

Deakin University

SIG788- OnTrack Submission

Task 3. P

Submitted by

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Attempt # 1
27/3/2023

Target Grade: P

Task Details –

Grade: P

Q1: For this task you need to design and deploy a machine learning model using Azure ML studio (designer). You need to use Microsoft Azure Machine Learning Studio to design and deploy your model. To complete this task, you need to select a dataset and design a decision tree model (classification tree or regression tree) and then deploy the built model and get the API key. To do this task you need to follow the workshop recording and slides and deploy your own model on Azure. You need to provide the screenshots of your designed model, training model, the performance of the built model (e.g., Accuracy, confusion matrix and etc) and deployed model with the API key and test the model. The screenshot of the model should include your Azure account name since the API key is unique to you.

Step 1: Create Resources

The screenshot shows the Microsoft Azure portal interface. The top navigation bar includes the URL <https://portal.azure.com/#@deakin365.onmicrosoft.com/resource/subscriptions/c094e16e-df8d-4a15-bbc5-0dd2487e788c/>, a search bar, and user information. The main content area displays the 'Task3NS' resource group under 'All resources'. The left sidebar shows navigation options like Home, All resources, Task3NS (selected), Overview, Activity log, Access control (IAM), Tags, Resource visualizer, Events, and Settings. The 'Overview' tab is active, showing the following details:

Subscription (move)	Deployments
Free Trial	2 Succeeded
Subscription ID	Location
c094e16e-df8d-4a15-bbc5-0dd2487e788c	Central India
Tags (edit)	
Click here to add tags	

Below the overview, there are tabs for 'Resources' and 'Recommendations (3)'. The bottom right corner of the page has a 'JSON View' link.

Step 2: Create a new workspace

The screenshot shows the Microsoft Azure portal interface for the 'ML01' workspace. The left sidebar contains navigation links for Overview, Activity log, Access control (IAM), Tags, Diagnose and solve problems, Events, Settings (Networking, Properties, Locks), Monitoring (Alerts, Metrics, Diagnostic settings, Logs), and Data assets. The main content area displays the workspace's 'Essentials' configuration, including Resource group (Task3NS), Location (Central India), Subscription (Free Trial), Subscription ID (c094e16e-df8d-4a15-bbc5-0dd2487e788c), Storage (ml017463828281), Studio web URL (<https://ml.azure.com/?tid=d02378ec-1688-46d5-8540-1c28b5f470f6>), Container Registry (ml015376222244), Key Vault (ml016249384738), Application Insights (ml016249384738), and MLflow tracking URI (azureml://centralindia.api.azureml.ms/mlflow/v1.0/subscriptions/c09...). A large 'Data' icon is centered below the configuration. Below the configuration, a section titled 'Work with your models in Azure Machine Learning Studio' provides instructions to start exploring or learn more about the studio.

Step 3: Upload the Dataset

The screenshot shows the Microsoft Azure Machine Learning Studio interface, specifically the 'Data' assets page. The left sidebar includes links for Deakin University, New, Home, Authoring, Notebooks, Automated ML, Designer, Assets, Data (Jobs, Components, Pipelines, Environments, Models, Endpoints, Manage), Compute, and Linked Services. The main content area shows a list of data assets under the 'Data assets' tab. The list includes two entries: 'Insurance_Binary' and 'Insurance'. Both assets were created on Mar 27, 2023, at 7:46 AM, and modified on Mar 27, 2023, at 7:46 AM. The data source for both is 'workspaceblobstore'. The table has columns for Name, Version, Data source, Created on, and Modified on.

Name	Version	Data source	Created on	Modified on
Insurance_Binary	1	workspaceblobstore	Mar 27, 2023 7:46 AM	Mar 27, 2023 7:46 AM
Insurance	1	workspaceblobstore	Mar 26, 2023 2:51 PM	Mar 26, 2023 2:51 PM

Step 4: Explore the dataset, EDA of Dataset

Microsoft Azure Machine Learning Studio

Deakin University > ML01 > Data > Insurance_Binary

Insurance_Binary Version: 1 (latest)

Details Consume **Explore** Models Jobs

Refresh Generate profile

Preview Profile

Number of columns: 10 Number of rows: 50 (of 2861)

Column1	Age	Type	Claimed	Commision	Channel	Duration	Sales	Product ...	Destination
0	48	0	0	0.7	1	7	2.51	2	0
1	36	1	0	0	1	34	20	2	0
2	39	1	0	5.94	1	3	9.9	2	1
3	36	1	0	0	1	4	26	1	0
4	33	0	0	6.3	1	53	18	0	0
5	45	0	1	15.75	1	8	45	0	0
6	61	1	0	35.64	1	30	59.4	2	1
7	36	1	0	0	1	16	80	1	0
8	36	1	0	0	1	19	14	1	0

Microsoft Azure Machine Learning Studio

Deakin University > ML01 > Data > Insurance_Binary

Insurance_Binary Version: 1 (latest)

Details Consume **Explore** Models Jobs

Refresh Generate profile

Preview Profile

Number of columns: 10 Number of rows: 2861

Column ▾ Profile

Age

Type

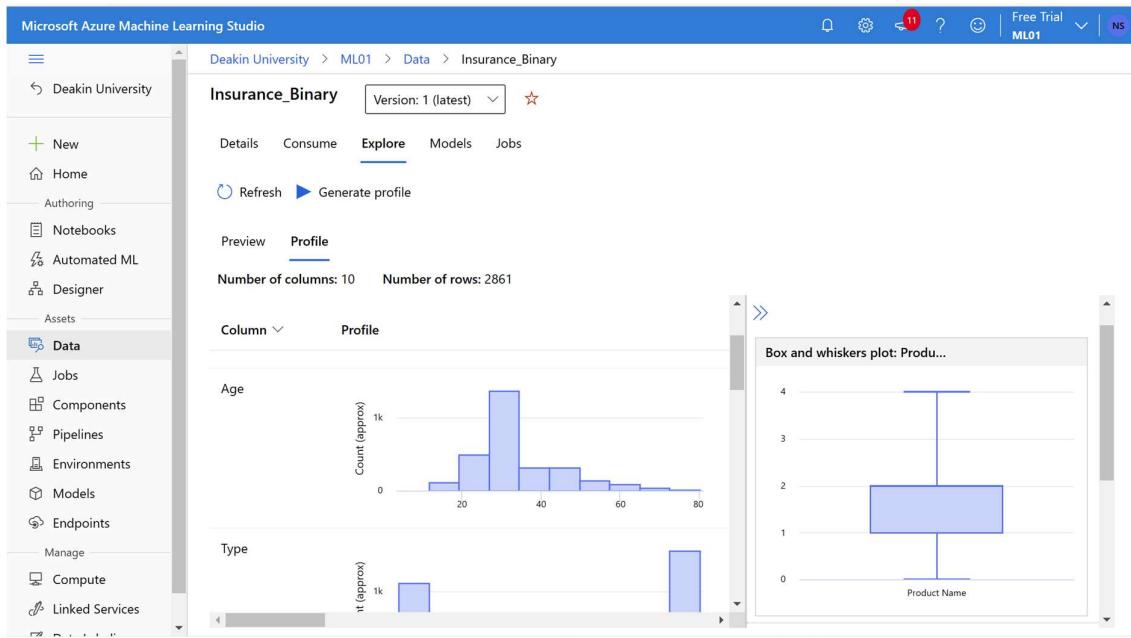
Column statistics: Product Na...

Quantiles (5)

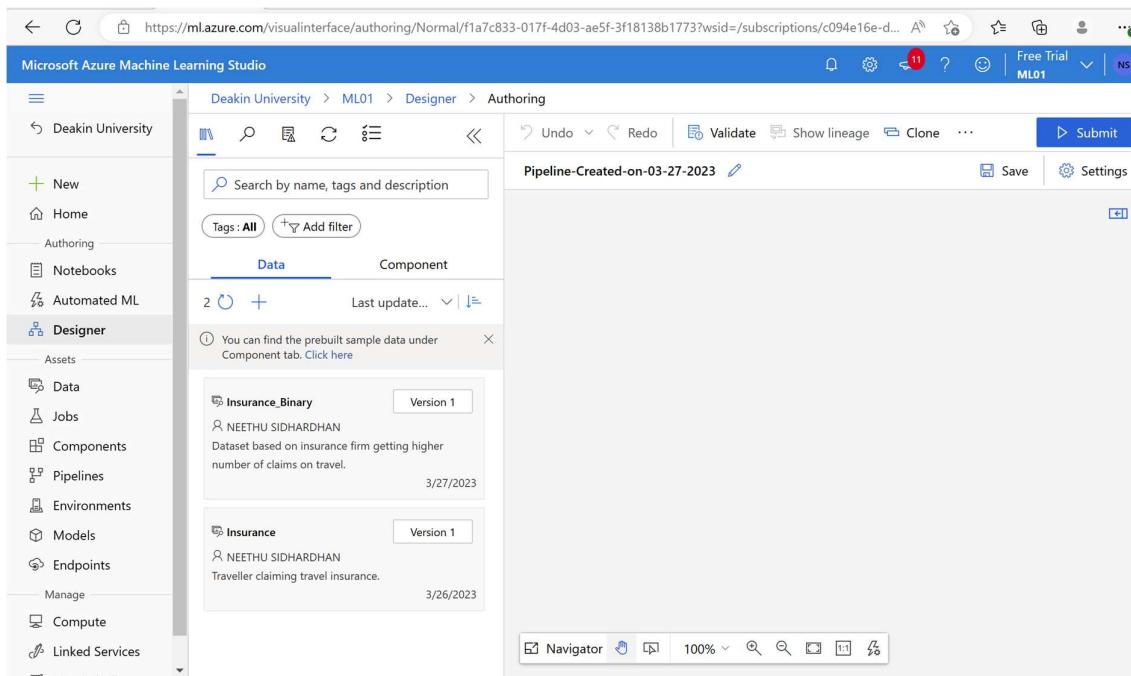
- Min: 0
- Q1 (approx): 1.00
- Median (approx): 2.00
- Q3 (approx): 2.00
- Max: 4

Moments (2)

- Mean: 1.67



Step 5: Create Pipeline



Step 6: Create a new pipeline

The screenshot shows the Microsoft Azure Machine Learning Studio interface. The left sidebar is titled 'Deakin University' and includes sections for New, Home, Authoring, Notebooks, Automated ML, Designer (which is selected), Assets, Data, Jobs, Components, Pipelines, Environments, Models, Endpoints, Manage, Compute, and Linked Services. The main workspace is titled 'Insu001' and has tabs for Data and Component. Under the Data tab, there is a search bar and a 'Tags: All' filter. Below the search bar is a list of categories: Sample data (16), Data Transformation (19), Computer Vision (6), Model Scoring & Evaluation (6), Machine Learning Algorithms (19), Text Analytics (7), Python Language (2), Data Input and Output (3), Recommendation (5), R Language (1), Feature Selection (2), and Anomaly Detection (2). At the bottom of the workspace are buttons for Navigator, Save, and Settings.

Step 7: Select the Data under Dataset

The screenshot shows the Microsoft Azure Machine Learning Studio interface, similar to the previous one but with different content in the Data tab. The left sidebar is the same. The main workspace is titled 'Insu001'. The Data tab is selected, showing a list of datasets. There is a plus sign icon to add more datasets. A message box says: 'You can find the prebuilt sample data under Component tab. Click here'. Below this, three datasets are listed: 'Insurance_demo' by NEETHU SIDHARDHAN (Version 1, 3/27/2023), 'Insurance_Binary' by NEETHU SIDHARDHAN (Dataset based on insurance firm getting higher number of claims on travel, Version 1, 3/27/2023), and 'Insurance' by NEETHU SIDHARDHAN (Traveller claiming travel insurance, Version 1). At the bottom of the workspace are buttons for Navigator, Save, and Settings.

Step 8: Use the dataset under designer

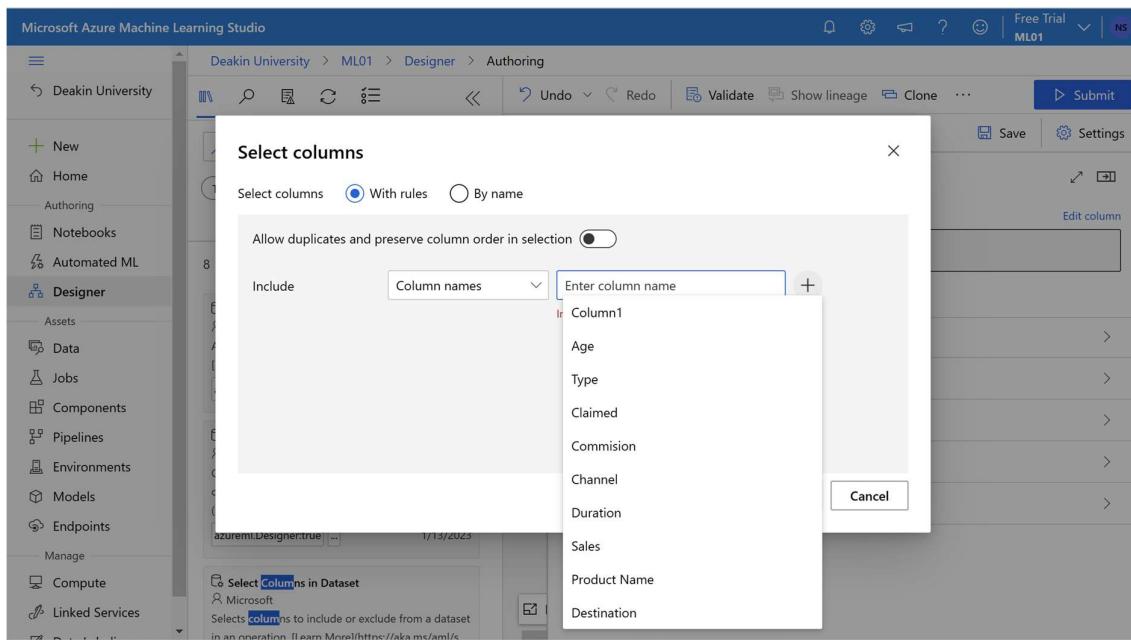
The screenshot shows the Microsoft Azure Machine Learning Studio Designer interface. The left sidebar is titled 'Deakin University' and includes sections for New, Home, Authoring, Notebooks, Automated ML, Designer (selected), Assets, Data, Jobs, Components, Pipelines, Environments, Models, Endpoints, Manage, Compute, and Linked Services. The main workspace is titled 'Insu001' and shows a 'Data' tab selected. It displays three datasets: 'Insurance_demo' (Version 1 by NEETHU SIDHARDHAN, 3/27/2023), 'Insurance_Binary' (Version 1 by NEETHU SIDHARDHAN, Dataset based on insurance firm getting higher number of claims on travel, 3/27/2023), and 'Insurance' (Version 1 by NEETHU SIDHARDHAN, Traveller claiming travel insurance). A tooltip suggests finding prebuilt sample data under the Component tab. The top navigation bar includes 'Free Trial', 'ML01', 'Save', and 'Settings'.

Step 9: Select the Components

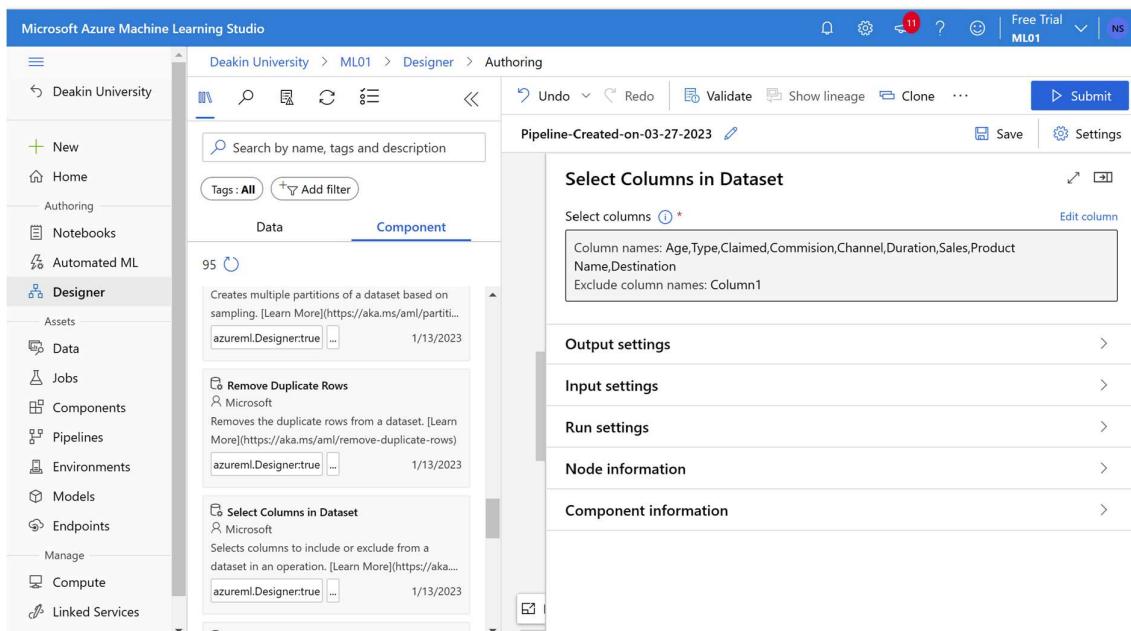
I. Select Columns in Dataset

The screenshot shows the Microsoft Azure Machine Learning Studio Designer interface. The left sidebar is identical to the previous screenshot. The main workspace is titled 'Insu001' and shows a 'Component' tab selected. It displays three components: 'Add Columns' (Microsoft, Adds a set of columns from one dataset to another, [Learn More](https://aka.ms/aml/add-column)), 'Select Columns Transform' (Microsoft, Create a transformation that selects the same subset of columns as in the given dataset, [Learn More](https://aka.ms/aml/select-column-transform)), and 'Select Columns in Dataset' (Microsoft, Selects columns to include or exclude from a dataset in an operation, [Learn More](https://aka.ms/aml/select-column-in-dataset)). The 'Select Columns in Dataset' component has a red warning icon. The top navigation bar includes 'Free Trial', 'ML01', 'Save', and 'Settings'.

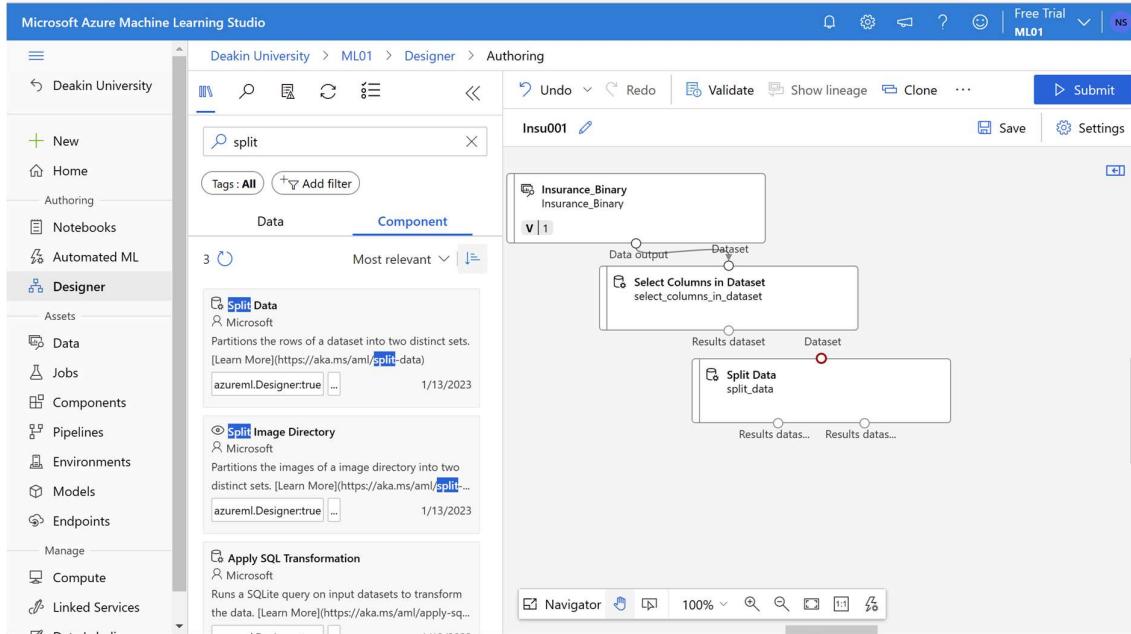
II. Select the columns in the dataset



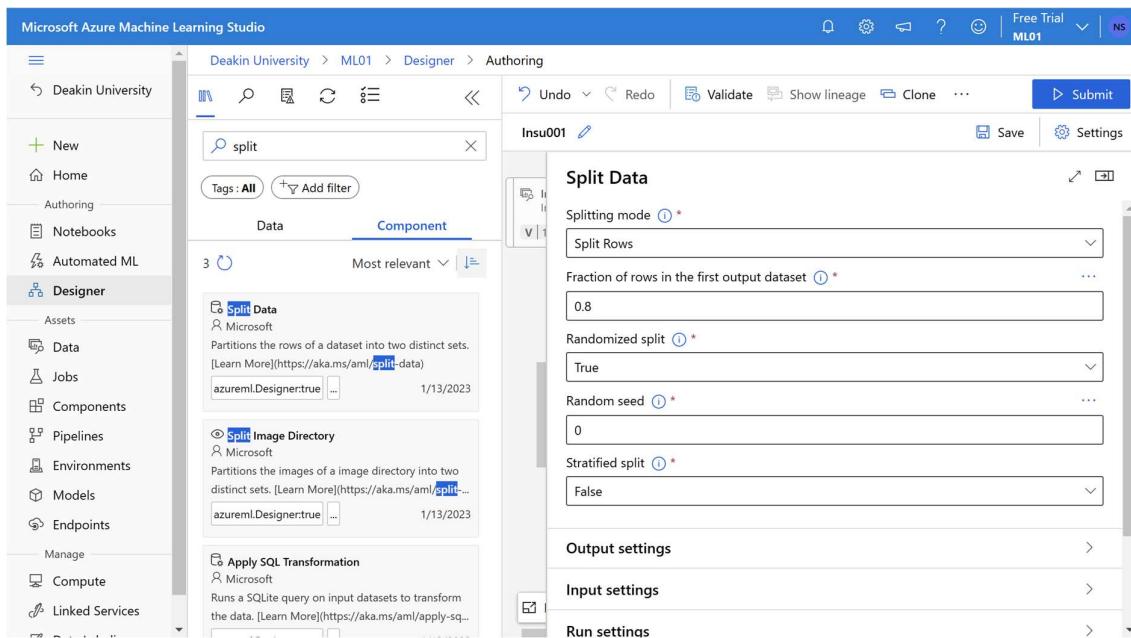
III. Columns selected



IV. Split the dataset into train and test



V. Select the parameter



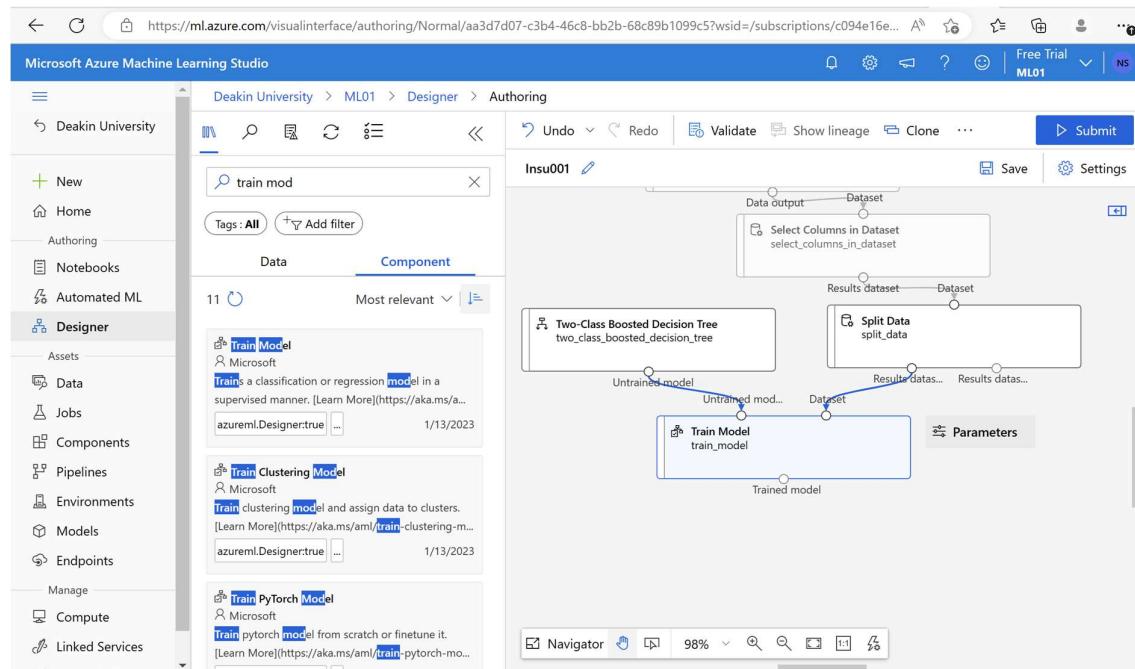
VI. Select the component : Two – Class Boosted Decision Tree

The screenshot shows the Microsoft Azure Machine Learning Studio interface. The left sidebar is titled 'Deakin University' and includes sections for New, Home, Authoring, Notebooks, Automated ML, Designer, Assets, Data, Jobs, Components, Pipelines, Environments, Models, Endpoints, Manage, Compute, and Linked Services. The 'Designer' section is currently selected. The top navigation bar shows 'Deakin University > ML01 > Designer > Authoring'. A search bar at the top has 'tree' typed into it. Below the search bar, there are tabs for 'Data' and 'Component'. The 'Component' tab is selected, and the search results show three items: 'Boosted Decision Tree Regression' (Most recent), 'MultiClass Boosted Decision Tree' (Most recent), and 'Two-Class Boosted Decision Tree' (Most recent). The 'Two-Class Boosted Decision Tree' component is highlighted. The main workspace shows a flowchart titled 'Insu001' with nodes: 'Select Columns in Dataset', 'Two-Class Boosted Decision Tree', and 'Parameters'. The 'Two-Class Boosted Decision Tree' node is connected to 'Select Columns in Dataset' and 'Parameters'.

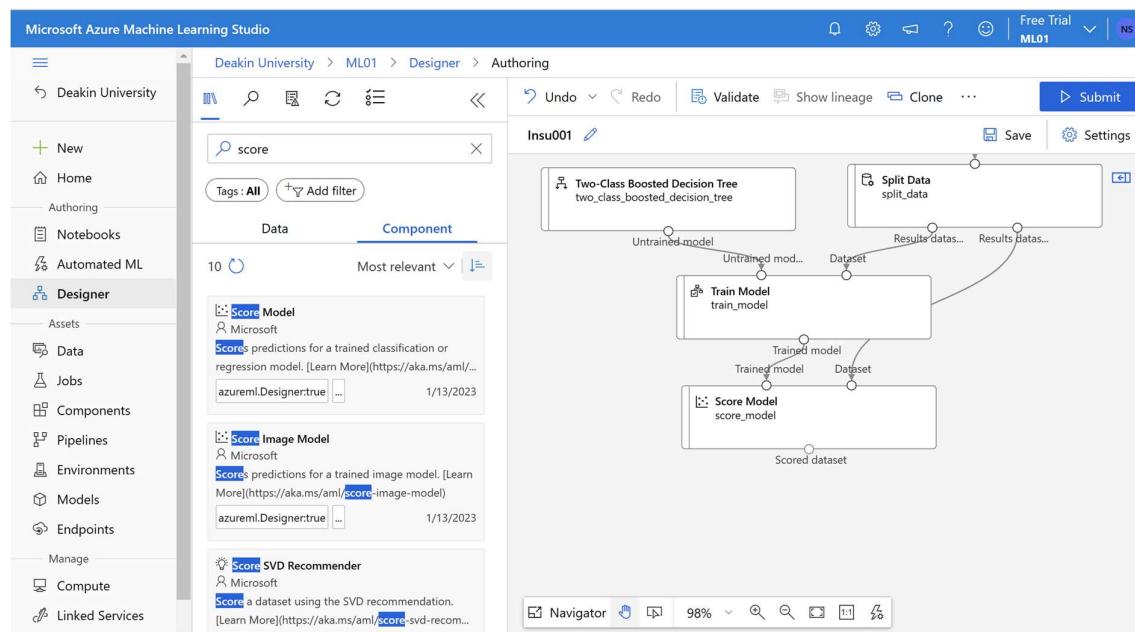
VII. Select Train Model and Connect the dataset with target parameter

The screenshot shows the Microsoft Azure Machine Learning Studio interface. The left sidebar is identical to the previous screenshot. The top navigation bar shows 'Deakin University > ML01 > Designer > Authoring'. A search bar at the top has 'train mod' typed into it. Below the search bar, there are tabs for 'Data' and 'Component'. The 'Component' tab is selected, and the search results show three items: 'Train Model' (Most recent), 'Train Clustering Model' (Most recent), and 'Train PyTorch Model' (Most recent). The 'Train Model' component is highlighted. The main workspace shows a configuration panel for 'Train Model' with sections: 'Label column' (set to 'claim'), 'Model explanations' (set to 'False'), 'Output settings', 'Input settings', 'Run settings', 'Node information', and 'Component information'.

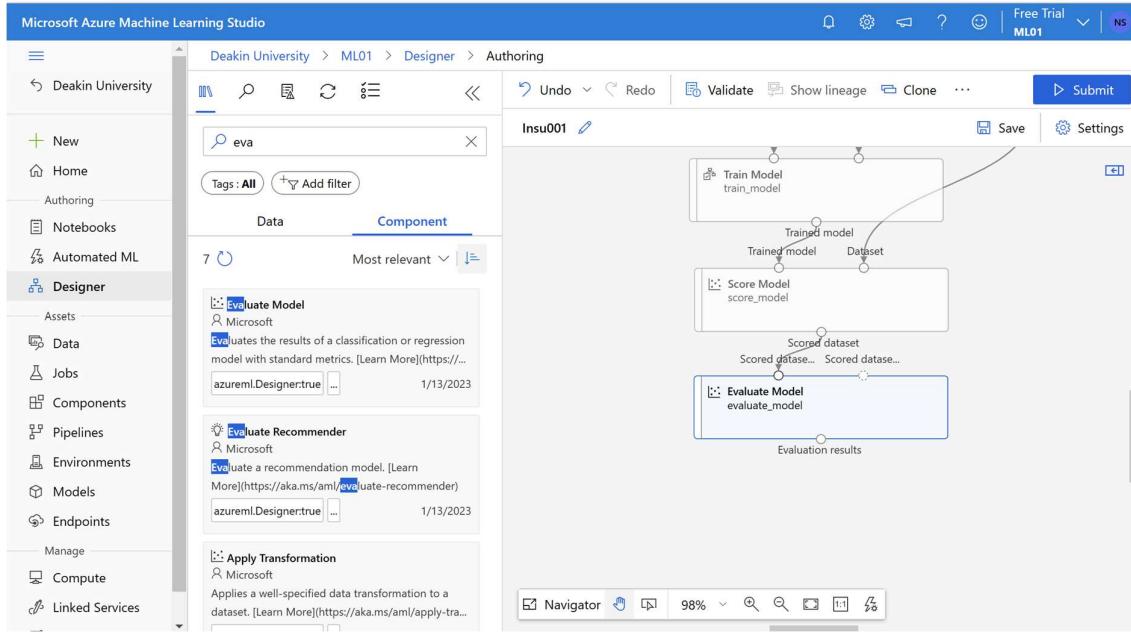
VIII. Connect the Train Model



IX. Select the component Score Model: Connect the train model and test model

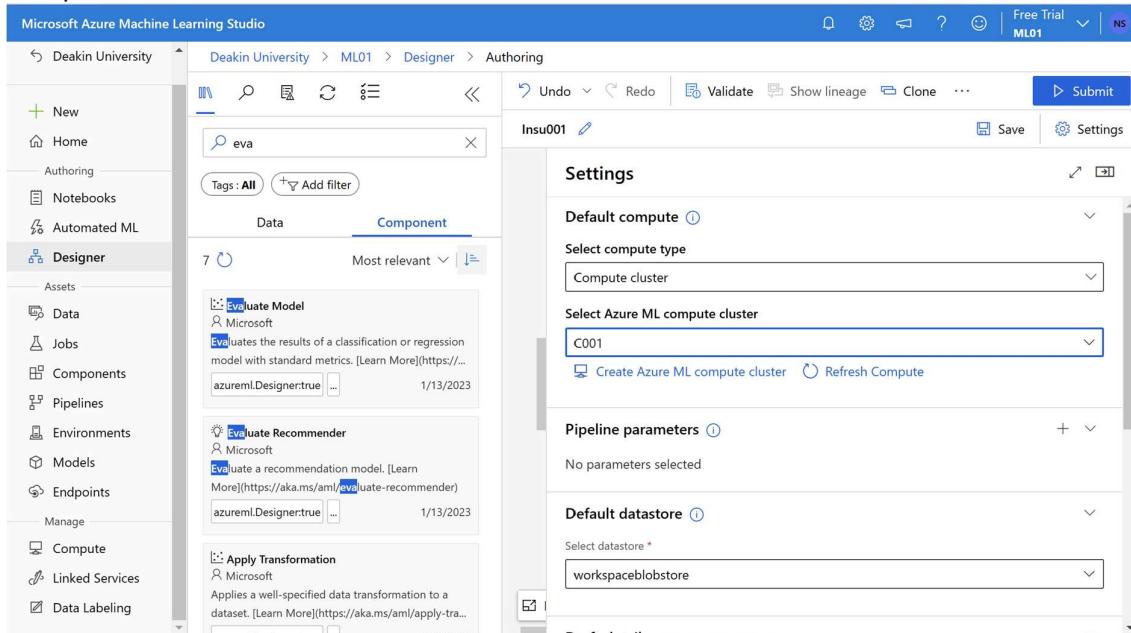


X. Select the component : Evaluate the model

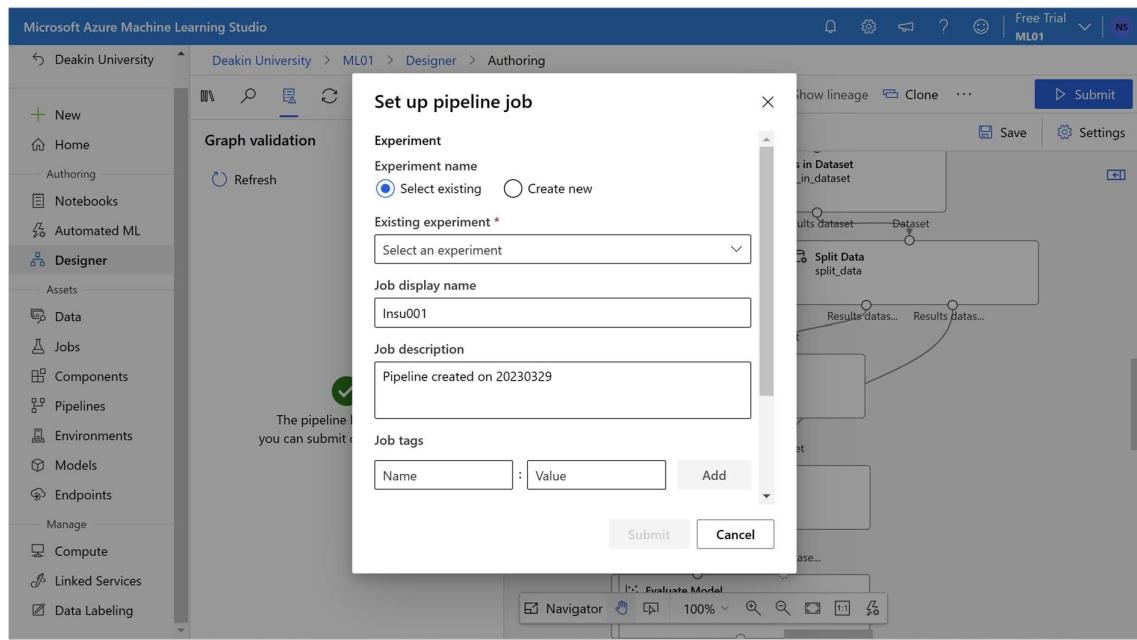


Save the Pipeline

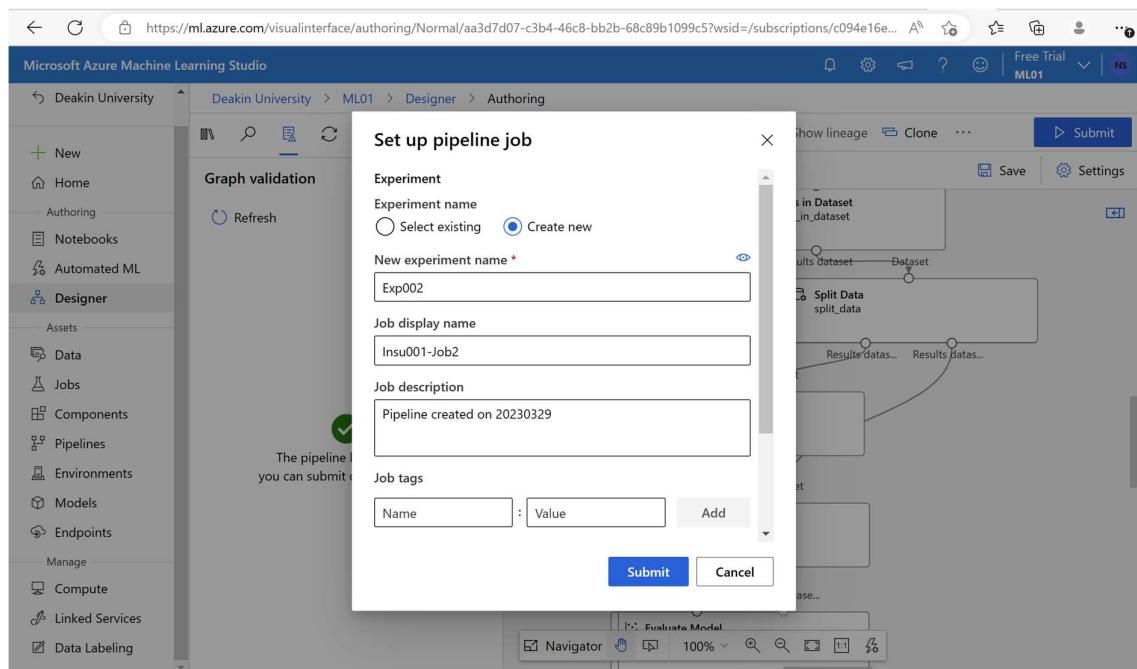
Before submit the pipeline -> Steetings> Select the Compute Type and Select the Azure ML Compute Cluster



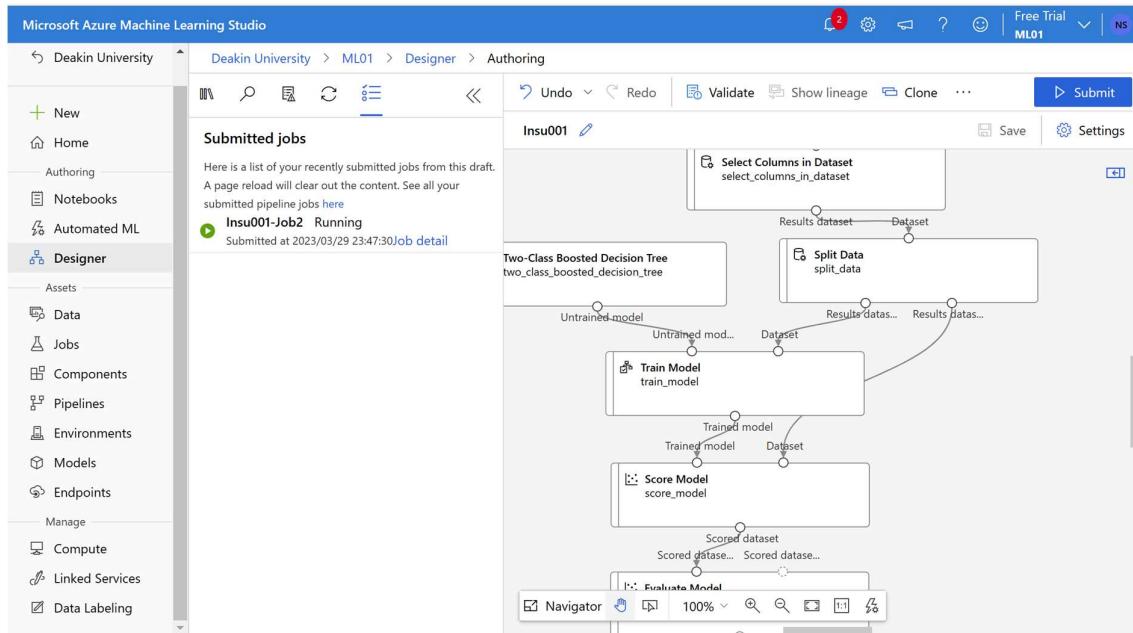
XI. Submit the pipeline and Set up pipeline Job



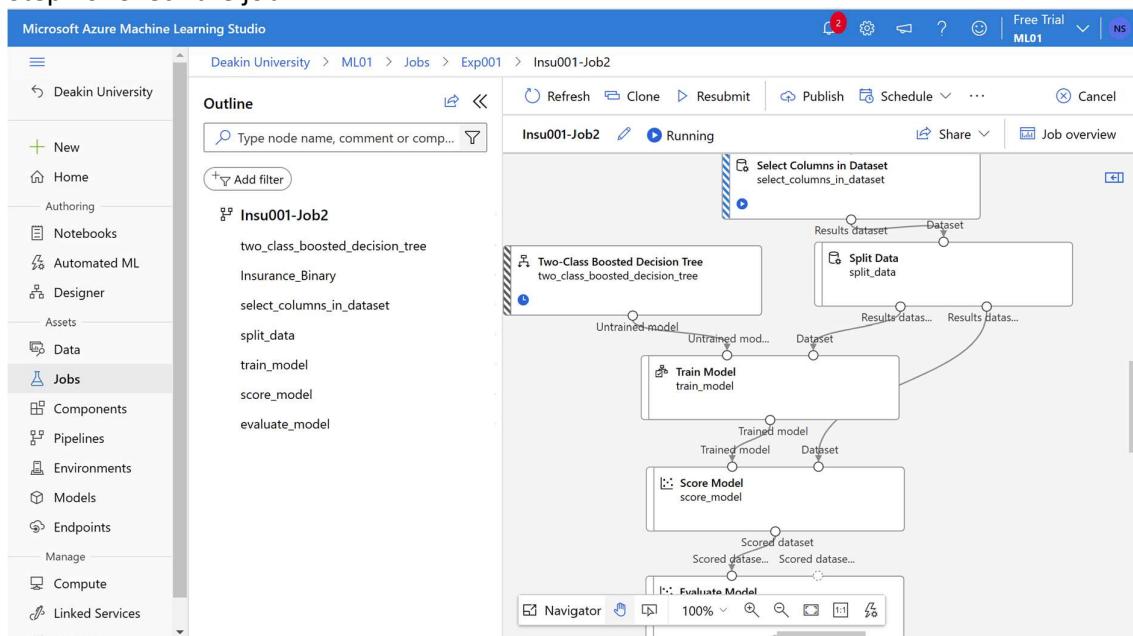
XII. Create new Pipeline Job



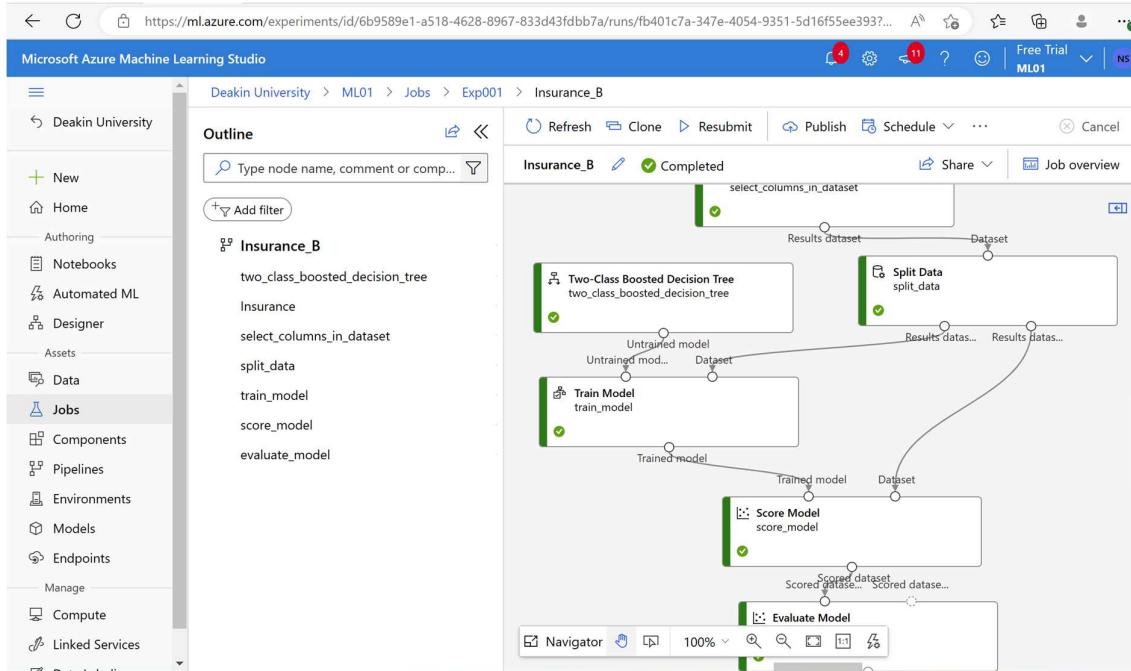
XIII. Submit the Job



Step 10: Check the job



Step 11: Post completion of Job



Step 12: Create Compute

The screenshot shows the Microsoft Azure Machine Learning Studio interface. The left sidebar navigation bar includes options like Deakin University, New, Home, Authoring, Notebooks, Automated ML, Designer, Assets, Data, Jobs, Components, Pipelines, Environments, Models, Endpoints, Manage, Compute (selected), and Linked Services. The main workspace displays the 'Compute' section under 'ML01 > Compute'. The section title is 'Compute' with sub-options: 'Compute instances' (selected), 'Compute clusters', 'Kubernetes clusters', and 'Attached computes'. Below the title is a large blue hexagonal icon with a circuit board pattern inside, representing cloud computing. To the right of the icon, text reads: 'Get started with Azure Machine Learning notebooks and R scripts by creating a compute instance'. Below this text is a 'New' button. At the bottom of the page, there are links: 'View Azure Machine Learning tutorials' and 'View available quota'.

1. Select tab Compute Cluster> New

Create compute cluster [?](#)

Virtual Machine

Advanced Settings

Select virtual machine
Select the virtual machine size you would like to use for your compute cluster.

Location *

Virtual machine tier [?](#)
 Dedicated Low priority

Virtual machine type [?](#)
 CPU GPU

Virtual machine size [?](#)
 Select from recommended options Select from all options

Name ↑	Category	Workload types	Av... ?	Cost ?
<input type="radio"/> Standard_DS11_v2	Memory optimized	Development on Notebooks (or other IDE) and	6 cores	\$0.19/hr

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

Microsoft Azure Machine Learning Studio

Create compute cluster [?](#)

Virtual Machine

Advanced Settings

Configure Settings
Configure compute cluster settings for your selected virtual machine size.

Name	Category	Cores	Available quota	RAM	Storage	Cost/Node
Standard_DS3_v2	General purpose	4	6 cores	14 GB	28 GB	\$0.34/hr

Compute name * [?](#)

Minimum number of nodes * [?](#)

Maximum number of nodes * [?](#)

Idle seconds before scale down * [?](#)

Enable SSH access [?](#)

[Back](#) [Create](#) [Download a template for automation.](#) [Cancel](#)

Compute Successfully Created

The screenshot shows the Microsoft Azure Machine Learning Studio interface. The left sidebar navigation bar includes options like New, Home, Authoring, Notebooks, Automated ML, Designer, Assets, Data, Jobs, Components, Pipelines, Environments, Models, Endpoints, Manage, Compute, and Linked Services. The main content area is titled "Compute" and shows a table of existing compute instances. One instance, named "C001", is listed with a green checkmark indicating it has succeeded (0 nodes), is of size STANDARD_DS3_V2, located in centralindia, and was created on Mar 27, 2023, at 9:11 AM.

Step 13: Double click the Train Model – Output + logs

Download 3 files {}_sample.json ; conda_env.yaml ; PY score.py

The screenshot shows the Microsoft Azure Machine Learning Studio interface, specifically the "Jobs" section. A job named "Insurance_B" is displayed as "Completed". The pipeline diagram shows a sequence of components: "Select Columns in Dataset" (with a note "Two-Class Boosted Decision Tree"), "Two-Class Boosted Decision Tree" (with a note "train_model"), "Train Model" (with a note "score_model"), and finally "Score Model". The "Outputs + logs" tab is selected, showing the "Data outputs" section which lists files such as "snapshot_capability", "trained_model_outputs" (including ".meta.yaml", "{}_samples.json", "{}_schema.json", and "conda_env.yaml"), and "data.learner".

Step 14: Register the model

The screenshot shows the Microsoft Azure Machine Learning Studio interface. The left sidebar navigation bar includes options like New, Home, Authoring, Notebooks, Automated ML, Designer, Assets, Data, Jobs, Components, Pipelines, Environments, Models (which is selected and highlighted in blue), Endpoints, Manage, Compute, and Linked Services. The main content area is titled "Model List" and shows a table of two registered models. The columns are Name, Version, Type, Source, and Experiment. The first model is "Insu001" (Version 2, CUSTOM type, This workspace source, Exp001 experiment). The second model is "Insu001" (Version 1, CUSTOM type, This workspace source, Exp001 experiment). There are buttons for Register, Refresh, Delete, Archive, Deploy, Compare (preview), Edit columns, Reset view, and a search bar.

Step 15: Create AKS -(AKS1 was created , Below snips just for creation reference pics)

The screenshot shows the "Create AksCompute" wizard. The current step is "Virtual Machine". It displays a message: "This wizard creates or attaches Azure Kubernetes Services cluster for AzureML API v1. Learn more to attach Azure Kubernetes Service cluster using the recommended approach for v2." Below this, there are two sections: "Select virtual machine" and "Kubernetes Service". Under "Select virtual machine", it says "Select the virtual machine size you would like to use for your inference cluster." and shows two radio button options: "Create new" (selected) and "Use existing". Under "Kubernetes Service", it shows "Create new" and "Use existing" radio buttons. The "Location" section shows "Central India" selected in a dropdown, with a "Search by VM name..." input field. Below this, it says "Showing 477 VM sizes" and lists two items in a table:

Name	Category	Available quota
Standard_A2_v2 2 cores, 4GB RAM, 20GB storage	General purpose	0 cores
Standard_A2m_v2 2 cores, 16GB RAM, 20GB storage	General purpose	0 cores

At the bottom are "Back", "Next", and "Cancel" buttons.

Create AksCompute

This wizard creates or attaches Azure Kubernetes Services cluster for AzureML API v1. Learn more to attach Azure Kubernetes Service cluster using the recommended approach for v2.

Virtual Machine Advanced Settings

Configure compute cluster settings for your selected virtual machine size.

Name	Category	Cores	Available quota	RAM	Storage
Standard_A4_v2	General purpose	4	4 cores	8 GB	40 GB

Compute name *

Cluster purpose Production Dev-test

Number of nodes *

Network configuration Basic Advanced

Enable SSL configuration

[Back](#) [Create](#) Download a template for automation. [Cancel](#)

Microsoft Azure Machine Learning Studio

Deakin University > ML01 > Compute

[New](#) [Home](#) [Authoring](#) [Notebooks](#) [Automated ML](#) [Designer](#) [Assets](#) [Data](#) [Jobs](#) [Components](#) [Pipelines](#) [Environments](#) [Models](#) [Endpoints](#) [Manage](#) [Compute](#) [Linked Services](#) [Data Labeling](#)

Compute

The "Kubernetes clusters" tab is now where you can access previous versions of "inference clusters" (also known as "AKS clusters") and "attached Kubernetes" compute types along with any previously created compute targets using those types. Learn more about Kubernetes clusters.

Compute instances Compute clusters [Kubernetes clusters](#) Attached computes

+ New [Refresh](#) [Delete](#) [Detach](#) [Edit columns](#) [Reset view](#)

State Location All filters Clear all

Name	State	Type	Attached/Created	Location	Cr
aks1	✓ Succeeded	AksCompute	Created	centralindia	M
aks001	✗ Failed	AksCompute	Created	eastus	M

Step 16: Deploy the Model > Web service >

Microsoft Azure Machine Learning Studio

Deakin University > ML01 > Models > Insu001:1

Insu001:1

Details Versions Artifacts Endpoints Jobs Data Responsible AI Explanations (preview) Fairness (preview)

Refresh Archive Deploy Download all Share model

Attributes

Name: Insu001
Version: 1
Created on: Mar 27, 2023 9:39 AM
Created by: NEETHU SIDHARDHAN
Type: CUSTOM
Created by job: 9eda81dd-978b-4519-8897-a42c857e0cc9
Asset ID: azureml://locations/centralindia/workspaces/305b8ebd-537f-41a1-877a-30117a5577d1/notebooks/Insu001.ipynb

Real-time endpoint
Deploy the model using the real-time endpoint wizard

Batch endpoint
Deploy the model using the batch endpoint wizard

Web service
Deploy to a web service (only for models based on frameworks)

No tags

No properties

Description

Click edit icon to add a description

Microsoft Azure Machine Learning Studio

Deakin University > ML01 > Models > Insu001:1

Insu001:1

Details Versions Artifacts Endpoints Jobs

Refresh Archive Deploy Download all

Attributes

Name: Insu001
Version: 1
Created on: Mar 27, 2023 9:39 AM
Created by: NEETHU SIDHARDHAN
Type: CUSTOM
Created by job: 9eda81dd-978b-4519-8897-a42c857e0cc9
Asset ID: azureml://locations/centralindia/workspaces/305b8ebd-537f-41a1-877a-30117a5577d1/notebooks/Insu001.ipynb

Deploy a model

Name * insu003

Description

Compute type * AksCompute

Compute name * aks1

Models: Insu001:
Enable authentication
Type Token-based authentication

Microsoft Azure Machine Learning Studio

Deakin University > ML01 > Models > Insu001:2

Insu001:2 ★

Details Versions Artifacts Endpoints Jobs Data Responsible AI Explanations (preview) Fairness (preview)

Success: insurance01 deployment started successfully

Refresh Archive Deploy Download all Share model

Attributes

Name	Insu001
Version	2
Created on	Mar 27, 2023 9:40 AM
Created by	NEETHU SIDHARDHAN
Type	CUSTOM
Created by job	9eda81dd-978b-4519-8897-a42c857e0cc9
Asset ID	

Tags

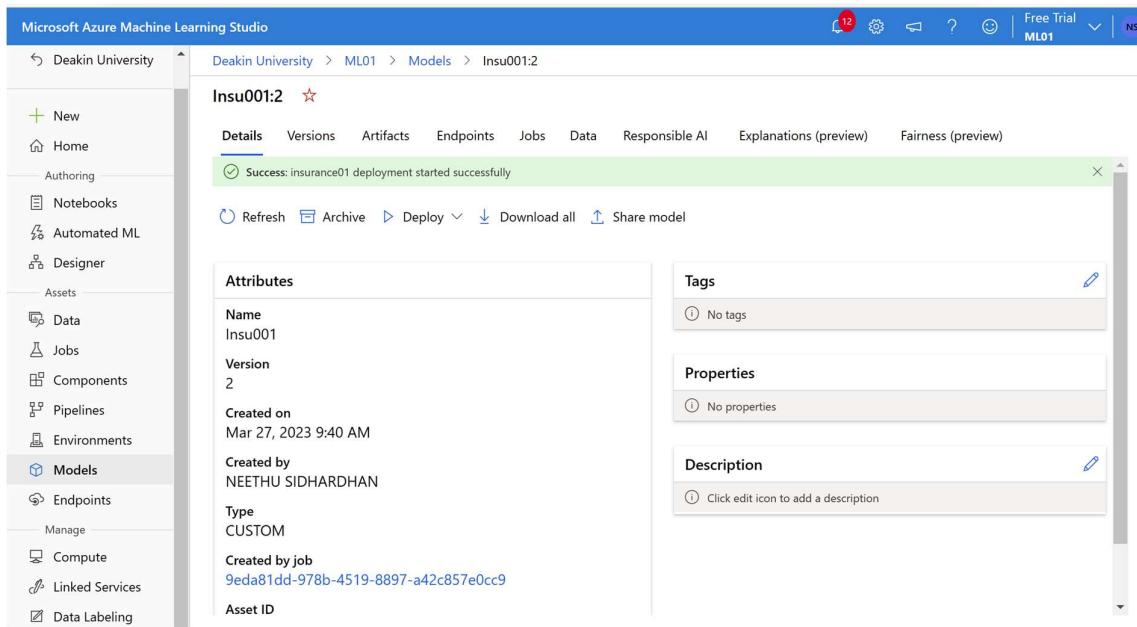
No tags

Properties

No properties

Description

Click edit icon to add a description



Step 17: After successful Deploying then check the end point

Microsoft Azure Machine Learning Studio

Deakin University > ML01 > Endpoints

Endpoints

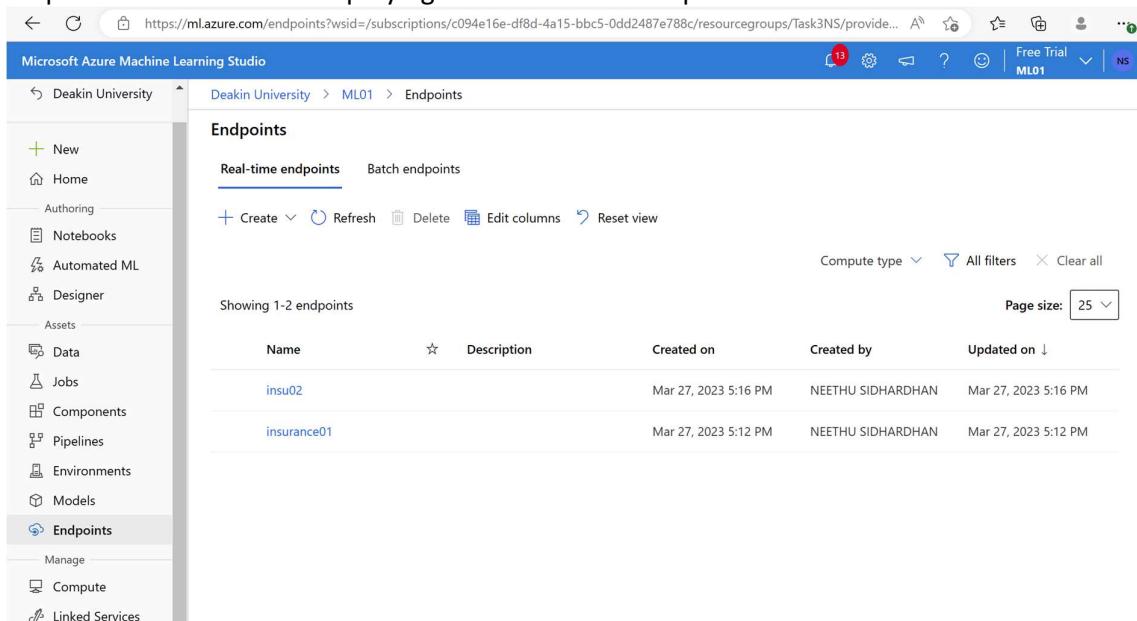
Real-time endpoints Batch endpoints

+ Create Refresh Delete Edit columns Reset view

Compute type All filters Clear all

Showing 1-2 endpoints Page size: 25

Name	Description	Created on	Created by	Updated on
insu02		Mar 27, 2023 5:16 PM	NEETHU SIDHARDHAN	Mar 27, 2023 5:16 PM
insurance01		Mar 27, 2023 5:12 PM	NEETHU SIDHARDHAN	Mar 27, 2023 5:12 PM



Microsoft Azure Machine Learning Studio

Deakin University > ML01 > Endpoints > insu02

insu02

Details Deployment logs

Attributes

Service ID
insu02

Description
--

Deployment state
Transitioning ⓘ

Compute type
AksCompute

Created by
NEETHU SIDHARDHAN

Model ID
Insu001:2

Created on
Mar 27, 2023 5:16 PM

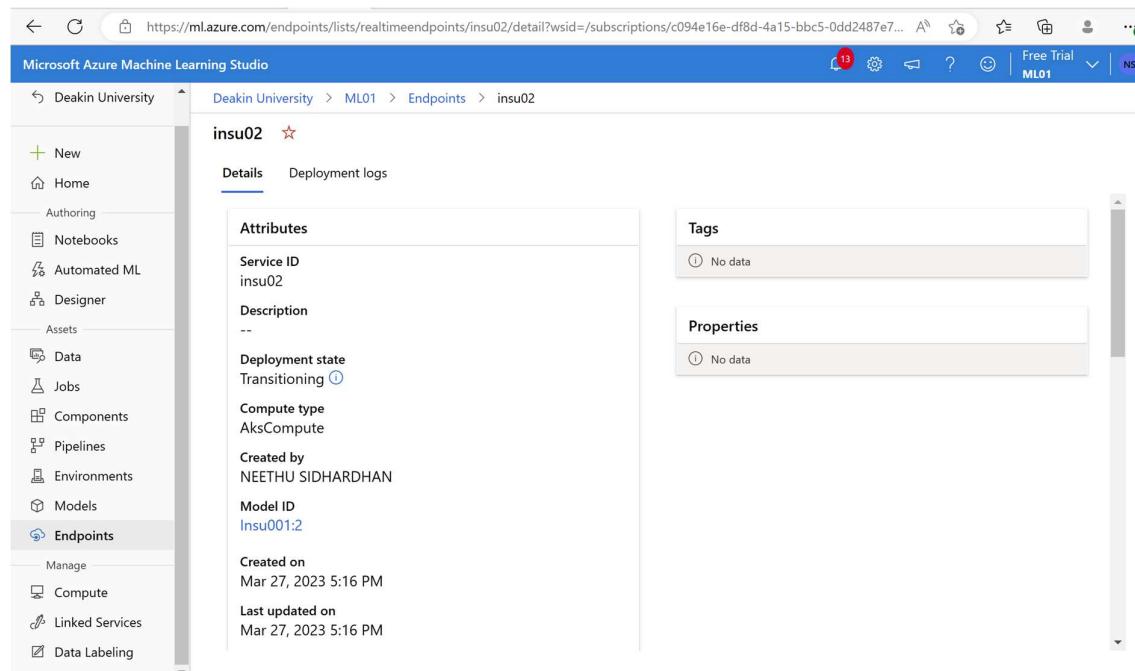
Last updated on
Mar 27, 2023 5:16 PM

Tags

No data

Properties

No data



After successful deploying the status changes to "Healthy"

Microsoft Azure Machine Learning Studio

Deakin University > ML01 > Endpoints > insu02

insu02

Details Test Consume Deployment logs

Attributes

Service ID
insu02

Description
--

Deployment state
Healthy ⓘ

Compute type
AksCompute

Created by
NEETHU SIDHARDHAN

Model ID
Insu001:2

Created on
Mar 27, 2023 5:16 PM

Last updated on
Mar 27, 2023 5:26 PM

Tags

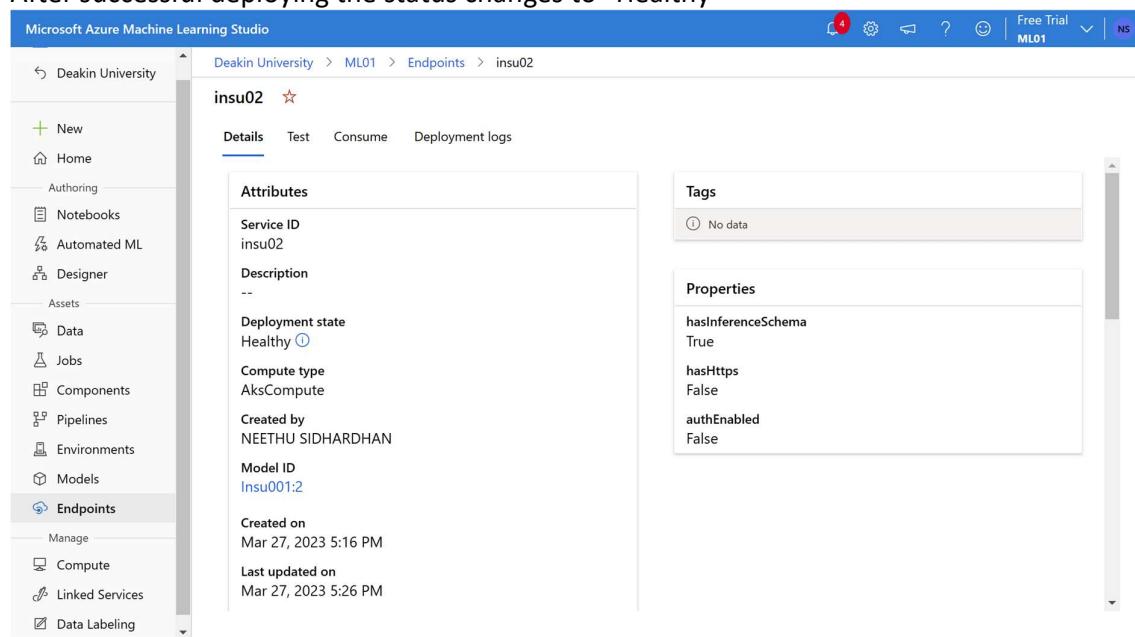
No data

Properties

hasInferenceSchema
True

hasHttps
False

authEnabled
False



Check the Consume Tab for various coding options C#, Python and R

Basic consumption info

REST endpoint

http://20.204.218.135:80/api/v1/service/insu02/score

Consumption option

Consumption types

C# Python R

```
1 // This code requires the Nuget package Microsoft.AspNet.WebApi.C  
2 // Instructions for doing this in Visual Studio:  
3 // Tools -> Nuget Package Manager -> Package Manager Console  
4 // Install-Package Newtonsoft.Json  
5 // .NET Framework 4.7.1 or greater must be used  
6  
7 using System;  
8 using System.Collections.Generic;  
9 using System.IO;  
10 using System.Net.Http;
```

Step 18: Check the Evaluate Model in pipeline for Accuracy, Confusion Matrix, Recall, Precision, F1 Score

Outline

Type node name, comment or comp...

Insurance_B

two_class_boosted_decision_tree

Insurance

select_columns_in_dataset

split_data

train_model

score_model

evaluate_model

Evaluate Model

Metrics

Accuracy	AUC	F1 Score
0.7516667	0.7859525	0.5552239

Precision	Recall
0.62	0.5027027

Evaluate Model

↗ ↘



Overview Parameters Outputs + logs Metrics Child jobs Images ...

⟳ Refresh

📊 Create custom chart

View as... ⚙️

...

>Select metrics

Accuracy

0.7516667

AUC

0.7859525

F1 Score

0.5552239

Precision

0.62

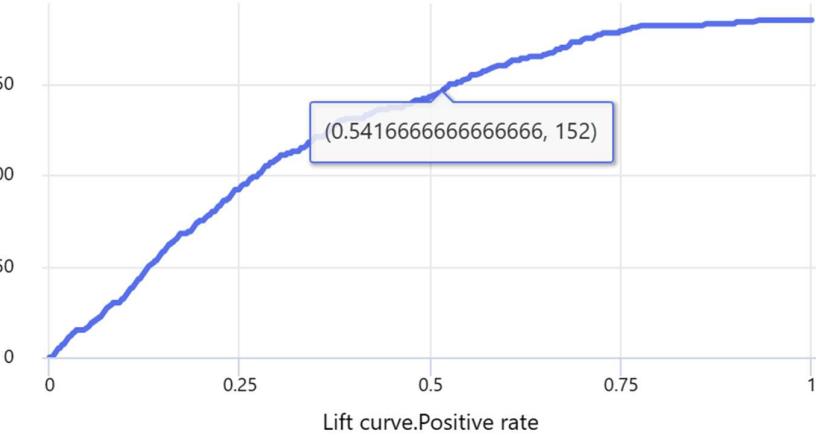
Recall

0.5027027

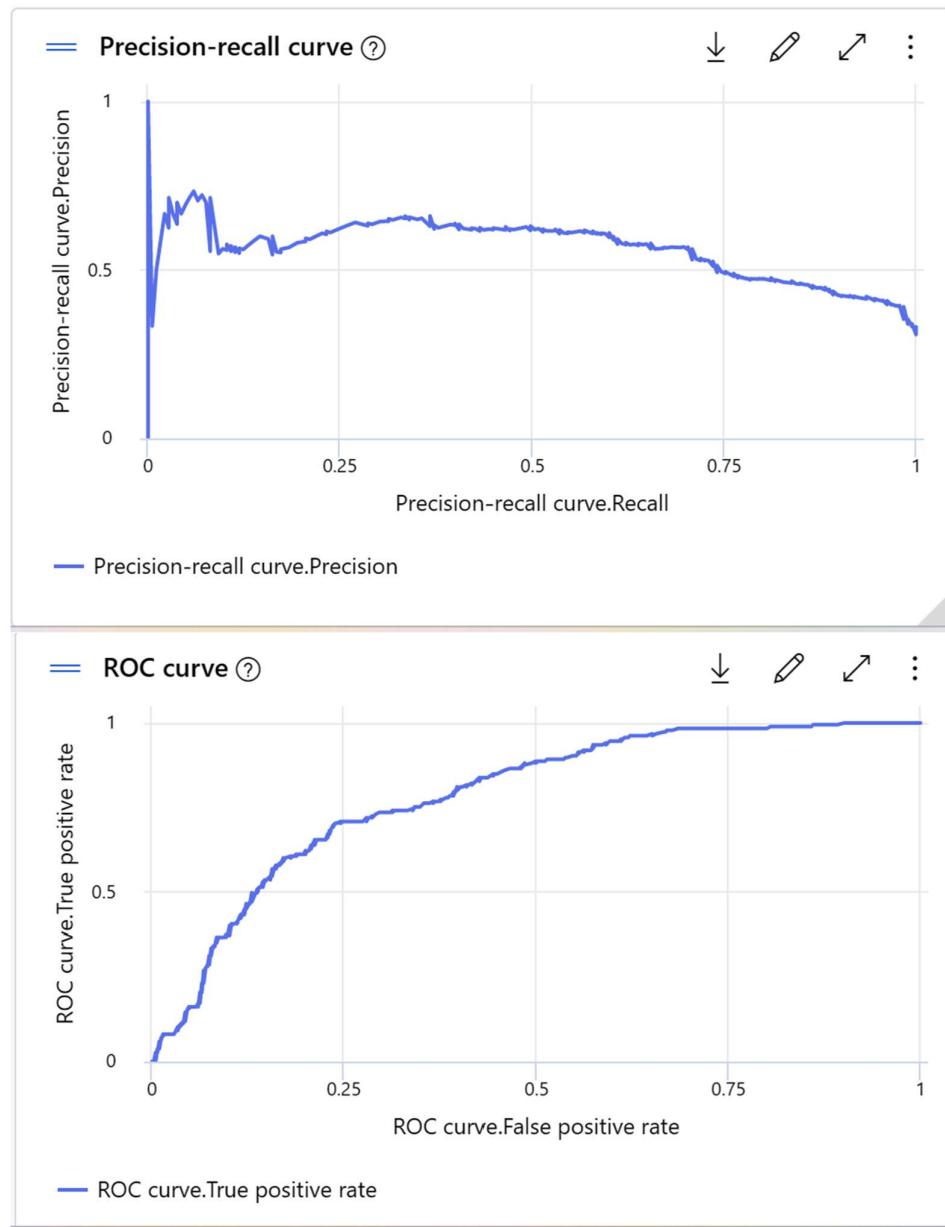
Lift curve ⓘ

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Lift curve.Number of true positive



— Lift curve.Number of true positive



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