCE_RATING",  
        "LAST_POTENTIAL_RATING",  
        "EMPLOYEE_PAY_FREQUENCY",  
        "EXEMPTTF",  
      ]  
    }  
  ]  
}
```

8. Select the Paste JSON tab and highlight the entire input data as shown below:

The screenshot shows the 'Attraction Prediction' API interface with the 'JSON input' tab selected. The JSON input field contains the same JSON code as above, with the entire input data block highlighted in blue.

```
{  
  "input_data": [  
    {  
      "fields": [  
        "TITLE",  
        "VIRTUAL_MASTER_HR_DATA_DEPARTMENT",  
        "FUNCTION",  
        "DIVISION",  
        "UNION_STATUS",  
        "EMPLOYMENT_CATEGORY",  
        "AGE",  
        "GENERATION",  
        "GENDER",  
        "ETHNIC_ORIGIN",  
        "LAST_PERFORMANCE_RATING",  
        "LAST_POTENTIAL_RATING",  
        "EMPLOYEE_PAY_FREQUENCY",  
        "EXEMPTTF",  
      ]  
    }  
  ]  
}
```

You will now need to open another Firefox tab and copy the JSON code from
<https://raw.githubusercontent.com/cwong79/CPD4.5.0Lab/main/model-payload.json>

Attrition Prediction ● Deployed Online

API reference Test Deployment details

Enter input data

Text input JSON input

Manually enter or upload a file containing input data in JSON format. Max file size is 50 MB.

Browse local files ... Search in space ...

```
{ "input_data": [ { "fields": [ "TITLE", "DEPARTMENT", "FUNCTION", "DIVISION", "UNION_STATUS", "EMPLOYMENT_CATEGORY", "AGE", "GENERATION", "PAY_SCALE_GROUP", "GENDER", "ETHNIC_ORIGIN", "LAST_PERFORMANCE_RATING", "LAST_POTENTIAL_RATING", "EMPLOYEE_PAY_FREQUENCY", ] } ] }
```



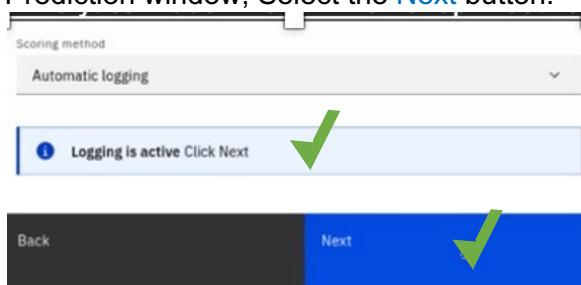
9. After successfully pasting the code – Select the “Predict” button in the lower right.



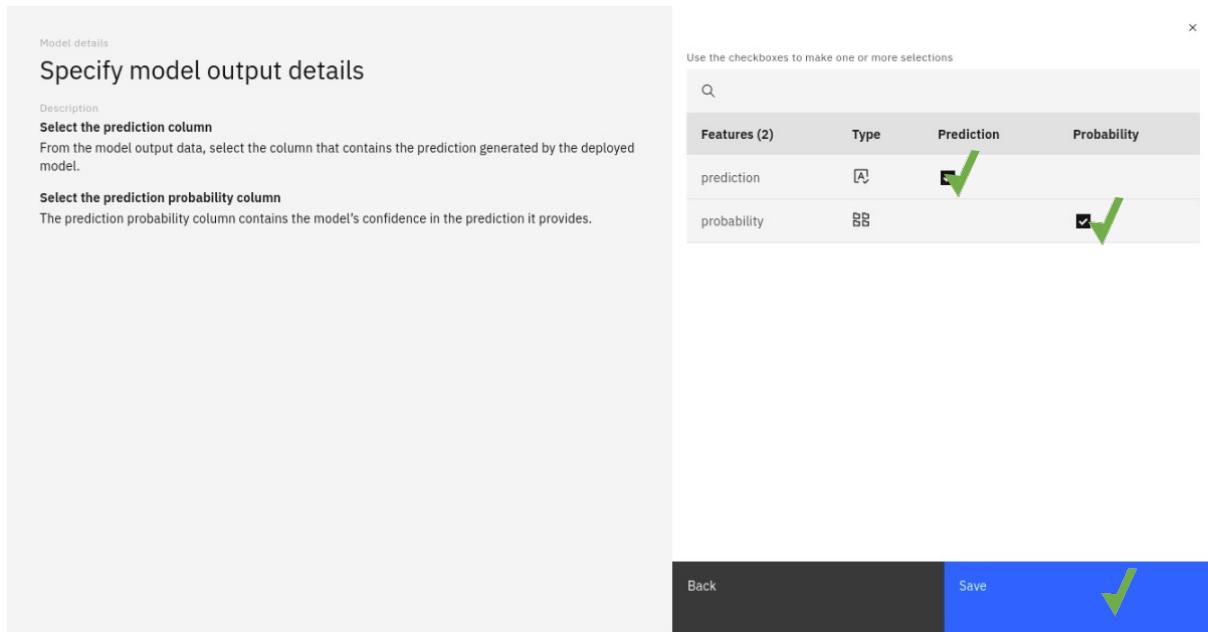
10. Wait about 60 seconds, and then in the Attrition Prediction window (in your original Firefox tab), Select the “Check now” button in the right window.



11. Note that the message “Logging is active Click Next” appears in the left pane of the Attrition Prediction window, Select the **Next** button.



12. When the Attrition Prediction window appears, select the **Prediction** check box for the “**Prediction**” feature and select the **Probability** check box for “**probability**” feature, then “**Save**” button.

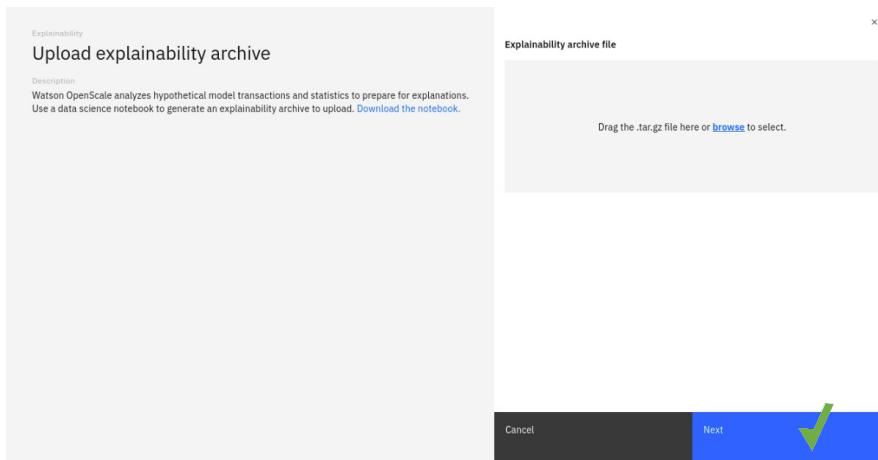


Configure Explainability

It is important to understand how the model came to its decision. This understanding is required both to explain model predictions and to ensure model owners that the decisions are valid. To understand these decisions, follow these steps to observe the model's explainability.

In the Explainability section of your model configuration page, configure explainability to analyze the factors that influence your model outcomes. You can choose to configure local explanations to analyze the impact of factors for specific model transactions and configure global explanations to analyze general factors that impact model outcomes.

1. On the General settings tab, you can configure explainability settings manually or you can run a custom notebook to generate an explainability archive. In this case, you will be configuring the metrics manually. Select **Next**.



2. You can also choose to specify **Controllable Features** and enable language support. Controllable features are features that can be changed and have a significant impact on your model outcomes. [OpenScale](#) analyzes the controllable features that you specify to identify changes that might produce different outcomes.

Select all features as **Controllable** and click **Next**.

Feature	Type	Controllable
TITLE	▲	<input checked="" type="checkbox"/> On
VIRTUAL_MASTER_HR_DATA_DEPARTMENT	▲	<input checked="" type="checkbox"/> On
FUNCTION	▲	<input checked="" type="checkbox"/> On
DIVISION	▲	<input checked="" type="checkbox"/> On
UNION_STATUS	▲	<input checked="" type="checkbox"/> On
EMPLOYMENT_CATEGORY	▲	<input checked="" type="checkbox"/> On
AGE	▲	<input checked="" type="checkbox"/> On
GENERATION	▲	<input checked="" type="checkbox"/> On
GENDER	▲	<input checked="" type="checkbox"/> On

You can choose to configure local explanations to analyze the impact of factors for specific model transactions and configure global explanations to analyze general factors that impact model outcomes.

3. Select **LIME** and **Save** the configurations.

SHAP global explanation Off

Local explanation method ⓘ
 SHAP (Kernel Explainer)
 LIME (enhanced)

Note that as it is saving, you will see Explainability running/spooling in the left menu.

Explainability

- General settings ✓
- SHAP
- LIME (enhanced)

Once it finishes, the running/spooling animation will stop, and a blue dot will appear.

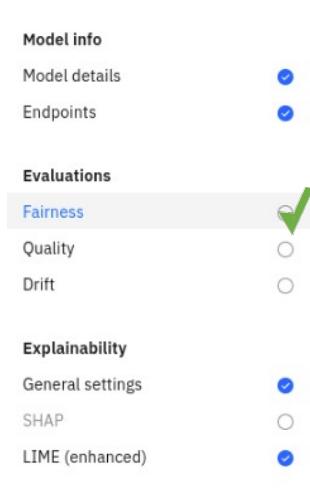


Configure Fairness

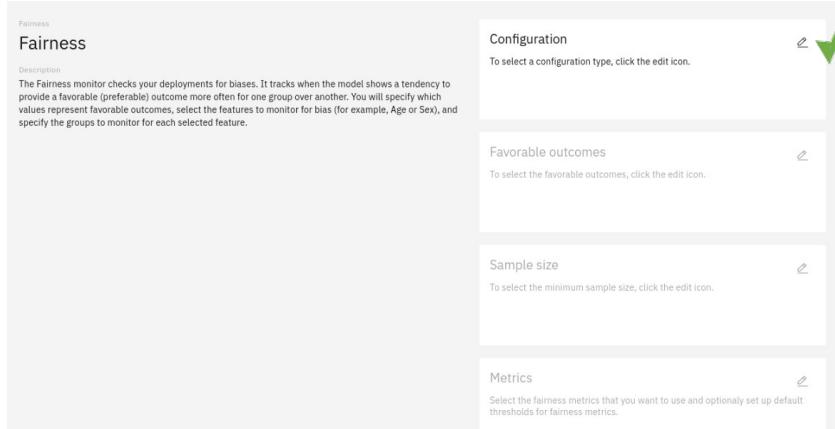
The Fairness monitor checks your deployments for biases. It tracks when the model shows a tendency to provide a favorable (preferable) outcome more often for one group over another. You will specify which values represent favorable outcomes, select the features to monitor for bias (for example, Age or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

1. Select “Fairness” from the Evaluations menu.

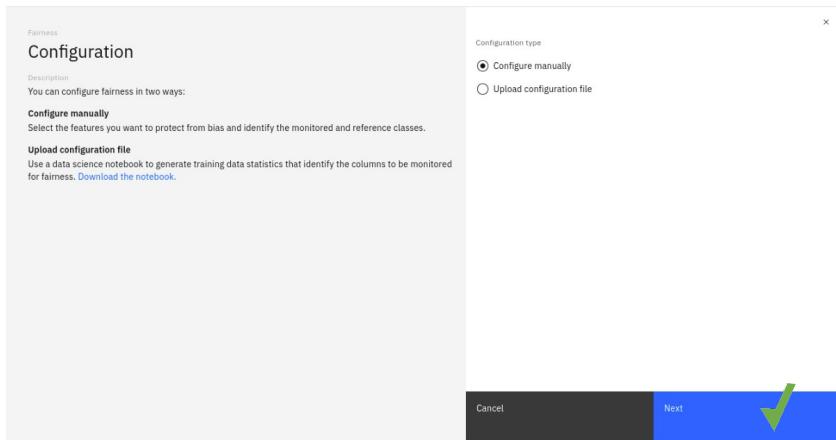
Attrition Prediction



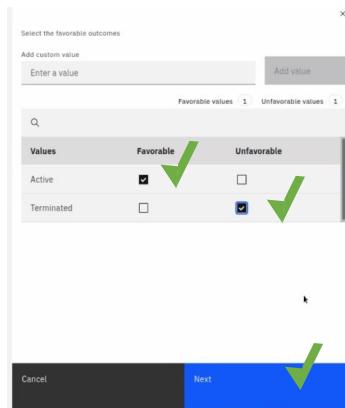
2. Select the “Pencil” icon in the Configuration window.



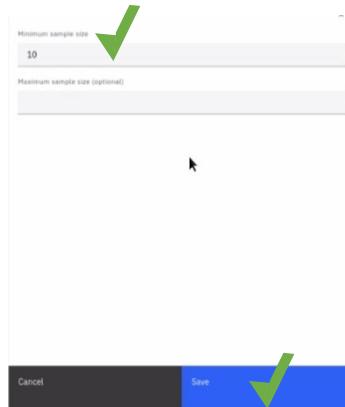
3. Select **Configure manually** and click **Next** to proceed.



4. Select **Favorable** for the Active value and select **Unfavorable** for the Terminated value. Select the **Next** button.



5. Enter “10” into the “Minimum sample size” and select the **Next** button.



When you configure fairness evaluations in IBM Watson OpenScale, you can generate a set of metrics to evaluate the fairness of your model. You can use the fairness metrics to determine if your model produces biased outcomes. You can find more information about the various metrics [here](#). In this tutorial, we will be select Disparate Impact as the evaluate the fairness score for different groups. Disparate impact compares the percentage of favorable outcomes for a monitored group to the percentage of favorable outcomes for a reference group.

6. Check “Disparate impact” and click Next.

The fairness monitor tracks multiple fairness metrics. You can select that will be monitored across the features in the future and set up the default fairness metrics. Metric thresholds track when a metric value is outside of an acceptable range.

In this scenario, women are identified as the monitored group for whom fairness is being measured and the threshold for fairness is to be at least 80%.

7. Insert 80 and 120 and click Next.

8. Select Gender, and then select the Save button.

- Select Monitored for the Female value and Reference for Male value. Then select the Next button.

Values	Monitored	Reference	Recommended
Female	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Monitored
Male	<input type="checkbox"/>	<input checked="" type="checkbox"/>	Reference

Back Next

- Select Use default thresholds for the Female value and then select Save button

Fairness

Specify the monitored groups for [GENDER]

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.

FAQ Recommended groups

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

Set up threshold for feature [GENDER]

Use default thresholds

Set up different thresholds

Disparate impact 80 - 120

Back Save

Notice Fairness is Spooling/Running

Attrition Prediction

Model info

Model details

Endpoints

Evaluations

Fairness

Quality

Drift

Explainability

General settings

SHAP

LIME (enhanced)

Save

When Cloud Pak completes the Fairness monitoring setup the spooling stops.

Attrition Prediction

Model info

Model details

Endpoints

Evaluations

- Fairness (selected)
- Quality
- Drift

Explainability

General settings

SHAP

LIME (enhanced)

[Go to model summary](#)

Quality

Quality evaluations monitor how well your model predicts accurate outcomes. It identifies when model quality declines, so you can retrain your model appropriately. To evaluate the model, you provide feedback data, which is labeled data where the outcome is known. Quality evaluations use a set of standard data science metrics to evaluate how well the model predicts outcome that matches the actual outcomes in the labeled data set.

You can set acceptable quality thresholds for the metrics used to evaluate your model. You can also set the sample size, which is the number of rows of feedback data, to consider for the evaluation.

1. Select the Quality menu item and then select the “Pencil” icon to configure the quality monitor in OpenScale. As explained on the Quality page, OpenScale can monitor the Quality metric which measures the model’s ability to correctly predict outcomes that match labeled data.

Attrition Prediction

Model Info

Model details

Model governance

Endpoints

Evaluations

- Fairness
- Quality (selected)
- Drift
- Explainability

[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 thresholds
To select quality threshold values, click the edit icon.

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

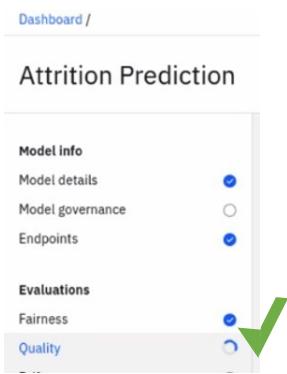
2. This window enables us to enter custom threshold values. For this demo, we will not change the default thresholds. Select the Next button.



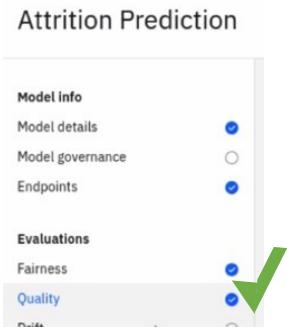
3. Enter 10 and then select the Save button.



4. The Quality job will spool and run for a few minutes.



5. When it completes and displays a solid blue dot, we will set up the Drift monitor



Drift

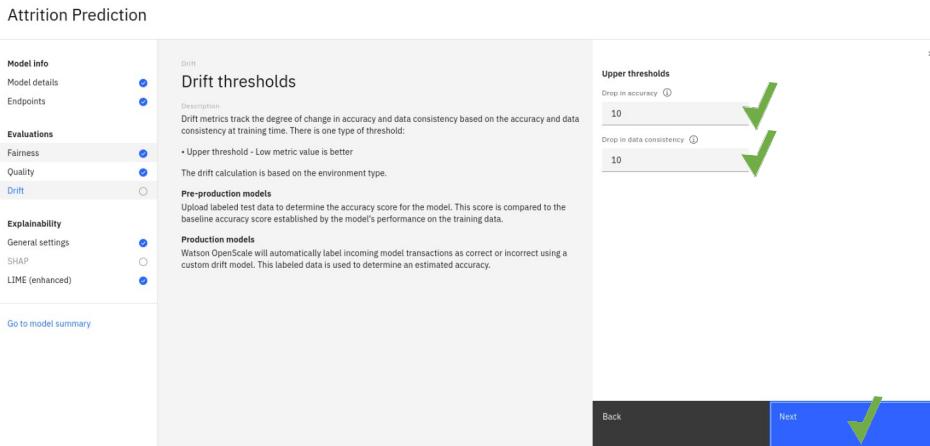
When configuring Drift in [OpenScale](#), you must specify the tolerable accuracy drift magnitude. The drift is measured as the drop in accuracy as compared to the model accuracy at training time. For example, if the model accuracy at training time was 90% and at runtime the estimated accuracy of the model is 80%, then the model is said to have drifted by 10%.

1. Select Drift from the Evaluations menu and then select the “[Pencil](#)” icon from Drift Model

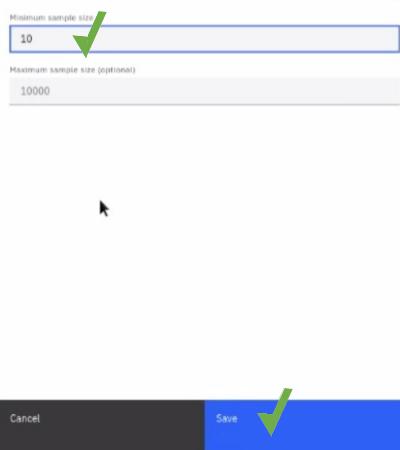
2. Select Trust in [OpenScale](#) radio button and select the Next button.

For details on Drift monitors, check the Drift documentation page.

3. Set the drift thresholds at the **10%** range for both Drop in accuracy and data consistency, then select the **Next** button.



4. Enter **10** into the Maximum sample size and select the **Save** button.



5. Wait for Drift evaluation to complete, then select the Go to model summary link.



Observe the model monitors.

- When you return to the Attrition Prediction window, Select the drop-down arrow in the Actions section, then select Evaluate now.

The screenshot shows the Attrition Prediction dashboard. At the top right, there is a blue 'Actions' button with a dropdown menu. The 'Evaluate now' option is highlighted with a green arrow. Below the dashboard, there is a summary card with various metrics: 'Test data set' (0), 'Number of explanations' (0), 'Tests run' (0), 'Tests passed' (0), and 'Tests failed' (0).

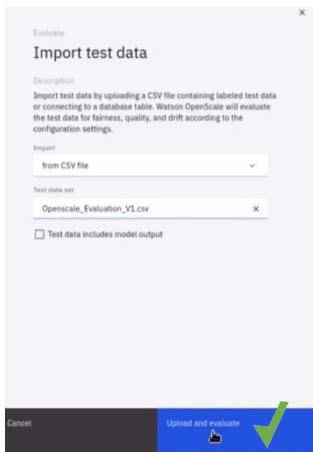
- Select the dropdown on Import Test Data file and select the “from CSV file” link, then Select browse.

The screenshot shows the 'Import test data' dialog. In the 'Import' section, there is a dropdown menu with two options: 'from database or cloud storage' and 'from CSV file'. The 'from CSV file' option is highlighted with a green arrow.

- Select the “Openscale_Evaluation.csv” line item and then Select the Open button.

The screenshot shows the 'File Upload' dialog. On the left, there is a sidebar with recent locations: Home, Documents, Downloads, Music, Pictures, Videos, and Other Locations. The main area shows a list of files in the 'ibmdemo' folder. The file 'Openscale_Evaluation_V1.csv' is selected and highlighted with a green arrow. At the bottom right, there is an 'Open' button, which is also highlighted with a green arrow.

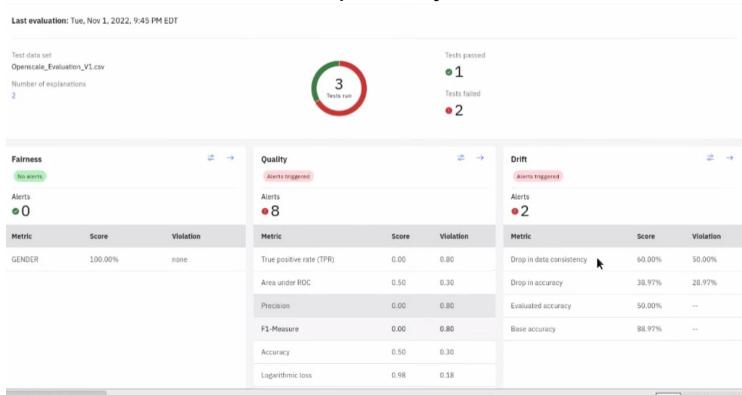
4. Select the Upload and Evaluate button.



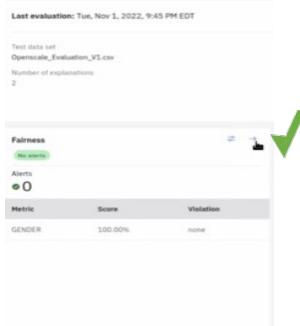
You will see the Evaluation running/loading. This can take up to 3 minutes.



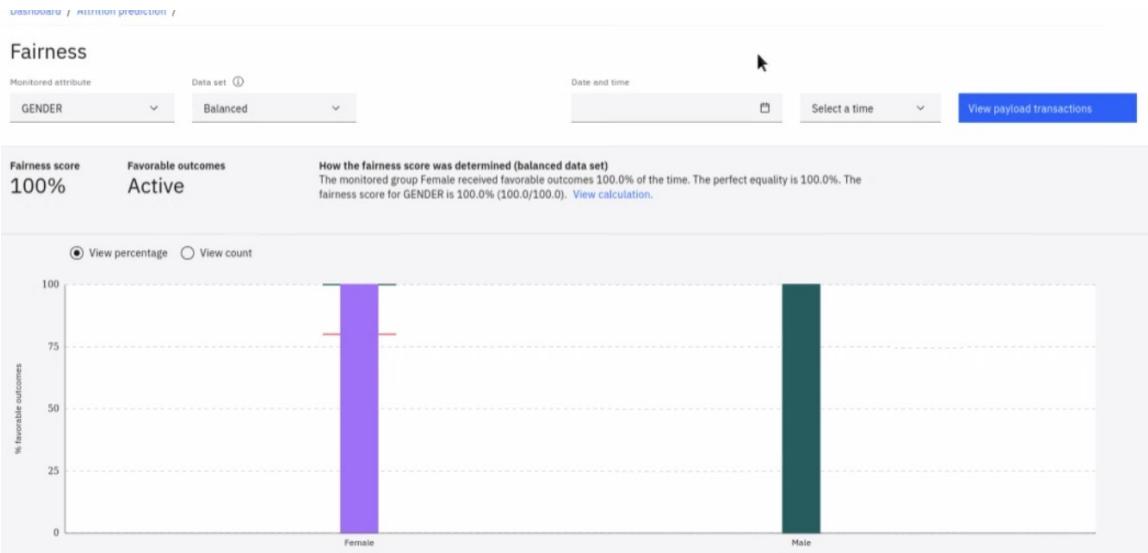
When the Evaluation completes, you will see this screen.



We have successfully completed the [OpenScale](#) evaluation for fairness, quality, and drift for our attrition prediction model. Note that by selecting the right-facing arrow within each monitor, additional details regarding that monitor's observations are available.

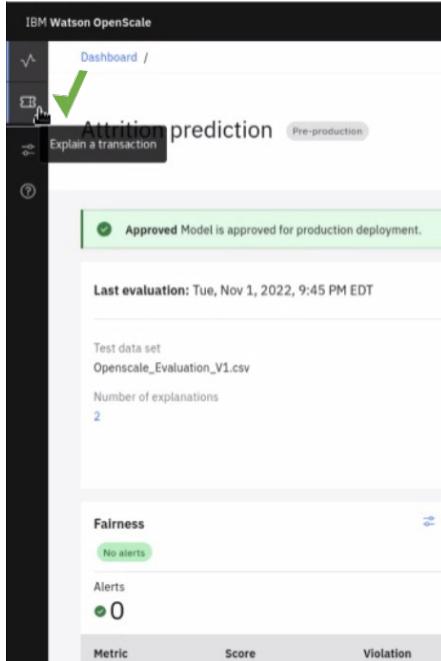


See details:



In production, as your machine learning model is deployed in an end-user application, Cloud Pak for Data will monitor scoring events via APIs and display a dashboard that business/AI Ops users can leverage to detect undesirable behavior(s) and establish trust in the AI monitors. [OpenScale](#) uploads evaluation data runs scoring against it and compares the model prediction to the labeled result to compute an overall quality score. Once the evaluation completes, you can investigate your results further.

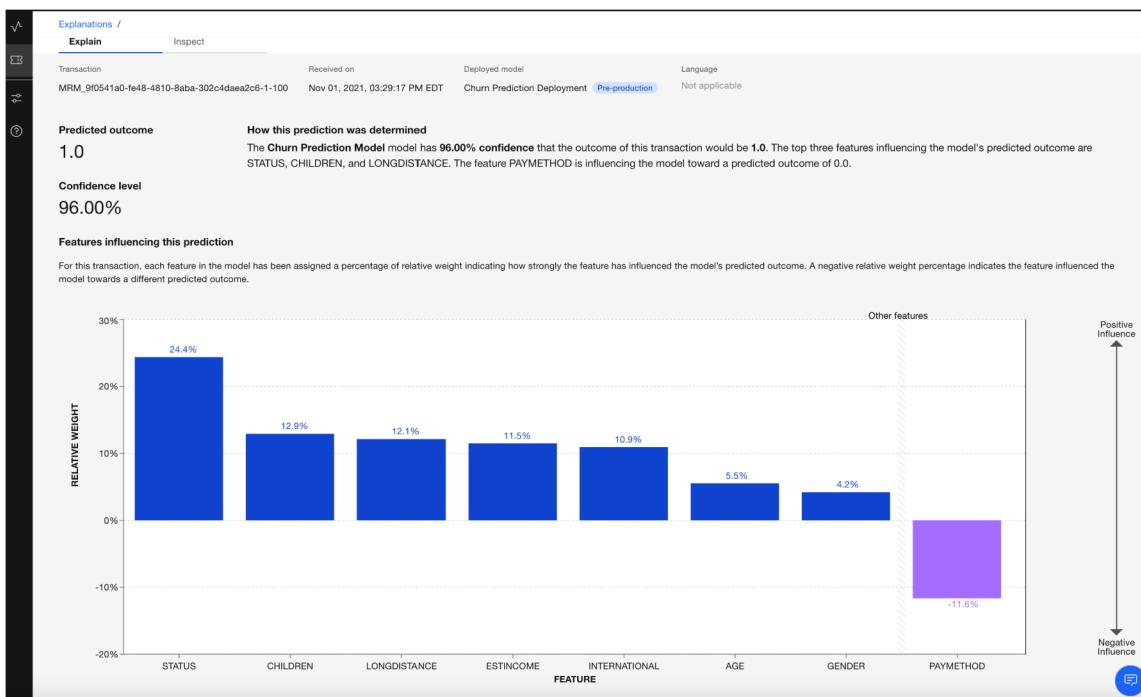
5. You can search for specific model transactions using [OpenScale](#). Explain a transaction by, Select the Explain a transaction menu button.



6. On the Transactions page, review the results. Select the Explain link under the Actions column for one or more of these transactions to better understand how the model reached the output prediction.

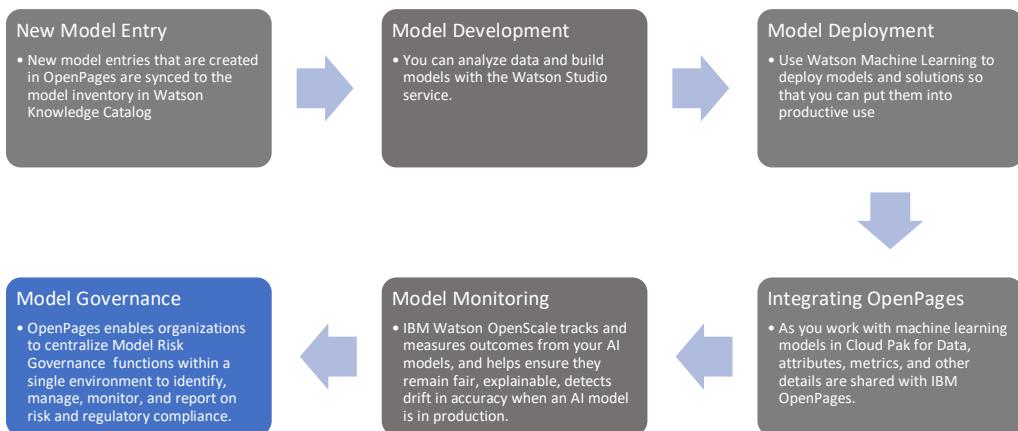
Transaction ID	Timestamp	Prediction	Confidence	Actions
MRM_692fa8f8-59ff-4b70-af2f-3990afb8a0e2-1-1	Nov 1, 2022, 9:45:32 PM	Active	61.07%	Explain
MRM_692fa8f8-59ff-4b70-af2f-3990afb8a0e2-1-10	Nov 1, 2022, 9:45:32 PM	Active	88.39%	Explain
MRM_692fa8f8-59ff-4b70-af2f-3990afb8a0e2-1-2	Nov 1, 2022, 9:45:32 PM	Active	87.82%	Explain

7. On the Explanations page, review the various features and how they contributed to the output prediction for these records.



Summary: This section illustrated how you can leverage [OpenScale](#) capabilities to deliver AI Governance by running model evaluation to validate that Quality, Fairness, and Drift metrics are within the configured thresholds. Additionally, AIOps engineers, data scientists, and business users can trigger explanations of individual transactions to gain confidence in the predictions of the model.

2.2 AI Governance



FOUNDATION

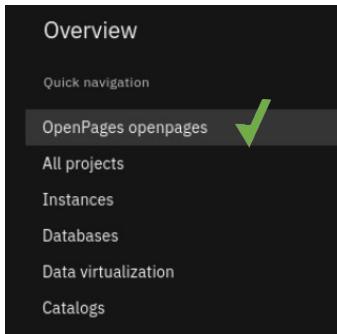
Congratulations! We are nearly at the end of this AI Governance workshop. We will now review features of OpenPages and how a Model Governor can instill a trusted AI practice using Cloud Pak for Data.

We have built a model, deploy that model, integrated that model into an AI Governance workflow and created monitors to ensure it operates with transparency and trust.

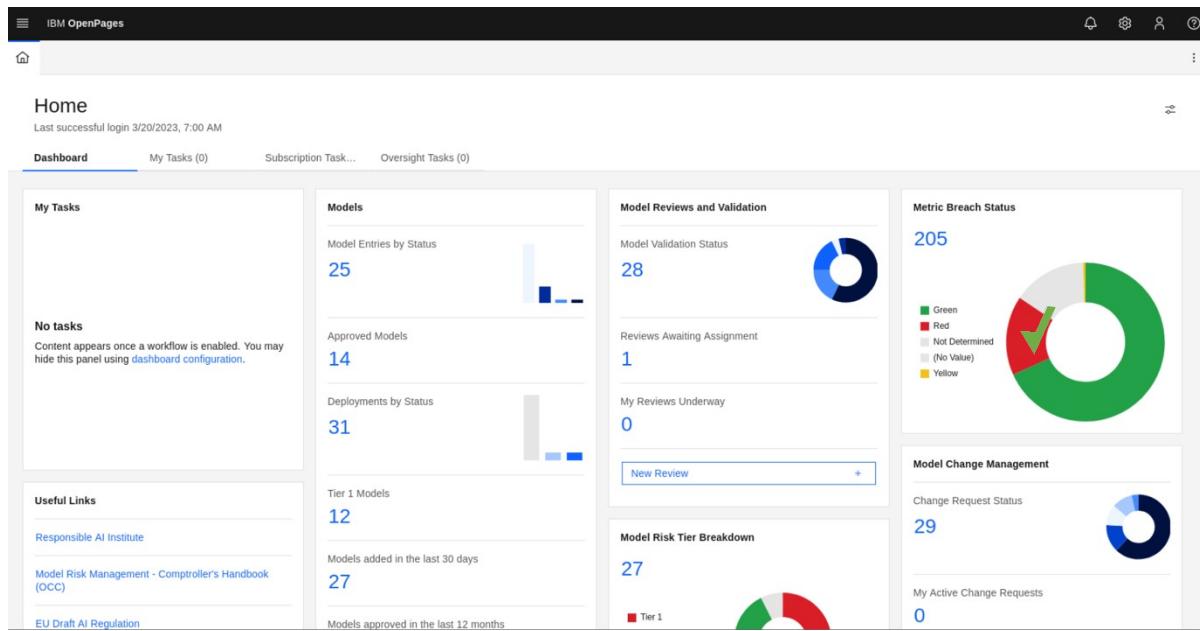
We will now review features in OpenPages which will allow one to govern models, build workflows to automate processes, assign model remediation tasks, and ensure operational validity of models in production.



1. Open a new browser window and access Cloud Pak for Data. Select “OpenPages openpages” instance from the “Quick navigation” menu.

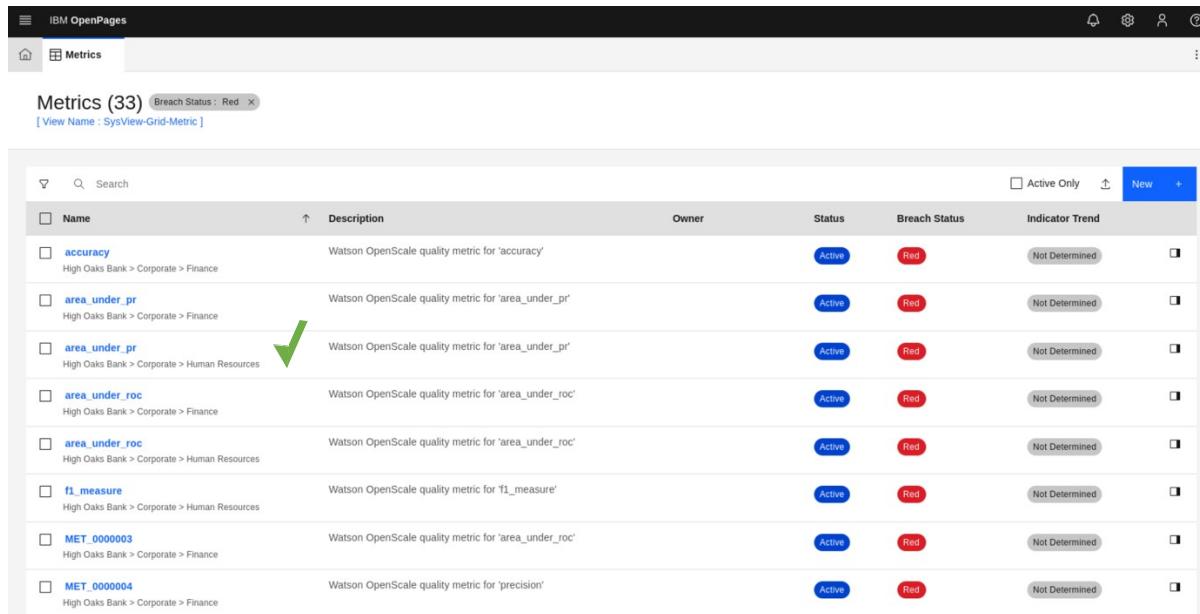


2. Here is a quick overview of this custom Model Risk Governance dashboard within OpenPages.



AI Models are cataloged by multiple metric indicators and lifecycle stages. For instance, select the “Red” Metric Breach Status.

3. You will see which metric for which model breached a monitoring threshold set in [OpenScale](#).



4. Select ‘area_under_pr’ under Metrics “Name” for the High Oaks Bank > Corporate > Human Resources category. A metric model window will open. *If you recollect, this metric represents a quality monitor for our Attrition Prediction model. This step is located in step 7 on page 7 where we assigned the model entry to this organizational space.*

The screenshot shows the 'IBM OpenPages' interface with the 'Metrics' tab selected. A search bar at the top right contains the text 'area_under...'. Below it, a table displays the metric details:

Task	Activity	Admin
Name * area_under_pr	Description * Watson OpenScale quality metric for 'area_under_pr'	Breach Status Red
Metric Type Watson OpenScale	Owner *	Metric Capturer *
		Status * Active

Watson Studio Information

OpenScale Category Quality	OpenScale Subcategory Area under pr	OpenScale Description Watson OpenScale quality metric for 'area_under_pr'
OpenScale Subscription Name	OpenScale Subscription Type pre-production	
OpenScale Metric	https://cpd-cpd-instance.apps.amwv12.workshop.tec/aiopenscale/insights/2ca869a3-1abf-4f93-b0a7-1d4c913ea8a9?instance_id=00000000-0000-0000-0000-000000000000	

5. By scrolling down this Metric window, one can quickly determine how and why this breach occurred. In this case, the “area_under_pr” for our Attrition Prediction model fell under our OpenScale quality metric which was set at 0.80.

The screenshot shows the 'IBM OpenPages' interface with the 'Metrics' tab selected. A search bar at the top right contains the text 'area_under...'. Below it, a table displays monitored items:

Name	Collection Status	Breach Status	Value	Value Date
area_under_pr_MV_0000107	Collected	Red	0.1764706	3/20/2023

Monitored Items

Associated Deployment	Associated Models
	<input type="checkbox"/> Attrition Prediction High Oaks Bank > Corporate > Human Resources

Metric Measurement Information

Data Source Watson Studio	Nature Current	Frequency Multiple times a day
Frequency Offset Days	Unit of Measure	Direction Information

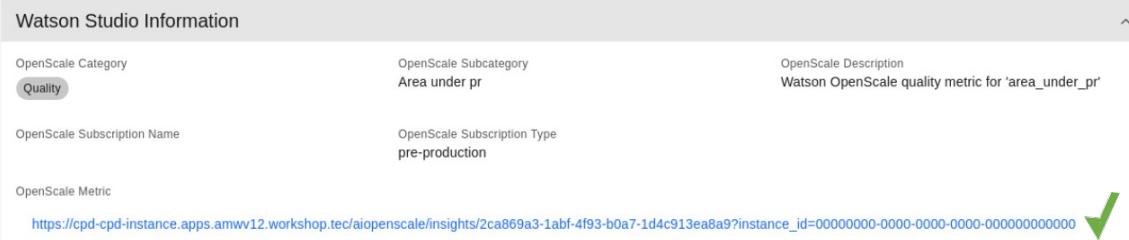
Note: What is Area Under PR?

Area under Precision Recall gives the area under the precision and recall curve, which can be useful when classes are particularly imbalanced.

Precision is a ratio of the number of true positives divided by the sum of the true positives and false positives. It describes how good a model is at predicting the positive class. Precision is referred to as the positive predictive value.

Recall is calculated as the ratio of the number of true positives divided by the sum of the true positives and the false negatives. Recall is the same as sensitivity.

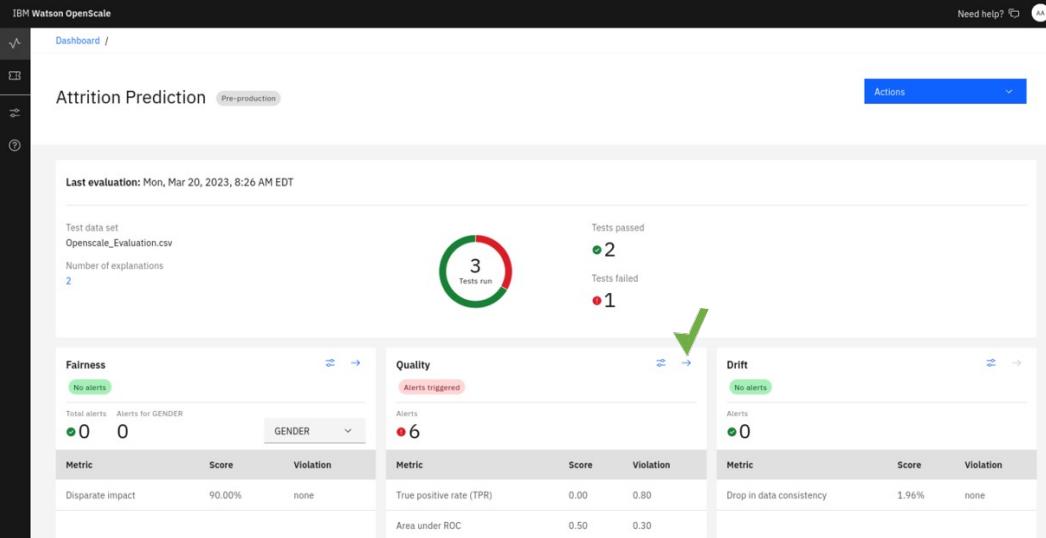
- One of the methods to identify how this metric exceeded its threshold is to review how the monitor set in OpenScale provided an alert. You can do this within OpenPages by scrolling to the “[Watson Studio Information](#)” section and selecting the OpenScale link.



Watson Studio Information

OpenScale Category Quality	OpenScale Subcategory Area under pr	OpenScale Description Watson OpenScale quality metric for 'area_under_pr'
OpenScale Subscription Name	OpenScale Subscription Type pre-production	
OpenScale Metric	https://cpd-cpd-instance.apps.amvw12.workshop.tec/aiopenscale/insights/2ca869a3-1abf-4f93-b0a7-1d4c913ea8a9?instance_id=00000000-0000-0000-0000-000000000000	

- An OpenPages instance will open, select the “[Arrow](#)” icon under the “Quality” tile.



IBM Watson OpenScale

Dashboard / Attrition Prediction (Pre-production) Actions

Last evaluation: Mon, Mar 20, 2023, 8:26 AM EDT

Test data set: Openscale_Evaluation.csv
Number of explanations: 2

Fairness: No alerts
Total alerts: 0 Alerts for GENDER: 0

Quality: Alerts triggered: 6
Tests passed: 2 Tests failed: 1

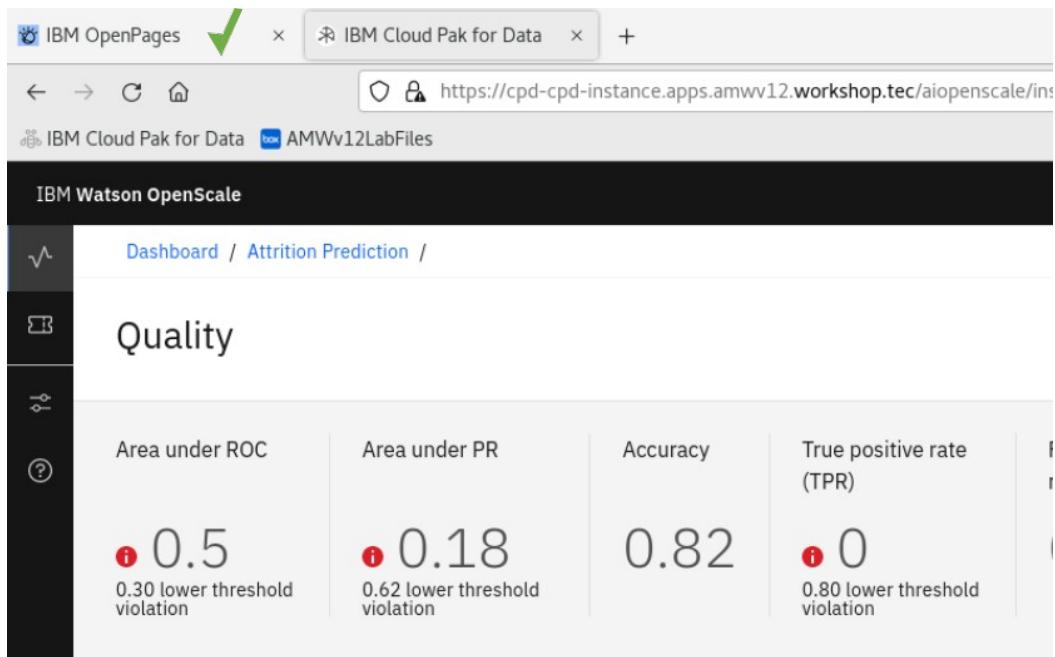
Drift: No alerts
Alerts: 0

Metric	Score	Violation
Disparate impact	90.00%	none
True positive rate (TPR)	0.00	0.80
Area under ROC	0.50	0.30
Drop in data consistency	1.96%	none

8. A Confusion Matrix will be generated, we can see that our Attrition Prediction model incorrectly predicted Terminated employees as still Active. This is why the “Area under PR” score violated the set threshold and reported that breach in OpenPages.

Quality									Mon, Mar 20, 2023, 8:26 AM EDT
Area under ROC	Area under PR	Accuracy	True positive rate (TPR)	False positive rate (FPR)	Recall	Precision	F1-Measure	Logarithmic loss	
0.5 0.30 lower threshold violation	0.18 0.62 lower threshold violation	0.82	0 0.80 lower threshold violation	0	0 0.80 lower threshold violation	0 0.80 lower threshold violation	0 0.80 lower threshold violation	0.52	
							Prediction		
Actual			Active		Terminated		Total		
	Active		42		0		42		
	Terminated		9		0		9		
Total		51		0		51			

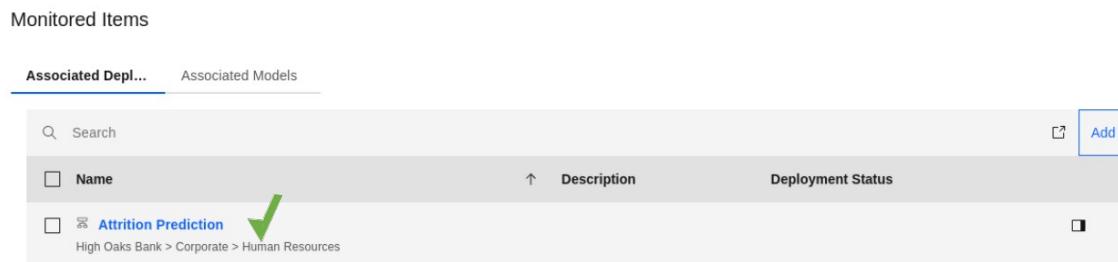
9. Return to OpenPages to perform the next task. You can do this by switching to the OpenPages browser window.



The screenshot shows the IBM OpenPages interface. The title bar has tabs for "IBM OpenPages" and "IBM Cloud Pak for Data". The address bar shows the URL "https://cpd-cpd-instance.apps.amwv12.workshop.tec/aiopenscale/ins". Below the address bar, there's a navigation bar with icons for back, forward, search, and home. The main content area is titled "IBM Watson OpenScale". On the left, there's a sidebar with icons for dashboard, report, filter, and help. The main content area shows a "Dashboard / Attrition Prediction / Quality" section. It displays four metrics in a grid:

Area under ROC	Area under PR	Accuracy	True positive rate (TPR)
0.5 0.30 lower threshold violation	0.18 0.62 lower threshold violation	0.82	0 0.80 lower threshold violation

10. Let us assign a ticket for a resolution of the above metric breach. We will do so by, first retrieving the model entry. From the “area_under_pr” window, scroll down to “Monitored Items”. Select the “Attrition Prediction” deployment.



The screenshot shows the "Monitored Items" section. At the top, there are tabs for "Associated Deployments" and "Associated Models", with "Associated Deployments" being the active tab. Below the tabs is a search bar and an "Add" button. The main table lists monitored items with columns for "Name", "Description", and "Deployment Status". One item, "Attrition Prediction", is highlighted with a green checkmark. The full table row for "Attrition Prediction" is as follows:

Name	Description	Deployment Status
Attrition Prediction	High Oaks Bank > Corporate > Human Resources	

11. Scroll down in the Attrition Prediction window on OpenPages to the “Issues and Documents” category. Select “New”.

The screenshot shows the IBM OpenPages interface. At the top, there's a navigation bar with icons for Home, Metrics, area_under_..., and Attrition Pr... (Attrition Prediction). Below the navigation bar is the Attrition Prediction dashboard. It features a table with three rows of data:

Task	Description	Value	Status	Date	Action
log_loss	Watson OpenScale quality metric for 'log_loss'	0.5162713	Green	3/20/2023	<input type="checkbox"/>
precision	Watson OpenScale quality metric for 'precision'	0.00	Red	3/20/2023	<input type="checkbox"/>
recall	Watson OpenScale quality metric for 'recall'	0.00	Red	3/20/2023	<input type="checkbox"/>

Below the table, it says "Items per page: 10" and "1–10 of 11 items". To the right, there are navigation arrows and a page number indicator "1 of 2 pages".

Further down the page, under the heading "Issues and Documents", there are two tabs: "Issues" (which is selected) and "Files". A green arrow points to the "New" button in the "Issues" tab. Below the tabs, there's a search bar and a table with columns: Name, Description, Issue Owner, and Issue Status. The table displays "No results".

At the bottom left, there's an "Administration" section with a help icon. On the right side of the dashboard, there's a vertical scroll bar.

12. A “New Issue” sidebar will open. Set the following fields as follow:

- Priority: High
- Issue Type: Test Failure
- Issue Owner: Missy Danforth
- Due date: ***Please select any entry available***

Select “Save”.

The screenshot shows the "New Issue" form. At the top, it says "Issue New Issue". There are several input fields:

- "* Issue Owner": A dropdown menu showing "Missy Danforth ModelDeveloper@ibm.com". A green arrow points to this field.
- "Identified By Individual": A dropdown menu showing "Search users".
- "Identified By Group": A dropdown menu showing "Search users".
- "* Due Date": A date picker showing "3/17/2023". A green arrow points to this field.
- "What is this Issue related to?": A section with a "Cancel" button and a "Save" button. A green arrow points to the "Save" button.

A tooltip box titled "Important information" is visible, stating: "Issues can be related to several other GRC components. Select the primary component concerned."

13. You have now created a ticket for an issue for an assigned model developer to resolve.

The screenshot shows a table with columns: Name, Description, Issue Owner, and Issue Status. A single row is selected, showing 'Attrition Prediction_ISS_0000023' under 'Name', 'High Oaks Bank > Corporate > Human Resources' under 'Description', 'Missy Danforth' under 'Issue Owner', and 'Open' under 'Issue Status'. A green checkmark icon is overlaid on the 'Open' status button.

Name	Description	Issue Owner	Issue Status
Attrition Prediction_ISS_0000023	High Oaks Bank > Corporate > Human Resources	Missy Danforth	Open

14. One of the primary features of OpenPages is the capability to build AI workflows. Through an embedded GRC workflow editor within OpenPages, one can design process automation. We will not be building a workflow; we will just review a prebuilt one to understand some basic concepts of the tool. The idea one should takeaway is that scalable model production can be achieved through a customized workflow. This feature enables the oversight of an entire AI factory.

The screenshot shows a navigation menu with several items: Solution Configuration, Dashboards, Views, Workflows, Calculations, and Scheduler. The 'Workflows' item is highlighted with a green checkmark icon.

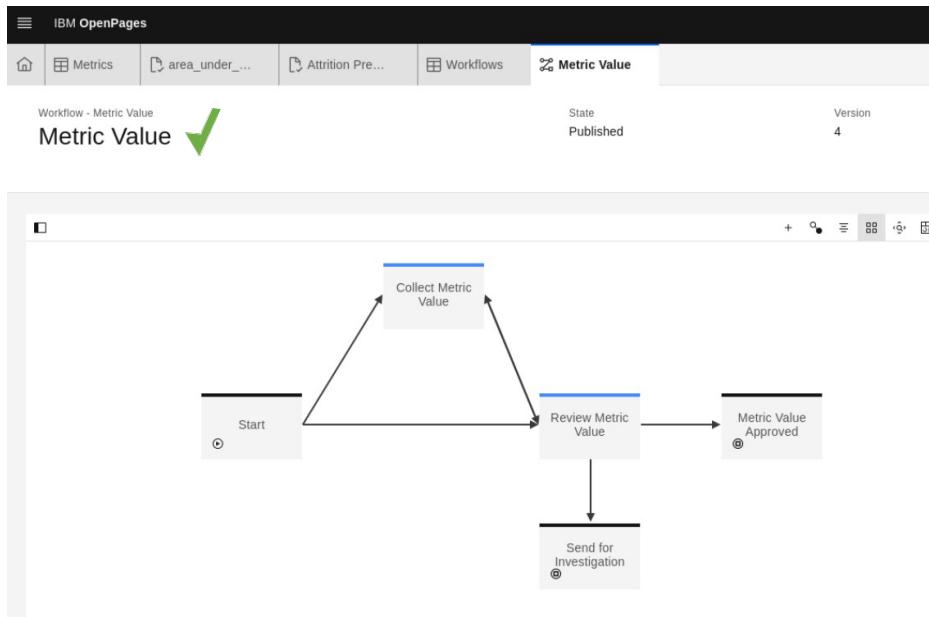
15. In the “Workflows” window, select “Metric Value” Label.

Workflows (20) Workflow Instances

The screenshot shows a list of workflows. The 'Label' column contains checkboxes, and the 'Name' column lists the workflow names. The 'Metric Value' entry has its checkbox checked and is highlighted with a green checkmark icon.

Label	Name
<input type="checkbox"/>	Action Item Approval Workflow
<input type="checkbox"/>	FCM Certification - Business Level
<input type="checkbox"/>	Challenge
<input type="checkbox"/>	Issue Review Workflow
<input checked="" type="checkbox"/>	Metric Value

16. The “Metric Value” workflow was designed to send a Model for investigation when a “Metric Value” is breached.



17. Review “Workflow Properties” sidebar on the right. Scroll down to “Oversight”. An oversight person can be designated specifically for workflow processes. In this case, the model owner, will be overseeing any Metric Value violation. This person will be notified of any progress or breach in this workflow. The “Applicability” section enables users to configure under what conditions the workflow should start.

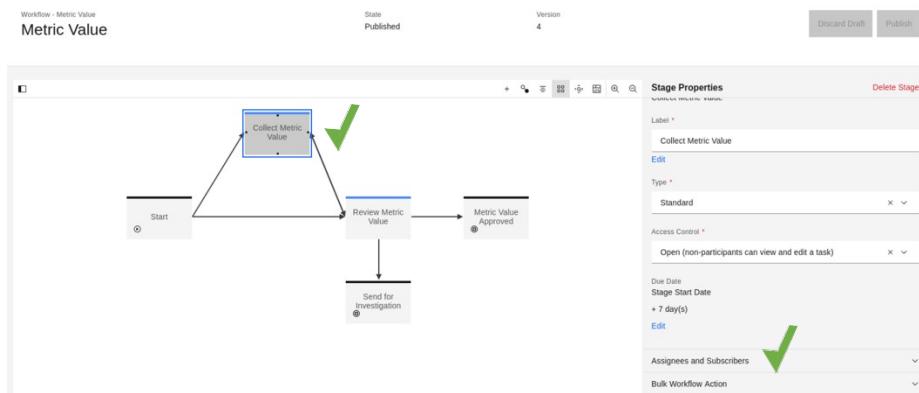
User	Object
Owner (MRG-Metric:Owner)	Primary Parent Only Metric

Overall Due Date
[Edit](#)

New Condition +

ID	Field	Operator	Value
No results			

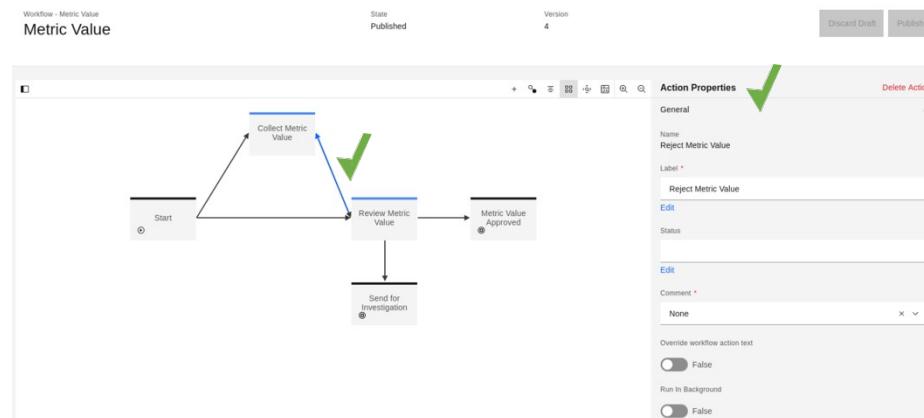
18. Click on the “Collect Metric Value” stage and expand the “Assignees and Subscribers” section. Notice how each stage of the workflow can have different assignees and subscribers.



19. This feature shows how specific overseers can be embedded in different portions of a workflow. In this instance, the Metric Capturer is assigned to Collect Metrics and manage the process around Metric Capture. This role is overseen by a Metric Owner who subscribes to the process and can be notified via reminders.

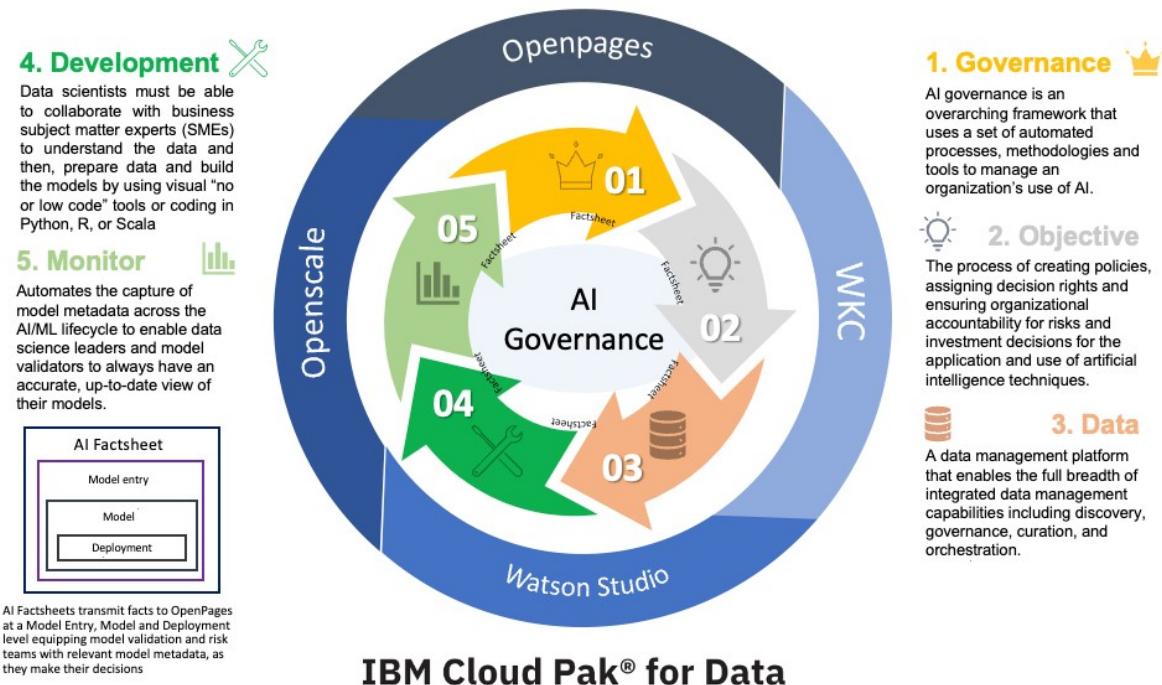
The screenshot shows the 'Assignees and Subscribers' configuration interface. It is divided into three main sections: 'Assignees', 'Subscribers', and 'Enable Reminders'. The 'Assignees' section shows 'Metric Capturer (MRG-Metric-Shared:Metric Capturer)' assigned to the 'Metric Value' object. The 'Subscribers' section shows 'Metric Owner (MRG-MetricVal:Metric Owner)' subscribed to the 'Metric Value' object. The 'Enable Reminders' section has a toggle switch set to 'False', with a green checkmark indicating the status.

20. Click on one of the arrows. Arrows represent actions, which is how you move from one stage to another. Notice how different conditions, validations, and operations can be configured as you move from one stage to another. This enables you to automate tasks (such as updating field values) as an object moves through a workflow. Custom actions can also be configured using a custom java class.



21. You have completed a basic exploration of some OpenPages capabilities.

Congratulations! You have built an AI governance solution to drive responsible, transparent, and explainable AI workflows. Through this journey, you have provided an AI solution to a business challenge, created monitors to ensure fair and unbiased considerations, and created a governance framework for your AI solution.



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