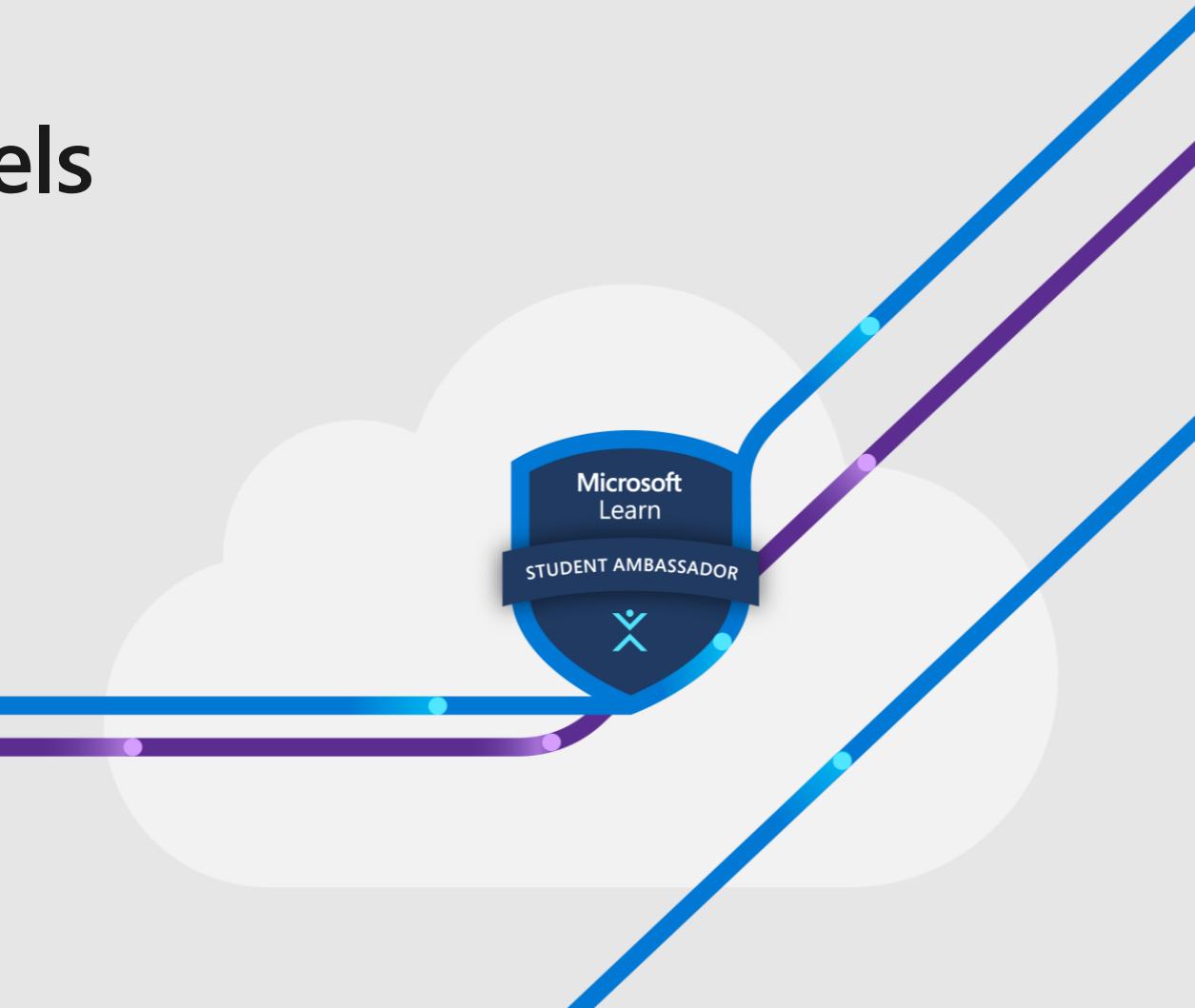


Create and Deploy ML Models with Azure ML Designer

Sudipto Ghosh



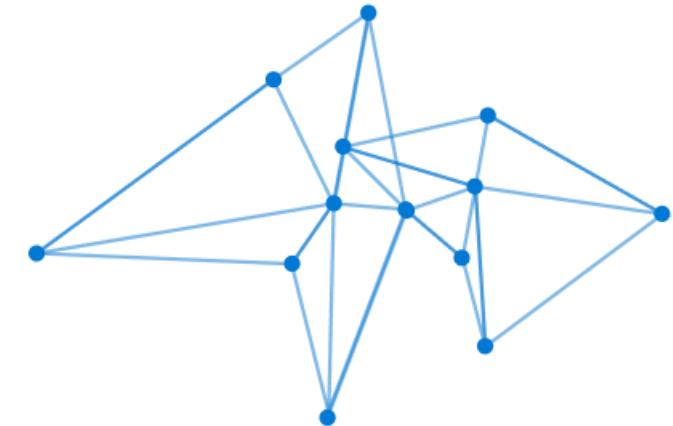
Lifecycle of a ML Project

Subtitle or speaker name



Machine Learning

- Doesn't really have a well-defined definition.
- "*Field of study that gives computers the ability to learn without being explicitly programmed.*" [Arthur Samuel (1959)]
- Definition of *learning*: "*A computer program is said to learn from experience E with respect to some class of tasks T and performance measure P, if its performance at tasks in T, as measured by P, improves with experience E.*" [Tom Michel (1999)]
- Use of mathematical models of data to help a computer learn without direct instruction.
- With increased data and experience, the accuracy of these models might increase, just like how humans improve with more practice.



ML Techniques



Supervised Learning

Addressing datasets with labels or structure, data acts as a *teacher* and *trains* the machine, increasing its ability to make a prediction or decision.



Unsupervised Learning

Addressing datasets without any labels or structure, finding patterns and relationships by grouping data into clusters.



Reinforcement Learning

Replacing the human operator, an agent – a computer program acting on behalf of someone or something – helps determine outcome based upon a feedback loop.



What Can Machine Learning Do?



Predict Values

Helpful in identifying cause and effect between variables, regression algorithms create a model from values, which are then used to make a prediction.

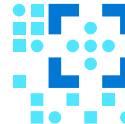
Regression studies help forecast the future, which can help anticipate product demand, predict sales figures, or estimate campaign results.



Identify Anomalies

Often used to spot potential risk, anomaly detection algorithms pinpoint data outside anticipated norm.

Equipment malfunction, structural defect, text errors, and instances of fraud are examples of how machine learning can be used to address concern.



Find Structure

Clustering algorithms are often the first step in machine learning, revealing the underlying structure within the dataset.

Categorising common items, clustering is commonly used in market segmentation, offering insight that can help select price and anticipate customer preferences.



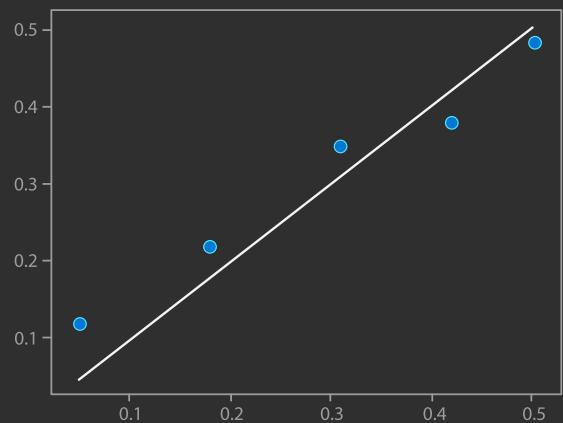
Predict Categories

Classification algorithms help determine the correct category for information.

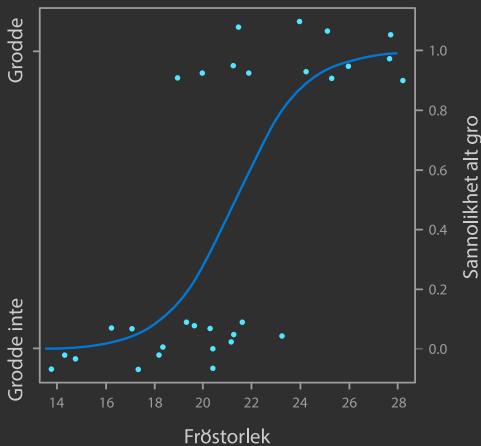
Bearing similarity to clustering, classification is different in that it is applied in supervised learning, where predefined labels are assigned.

... and much more

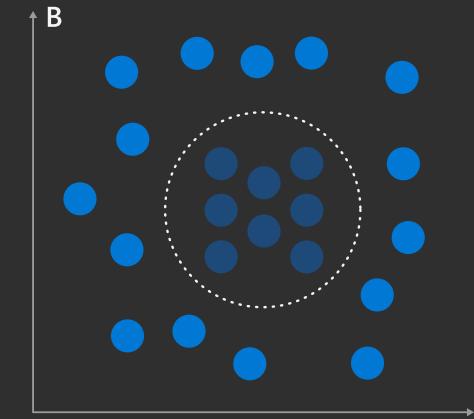




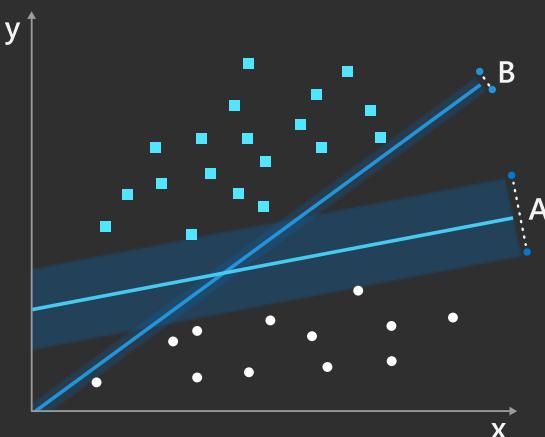
Linear Regression



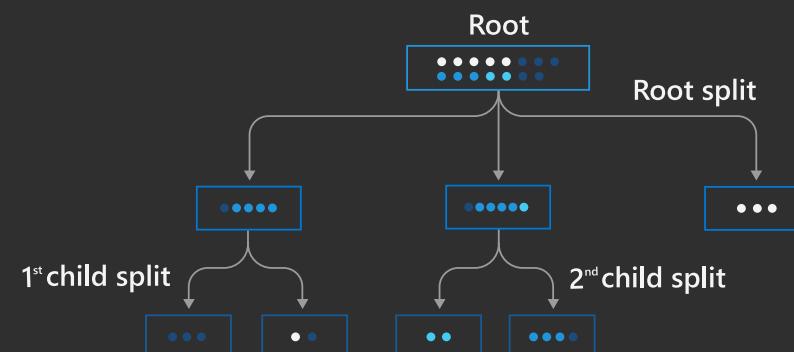
Logistic Regression



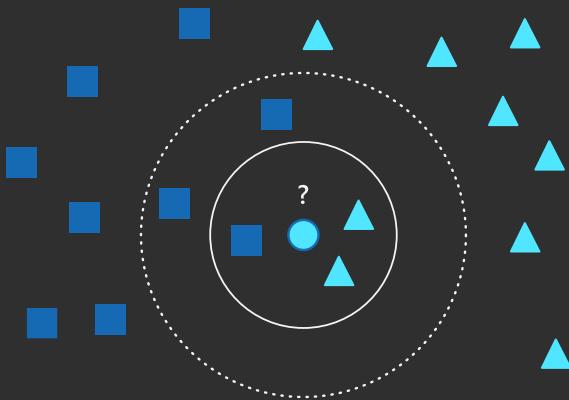
Naïve Bayes



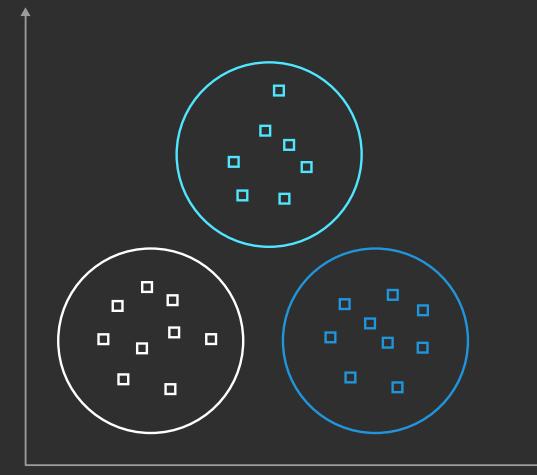
Support Vector Machines



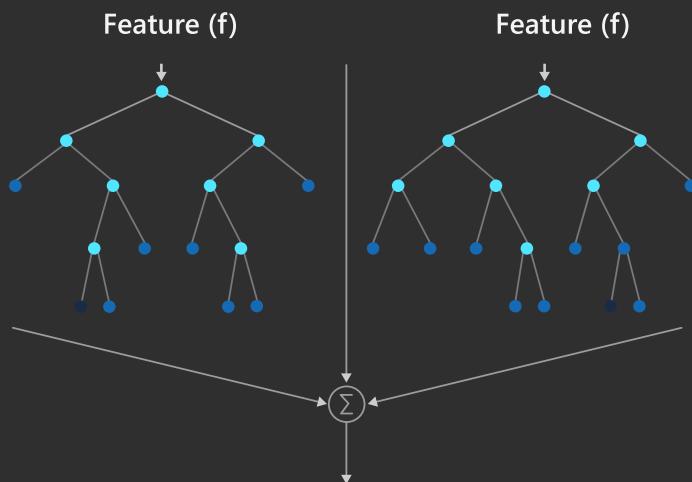
Decision Tree



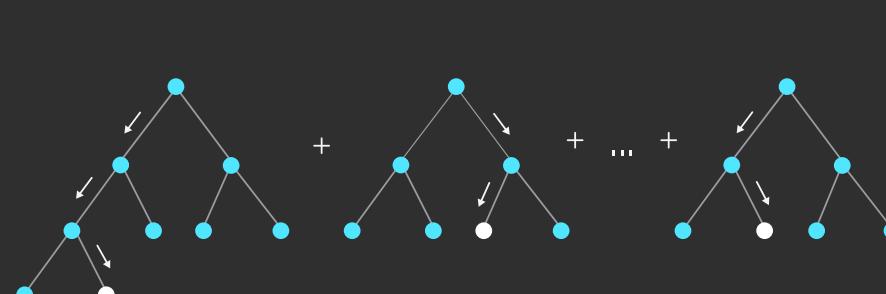
K-Nearest Neighbours



K-Means

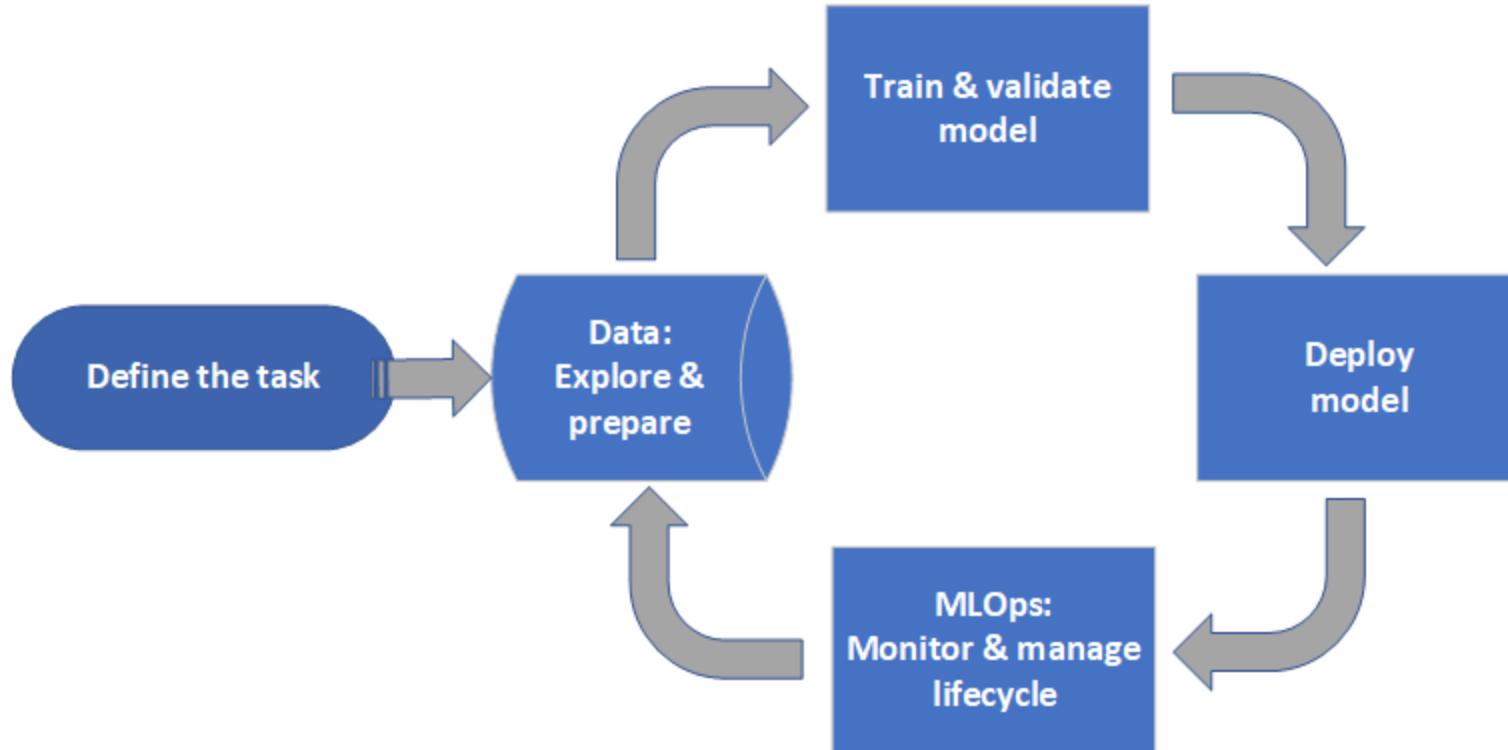


Random Forest

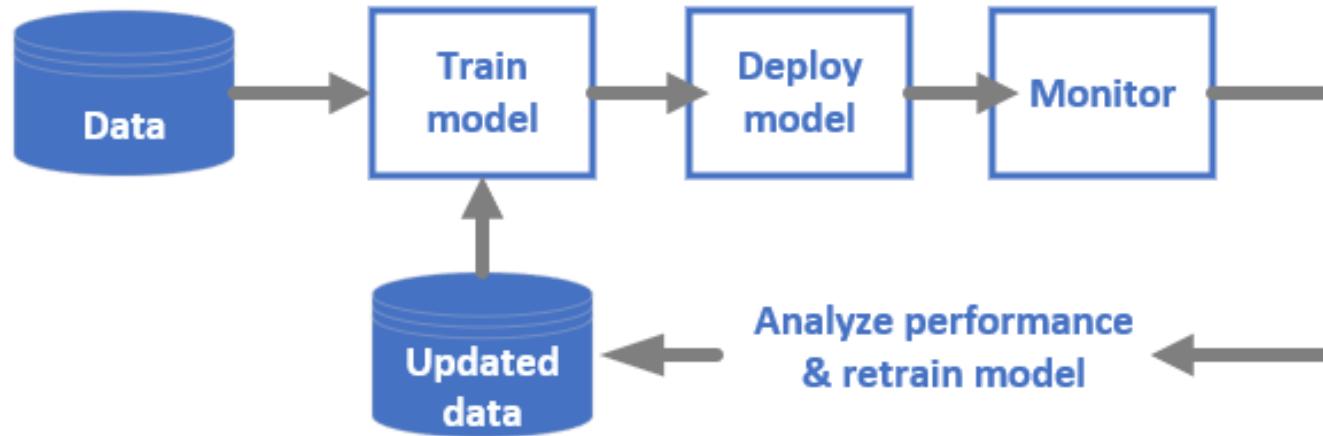


Gradient Boosting

Project Lifecycle



Model Lifecycle



Why Azure Machine Learning?

Subtitle or speaker name



Azure

- Public + private + hybrid cloud computing platform by Microsoft with a pay-as-you-go model.
- Freedom to build, manage, and deploy applications on a massive global network of Microsoft-managed datacenters using your favorite tools and frameworks.
- Much more than another place to only run VMs.
- More than 100 services ranging from raw compute, storage, virtual networking, and new software paradigms such as intelligent bots and mixed reality.
- Multiple ways to manage – Azure Portal, Azure CLI, REST APIs and SDKs for many popular programming languages.



Security & Management



Security Center



Azure portal



Azure Active Directory



Azure AD B2C



Multi-Factor Authentication



Key Vault



Azure Marketplace



VM Image Gallery



REST API and CLI

Media & CDN



Media Services



Media Analytics



Content Delivery Network

Integration



API Management



Service Bus



Azure Logic Apps

Application Platform



Web Apps



Mobile Apps



API Apps



Cloud Services



Service Fabric



Notification Hubs



Functions

Compute Services



Container Service



VM Scale Sets



Azure Batch



Dev/Test Lab

Developer Services



Visual Studio



Mobile Engagement



Azure DevOps



Xamarin



Application Insights



Visual Studio App Center

Data



SQL Database



Azure Synapse Analytics



Cosmos DB



SQL Server Stretch Database



Azure Cache for Redis



Table Storage



Azure Search

Intelligence



Cognitive Services



Bot Services



Azure ML Studio

Analytics & IoT



HDInsight



Machine Learning



Stream Analytics



Data Catalog



Data Lake Analytics Service



Data Lake Storage



IoT Hub



Event Hubs



Data Factory



Power BI Embedded

Infrastructure Services

Compute



Virtual Machines



Containers and Azure Kubernetes

Storage



Blob



Queues



Files



Disks

Networking



Virtual Network



Load Balancer



DNS



Express Route



Traffic Manager



VPN Gateway



App Gateway

Datacenter Infrastructure

Hybrid Cloud



Azure AD Connect Health



AD Privileged Identity Management



Domain Services



Backup



Azure Monitor



Import/Export



Azure Site Recovery



StorSimple

Home - Microsoft Azure x +

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Visual Studio Enterprise Subscription	Subscription	2 months ago

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Secure your apps and infrastructure

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Analyze and optimize your cloud spend for free

Useful links

Azure mobile app

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09:11

Azure Machine Learning

- Cloud service for accelerating and managing the machine learning project lifecycle.
- For individuals and teams implementing MLOps to bring machine learning models into production in a collaborative, secure and auditable production environment.
- Azure Machine Learning integrates with the Azure cloud platform to add security to ML projects with network security groups and secret vaults.
- Create Models in Azure ML or Bring-Your-Own-Model – support for common frameworks like PyTorch, TensorFlow, scikit-learn, XGBoost, LightGBM and languages like Python and R.
- Deploy Models and Monitor Performance with ease.



ML-for-all



E2E MLOps



Responsible Innovation



Open and Interoperable

Development tools



Languages



Frameworks



ONNX



Chainer



dmlc
XGBoost

K Keras

mxnet



mlflow

DASK

Azure Cognitive Services



Ready-to-use, Pretrained ML Models



Developed with Strict Ethical Standards

Decision APIs

Make smarter decisions faster.

Anomaly Detector

Identify potential problems early on.

Content Moderator

Detect potentially offensive or unwanted content.

Personaliser

Create rich, personalised experiences for every user.

Language APIs

Extract meaning from unstructured text.

Language Understanding

Build natural language understanding into apps, bots and IoT devices.

QnA Maker

Create a conversational question and answer layer over your data.

Text Analytics

Detect sentiment, key phrases and named entities.

Translator

Detect and translate 90+ supported languages.

Speech APIs

Improve experiences with speech.

Speech to Text

Transcribe audible speech into readable, searchable text.

Text to Speech

Convert text to lifelike speech for more natural interfaces.

Speech Translation

Integrate real-time speech translation into your apps.

Speaker Recognition

Identify and verify the people speaking based on audio.

Vision APIs

Identify and analyse content within images and videos.

Computer Vision

Analyze content in images and video.

Custom Vision

Customise image recognition to fit your needs.

Face API

Detect and identify people and emotions in images.

ml-ws - Microsoft Azure Microsoft Azure Machine Learning

https://ml.azure.com/?tid=84c31ca0-ac3b-4eae-ad11-519d80233e6f&wsid=/subscriptions/d4fefcb7-baa8-40f1-9afc-b5474a3281b4/resourcegroups/ml-rg/workspaces/ml-ws

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Setting Up the Infrastructure



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https://portal.azure.com/#create/hub

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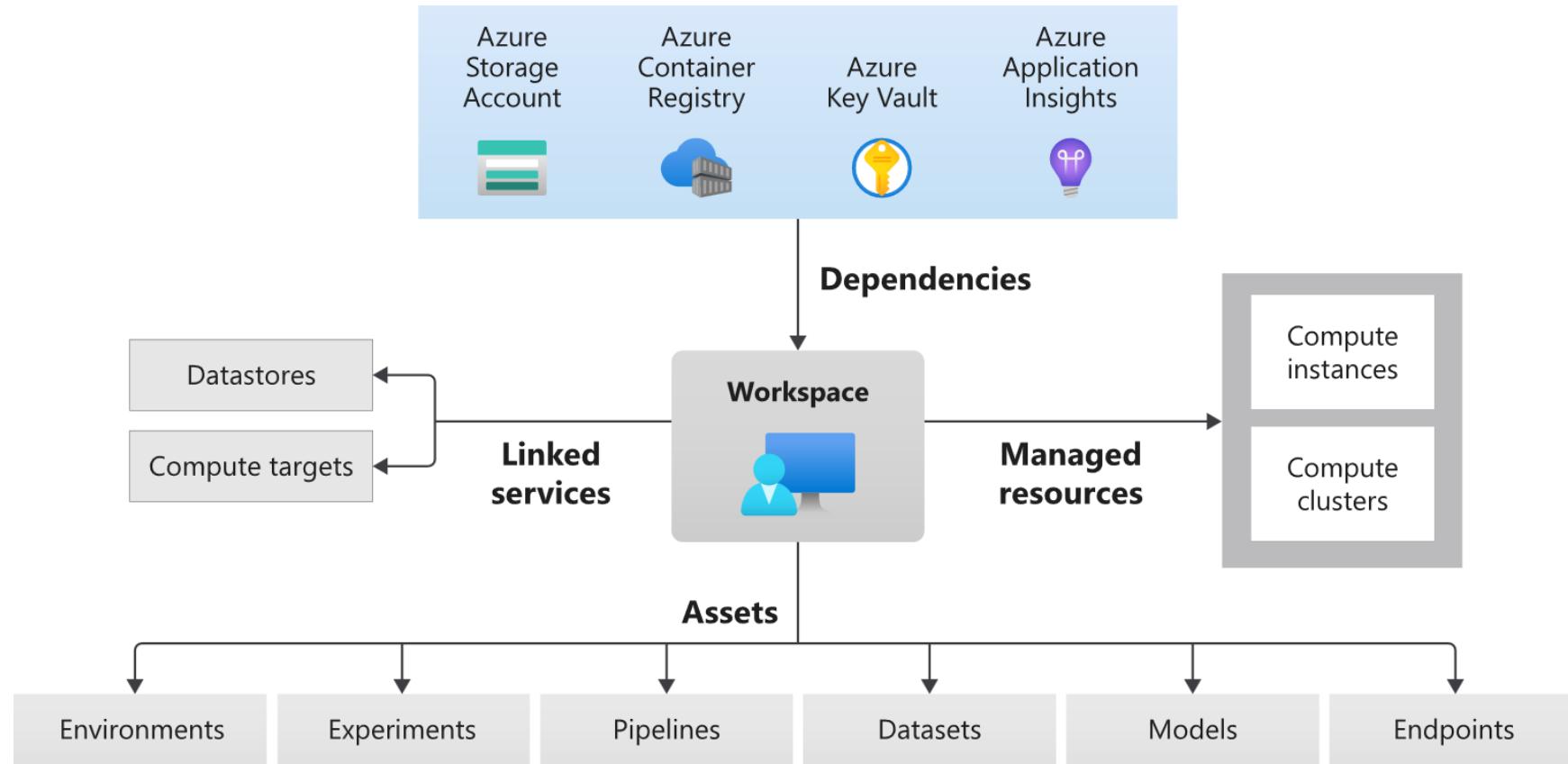
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Machine Learning Workspace



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Create a machine learning workspace

Basics Networking Advanced Tags Review + create

Project details

Select the subscription to manage deployed resources and costs. Use resource groups like folders to organize and manage all your resources.

Subscription *

Resource group * [Create new](#)

Workspace details

Specify the name and region for the workspace.

Workspace name *

Region *

Storage account * [Create new](#)

Key vault * [Create new](#)

Application insights * [Create new](#)

[Review + create](#) < Previous Next : Networking

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Machine learning - Microsoft Azure

https://portal.azure.com/#create/Microsoft.MachineLearningServices

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Validation passed

Basics Networking Advanced Tags Review + create

Basics

Subscription	Visual Studio Enterprise Subscription
Resource group	(New) ml-rg
Region	East US 2
Workspace name	ml-ws
Storage account	(new) mlws8169296442
Key vault	(new) mlws3589990915
Application insights	(new) mlws4340426270
Container registry	None

Networking

Connectivity method	Public endpoint (all networks)
---------------------	--------------------------------

Advanced

Identity type	System assigned
Encryption type	Microsoft-managed keys
Enable HBI Flag	Disabled

Create < Previous Next > Download a template for automation

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09:22

Microsoft.MachineLearningService x +

https://portal.azure.com/#blade/HubsExtension/DeploymentDetailsBlade/overview/id/%2Fsubscriptions%2Fd4fefcb7-baa8-40f1-9afc-b5474a3281b4%2FresourceGroups%2Fml-rg%2Fproviders%2FMicrosoft.Resources%2Fdeploy...

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Delete Cancel Redeploy Refresh

We'd love your feedback! →

Deployment is in progress

Deployment name: Microsoft.MachineLearningServices
Subscription: Visual Studio Enterprise Subscription
Resource group: ml-rg

Start time: 10/3/2021, 9:23:07 AM
Correlation ID: 61cc31f9-3552-4a59-b888-e11fcc0d3b6

Deployment details (Download)

Resource	Type	Status	Operation details
ml-ws	Microsoft.MachineLearningServices/w...	Accepted	Operation details
mlws3589990915	Microsoft.KeyVault/vaults	OK	Operation details
mlws4340426270	Microsoft.Insights/components	OK	Operation details
mlws8169296442	Microsoft.Storage/storageAccounts	OK	Operation details

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Microsoft MachineLearningService

https://portal.azure.com/#blade/HubsExtension/DeploymentDetailsBlade/overview/id/%2Fsubscriptions%2Fd4fefcb7-baa8-40f1-9afc-b5474a3281b4%2FresourceGroups%2Fml-rg%2Fproviders%2FMicrosoft.Resources%2Fdeploy...

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Deployment

Search (Ctrl+ /) Delete Cancel Redeploy Refresh

We'd love your feedback! →

Your deployment is complete

Deployment name: Microsoft.MachineLearningServi... Start time: 10/3/2021, 9:23:07 AM
Subscription: Visual Studio Enterprise Subscription Correlation ID: 61cc31f9-3552-4a59-b888-e11fcc0d...

Resource group: ml-rg

Deployment details (Download)

Next steps

Go to resource

Deployment succeeded

Deployment 'Microsoft.MachineLearningServices' to resource group 'ml-rg' was successful.

Go to resource Pin to dashboard

Security Center

Secure your apps and infrastructure

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Azure experts are service provider partners who can help manage your assets on Azure and be your first line of support.

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Download config.json Delete

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Properties

Locks

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Alerts

Metrics

Diagnostic settings

Logs

Automation

Tasks (preview)

Essentials

Resource group : ml-rg

Location : East US 2

Subscription : Visual Studio Enterprise Subscription

Subscription ID : d4fefcb7-baa8-40f1-9afc-b5474a3281b4

Studio web URL : https://ml.azure.com/?tid=84c31ca0-ac3b-4eae-ad11-...

Storage : mlws8169296442

Registry : ...

Key Vault : mlws3589990915

Application Insights : mlws4340426270

JSON View

Manage your machine learning lifecycle

Use the Azure Machine Learning studio to build, train, evaluate, and deploy machine learning models. [Learn more](#)

Launch studio

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https://ml.azure.com/?tid=84c31ca0-ac3b-4eae-ad11-519d80233e6f&wsid=/subscriptions/d4fefcb7-baa8-40f1-9afc-b5474a3281b4/resourcegroups/ml-rg/workspaces/ml-ws

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Runs	Compute	Models	Datasets			
Run	Display name	Experiment	Status	Submitted time	Submitte...	Run type

No runs to display 

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Compute Targets

- A compute target is any machine or set of machines that run your computational task.
 - Azure Machine Learning introduces two fully managed cloud-based virtual machines (VM) that are configured for machine learning tasks:
 - Compute Instance: A VM which includes multiple tools and environments installed for machine learning.
 - Compute Clusters: A cluster of VMs with multi-node scaling capabilities. Suited for large jobs and production. The cluster scales up automatically when a job is submitted.
 - Remote machines, Kubernetes clusters are also supported as compute targets.
 - You can also use your local machine as a compute target and then scale up to the cloud without changing your training script.
- 
- A decorative horizontal bar at the bottom of the slide, consisting of a thick blue line above a thinner purple line. Both lines have small circular markers on them.

ml-ws - Microsoft Azure Compute - Microsoft Azure Mac + https://ml.azure.com/compute/list?wsid=/subscriptions/d4fefcb7-baa8-40f1-9afc-b5474a3281b4/resourcegroups/ml-rg/workspaces/ml-ws&tid=84c31ca0-ac3b-4eae-ad11-519d80233e6f

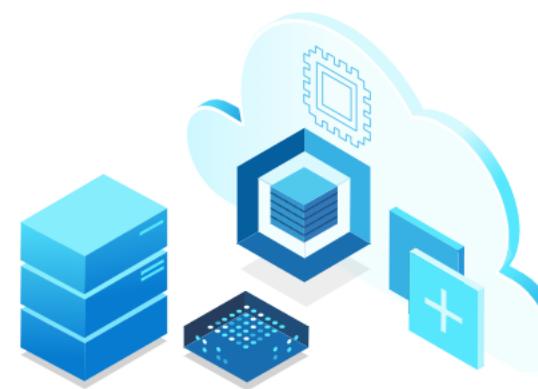
Microsoft Azure Machine Learning Studio Visual Studio Enterprise Subscription ml-ws

New Home Author Notebooks Automated ML Designer Assets Datasets Experiments Pipelines Models Endpoints Manage Compute Environments (preview) Datastores Data Labeling Linked Services

Home > Compute

Compute

Compute instances Compute clusters Inference clusters Attached computes



Get started with Azure Machine Learning notebooks and R scripts by creating a compute instance

Choose from a selection of CPU or GPU instances preconfigured with popular tools such as JupyterLab, Jupyter, and RStudio, ML packages, deep learning frameworks, and GPU drivers. [Learn more](#)

+ New

[View Azure Machine Learning tutorials](#)

Windows Taskbar: ml-ws - Microsoft Azure, Compute - Microsoft Azure Mac, File Explorer, Task View, Taskbar icons, 29°C Sunny, 09:25

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Create compute instance

Required Settings

Advanced Settings

Configure required settings
Select the name and virtual machine size you would like to use for your compute instance. Please note that a compute instance can not be shared. It can only be used by a single assigned user. By default, it will be assigned to the creator and you can change this to a different user in the advanced settings section.

Compute name * (i)
mlsa-compute

Location (i)
eastus2

Virtual machine type (i)
 CPU GPU

Virtual machine size (i)
 Select from recommended options Select from all options

Total available quota: 6 cores (i)

Name ↑	Category	Workload types	Available quota (i)	Cost (i)
Standard_DS11_v2 2 cores, 14GB RAM, 28GB storage	Memory optimized	Development on Notebooks (or other IDE) and light weight testing	6 cores	\$0.15/hr

Create **Back** **Next: Advanced Settings** **Cancel**

ml-ws - Microsoft Azure x mlsa-compute - Microsoft Azure x + https://ml.azure.com/compute/mlsa-compute/details?wsid=/subscriptions/d4fefcb7-baa8-40f1-9afc-b5474a3281b4/resourcegroups/ml-rg/workspaces/ml-ws&tid=84c31ca0-ac3b-4eae-ad11-519d80233e6f

Microsoft Azure Machine Learning Studio

1

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Home > Compute > mlsa-compute

mlsa-compute

Details Runs Monitoring (preview)

Refresh Connect Start Stop Restart Delete

Resource properties

Status
Running

Last operation
Created at 3 Oct 2021 09:28: Succeeded

Virtual machine size
Standard_DS12_v2 (4 cores, 28 GB RAM, 56 GB disk)

Processing unit
CPU - Memory optimized

Additional data storage
--

Applications
JupyterLab Jupyter VS Code RStudio Terminal

Created on
03/10/2021, 09:28:49

SSH access
Disabled

Private IP address
10.0.0.5

Virtual network/subnet
--

Schedules

No schedules

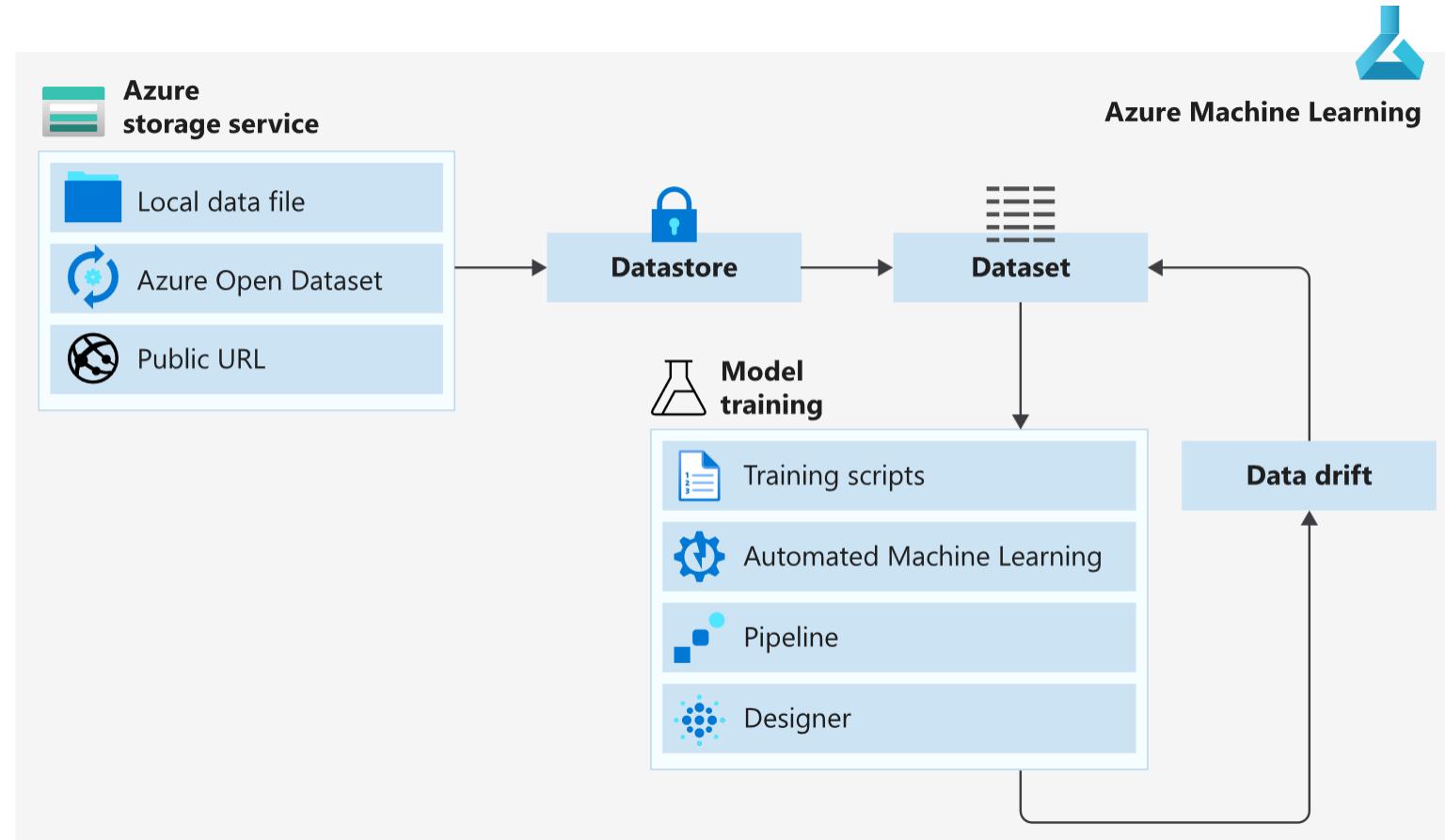
29°C Sunny 09:32

Datasets and Datastores

- An Azure Machine Learning Dataset is a reference to the data source location along with a copy of its metadata. The data itself is not copied and only a link is created.
- As the data remains in its existing location, you incur no extra storage cost.
- Datasets can be created from local files, public URLs, Azure Open Datasets, or Azure Storage services via datastores.
- Datastores store connection information without putting authentication credentials and the integrity of the original data source at risk.
- There are 2 types of datasets:
 - [FileDataset](#): References single or multiple files in datastores or public URLs.
 - [TabularDataset](#): Represents data in a tabular format by parsing the provided file or list of files.



Data Workflow in Azure ML



Diabetes Dataset

- PatientID: Unique Identifier
- Pregnancies: Number of Times Pregnant
- PlasmaGlucose: Plasma Glucose Concentration a 2 hours in an oral glucose tolerance test
- DiastolicBloodPressure: Diastolic Blood Pressure (mmHg)
- TricepsThickness: Triceps Skin Fold Thickness (mm)
- SerumInsulin: 2-Hour Serum Insulin (muU/ml)
- BMI: Body Mass Index (weight in kg/(height in m)²)
- DiabetesPedigree: Value of Diabetes Pedigree Function
- Age: Age (years)
- Diabetic: Class Label (0 if not actually diabetic, 1 if diabetic)

Source: National Institute of Diabetes and Digestive and Kidney Diseases

aka.ms/diabetes-data

Sample Data

PatientID	Pregnancies	PlasmaGlucose	DiastolicBloodPressure	TricepsThickness	SerumInsulin	BMI	DiabetesPedigree	Age	Diabetes
1882185	9	104	51	7	24	27.36983	1.350472	43	0
1662484	6	73	61	35	24	18.74367	1.074148	75	1
1228510	4	115	50	29	243	34.69215	0.74116	59	0



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- Linked Services

Datasets

Registered datasets

Dataset monitors (preview)



Register datasets to manage, share, and track data in your machine learning workflows.

With Azure Machine Learning datasets, you can keep a single copy of data in your storage referenced by datasets and seamlessly access data during model training without worrying about connection strings or data paths. [Learn more](#)

+ Create dataset ▾

[Explore GitHub repository](#)

[View Azure Machine Learning tutorials](#)

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Datasets

Registered datasets

Create dataset from web files

Basic info

Settings and preview

Schema

Confirm details

Basic info

Web URL *

https://aka.ms/diabetes-data

Name *

diabetes-data

Dataset type * ⓘ

Tabular

Description

Diabetes Dataset

Skip data validation ⓘ

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Datasets

Registered datasets

Create dataset from web files

Basic info

Settings and preview

Schema

Confirm details

Settings and preview

These settings were automatically detected. Please verify that the selections were made correctly or update.

File format

Delimited

Delimiter

Comma

Example

Field1,Field2,Field3

Encoding

UTF-8

Column headers

Only first file has headers

Skip rows

None

Dataset contains multi-line data i

i Note: Processing tabular files with multi-line data is slower because multiple CPU cores cannot be used to ingest the data in parallel. Checking this option may result in slower processing times.

Id	PatientID	Pregnancies	PlasmaGlucose	DiastolicBloodPr...	
1	1354778	0	171	80	34
2	1147438	8	92	93	47

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Datasets

Registered datasets

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Basic info

Settings and preview

Schema

Confirm details

Schema

Column types are auto-detected based on the first 200 rows of the data. Please make any necessary adjustments. Values not aligning with the specified column type will fail conversion and would be either null-filled or replaced with error value.

 Search

Include	Column name	Properties ⓘ	Type
<input checked="" type="checkbox"/>	Path	Not applicable to selected type	String
<input checked="" type="checkbox"/>	PatientID	Not applicable to selected type	Integer
<input checked="" type="checkbox"/>	Pregnancies	Not applicable to selected type	Integer
<input checked="" type="checkbox"/>	PlasmaGlucose	Not applicable to selected type	Integer
<input checked="" type="checkbox"/>	DiastolicBloodPressure	Not applicable to selected type	Integer
<input checked="" type="checkbox"/>	TricepsThickness	Not applicable to selected type	Integer
<input checked="" type="checkbox"/>	SerumInsulin	Not applicable to selected type	Integer

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Datasets

Registered datasets

Create dataset from web files

- Basic info
- Settings and preview
- Schema
- Confirm details

Confirm details

Basic info

Name
diabetes-data

Dataset type
Tabular

Web URL
<https://aka.ms/diabetes-data>

Description
Diabetes Dataset

File settings

File format
Delimited

Delimiter
Comma

Encoding
UTF-8

Column headers
Only first file has headers

Skip rows
None

Profile this dataset after creation ⓘ

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Create

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diabetes-data

Version 1 (latest) ▾

Details Consume Explore Models

New version Refresh Generate profile Unregister

Preview Profile

Number of columns: 10 Number of rows: 50 (of 10000)

Id	PatientID	Pregnancies	PlasmaGlucose	DiastolicBloodPr...	TricepsThickness	SerumInsulin	BMI	DiabetesPedigree
1	1354778	0	171	80	34	23	43.51	1.213
2	1147438	8	92	93	47	36	21.241	0.158
3	1640031	7	115	47	52	35	41.512	0.079
4	1883350	9	103	78	25	304	29.582	1.283
5	1424119	1	85	59	27	35	42.605	0.55
6	1619297	0	82	92	9	253	19.724	0.103
7	1660149	0	133	47	19	227	21.941	0.174
8	1458769	0	67	87	43	36	18.278	0.236
9	1201647	8	80	95	33	24	26.625	0.444
10	1403912	1	72	31	40	42	36.89	0.104
11	1943830	1	88	86	11	58	43.225	0.23
12	1824483	3	94	96	31	36	21.294	0.259
13	1848869	5	114	101	43	70	36.495	0.079
14	1669231	7	110	82	16	44	36.089	0.281

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Student Ambassadors

Azure ML Designer



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Designer

New pipeline

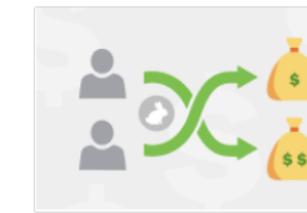
Show more samples ▾



Easy-to-use prebuilt modules ⓘ



Image Classification using
DenseNet ⓘ



Binary Classification using
Vowpal Wabbit Model - A... ⓘ



Wide & Deep based
Recommendation - Restau... ⓘ



Regression - Automobile Price
Prediction (Basic) ⓘ

Pipelines

Pipeline drafts Pipeline runs

No pipeline drafts found

Create a new pipeline or start from a sample

Model

- At its simplest, a model is a piece of code that takes an input and produces output.
- Creating a machine learning model involves
 - selecting an algorithm,
 - providing it with data, and
 - tuning parameters
- Training is an iterative process that produces a trained model, which encapsulates what the model learned during the training process.
- You can bring a model that was trained outside of Azure Machine Learning. Or you can train a model by submitting a run of an experiment to a compute target in Azure Machine Learning. Once you have a model, you register the model in the workspace.
- Azure Machine Learning is framework agnostic. When you create a model, you can use any popular machine learning framework.

Pipelines

- A blueprint for processing data, selecting an appropriate, training the model, making predictions.
- Pipelines are used to create and manage workflows that stitch together machine learning phases.
- Pipeline steps are reusable and can be run without rerunning the previous steps if the output of those steps hasn't changed.
- A valid pipeline has these characteristics:
 - Datasets can only connect to modules.
 - Modules can only connect to either datasets or other modules.
 - All input ports for modules must have some connection to the data flow.
 - All required parameters for each module must be set.
- When you're ready to run your pipeline draft, you submit a pipeline run to a compute target.
- Pipeline runs are grouped into experiments to organize run history.



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Home > Designer > Authoring

Pipeline-Created-on-10-03-2021

Submit Publish ...

Autosave on

Search canvas

Not started

95 assets in total

Datasets (0)

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Search by name, tags and description

Settings

Default compute target

Please select a default compute to run a pipeline.

Select compute type

Compute instance

Select Azure ML compute instance

Select a compute instance

Create Azure ML compute instance Refresh Compute

Pipeline parameters

No parameters selected

Default output settings

workspaceblobstore

Select default datastore

Draft details

Draft name

Pipeline-Created-on-10-03-2021

Navigator 100% 🔍 🔎 1:1 ⚡

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Diabetes Training Pipeline

Submit Publish ...

Search by name, tags and description

Autosave on

95 assets in total

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Search canvas

Not started

Settings

Default compute target

Select compute type

Compute instance

Select Azure ML compute instance

mlsa-compute - Running

Create Azure ML compute instance Refresh Compute

Pipeline parameters

No parameters selected

Default output settings

workspaceblobstore

Select default datastore

Draft details

Draft name

Pipeline-Created-on-10-03-2021

Draft description (optional)

Navigator 100%

29°C Sunny

09:33

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- diabetes-data Diabetes Dataset 10/3/2021

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diabetes-data

Parameters Outputs

ID 772e8400-61c0-458c-b510-f5cfaf7e3129

Dataset name diabetes-data

Dataset type Tabular

Datasource type AmlDataset

Description Diabetes Dataset

Data type DataFrameDirectory

Relative path https://aka.ms/diabetes-data

Created time 3 Oct 2021 09:46

Modified time

Set as pipeline parameter

Parameter name

Navigator 100% 🔍

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diabetes-data Diabetes Dataset 10/3/2021

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R Language (1)

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Computer Vision (6)

Recommendation (5)

Navigator 100% Search

Submit Publish ...

diabetes-data

Parameters Outputs

Dataset output

Preview data

29°C Sunny 09:49

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DatasetOutput XRows ? Columns ?
10,000 10

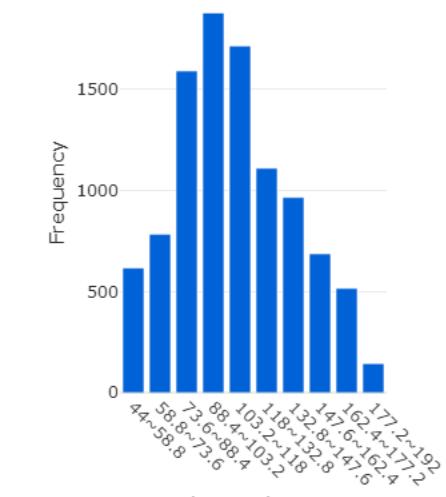
PatientID	Pregnancies	PlasmaGlucose	DiastolicBloodPressure	TricepsThickness	SerumInsulin	BMI	DiabetesPec
1354778	0	171	80	34	23	43.509726	0.1213191
1147438	8	92	93	47	36	21.240576	0.158365
1640031	7	115	47	52	35	41.511523	0.079019
1883350	9	103	78	25	304	29.582192	0.128287
1424119	1	85	59	27	35	42.604536	0.549542
1619297	0	82	92	9	253	19.72416	0.103424
1660149	0	133	47	19	227	21.941357	0.17416
1458769	0	67	87	43	36	18.277723	0.236165
1201647	8	80	95	33	24	26.624929	0.443947
1403912	1	72	31	40	42	36.889576	0.103944
1943830	1	88	86	11	58	43.225041	0.230285
1824483	3	94	96	31	36	21.294479	0.25902
1848869	5	114	101	43	70	36.49532	0.07919
1669231	7	110	82	16	44	36.089293	0.281276
1683688	0	148	58	11	179	39.192076	0.160829
1738587	3	109	77	46	61	19.847312	0.204345
1884264	3	106	64	25	51	29.044573	0.589188
1485251	1	156	53	15	226	29.786192	0.203824
1536832	8	117	39	32	164	21.230996	0.089363
1438701	3	102	100	25	289	42.18572	0.175593
1359971	0	92	84	8	324	21.86626	0.258332

PlasmaGlucose

Statistics

Mean	107.8502
Median	104.5848
Min	44
Max	192
Standard deviation	31.9209
Unique values	0
Missing values	0
Feature type	Numeric Feature

Visualizations



Modules

- A module is an algorithm that you can perform on your data.
 - A module may have a set of parameters that you can use to configure the working.
 - When you select a module on the canvas, the module's parameters are displayed in the Properties pane to the right of the canvas.
 - Modify the parameters in that pane to tune your pipeline.
 - Can set the compute resources for individual modules in the designer.
 - Modules may have one or more input and output ports.
 - Modules can be connected by drawing an edge from one port to the other.
- 
- A decorative horizontal bar at the bottom of the slide, consisting of a blue line above a purple line, both ending in small circular dots.

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Diabetes Training Pipeline

normalize

Autosave on Search canvas

Submit Publish ...

Autosaving draft

1 assets found.

Normalize Data

Microsoft Rescales numeric data to constrain dataset values to a standard range. [Learn More](https://aka.ms... 9/29/2021)

diabetes-data

Normalize Data

Transformation method * ZScore

Use 0 for constant columns when checked * True

Columns to transform * Edit column A value is required.

Output settings

Run settings

Comment

Module information

Navigator 100% 🔎 ⚡ 1:1 ⚡

29°C Sunny ⚡ 09:50

Normalization

- Normalization is a technique often applied as part of data preparation for machine learning.
- The goal of normalization is to change the values of numeric columns in the dataset to use a common scale, without distorting differences in the ranges of values or losing information.
- The difference in the scale of the numbers could cause problems when you attempt to combine the values as features during modeling.
- Normalization avoids these problems by creating new values that maintain the general distribution and ratios in the source data, while keeping values within a scale applied across all numeric columns used in the model.

Z-Score Standardization

$$z = \frac{X - \mu(X)}{\sigma(X)}$$

Min-Max Scaling

$$z = \frac{X - \min(X)}{\max(X) - \min(X)}$$

Logistic Function

$$z = \frac{1}{1 - e^{-x}}$$



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Diabetes Training Pipeline

normalize

Autosave on

Search canvas

Submit Publish ...

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Normalize Data

Transformation method: MinMax

Use 0 for constant columns when checked: True

Columns to transform: (Empty)

A value is required.

Output settings Run settings Comment Module information

Navigator 100% Search

29°C Sunny 09:52

```
graph LR; diabetes[diabetes-data] --> normalize1[Normalize Data];
```

ml-ws - Microsoft Azure Authoring - Microsoft Azure Machine Learning Studio

https://ml.azure.com/visualinterface/authoring/Normal/59216c14-ff5b-4500-ae35-fa5f76d7cd09?wsid=/subscriptions/d4fefcb7-baa8-40f1-9afc-b5474a3281b4/resourcegroups/ml-rg/workspaces/ml-ws&tid=84c31ca0-ac3b-4ea...

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Diabetes Training Pipeline

normalize

Autosave on

Search canvas

Submit Publish ...

Draft autosaved on 10/3/2021, 9:52:02 AM

1 assets found.

Columns to transform

Select columns With rules By name

Normalize Data Microsoft Rescales numeric data to a standard range. [Learn more]

Available columns

All types 2 Columns PatientID Diabetic

Add all

Selected columns

All types 8 Columns Pregnancies PlasmaGlucose DiastolicBloodPressure TricepsThickness SerumInsulin BMI

Remove all

Save Cancel

Navigator 100%

Module information

29°C Sunny 09:52

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Microsoft Azure Machine Learning Studio

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Diabetes Training Pipeline

Normalize Data

Autosave on

Search canvas

Submit Publish ...

Draft autosaved on 10/3/2021, 9:52:32 AM

Normalize Data

Transformation method * MinMax

Use 0 for constant columns when checked * True

Columns to transform * Edit column

Column names: Pregnancies,PlasmaGlucose,DiastolicBloodPressure,TricepsThickness,SerumInsulin,BMI,DiabetesPedigree,Age

Output settings

Run settings

Comment

Module information

New Home Author Notebooks Automated ML Designer Assets Datasets Experiments Pipelines Models Endpoints Manage Compute Environments (preview) Datastores Data Labeling Linked Services

Navigator 100% 🔎 🔍 1:1 ⚡

29°C Sunny ⚡ 09:52

The screenshot shows the Microsoft Azure Machine Learning Studio interface. On the left, there's a sidebar with various options like New, Home, Author, Notebooks, etc. The Designer section is selected. In the main area, a pipeline titled 'Diabetes Training Pipeline' is displayed. A 'Normalize Data' module is added to the canvas, with its input connected to a dataset named 'diabetes-data'. The pipeline canvas includes standard UI elements like a search bar, autosave toggle, and toolbar icons. To the right of the canvas is a detailed configuration pane for the 'Normalize Data' module. It specifies the transformation method as 'MinMax', sets 'Use 0 for constant columns when checked' to 'True', and lists the columns to transform as 'Pregnancies,PlasmaGlucose,DiastolicBloodPressure,TricepsThickness,SerumInsulin,BMI,DiabetesPedigree,Age'. Below this are sections for Output settings, Run settings, Comment, and Module information.

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Microsoft Azure Machine Learning Studio

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Diabetes Training Pipeline

Set up pipeline run

Experiment

Select existing Create new

New experiment name *

ml-experiment

Run description *

Diabetes Experiment

Continue on failure step

Compute target

Default mlsa-compute

Submit Cancel

Navigator 100% 🔍 1:1 ⚡

Draft autosaved on 10/3/2021, 9:52:32 AM

31°C Sunny 09:53

ml-ws - Microsoft Azure Authoring - Microsoft Azure

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Diabetes Training Pipeline

Search by name, tags and description

Autosave on

Search canvas

Running View run overview

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Anomaly Detection (2)

Web Service (2)

diabetes-data

Normalize Data

Running

Navigator 100% 🔍 1:1 ⚡

31°C Sunny ⚡ 09:55

```
graph TD; diabetes-data[diabetes-data] --> NormalizeData[Normalize Data]; subgraph Pipeline [Diabetes Training Pipeline]
```

ml-ws - Microsoft Azure Authoring - Microsoft Azure

https://ml.azure.com/visualinterface/authoring/Normal/59216c14-ff5b-4500-ae35-fa5f76d7cd09?wsid=/subscriptions/d4fefcb7-baa8-40f1-9afc-b5474a3281b4/resourcegroups/ml-rg/workspaces/ml-ws&tid=84c31ca0-ac3b-4ea...

Microsoft Azure Machine Learning Studio

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Diabetes Training Pipeline

Submit Create inference pipeline Publish ...

Search by name, tags and description

96 assets in total

Datasets (1)

Sample datasets (16)

Custom Module (0)

Data Input and Output (3)

Data Transformation (19)

Feature Selection (2)

Statistical Functions (1)

Machine Learning Algorithms (19)

Model Training (4)

Model Scoring & Evaluation (6)

Python Language (2)

R Language (1)

Text Analytics (7)

Computer Vision (6)

Recommendation (5)

Anomaly Detection (2)

Web Service (2)

Autosave on

Search canvas

Run finished View run overview

Normalize Data

Refresh Download all Enable log streaming Word wrap

Parameters Outputs + logs Details Metrics Child runs ...

Data outputs Hide data outputs

Transformation function

Transformed dataset

Other outputs

Preview data

azureml-logs

logs

module_statistics

Transformation_function

Transformed_dataset

File Explorer Pane

Navigator 100% 🔍 🔎 1:1 ⚡

ml-ws

Visual Studio Enterprise Subscription

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```
graph LR; diabetes-data[diabetes-data] --> NormalizeData[Normalize Data]; subgraph "Outputs + logs"; direction TB; TF[Transformation function]; TD[Transformed dataset]; end; subgraph "Other outputs"; direction TB; AZUREML[azureml-logs]; LOGS[logs]; MODULE[module_statistics]; TRANS[Transformation_function]; TRANSFORMED[Transformed_dataset]; end;
```

ml-ws - Microsoft Azure

Authoring - Microsoft Azure

<https://ml.azure.com/visualinterface/authoring/Normal/59216c14-ff5b-4500-ae35-fa5f76d7cd09?wsid=/subscriptions/d4fefcb7-baa8-40f1-9afc-b5474a3281b4/resourcegroups/ml-rg/workspaces/ml-ws&tid=84c31ca0-ac3b-4ea...>

Microsoft Azure Machine Learning Studio

Transformed_dataset 1

Rows ? Columns ?
10,000 10

PatientID	Pregnancies	PlasmaGlucose	DiastolicBloodPressure	TricepsThickness	SerumInsulin	BMI	DiabetesPedigreeFunction	PlasmaGlucose	
1354778	0	0.858108	0.602151	0.317647	0.011509	0.66895	0.510511	Statistics	
1147438	0.571429	0.324324	0.741935	0.470588	0.028133	0.080345	0.036123	Mean	0.4314
1640031	0.5	0.47973	0.247312	0.529412	0.026854	0.616134	0.000438	Median	0.4122
1883350	0.642857	0.398649	0.580645	0.211765	0.370844	0.300826	0.541848	Min	0
1424119	0.071429	0.277027	0.376344	0.235294	0.026854	0.645024	0.212047	Max	1
1619297	0	0.256757	0.731183	0.023529	0.305627	0.040264	0.011414	Standard deviation	0.2157
1660149	0	0.601351	0.247312	0.141176	0.272379	0.098868	0.043226	Unique values	149
1458769	0	0.155405	0.677419	0.423529	0.028133	0.002033	0.071112	Missing values	0
1201647	0.571429	0.243243	0.763441	0.305882	0.012788	0.222661	0.164558	Feature type	Numeric Feature
1403912	0.071429	0.189189	0.075269	0.388235	0.035806	0.49397	0.011648		
1943830	0.071429	0.297297	0.666667	0.047059	0.056266	0.661425	0.068467		
1824483	0.214286	0.337838	0.774194	0.282353	0.028133	0.08177	0.081391		
1848869	0.357143	0.472973	0.827957	0.423529	0.071611	0.483549	0.000516		
1669231	0.5	0.445946	0.623656	0.105882	0.038363	0.472817	0.0914		
1683688	0	0.702703	0.365591	0.047059	0.210997	0.554828	0.037231		
1738587	0.214286	0.439189	0.569892	0.458824	0.060102	0.043519	0.056802		
1884264	0.214286	0.418919	0.430108	0.211765	0.047315	0.286616	0.229878		
1485251	0.071429	0.756757	0.311828	0.094118	0.2711	0.306218	0.056567		
1536832	0.571429	0.493243	0.16129	0.294118	0.191816	0.080092	0.00509		
1438701	0.214286	0.391892	0.817204	0.211765	0.351662	0.633954	0.043871		
1359971	0	0.324324	0.645161	0.011765	0.396419	0.096883	0.081081		

Frequency

PlasmaGlucose

Training the Model



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Diabetes Training Pipeline

split

Autosave on

Search canvas

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2 assets found.

Split Data (Microsoft) Partitions the rows of a dataset into two distinct sets. [Learn More](https://aka.ms/aml/split-data) 9/29/2021

Split Image Directory (Microsoft) Partitions the images of a image directory into two distinct sets. [Learn More](https://aka.ms/a... 9/29/2021)

diabetes-data

Normalize Data

Completed

Split Data

Navigator 100% Search

Submit Publish ...

Split Data

Splitting mode * Split Rows

Fraction of rows in the first output dataset * 0.5

Randomized split * True

Random seed * 0

Stratified split * False

Output settings

Run settings

Comment

Module information

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split

2 assets found.

Split Data Microsoft Partitions the rows of a dataset into two distinct sets. [Learn More](https://aka.ms/aml/split-data) 9/29/2021

Split Image Directory Microsoft Partitions the images of a image directory into two distinct sets. [Learn More](https://aka.ms/a... 9/29/2021)

Autosave on Search canvas

diabetes-data

Normalize Data Completed

Split Data

Split Data

Navigator 100% Search

Visual Studio Enterprise Subscription ml-ws

1

Split Data

Splitting mode * Split Rows

Fraction of rows in the first output dataset * 0.6

Randomized split * True

Random seed * 123

Stratified split * False

Output settings

Run settings

Comment

Module information

31°C Sunny 09:58

```
graph TD; diabetes-data[diabetes-data] --> NormalizeData[Normalize Data]; NormalizeData --> SplitData1[Split Data]; SplitData1 --> SplitData2[Split Data]
```

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https://ml.azure.com/visualinterface/authoring/Normal/59216c14-ff5b-4500-ae35-fa5f76d7cd09?wsid=/subscriptions/d4fefcb7-baa8-40f1-9afc-b5474a3281b4/resourcegroups/ml-rg/workspaces/ml-ws&tid=84c31ca0-ac3b-4ea...

Microsoft Azure Machine Learning Studio

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Diabetes Training Pipeline

train

Autosave on

Search canvas

12 assets found.

Train Anomaly Detection Model

Train Clustering Model

Train Model

Train PyTorch Model

Train SVD Recommender

Normalize Data

Split Data

Train Model

diabetes-data

Completed

Search canvas

Navigator 100% 31°C Sunny 09:59

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```
graph TD; diabetes-data[diabetes-data] --> NormalizeData[Normalize Data]; NormalizeData --> SplitData[Split Data]; SplitData --> TrainModel[Train Model]
```

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Diabetes Training Pipeline

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two-class

Autosave on

Search canvas

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6 assets found.

Two-Class Averaged Perceptron

Two-Class Boosted Decision Tree

Two-Class Decision Forest

Two-Class Logistic Regression

Two-Class Neural Network

Normalize Data

Split Data

Train Model

diabetes-data

Completed

Untrained model: UntrainedModelDirectory

Navigator 100% 🔎 1:1 ⚡

31°C Sunny

10:00

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```
graph TD; diabetes-data[diabetes-data] --> NormalizeData[Normalize Data]; NormalizeData --> TwoClassLogisticRegression[Two-Class Logistic Regression]; NormalizeData --> SplitData[Split Data]; TwoClassLogisticRegression --> TrainModel[Train Model]; SplitData --> TrainModel
```

ml-ws - Microsoft Azure Authoring - Microsoft Azure Machine Learning Studio https://ml.azure.com/visualinterface/authoring/Normal/59216c14-ff5b-4500-ae35-fa5f76d7cd09?wsid=/subscriptions/d4fefcb7-baa8-40f1-9afc-b5474a3281b4/resourcegroups/ml-rg/workspaces/ml-ws&tid=84c31ca0-ac3b-4ea... Visual Studio Enterprise Subscription ml-ws

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Diabetes Training Pipeline

two-class

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Search canvas

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Train Model

Label column * A value is required.

Model explanations False

Output settings

Run settings

Comment

Module information

diabetes-data

Normalize Data Completed

Two-Class Logistic Regression

Split Data

Train Model

Navigator 100% Search

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```
graph TD; diabetes-data[diabetes-data] --> NormalizeData[Normalize Data]; NormalizeData --> TwoClassLogisticRegression[Two-Class Logistic Regression]; SplitData[Split Data] --> TrainModel[Train Model]; TwoClassLogisticRegression --> TrainModel;
```

ml-ws - Microsoft Azure Authoring - Microsoft Azure Machine Learning Studio https://ml.azure.com/visualinterface/authoring/Normal/59216c14-ff5b-4500-ae35-fa5f76d7cd09?wsid=/subscriptions/d4fefcb7-baa8-40f1-9afc-b5474a3281b4/resourcegroups/ml-rg/workspaces/ml-ws&tid=84c31ca0-ac3b-4ea... Visual Studio Enterprise Subscription ml-ws

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Diabetes Training Pipeline

two-class

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6 assets found.

Label column

Select a single column Column names Diabetic

Two-Class Averaged Perceptron Microsoft Creates an averaged perceptron classification model. [Learn More]

Two-Class Boosted Decision Tree Microsoft Creates a binary classifier using a boosted decision tree algorithm. [Learn More]

Two-Class Decision Forest Microsoft Creates a two-class classifier using a decision forest algorithm. [Learn More]

Two-Class Logistic Regression Microsoft Creates a two-class logistic regression model. [Learn More]

Two-Class Neural Network Microsoft Creates a binary classifier using a neural network algorithm. [Learn More]

Edit column

Save Cancel

Train Model

Navigator 100% Search

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Diabetes Training Pipeline

score

Autosave on

Search canvas

6 assets found.

Score Image Model (Microsoft) Scores predictions for a trained image model. [Learn More](https://aka.ms/aml/score-image-m... 9/29/2021)

Score Model (Microsoft) Scores predictions for a trained classification or regression model. [Learn More](https://aka.ms/a... 9/29/2021)

Score SVD Recommender (Microsoft) Score a dataset using the SVD recommendation. [Learn More](https://aka.ms/aml/score-svd-reco... 9/29/2021)

Score Vowpal Wabbit Model (Microsoft) Score data using Vowpal Wabbit from the command line interface. [Learn More](https://ak... 9/29/2021)

Score Wide and Deep Recommender (Microsoft) Score a dataset using the Wide and Deep recommendation model. [Learn More](https://ak... 9/29/2021)

Normalize Data (Completed)

Two-Class Logistic Regression

Split Data

Train Model

Score Model

Submit Publish ...

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Navigator 100% 🔎 1:1 ⚡

31°C Sunny 🌞 10:02

```
graph TD; ND[Normalize Data] --> TCR[Two-Class Logistic Regression]; TCR --> SD[Split Data]; SD --> TM[Train Model]; SD --> SM[Score Model]; TM --> SM;
```

Scoring

- Use this module to generate predictions using a trained classification or regression model.
- The score, or predicted value, can be in many different formats, depending on the model and your input data:
 - For classification models, Score Model outputs a predicted value for the class, as well as the probability of the predicted value.
 - For regression models, Score Model generates just the predicted numeric value.



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Microsoft Azure Machine Learning Studio

Visual Studio Enterprise Subscription ml-ws

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Diabetes Training Pipeline

Submit Publish ...

Search by name, tags and description

96 assets in total

Autosave on

Search canvas

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Two-Class Logistic Regression

Split Data

Train Model

Score Model

Evaluate Model

Score Image Model

Evaluate Model

Navigator 100% 🔎 1:1 ⚡

31°C Sunny ⚡ 10:03

The screenshot shows the Microsoft Azure Machine Learning Studio interface. On the left, a sidebar lists various workspace management and development tools. The main area is titled "Diabetes Training Pipeline" and displays a visual workflow diagram. The pipeline consists of several components connected by arrows: "Split Data" feeds into "Train Model" and "Score Model". "Train Model" feeds into "Score Model". "Score Model" feeds into "Evaluate Model". "Assign Data to Clusters" and "Cross Validate Model" are listed as assets in the sidebar, along with other components like "Evaluate Model", "Score Image Model", and "Score Model". The "Designer" section is currently selected in the sidebar.

Model Evaluation

- Use Evaluate Model module to measure the accuracy of a trained model. You provide a dataset containing scores generated from a model, and the Evaluate Model module computes a set of industry-standard evaluation metrics.
- The metrics returned by Evaluate Model depend on the type of model that you are evaluating.
 - Classification Models: Accuracy, Precision, Recall, F1 Score, AUC.
 - Regression Models: MAE, RMSE, RAE, RSE, R^2 (Coefficient of Determination)
 - Clustering Models: Avg. Distance to Other Center, Cluster Center, Maximal Distance to Cluster Center, Combined Evaluation Score



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Microsoft Azure Machine Learning Studio

Home > Designer > Authoring

» Diabetes Training Pipeline

Submit Create inference pipeline Publish ...

Autosave on Search canvas

Run finished View run overview

Score Model

Refresh Download all Enable log streaming

Parameters Outputs + logs Details Metrics Child runs ...

Data outputs Hide data outputs

Scored dataset Preview data

Other outputs

70_driver_log.txt

azureml-logs

55_azureml-execution-tvmps_64153864935c...
65_job_prep-tvmps_64153864935c89a082fb5...

75_job_post-tvmps_64153864935c89a082fb5...
process_info.json
process_status.json

logs

module_statistics

Scored_dataset

Navigator 100%

31°C Sunny 10:13

New Home Author Notebooks Automated ML Designer Assets Datasets Experiments Pipelines Models Endpoints Manage Compute Environments (preview) Datastores Data Labeling Linked Services

```
graph TD; A[Two-Class Logistic Regression] --> B[Split Data]; B --> C[Train Model]; C --> D[Score Model]; D --> E[Evaluate Model]; E --> F[Score Model];
```

The screenshot shows the Microsoft Azure Machine Learning Studio Designer interface. On the left, the 'Designer' section is selected in the navigation bar. The main workspace displays a 'Diabetes Training Pipeline' with the following components and flow:

- Two-Class Logistic Regression**: Completed.
- Split Data**: Completed. This component has two outgoing paths: one to **Train Model** and one to **Score Model**.
- Train Model**: Completed. This component has one outgoing path to **Score Model**.
- Score Model**: Completed. This component has one outgoing path to **Evaluate Model**.
- Evaluate Model**: Completed. This component has one outgoing path back to the second output of the **Score Model** component.

The right side of the screen shows the results of the last run, specifically the **Score Model** results. It includes tabs for Parameters, Outputs + logs (which is selected), Details, Metrics, and Child runs. Under **Outputs + logs**, the **Data outputs** section lists a **Scored dataset** and a **Other outputs** section containing files like **70_driver_log.txt**, **azureml-logs**, and several JSON files. The **70_driver_log.txt** file is currently selected.

ml-ws - Microsoft Azure Authoring - Microsoft Azure Machine Learning Studio https://ml.azure.com/visualinterface/authoring/Normal/59216c14-ff5b-4500-ae35-fa5f76d7cd09?wsid=/subscriptions/d4fefcb7-baa8-40f1-9afc-b5474a3281b4/resourcegroups/ml-rg/workspaces/ml-ws&tid=84c31ca0-ac3b-4ea... Visual Studio Enterprise Subscription ml-ws

Microsoft Azure Machine Learning Studio

Home > Designer > Authoring

» Diabetes Training Pipeline

Submit Create inference pipeline Publish ...

Autosave on Search canvas

Run finished View run overview

Scored_dataset

Rows 4,000 Columns 12

Age	Diabetic	Scored Labels	Scored Probabilities
0	0	0	0.150297
0.196429	1	0	0.206807
0.035714	0	0	0.16729
0.017857	1	0	0.102059
0.160714	1	1	0.567711
0.071429	0	0	0.130053
0.017857	1	0	0.374001
0.017857	0	0	0.019849
0.464286	1	1	0.715883
0.089286	0	0	0.028276
0.071429	0	1	0.628406
0.053571	0	1	0.797928
0.017857	0	0	0.066645
0.392857	1	1	0.64821
0.053571	0	0	0.222312

To view, select a column in the table

Two-Class Logistic Regression Completed

Split Data Completed

Train Model Completed

Score Model Completed

Evaluate Model Completed

Navigator 100%

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Windows Taskbar Icons

```
graph TD; A[Two-Class Logistic Regression] --> B[Split Data]; B --> C[Train Model]; C --> D[Score Model]; D --> E[Evaluate Model]; E --> F[Scored_dataset]
```

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Microsoft Azure Machine Learning Studio

Home > Designer > Authoring

Diabetes Training Pipeline

Submit Create inference pipeline Publish ...

Autosave on Search canvas Run finished View run overview

Two-Class Logistic Regression (Completed)

Split Data (Completed)

Train Model (Completed)

Score Model (Completed)

Evaluate Model (Completed)

Evaluate Model

Refresh Download all Enable log streaming Word wrap

Parameters Outputs + logs Details Metrics Child runs ...

Data outputs Hide data outputs

Evaluation results

Other outputs

70_driver_log.txt

70_drive

azureml-logs

55_azureml-execution-tvmps_64153864935c89...

65_job_prep-tvmps_64153864935c89a082fb5d7...

75_job_post-tvmps_64153864935c89a082fb5d7...

logs

module_statistics

Evaluation_results

310 2021/

311 2021/

312 Info: }

313 }

314 2021/

315 2021/

316 Info: }

317 }

318 2021/

319 Stoppe

320 Origina

321 Filter

322 2021/

323 2021/

324 2021/

Navigator 100% 1:1

31°C Sunny 10:13

```
graph TD; A[Two-Class Logistic Regression] --> B[Split Data]; B --> C[Train Model]; C --> D[Score Model]; D --> E[Evaluate Model];
```

ml-ws - Microsoft Azure Authoring - Microsoft Azure

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Microsoft Azure Machine Learning Studio

Evaluation_results

Scored dataset (left port)

ROC curve

Precision-recall curve

Lift curve

True positive rate

False positive rate

Precision

Recall

Number of true positives

Positive rate

Threshold: 0.5

Actual

Predicted

Accuracy: 0.786

Precision: 0.708

Recall: 0.593

F1 Score: 0.645

AUC: 0.861

Score bin ↓

Positive exam...

Negative exam...

Fraction above thresh...

Accuracy

F1 Score

Precisi...

Recall

Negative precisi...

Negative recall

Cumulative AUC

(0.900,1.000] 122 11 0.033 0.700 0.169 0.917 0.093 0.692 0.996 0.000

31°C Sunny

Visual Studio Enterprise Subscription ml-ws

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1 🔍 ⚙️ ? 😊 Visual Studio Enterprise Subscription ml-ws

Microsoft Azure Machine Learning Studio

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Diabetes Training Pipeline

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Submit Publish ...

Two-Class Logistic Regression (Completed)

Split Data (Completed)

Two-Class Boosted Decision Tree

Train Model (Completed)

Train Model

Score Model (Completed)

Score Model

Evaluate Model (Completed)

Diagram description: This screenshot shows the 'Diabetes Training Pipeline' in the Microsoft Azure Machine Learning Studio. The pipeline consists of several steps connected by arrows. It starts with a 'Split Data' step (Completed) which splits the data into two paths. The left path contains a 'Two-Class Logistic Regression' step (Completed) followed by a 'Train Model' step (Completed). The right path contains a 'Two-Class Boosted Decision Tree' step (Completed) followed by another 'Train Model' step. Both 'Train Model' steps then feed into their respective 'Score Model' steps (Completed), which finally converge at an 'Evaluate Model' step (Completed) at the bottom.

Navigator 100% 🔎 1:1 ⚡

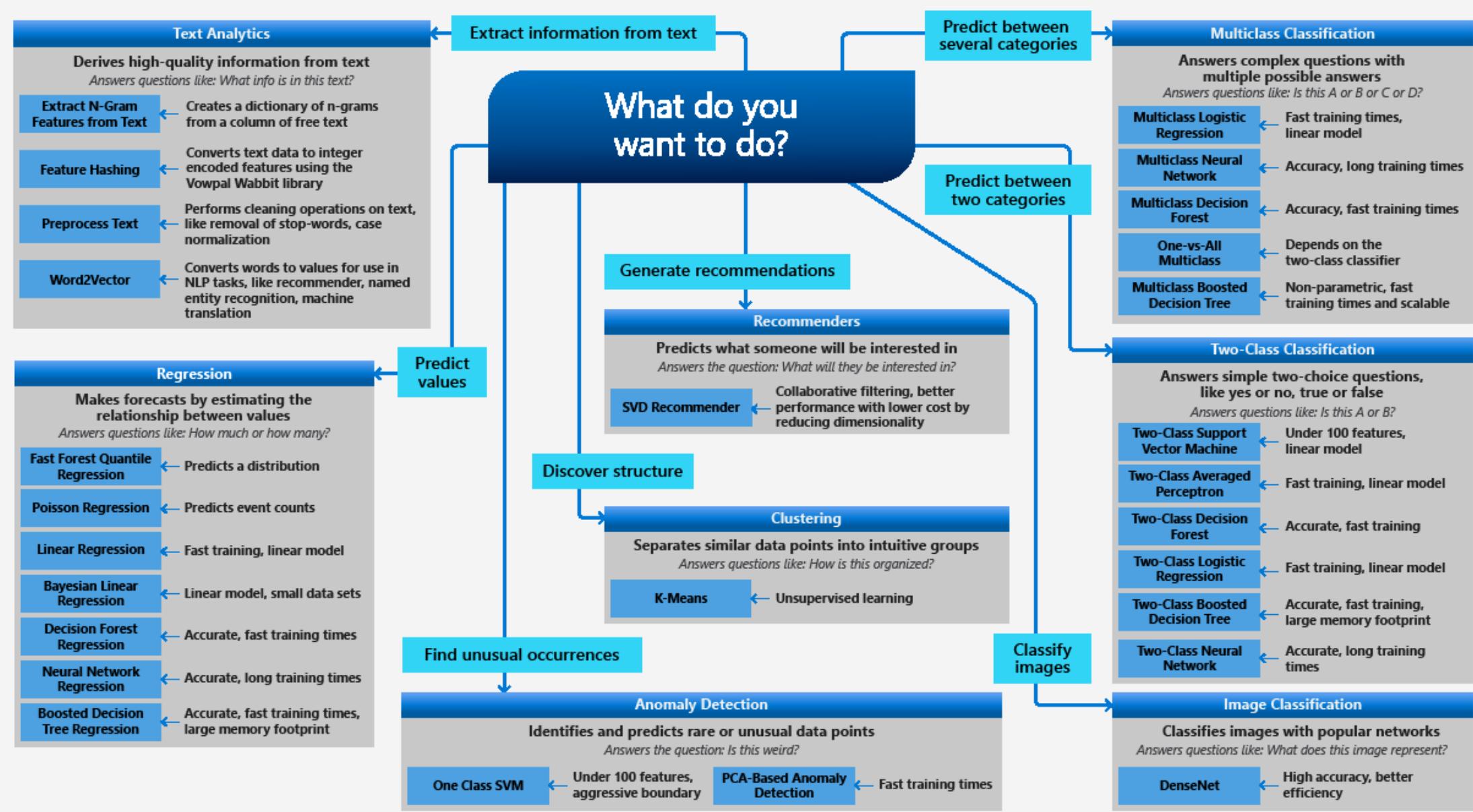
31°C Sunny 🌞 10:17



Microsoft Azure

Machine Learning Algorithm Cheat Sheet

This cheat sheet helps you choose the best machine learning algorithm for your predictive analytics solution. Your decision is driven by both the nature of your data and the goal you want to achieve with your data.



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https://ml.azure.com/visualinterface/authoring/Normal/59216c14-ff5b-4500-ae35-fa5f76d7cd09?wsid=/subscriptions/d4fefcb7-baa8-40f1-9afc-b5474a3281b4/resourcegroups/ml-rg/workspaces/ml-ws&tid=84c31ca0-ac3b-4ea...

Microsoft Azure Machine Learning Studio

Home > Designer > Authoring

Diabetes Training Pipeline

Submit Create inference pipeline Publish ...

Autosave on Search canvas Run finished View run overview

Evaluate Model

Refresh Download all Enable log streaming Word wrap

Parameters Outputs + logs Details Metrics Child runs ...

Data outputs Hide data outputs Evaluation results

Other outputs

70_driver_log.txt

70_drive

azureml-logs

55_azureml-execution-tvmps_64153864935c...

65_job_prep-tvmps_64153864935c89a082fb5...

75_job_post-tvmps_64153864935c89a082fb5...

process_info.json

process_status.json

logs

module_statistics

Evaluation_results

Navigator 100% 31°C Light rain 10:26

```
graph TD; SD[Split Data] --> T1[Two-Class Boosted Decision Tree]; SD --> TM1[Train Model]; SD --> TM2[Train Model]; TM1 --> SM1[Score Model]; TM2 --> SM2[Score Model]; SM1 --> EM[Evaluate Model]; SM2 --> EM;
```

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Microsoft Azure Machine Learning Studio

Evaluation_results

Left port Right port

Scored dataset (left port) Scored dataset to compare (right port)

ROC curve

Precision-recall curve

Lift curve

True positive rate

False positive rate

Precision

Recall

Number of true positives

Positive rate

Threshold 0.5

Actual

Predicted

Accuracy 0.786

Precision 0.708

Recall 0.593

F1 Score 0.645

AUC 0.861

Score bin ↓ Positive exam... Negative exam... Fraction above thresh... Accuracy F1 Score Precisi... Recall Negative precisi... Negative recall Cumulative AUC

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ml-ws

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1

?

Smile

Windows Taskbar

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Microsoft Azure Machine Learning Studio

Evaluation_results

Left port Right port

Scored dataset (left port) Scored dataset to compare (right port)

ROC curve

Precision-recall curve

Lift curve

True positive rate

False positive rate

Precision

Recall

Number of true positives

Positive rate

Threshold 0.5

Actual

1 0

1 1218 79

0 95 2608

Accuracy 0.957

Precision 0.939

Recall 0.928

F1 Score 0.933

AUC 0.99

Score bin ↓ Positive exam... Negative exam... Fraction above thresh... Accuracy F1 Score Precisi... Recall Negative precisi... Negative recall Cumulative AUC

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10:27

Making Predictions



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Microsoft Azure Machine Learning Studio

ml.azure.com says
Current training pipeline has more than one trained model. Please select one Train Model module to create inference pipeline.

OK

Submit Create inference pipeline Publish ...

Real-time inference pipeline Run finished View run overview

Batch inference pipeline

Autosave on Search canvas

Diabetes Training Pipeline

Session Split Data Two-Class Boosted Decision Tree

Train Model Train Model

Score Model Score Model

Evaluate Model

New Home Author Notebooks Automated ML Designer Assets Datasets Experiments Pipelines Models Endpoints Manage Compute Environments (preview) Datastores Data Labeling Linked Services

Navigator 100% 1:1

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```
graph TD; SD[Split Data] --> TM1[Train Model]; SD --> TM2[Train Model]; TM1 --> SM1[Score Model]; TM2 --> SM2[Score Model]; SM1 --> EM[Evaluate Model]; SM2 --> EM;
```

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Home > Designer > Authoring

Training pipeline Real-time inference pipeline

» Diabetes Training Pipeline-real time inference

Autosave on Search canvas

Not started

TD-Diabetes_Training_Pipeline-Normal... diabetes-data Web Service Input

MD-Diabetes_Training_Pipeline-Train_M... Apply Transformation

Score Model

Web Service Output Evaluate Model

Navigator 100% 🔎 🔍 1:1 ⚡

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Training pipeline Real-time inference pipeline

Predict Diabetes

Autosave on Search canvas

Draft autosaved on 10/3/2021, 10:29:09 AM

Submit Deploy ...

```
graph TD; TD[TD-Diabetes_Training_Pipeline-Normal...]; diabetes[diabetes-data]; TD --> MD[MD-Diabetes_Training_Pipeline-Train_M...]; diabetes --> AT[Apply Transformation]; MD --> SM[Score Model]; AT --> SM; SM --> WS[Web Service Output]; SM --> EM[Evaluate Model]; WS --> DraftDetails[Draft details]
```

Settings

Default compute target

Select compute type Compute instance

Select Azure ML compute instance mlsa-compute - Running

Create Azure ML compute instance Refresh Compute

Pipeline parameters

No parameters selected

Default output settings

workspaceblobstore
Select default datastore

Draft details

Draft name

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Training pipeline Real-time inference pipeline

Predict Diabetes

manual

Autosave on

Search canvas

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1 assets found.

Enter Data Manually Microsoft Enables entering and editing small datasets by typing values. [Learn More](https://aka.ms/aml/e...) 9/29/2021

diabetes-data

TD-Diabetes_Training_Pipeline-Normali...

Enter Data Manually

Web Service Input

MD-Diabetes_Training_Pipeline-Train_M...

Apply Transformation

Score Model

Web Service Output

Evaluate Model

Navigator 100% 🔍 🔎 1:1 ⚡

```
graph TD; diabetes[diabetes-data] --> TD[TD-Diabetes_Training_Pipeline-Normali...]; TD --> EnterData[Enter Data Manually]; EnterData --> MD[MD-Diabetes_Training_Pipeline-Train_M...]; MD --> Apply[Apply Transformation]; Apply --> Score[Score Model]; Score --> WebOutput[Web Service Output]; Score --> Evaluate[Evaluate Model]
```

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Training pipeline Real-time inference pipeline

Predict Diabetes

manual

Autosave on

Search canvas

Enter Data Manually

TD-Diabetes_Training_Pipeline-Normali...

MD-Diabetes_Training_Pipeline-Train_M...

Score Model

Web Service Output

Enter Data

Apply Transform

Evaluate

Submit Deploy ...

1 assets found.

Enter Data Manually

Microsoft

Enables entering and editing small datasets by typing values. [Learn More](https://aka.ms/aml/e... 9/29/2021

Data format CSV

Has header True

Data

	PatientID	Pregnancies	PlasmaGlucose	DiastolicBloodPressure	SkinThickness	Insulin	BreastDensity	Age	Outcome
1	1882185	9	104	51	7	24	27.36983156	1.350472047	43
2	1662484	6	73	61	35	24	18.74367404	1.074147566	75
3	1228510	4	115	50	29	243	34.69215364	0.741159926	59
4									

Navigator 100% Search

31°C Light rain 10:30

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Training pipeline Real-time inference pipeline

Predict Diabetes

Submit Deploy ...

manual

Autosave on

Search canvas

1 assets found.

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TD-Diabetes_Training_Pipeline-Normali... Enter Data Manually Web Service Input

MD-Diabetes_Training_Pipeline-Train_M... Apply Transformation

Score Model

Web Service Output Evaluate Model

Navigator 100% 🔎 1:1 ⚡

31°C Light rain 🌧 10:31

```
graph TD; A[TD-Diabetes_Training_Pipeline-Normali...]; B[Enter Data Manually]; C[Web Service Input]; D[MD-Diabetes_Training_Pipeline-Train_M...]; E[Apply Transformation]; F[Score Model]; G[Web Service Output]; H[Evaluate Model]; B --> E; C --> E; D --> E; E --> F; F --> G; F --> H;
```

ml-ws - Microsoft Azure x Authoring - Microsoft Azure Map x + https://ml.azure.com/visualinterface/authoring/Normal/f9548355-f19e-465c-9b0a-7e2071c6b5bc?wsid=/subscriptions/d4fefcb7-baa8-40f1-9afc-b5474a3281b4/resourcegroups/ml-rg/workspaces/ml-ws&tid=84c31ca0-ac3b-4e... 🔍 ⭐ 🌐 🏷️ 🎯 ... Microsoft Azure Machine Learning Studio 1 🔍 🚪 ? 😊 Visual Studio Enterprise Subscription ml-ws

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Training pipeline Real-time inference pipeline

Predict Diabetes

script

Autosave on

Search canvas

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4 assets found.

Execute Python Script

Microsoft

Executes a Python script from an Azure Machine Learning designer pipeline. [Learn More](https://...)

9/29/2021

Execute R Script

Microsoft

Executes an R script from an Azure Machine Learning designer pipeline. [Learn More](https://...)

9/29/2021

Create Python Model

Microsoft

Creates Python model using custom script. [Learn More](https://aka.ms/aml/create-python-model)

9/29/2021

Summarize Data

Microsoft

Generates a basic descriptive statistics report for the columns in a dataset. [Learn More](https://ak...)

9/29/2021

MD-Diabetes_Training_Pipeline-Train_M...

Apply Transformation

Score Model

Execute Python Script

Web Service Output

Submit Deploy ...

Navigator 100% 🔍 🔎 1:1 ⚡

```
graph TD; A[MD-Diabetes_Training_Pipeline-Train_M...] --> B[Apply Transformation]; A --> C[Score Model]; B --> D[Execute Python Script]; C --> D; D --> E[Web Service Output]
```

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Training pipeline Real-time inference pipeline

>> Predict Diabetes

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MD-Diabetes_Training_Pipeline-Train_M... Apply Transform Score Model Execute Python Script Web Service Output

Submit Deploy ...

Execute Python Script

Python script *

```
2 # The script MUST contain a function named azureml_main
3 # which is the entry point for this module.
4
5 # imports up here can be used to
6 import pandas as pd
7
8 # The entry point function MUST have two input arguments.
9 # If the input port is not connected, the corresponding
10 # dataframe argument will be None.
11 # Param<dataframe1>: a pandas.DataFrame
12 # Param<dataframe2>: a pandas.DataFrame
13 def azureml_main(dataframe1 = None, dataframe2 = None):
14
15     # Execution logic goes here
16     print(f'Input pandas.DataFrame #1: {dataframe1}')
17
18     # If a zip file is connected to the third input port,
19     # it is unzipped under "./Script Bundle". This directory is added
20     # to sys.path. Therefore, if your zip file contains a Python file
21     # mymodule.py you can import it using:
22     # import mymodule
```

Edit code

Navigator 100%

31°C Light rain 10:32

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Microsoft Azure Machine Learning Studio

Home > Designer > Authoring

Trainin

Python script

```
1 # The script MUST contain a function named azureml_main
2 # which is the entry point for this module.
3
4
5 # imports up here can be used to
6 import pandas as pd
7
8 # The entry point function MUST have two input arguments.
9 # If the input port is not connected, the corresponding
10 # dataframe argument will be None.
11 # Param<dataframe1>: a pandas.DataFrame
12 # Param<dataframe2>: a pandas.DataFrame
13 def azureml_main(dataframe1 = None, dataframe2 = None):
14     scored_results = dataframe1[['PatientID', 'Scored Labels', 'Scored Probabilities']]
15     scored_results.rename(columns={'Scored Labels':'DiabetesPrediction',
16                               'Scored Probabilities':'Probability'},
17                           inplace=True)
18     return scored_results,
19
20
```

Submit Deploy ...

ft autosaved on 10/3/2021, 10:33:12 AM

name1 = None, dataframe1 = None
goes here
es.DataFrame #1: {dataframe1'})
connected to the third input p
nder "./Script Bundle". This di
re before, if your zip file contai
can import it using:
be of a sequence of pandas.Da
rn value: return dataframe1,
values: return dataframe1, data
dataframe1[['PatientID', 'Scored
ame(columns={'Scored Labels': 'D
'Scored Probabilities'
inplace=True)
ts,

save cancel

Navigator 100% Edit code

31°C Light rain 10:33

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Training pipeline Real-time inference pipeline

Predict Diabetes

Autosave on

Search by name, tags and description

Search canvas

Draft autosaved on 10/3/2021, 10:34:05 AM

98 assets in total

TD-Diabetes_Training_Pipeline-Normali...

Enter Data Manually

Web Service Input

MD-Diabetes_Training_Pipeline-Train_M...

Apply Transformation

Score Model

Execute Python Script

Web Service Output

Submit Deploy ...

Navigator 100% 1:1

31°C Light rain 10:34

```
graph TD; TD[TD-Diabetes_Training_Pipeline-Normali...]; EM[Enter Data Manually]; AT[Apply Transformation]; MD[MD-Diabetes_Training_Pipeline-Train_M...]; SM[Score Model]; EPS[Execute Python Script]; WSO[Web Service Output]; TD --> EM; MD --> EM; EM --> AT; AT --> SM; AT --> EPS; MD --> AT; AT --> SM; SM --> EPS; EPS --> WSO
```

ml-ws - Microsoft Azure Authoring - Microsoft Azure Machine Learning Studio https://ml.azure.com/visualinterface/authoring/Normal/f9548355-f19e-465c-9b0a-7e2071c6b5bc?wsid=/subscriptions/d4fefcb7-baa8-40f1-9afc-b5474a3281b4/resourcegroups/ml-rg/workspaces/ml-ws&tid=84c31ca0-ac3b-4e... Visual Studio Enterprise Subscription ml-ws

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Training pipeline Real-time inference pipeline

Set up pipeline run

Experiment

Select existing Create new

Existing experiment * ml-experiment

Run description * Predict Diabetes

Continue on failure step

Compute target

Default mlsa-compute

Submit Cancel

Web Service Input

Web Service Output

Navigator 100% 🔍 1:1 ⚡

31°C Light rain 🌧 10:34

```
graph LR; WSInput[Web Service Input] --> WSOutput[Web Service Output]
```

ml-ws - Microsoft Azure Authoring - Microsoft Azure Machine Learning Studio Visual Studio Enterprise Subscription ml-ws

Home > Designer > Authoring

Training pipeline Real-time inference pipeline

Predict Diabetes ⚙️

Autosave on ⌚ ↶ ↷ trash undo redo refresh Search canvas

Run finished View run overview

Scored_dataset X

Rows ② Columns ② 3 11

serumInsulin	BMI	DiabetesPedigree	Age	Scored Labels	Scored Probabilities
012788	0.24235	0.572251	0.392857	1	0.988365
012788	0.014349	0.447979	0.964286	0	0.001042
292839	0.435889	0.298224	0.678571	1	0.992909

To view, select a column in the table

MD-Diabetes_Training_Pipeline-Train_M... ⋮

Apply Transformation ⌚ Completed

Score Model ⌚ Completed

Execute Python Script ⌚ Completed

Web Service Output ⌚

Navigator 100% 🔍 🔍 ⌚ ⌚

32°C Light rain /weather 10:54

```
graph TD; A[MD-Diabetes_Training_Pipeline-Train_M...] --> B[Apply Transformation]; B --> C[Score Model]; C --> D[Execute Python Script]; D --> E[Web Service Output]
```

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https://ml.azure.com/visualinterface/authoring/Normal/f9548355-f19e-465c-9b0a-7e2071c6b5bc?wsid=/subscriptions/d4fefcb7-baa8-40f1-9afc-b5474a3281b4/resourcegroups/ml-rg/workspaces/ml-ws&tid=84c31ca0-ac3b-4e...

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Training pipeline Real-time inference pipeline

Predict Diabetes

Autosave on Search canvas

Run finished View run overview

Submit Deploy ...

MD-Diabetes_Training_Pipeline-Train_M...

Apply Transformation Completed

Score Model Completed

Execute Python Script Completed

Web Service Output

Result_Dataset Scored_dataset

Rows ② Columns ② 3 3

PatientID	DiabetesPrediction	Probability
1882185	1	0.988365
1662484	0	0.001042
1228510	1	0.992909

To view, select a column in the table

Navigator 100%

32°C Light rain 10:54

ml-ws

Deploying Models



Azure ML Endpoints

- An endpoint is an HTTPS endpoint that clients can call to receive the inferencing (scoring) output of a trained model.
- It provides:
 - Authentication using "key & token" based authentication.
 - SSL termination
 - Traffic allocation/Load-balancing between deployments
 - A stable scoring URI (endpoint-name.region.inference.ml.azure.com)
- A deployment is a set of compute resources hosting the model that performs the actual inferencing. It contains:
 - Model details (code, model, environment)
 - Compute resource and scale settings
 - Advanced settings (like request and probe settings)



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https://ml.azure.com/visualinterface/authoring/Normal/f9548355-f19e-465c-9b0a-7e2071c6b5bc?wsid=/subscriptions/d4fefcb7-baa8-40f1-9afc-b5474a3281b4/resourcegroups/ml-rg/workspaces/ml-ws&tid=84c31ca0-ac3b-4e...

Microsoft Azure Machine Learning Studio

Home > Designer > Authoring

Training pipeline Real-time inference

>> Predict Diabetes

Autosave on

Set up real-time endpoint

Deploy new real-time endpoint Replace an existing real-time endpoint

Name * ml-endpoint

Description Diabetes Prediction Endpoint

Compute type * Azure Container Instance

Advanced

Deploy Cancel

Web Service Input

Web Service Output

Navigator 100% 1:1

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Submit Deploy ...

Run finished View run overview

32°C Light rain

10:55

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Deploy: Waiting real-time endpoint creation

Training pipeline Real-time inference pipeline

Predict Diabetes

Submit Deploy ...

Autosave on

Search canvas

Run finished View run overview

TD-Diabetes_Training_Pipeline-Normali...

Enter Data Manually Completed

Web Service Input

MD-Diabetes_Training_Pipeline-Train_M...

Apply Transformation Completed

Score Model Completed

Apply Transformation

Execute Python Script Completed

Navigator 100%

Visual Studio Enterprise Subscription ml-ws

32°C Light rain 10:56

```
graph TD; TD[TD-Diabetes_Training_Pipeline-Normali...]; Enter[Enter Data Manually  
Completed]; WS[Web Service Input]; MD[MD-Diabetes_Training_Pipeline-Train_M...]; AT1[Apply Transformation  
Completed]; Score[Score Model  
Completed]; AT2[Apply Transformation]; Exec[Execute Python Script  
Completed]; TD --> AT1; Enter --> AT1; MD --> AT2; AT1 --> Score; AT2 --> Score; Score --> Exec; Exec --> AT2
```

ml-ws - Microsoft Azure ml-endpoint - Microsoft Azure

https://ml.azure.com/endpoints/lists/realtimeendpoints/ml-endpoint/detail?wsid=/subscriptions/d4fefcb7-baa8-40f1-9afc-b5474a3281b4/resourcegroups/ml-rg/workspaces/ml-ws&tid=84c31ca0-ac3b-4eae-ad11-519d80233e6f

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1 🔍 ⚙️ ? 😊 Visual Studio Enterprise Subscription ml-ws

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Home > Endpoints > ml-endpoint

ml-endpoint

Details Test Consume Deployment logs

Attributes

Service ID
ml-endpoint

Description
Diabetes Prediction Endpoint

Deployment state
Healthy ⓘ

Compute type
Container instance

Created by
Sudipto Ghosh

Model ID
[amlstudio-ml-endpoint:1](#)

Created on
10/3/2021 10:55:56 AM

Last updated on
10/3/2021 10:55:56 AM

Image ID
--

REST endpoint
<http://9dbc7c50-f5fd-44b9-bb87-fa2484acb8c7.eastus2.azurecontainer.io/score>

Tags

CreatedByAMLStudio
true

Properties

LinkedPipelineDraftId
f9548355-f19e-465c-9b0a-7e2071c6b5bc

LinkedPipelineRunId
fd667bad-e7c1-451b-ab07-8e3a74b6ff5e

hasInferenceSchema
True

hasHttps
False

32°C Light rain 11:10

ml-ws - Microsoft Azure ml-endpoint - Microsoft Azure

https://ml.azure.com/endpoints/lists/realtimeendpoints/ml-endpoint/test?wsid=/subscriptions/d4fefcb7-baa8-40f1-9afc-b5474a3281b4/resourcegroups/ml-rg/workspaces/ml-ws&tid=84c31ca0-ac3b-4eae-ad11-519d80233e6f

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1

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Linked Services

Home > Endpoints > ml-endpoint

ml-endpoint

Details Test Consume Deployment logs

Input data to test real-time endpoint Test

Select editor type Form editor JSON editor

WebServiceInput0 CSV

PatientID: 1882185

Pregnancies: 9

PlasmaGlucose: 104

DiastolicBloodPressure: 51

TricepsThickness: 7

Test result

WebServiceOutput0

key	value
PatientID	1882185
DiabetesPrediction	1
Probability	0.9883647682153893

parsed raw

32°C Light rain 11:10

ml-ws - Microsoft Azure ml-endpoint - Microsoft Azure + https://ml.azure.com/endpoints/lists/realtimeendpoints/ml-endpoint/test?wsid=/subscriptions/d4fefcb7-baa8-40f1-9afc-b5474a3281b4/resourcegroups/ml-rg/workspaces/ml-ws&tid=84c31ca0-ac3b-4eae-ad11-519d80233e6f Visual Studio Enterprise Subscription ml-ws

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Home > Endpoints > ml-endpoint

ml-endpoint

Details Test Consume Deployment logs

Input data to test real-time endpoint

Test result

parsed **raw**

Select editor type

Form editor JSON editor

{ "Inputs": { "WebServiceInput0": [{ "PatientID": 1882185, "Pregnancies": 9, "PlasmaGlucose": 104, "DiastolicBloodPressure": 51, "TricepsThickness": 7, "SerumInsulin": 24, "BMI": 27.36983156, "DiabetesPedigree": 1.3504720469999998, "Age": 43 }, { "PatientID": 1662484, "Pregnancies": 6, "PlasmaGlucose": 73, "DiastolicBloodPressure": 61, "TricepsThickness": 35, "SerumInsulin": 24, "BMI": 18.74367404, "DiabetesPedigree": 1.074147566, "Age": 31 }] } }

{ "Results": { "WebServiceOutput0": [{ "PatientID": 1882185, "DiabetesPrediction": 1, "Probability": 0.9883647682153893 }, { "PatientID": 1662484, "DiabetesPrediction": 0, "Probability": 0.001041963447437255 }, { "PatientID": 1228510, "DiabetesPrediction": 1, "Probability": 0.9929091204831704 }] } }

32°C Light rain 11:11

ml-ws - Microsoft Azure ml-endpoint - Microsoft Azure + https://ml.azure.com/endpoints/lists/realtimeendpoints/ml-endpoint/consume?wsid=subscriptions/d4fefcb7-baa8-40f1-9afc-b5474a3281b4/resourcegroups/ml-rg/workspaces/ml-ws&tid=84c31ca0-ac3b-4eae-ad11-519d8023... Visual Studio Enterprise Subscription ml-ws

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Home > Endpoints > ml-endpoint

ml-endpoint

Details Test **Consume** Deployment logs

Basic consumption info

REST endpoint
http://9dbc7c50-f5fd-44b9-bb87-fa2484acb8c7.eastus2.azurecontainer.io/score 

Authentication

Primary key
pxCgp9G7Coe5aeX8Pw4LS2yT6ksqJrDp  Regenerate
Secondary key
jWas7XgknSksJMq1oLWqYqDNaeDVmDj  Regenerate

Consumption option

Consumption types

C# Python R

```
1 import urllib.request
2 import json
3 import os
4 import ssl
5
6 def allowSelfSignedHttps(allowed):
7     # bypass the server certificate verification on client side
8     if allowed and not os.environ.get('PYTHONHTTPSVERIFY', '') and getattr(ssl, '_create_u
9         ssl._create_default_https_context = ssl._create_unverified_context
10
```

Integrating Applications



Overview

POST http://9dbc7c50-... ●



...

No Environment



http://9dbc7c50-f5fd-44b9-bb87-fa2484acb8c7.eastus2.azurecontainer.io/score

Save



POST http://9dbc7c50-f5fd-44b9-bb87-fa2484acb8c7.eastus2.azurecontainer.io/score

Send



Params Auth ● Headers (8) Body ● Pre-req. Tests Settings

...

Response



raw JSON

Beautify

```
1 {  
2   "Inputs": {  
3     "WebServiceInput0": [  
4       {  
5         "PatientID": "1882185",  
6         "Pregnancies": "9",  
7         "PlasmaGlucose": "104",  
8         "DiastolicBloodPressure": "51",  
9         "TricepsThickness": "7",  
10        "SerumInsulin": "24",  
11        "BMI": "27.36983156",  
12        "DiabetesPedigree": "1.3504720469999998",  
13        "Age": "43"  
14      }  
15    ]  
16  },  
17  "GlobalParameters": {}  
18}  
19
```



Click Send to get a response



Overview

POST http://9dbc7c50-...

+ ...

No Environment



http://9dbc7c50-f5fd-44b9-bb87-fa2484acb8c7.eastus2.azurecontainer.io/score

Save



POST

http://9dbc7c50-f5fd-44b9-bb87-fa2484acb8c7.eastus2.azurecontainer.io/score

Send



Params Auth ● Headers (8) Body ● Pre-req. Tests Settings

...

Response



Type

Bearer Token



The authorization header will be automatically generated when you send the request.

[Learn more about authorization ↗](#)

Token

pXcgp9G7Coe5aeX8Pw4LS2yT6ksq...



Click Send to get a response

Overview

POST http://9dbc7c50-... ●

+

...

No Environment

▼

...



http://9dbc7c50-f5fd-44b9-bb87-fa2484acb8c7.eastus2.azurecontainer.io/score

Save

</>



POST http://9dbc7c50-f5fd-44b9-bb87-fa2484acb8c7.eastus2.azurecontainer.io/score

Send

▼

...



Params Auth ● Headers (8) Body ● Pre-req. Tests Settings

...

Body

200 OK 912 ms 408 B Save Response



raw

JSON

Beautify

Pretty

Raw

Preview

Visualize

JSON

```
1 {  
2   "Inputs": {  
3     "WebServiceInput0": [  
4       {  
5         "PatientID": "1882185",  
6         "Pregnancies": "9",  
7         "PlasmaGlucose": "104",  
8         "DiastolicBloodPressure": "51",  
9         "TricepsThickness": "7",  
10        "SerumInsulin": "24",  
11        "BMI": "27.36983156",  
12        "DiabetesPedigree": "1.3504720469999998",  
13        "Age": "43"  
14      }  
15    ]  
16  },  
17  "GlobalParameters": {}  
18}  
19
```

```
1 {  
2   "Results": {  
3     "WebServiceOutput0": [  
4       {  
5         "PatientID": 1882185.0,  
6         "DiabetesPrediction": 1.0,  
7         "Probability": 0.9883647682153893  
8       }  
9     ]  
10   }  
11 }  
12 }
```

Microsoft Azure Machine Learning Studio

Visual Studio Enterprise Subscription
ml-ws

- New
- Home
- Author
- Notebooks
- Automated ML
- Designer
- Assets
- Datasets
- Experiments
- Pipelines
- Models
- Endpoints
- Manage
- Compute
- Environments (preview)
- Datastores
- Data Labeling
- Linked Services

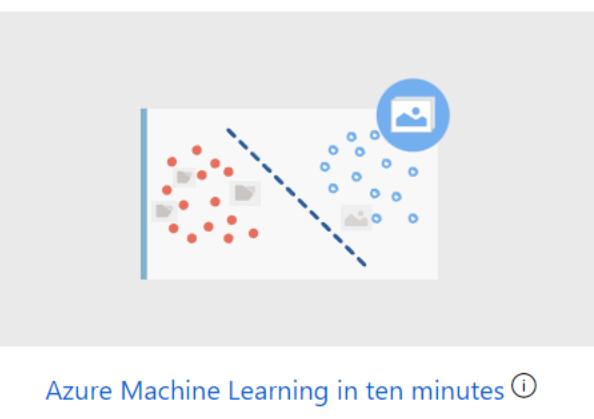
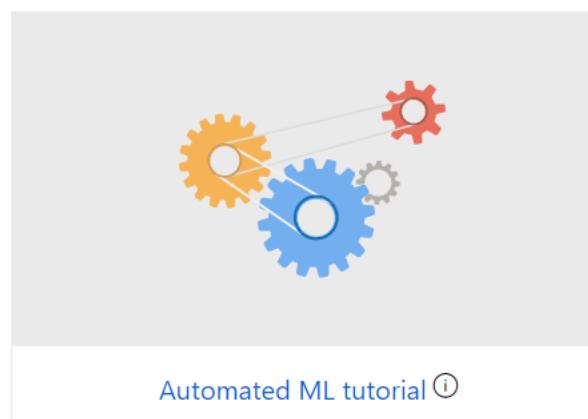
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Notebooks

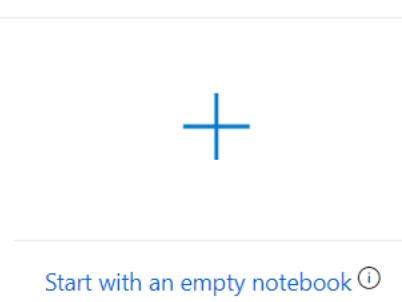
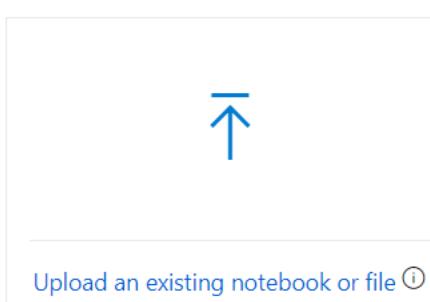
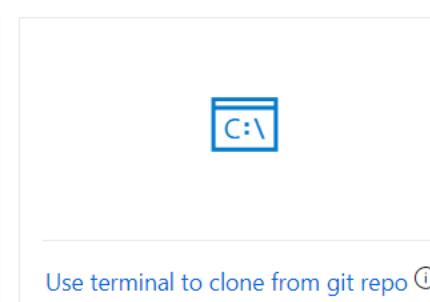
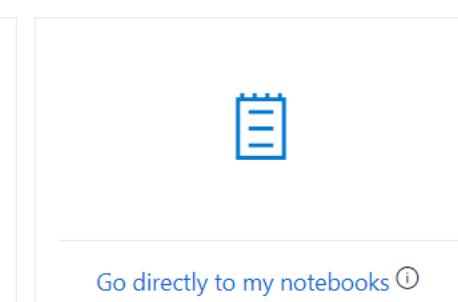
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Notebooks

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- Upload an existing notebook or file [\(1\)](#)
- Use terminal to clone from git repo [\(1\)](#)
- Go directly to my notebooks [\(1\)](#)

Create new file

File location
Users/Sudipto.Ghosh [Edit location](#)

File name *****
Test.ipynb

File type
Notebook (*.ipynb)

Overwrite if already exists

Create Cancel

View Azure Machine Learning Tutorials

View Release Notes to learn more about the latest features

32°C Light rain 11:13

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Microsoft Azure Machine Learning Studio

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Home > Notebooks

Notebooks Get started Test.ipynb

Files Samples

mlsa-compute · Kernel idle Last saved a few seconds ago Python 3.8.1

1 Press shift + enter to execute cells

+ Code + Markdown

mla-compute - Running

Python 3.8 - AzureML

32°C Light rain 11:13

The screenshot shows the Microsoft Azure Machine Learning Studio interface. On the left, there's a sidebar with various options: New, Home, Author, Notebooks (selected), Automated ML, Designer, Assets, Datasets, Experiments, Pipelines, Models, Endpoints, Manage, Compute, Environments (preview), Datastores, Data Labeling, and Linked Services. The main area is titled 'Notebooks' and shows a list of notebooks under 'Files'. One notebook, 'Test.ipynb', is currently open. The notebook title bar says 'Test.ipynb' and shows a status of 'mlsa-compute - Running'. The notebook content area displays a single cell with the number '1' and the instruction 'Press shift + enter to execute cells'. There are buttons for '+ Code' and '+ Markdown'. The top right corner of the interface shows 'Visual Studio Enterprise Subscription' and 'ml-ws'. The bottom right corner shows the system tray with icons for battery, signal, and time.

ml-ws - Microsoft Azure ml-endpoint - Microsoft Azure Notebooks - Microsoft Azure

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Microsoft Azure Machine Learning Studio

Home > Notebooks

Notebooks

Get started

Test.ipynb

Files Samples

mlsa-compute · Kernel idle Last saved a few seconds ago

1 Press shift + enter to execute cells

+ Code + Markdown

Edit in VS Code (pr...) Compute: mlsa-compute - Running

Python 3.8 - AzureML

Python 3.8 - Tensorflow

Python 3.8 - PyTorch

Python 3.6 - AzureML

Python 3.8 - AzureML

R

Python 3

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ml-ws - Microsoft Azure ml-endpoint - Microsoft Azure Notebooks - Microsoft Azure Quickstart — Requests 2.26.0 do +

https://ml.azure.com/fileexplorerAzNB?wsid=/subscriptions/d4fefcb7-baa8-40f1-9afc-b5474a3281b4/resourcegroups/ml-rg/workspaces/ml-ws&tid=84c31ca0-ac3b-4eae-ad11-519d80233e6f¬ebookPivot=0&activeFilePath=...

Microsoft Azure Machine Learning Studio

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Home > Notebooks

Notebooks Get started Files Samples

*Test.ipynb x

microsoft-compute · Kernel idle Last saved a few seconds ago Python 3.8.1

Import json
data = {
 'Inputs': {
 'WebServiceInput0': [
 {
 'PatientID': "1882185",
 'Pregnancies': "9",
 'PlasmaGlucose': "104",
 'DiastolicBloodPressure': "51",
 'TricepsThickness': "7",
 'SerumInsulin': "24",
 'BMI': "27.36983156",
 'DiabetesPedigree': "1.3504720469999998",
 'Age': "43",
 },
],
 },
 'GlobalParameters': {}
}
body = str.encode(json.dumps(data))

Press shift + enter to execute cells

+ Code + Markdown

Visual Studio Enterprise Subscription ml-ws

33°C Light rain 11:24

ml-ws - Microsoft Azure ml-endpoint - Microsoft Azure Notebooks - Microsoft Azure Quickstart — Requests 2.26.0 do +

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Microsoft Azure Machine Learning Studio Visual Studio Enterprise Subscription ml-ws

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Notebooks Get started Files Samples

*Test.ipynb x

mlsa-compute · Kernel idle Last saved a few seconds ago Python 3.8.1

```
1 import requests
2 r = requests.post(
3     url="http://9dbc7c50-f5fd-44b9-bb87-fa2484acb8c7.eastus2.azurecontainer.io/score",
4     data=body,
5     headers={
6         'Content-Type': 'application/json',
7         'Authorization': 'Bearer pXcgp9G7Coe5aeX8Pw4LS2yT6ksqJrDp' # Key from Endpoint > ml-endpoint > Consume Tab
8     }
9 )
✓ <1 sec
```

[8]

```
1 print(r.text)
✓ <1 sec
```

[9]

```
{"Results": {"WebServiceOutput0": [{"PatientID": 1882185.0, "DiabetesPrediction": 1.0, "Probability": 0.9883647682153893}]}]
```

+ Code + Markdown

33°C Light rain ↕ 11:26

```
1 import requests
2 r = requests.post(
3     url="http://9dbc7c50-f5fd-44b9-bb87-fa2484acb8c7.eastus2.azurecontainer.io/score",
4     data=body,
5     headers={
6         'Content-Type': 'application/json',
7         'Authorization': 'Bearer pXcgp9G7Coe5aeX8Pw4LS2yT6ksqJrDp' # Key from Endpoint > ml-endpoint > Consume Tab
8     }
9 )
✓ <1 sec
```

[8]

```
1 print(r.text)
✓ <1 sec
```

[9]

```
{"Results": {"WebServiceOutput0": [{"PatientID": 1882185.0, "DiabetesPrediction": 1.0, "Probability": 0.9883647682153893}]}]
```

Cleaning Up



ml-rg - Microsoft Azure ml-endpoint - Microsoft Azure Designer - Microsoft Azure Mac | + https://portal.azure.com/#@stdnpartners.onmicrosoft.com/resource/subscriptions/d4fefcbb-aa8-40f1-9afc-b5474a3281b4/resourceGroups/ml-rg/overview Sudipto.Ghosh@student... STUDENT AMBASSADORS (STDN...)

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Search resources, services, and docs (G+/-)

Create a resource

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Function App

SQL databases

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Storage accounts

Virtual networks

Azure Active Directory

Monitor

Advisor

Security Center

Cost Management + Billing

Help + support

Page 1 of 1

Resource groups

Student Ambassadors (stdnpartners.onmicrosoft.com)

+ Create Manage view ...

Filter for any field...

Name ↑

- ml-rg
- NetworkWatcherRG

ml-rg Resource group

Search (Ctrl+/)

Overview

Activity log

Access control (IAM)

Tags

Resource visualizer

Events

Settings

Deployments

Security

Policies

Properties

Locks

Cost Management

Cost analysis

Cost alerts (preview)

Budgets

Advisor recommendations

Monitoring

+ Create Edit columns Delete resource group Refresh Export to CSV ...

JSON View

Essentials

Subscription (change) Visual Studio Enterprise Subscription Deployments 1 Failed, 1 Succeeded

Subscription ID d4fefcbb-aa8-40f1-9afc-b5474a3281b4 Location East US 2

Tags (change) Click here to add tags

Resources

Recommendations

Filter for any field... Type == all × Location == all × Add filter

Showing 1 to 6 of 6 records. Show hidden types No grouping

Name ↑	Type ↑↓	Location ↑↓
47749ab01c94488aaadfe7c06959886c	Container registry	East US 2
ml-endpoint-sJp0R5Qcikiq3_fAaVmIbA	Container instances	East US 2
ml-ws	Machine learning	East US 2
mlws3589990915	Key vault	East US 2
mlws4340426270	Application Insights	East US 2
mlws8169296442	Storage account	East US 2

33°C Light rain 11:35

Are you sure you want to delete... ml-endpoint - Microsoft Azure Designer - Microsoft Azure Mac | + https://portal.azure.com/#@stdnpartners.onmicrosoft.com/resource/subscriptions/d4fefcbb-aa8-40f1-9afc-b5474a3281b4/resourceGroups/ml-rg/overview Sudipto.Ghosh@student... STUDENT AMBASSADORS (STDN...)

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Home > Resource groups >

Resource groups

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+ Create Manage view ...

Filter for any field...

Name ↑

- ml-rg
- NetworkWatcherRG

ml-rg Resource group

Search (Ctrl+/)

Overview

Activity log

Access control (IAM)

Tags

Resource visualizer

Events

Subscription (change) Visual Studio Enterprise

Subscription ID d4fefcbb-aa8-40f1-9afc-b5474a3281b4

Tags (change) Click here to add tags

Resources Reco

Filter for any field...

Showing 1 to 6 of 6

List view

Name	Type	Location
47749ab01c94488aaadfe7c069...	Container registry	East US 2
Application Insights Smart Dete...	microsoft.insights/a...	Global
ml-ws	Machine learning	East US 2
mlws3589990915	Key vault	East US 2
mlws4340426270	Application Insights	East US 2
mlws8169296442	Storage account	East US 2

Are you sure you want to delete "ml-rg"?

Warning! Deleting the "ml-rg" resource group is irreversible. The action you're about to take can't be undone. Going further will delete this resource group and all the resources in it permanently.

TYPE THE RESOURCE GROUP NAME:

ml-rg

AFFECTED RESOURCES

There are 6 resources in this resource group that will be deleted.

Delete Cancel

Resources

- [Learning Path – Use visual tools to create machine learning models with Azure Machine Learning](#)
- [Azure Machine Learning Documentation](#)

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