

Machine Learning Use Cases



with Azure ML

Agenda

- * Use Cases
- * Azure ML Studio
- * Create a Model
- * Operationalize Model
- * Getting Started



Why Azure ML ?

- * Start in minutes
- * No hardware or installation
- * Only need a browser
- * Use existing R or Python code
- * One-click publishing
- * Use what you need



Use Cases

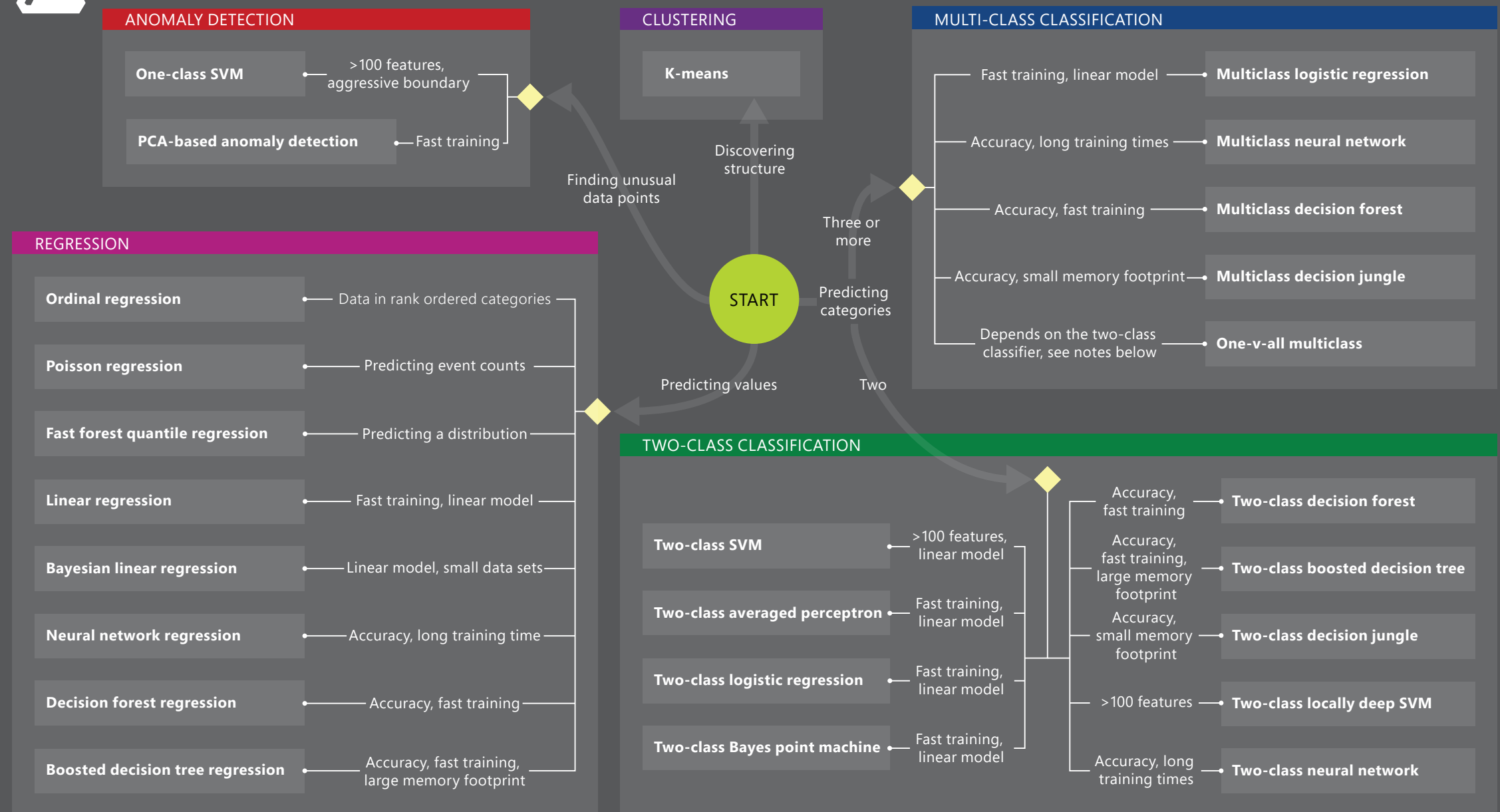
- * Data Cleaning and Preprocessing
- * Build ML Models
- * Operationalize your Model
- * Technology Mashups
- * Jupyter Notebooks

OOTB Algorithms



Microsoft Azure Machine Learning: Algorithm Cheat Sheet

This cheat sheet helps you choose the best Azure Machine Learning Studio algorithm for your predictive analytics solution. Your decision is driven by both the nature of your data and the question you're trying to answer.



Custom Algorithms

- * R

- * Execute R - Data Processing & Cleanup

- * Create R Model - Predictions

- * Python

- * Execute Python - Data Processing & Cleanup

Demo: ML Studio

Microsoft Azure Machine Learning

Home

Studio

Gallery PREVIEW

Demo



Search experiment items



Saved Datasets

My Datasets

Samples

Trained Models

Data Format Conversions

Data Input and Output

Data Transformation

Feature Selection

Machine Learning

OpenCV Library Modules

Python Language Modules

R Language Modules

Statistical Functions

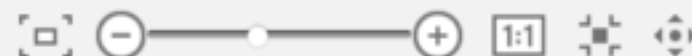
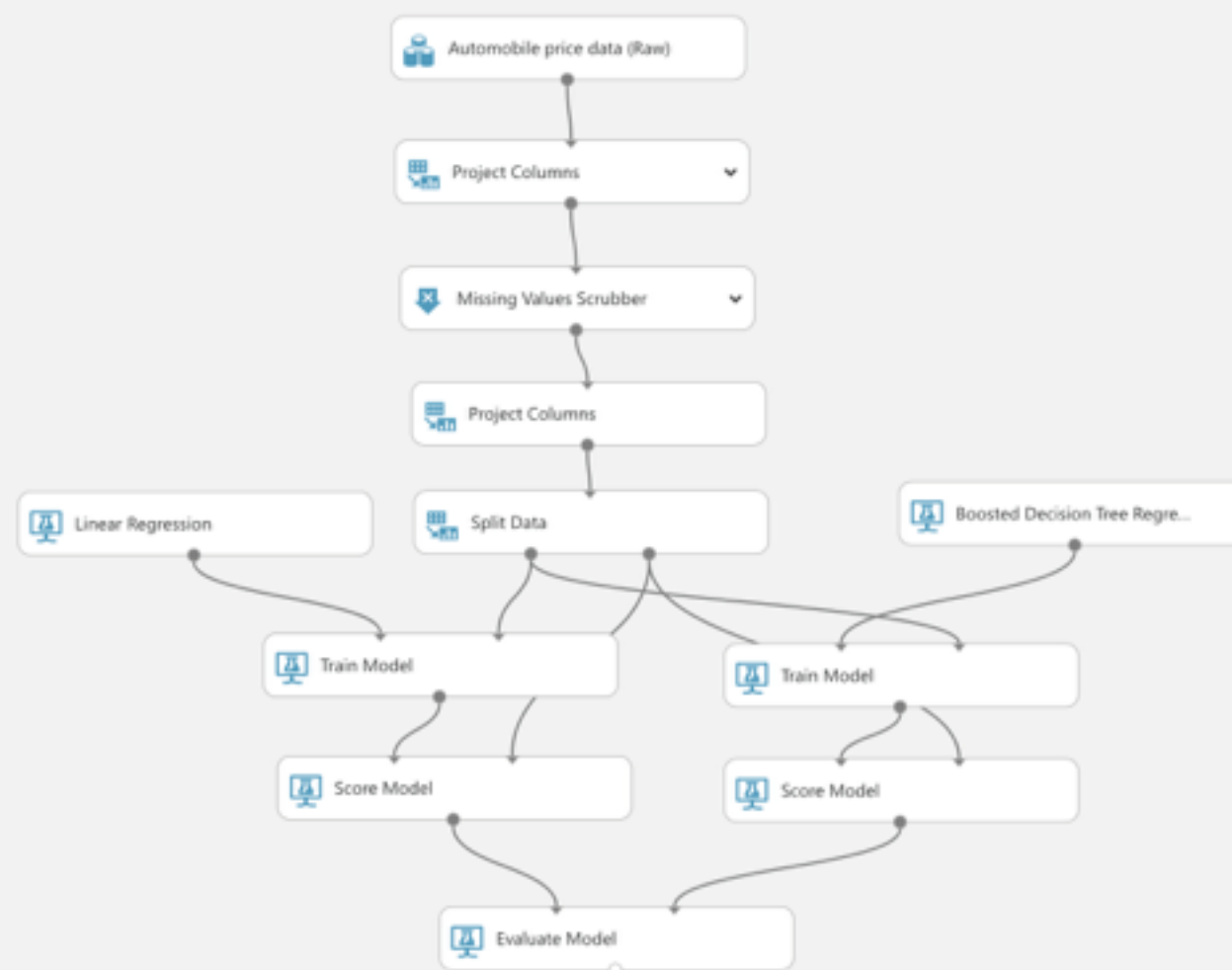
Text Analytics

Web Service

Deprecated

Automobile Price Prediction Training Base

In draft



Properties

Experiment Properties

START TIME 6/2/2015 1...

END TIME 6/2/2015 1...

STATUS CODE InDraft

STATUS DETAILS None

Summary

Enter a few sentences describing your experiment (up to 140 characters).

Description

Enter the detailed description for your experiment.

Quick Help

+ NEW

RUN HISTORY

SAVE

DISCARD CHANGES

RUN

SET UP WEB SERVICE

PUBLISH TO GALLERY

Demo: R Model

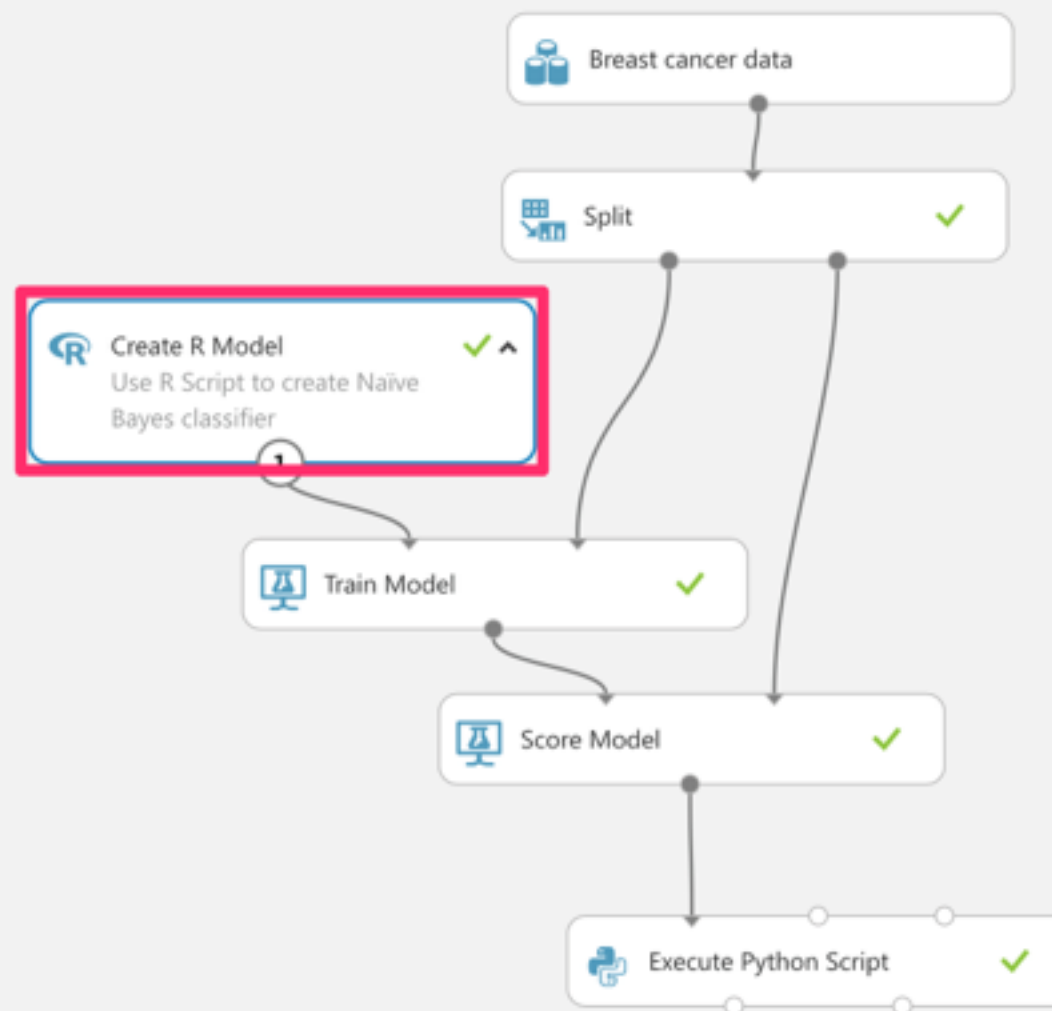


Search experiment items

- ▶ Saved Datasets
- ▶ Trained Models
- ▶ Data Format Conversions
- ▶ Data Input and Output
- ▶ Data Transformation
- ▶ Feature Selection
- ▶ Machine Learning
- ▶ OpenCV Library Modules
- ▶ Python Language Modules
- ▶ R Language Modules
- ▶ Statistical Functions
- ▶ Text Analytics
- ▶ Web Service
- ▶ Deprecated

Naive Bayes Classifier R Model

Finished running ✓



Properties

Create R Model

Trainer R script

```
7 library(e1071)
8 features <- get.feature.columns(dataset)
9 labels <- as.factor(get.label.column(dataset))
10 train.data <- data.frame(features, labels)
11 feature.names <- get.feature.column.names(dataset)
12 names(train.data) <- c(feature.names, "Class")
```

Scorer R script

```
6
7 library(e1071)
8 probabilities <- predict(model, dataset, type="raw")[,2]
9 classes <- as.factor(as.numeric(probabilities >= 0.5))
10 scores <- data.frame(classes, probabilities)
11
```

START TIME 9/20/2015 4:47:01 PM

END TIME 9/20/2015 4:47:01 PM

ELAPSED TIME 0:00:00.000

STATUS CODE Finished

STATUS DETAILS Task output was present in output cache

Quick Help

Creates an R model using custom resources
([more help...](#))

Demo: Publish a Service



naive bayes classifier model in r [scoring exp.]

DASHBOARD CONFIGURATION

General

Published experiment

[View snapshot](#) [View latest](#)

Description

No description provided for this web service.

API key

Default Endpoint

API HELP PAGE

TEST

APPS

LAST UPDATED



[REQUEST/RESPONSE](#)

Test

 [Download Excel Workbook](#)

9/19/2015 9:32:15 PM

[BATCH EXECUTION](#)

9/19/2015 9:32:15 PM

Getting Started

<https://studio.azureml.net>

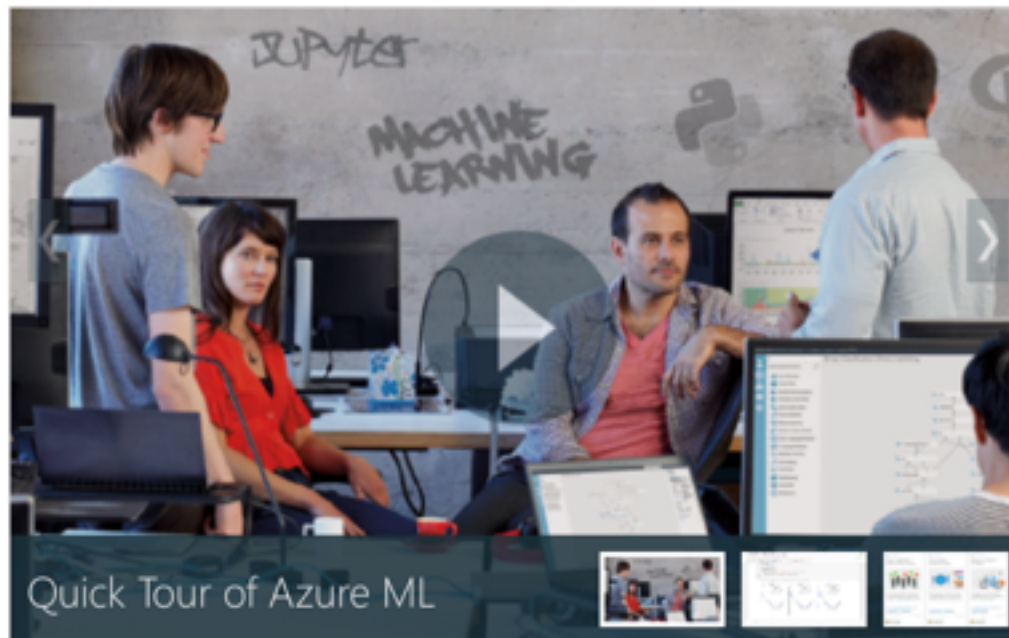
Microsoft Azure Machine Learning

Home

Studio

Gallery PREVIEW

Sign In



Quick Tour of Azure ML

Welcome to Azure Machine Learning

Try it for free

No [Azure subscription](#)? No credit card? No problem! Choose anonymous Guest Access, or sign in with your work or school account, or a Microsoft account.

[Get started](#) ➔

Pricing & FAQ

By using this free version, you agree to be bound by the [Microsoft Azure Website Terms of Use](#).

Webinars NEW!

Harness Predictive Customer Churn Models with Cortana Analytics Suite

Aired on August 18, 2015

Learn how to build a real-life churn model with Azure Machine Learning, make it enterprise-ready with Azure Data Factory, and deliver data insights with Power BI.

[> Learn More](#)

Introduction to Azure Data Factory

Aired on August 04, 2015

This session will help you jumpstart on understanding Data Factory capabilities, and the scenarios where Data Factory can be applied.

[> Learn More](#)

Energy Forecasting in Smart Grids using Azure Machine Learning

Aired on July 21, 2015

Learn about how we use Azure Stream Analytics to collect real time data; use Azure SQL to store data; use Azure Machine Learning to build a forecast model; use Azure Data Factory to automate the model and use PowerBI to visualize results on a dashboard.

[> Learn More](#)

Upcoming Webinars ➔

Free vs. Standard

Pricing Details

Machine Learning is offered in two tiers: Free and Standard.

Features by tier are compared in the table below:

	FREE	STANDARD
Authentication	Microsoft account (does not require an Azure subscription or a credit card)	Requires Azure subscription
Max Number of Modules per Experiment	100	Unlimited
Max Experiment Duration	1 hour	None
Max Storage Space	10 GB	Unlimited - BYO
Execution / Performance	Single node	Multiple nodes
Staging Web API	Yes (Throttled performance)	Yes (Selectable performance)
Production Web API	No	Yes
SLA	No	Yes

Questions ?

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[@CAMCHENRY](https://twitter.com/CAMCHENRY)



<http://cmchenry.com>



<http://www.linkedin.com/in/cmchenry>



<https://plus.google.com/+chrismchenry>



Backups

Pricing

Standard tier pricing

ML Seat Subscription		
	Monthly Fee	\$9.99/ Seat/ Month
ML Studio Usage		
	Hourly	\$1/Studio Experiment Hour
ML API Usage		
	Hourly	\$2/Production API Compute Hour
	Transactions	\$0.50/1,000 Production API Transactions

Hourly charges only apply to active use of the service. Where multiple meters are present they are applied concurrently.

Experiments



EXPERIMENTS



WEB SERVICES



NOTEBOOKS



DATASETS



TRAINED MODELS



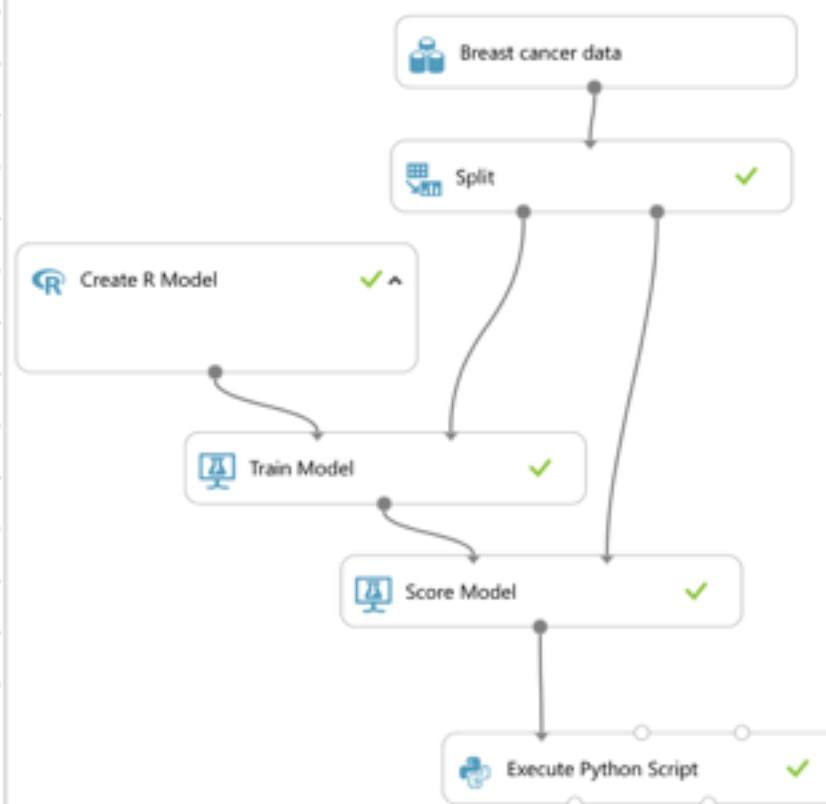
SETTINGS

experiments

MY EXPERIMENTS

SAMPLES

	NAME	AUTHOR	STATUS	
<input checked="" type="checkbox"/>	Naive Bayes Classifier R Model	cmchenry	Finished	9/23/20...
<input type="checkbox"/>	Dimensionality Reduction with R	cmchenry	Draft	9/21/20...
<input type="checkbox"/>	Reader and Writer	cmchenry	Draft	9/21/20...
<input type="checkbox"/>	Bike Rentals	cmchenry	Finished	9/20/20...
<input type="checkbox"/>	Important Entities in the S&P 500	cmchenry	Draft	9/19/20...
<input type="checkbox"/>	Get R Packages	cmchenry	Finished	9/19/20...
<input type="checkbox"/>	Dataset Sampling with R	cmchenry	Finished	9/7/201...
<input type="checkbox"/>	Automobile Price Prediction Training Base	cmchenry	Finished	6/2/201...
<input type="checkbox"/>	Automobile Price Prediction Training	cmchenry	Finished	6/2/201...
<input type="checkbox"/>	Predict MSFT Stock Direction Training	cmchenry	Finished	6/2/201...
<input type="checkbox"/>	Predict MSFT Stock Price Training	cmchenry	Finished	6/2/201...
<input type="checkbox"/>	Automobile Price Prediction Scoring	cmchenry	Finished	6/2/201...
<input type="checkbox"/>	Credit Risk - Model Selection	cmchenry	Finished	4/19/20...
<input type="checkbox"/>	Credit Risk - Scoring [Scoring Exp.]	cmchenry	Finished	4/19/20...
<input type="checkbox"/>	Credit Risk - Scoring	cmchenry	Finished	4/19/20...



NEW



DELETE

New Experiment

Microsoft Azure Machine Learning | Home Studio Gallery PREVIEW

Demo     

NEW


 DATASET

 MODULE

 EXPERIMENT

 NOTEBOOK PREVIEW

 Search experiment templates

 Microsoft Samples

[VIEW MORE IN GALLERY](#) 



Blank Experiment

Experiment
Tutorial



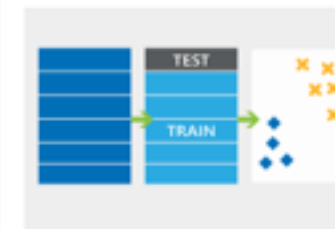
Sample 1: Download
dataset from UCI: Adult 2
class dataset



Sample 2: Dataset
Processing and Analysis:
Auto Imports Regression



Sample 3: Cross
Validation for Binary
Classification: Adult



 Two-Class Averaged Perceptron,
Two-Class Logistic Regression,

Sample 4: Cross
Validation for Regression:
Auto Imports Dataset



 Linear Regression, Boosted
Decision Tree Regression, Poisson

Sample 5: Train, Test,
Evaluate for Binary
Classification: Adult



 Two-Class Boosted Decision Tree


Sample 6: Train, Test,
Evaluate for Regression:
Auto Imports Dataset



 Poisson Regression, Decision
Forest Regression

Sample 7: Train, Test,
Evaluate for Multiclass
Classification: Letter



 Multiclass Decision Jungle, One-
vs-All Multiclass, Two-Class

Sample 8: Apply SQL
transformation



Sample 9: Split, partition

Anomaly Detection:

Binary Classification:

Binary Classification:

Binary Classification:

Regression Experiment

Microsoft Azure Machine Learning

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Demo



Search experiment items

Saved Datasets

My Datasets

Samples

Trained Models

Data Format Conversions

Data Input and Output

Data Transformation

Feature Selection

Machine Learning

OpenCV Library Modules

Python Language Modules

R Language Modules

Statistical Functions

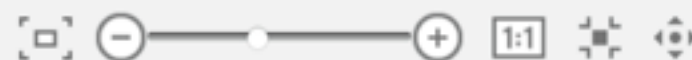
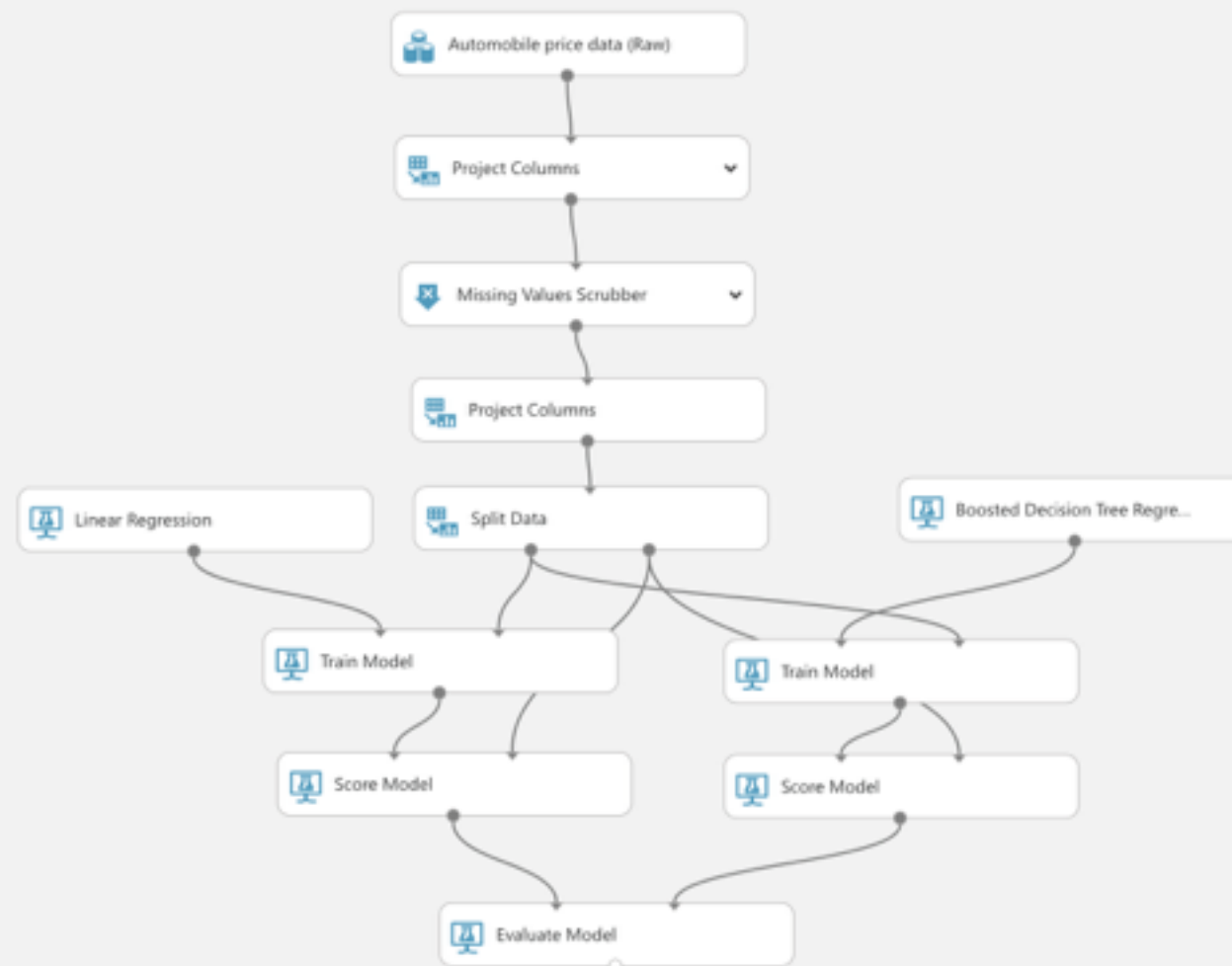
Text Analytics

Web Service

Deprecated

Automobile Price Prediction Training Base

In draft



Properties

Experiment Properties

START TIME 6/2/2015 1...

END TIME 6/2/2015 1...

STATUS CODE InDraft

STATUS DETAILS None

Summary

Enter a few sentences describing your experiment (up to 140 characters).

Description

Enter the detailed description for your experiment.

Quick Help



Visualize Data

Automobile Price Prediction Training Base









In draft

Properties

Search Automobile Price Prediction Training Base > Automobile price data (Raw) > dataset

rows
205

columns
26

	bore	stroke	compression-ratio	horsepower	peak-rpm	city-mpg	highway-mpg	price
								
	3.47	2.68	9	111	5000	21	27	13495
	3.47	2.68	9	111	5000	21	27	16500
	2.68	3.47	9	154	5000	19	26	16500
	3.19	3.4	10	102	5500	24	30	13950
	3.19	3.4	8	115	5500	18	22	17450
	3.19	3.4	8.5	110	5500	19	25	15250
	3.19	3.4	8.5	110	5500	19	25	17710
	3.19	3.4	8.5	110	5500	19	25	18920
	3.13	3.4	8.3	140	5500	17	20	23875
	3.13	3.4	7	160	5500	16	22	
	3.5	2.8	8.8	101	5800	23	29	16430

Statistics

Mean	30.7512
Median	30
Min	16
Max	54
Standard Deviation	6.8864
Unique Values	30
Missing Values	0
Feature Type	Numeric Feature

Visualizations

highway-mpg

Histogram

compare to



Score a Model

Automobile Price Prediction Training Base

In draft

Properties

Automobile Price Prediction Training Base > Score Model > Scored dataset

rows
48

columns
9

body-style	wheel-base	engine-size	horsepower	peak-rpm	highway-mpg	price	Scored Labels
sedan	97	108	111	4800	29	11259	9183.007813
hatchback	93.7	92	68	5500	38	6669	6363.914551
hatchback	93.7	90	68	5500	38	6229	6320.089355
hatchback	86.6	92	76	6000	38	6855	6209.195801
convertible	88.6	130	111	5000	27	16500	13514.070313
wagon	104.3	141	114	5400	28	16515	13750.133789
hatchback	96	119	90	5000	29	11048	8896.053711
hatchback	93.7	90	68	5500	41	5572	6086.006836
sedan	101.2	108	101	5800	29	16430	11927.901367
hatchback	93.7	92	68	5500	41	5389	6129.832031
sedan	103.5	209	182	5400	22	41315	32625.902344
sedan	113	258	176	4750	19	35550	35585.007813
hatchback	93.7	90	68	5500	38	6229	6320.089355

Statistics

Visualizations

To create a graph, select a column in the table

Evaluate Models

Microsoft Azure Machine Learning

Home Studio Gallery PREVIEW

Demo



Automobile Price Prediction Training Base

In draft

Properties

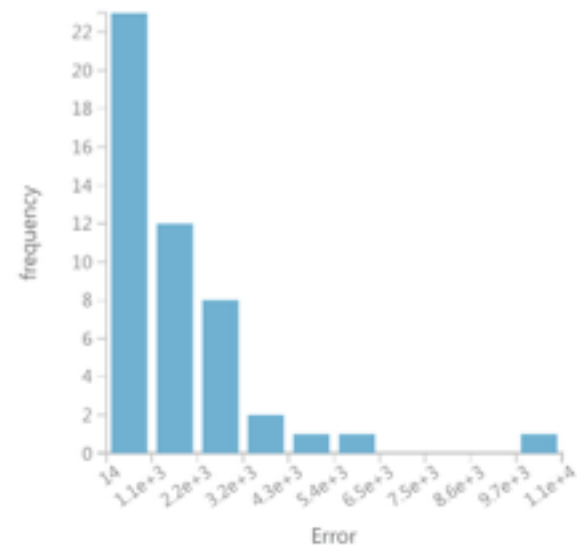
Search experiments

Automobile Price Prediction Training Base > Evaluate Model > Evaluation results

Metrics

Mean Absolute Error	1656.147651
Root Mean Squared Error	2456.983209
Relative Absolute Error	0.276606
Relative Squared Error	0.089608
Coefficient of Determination	0.910392

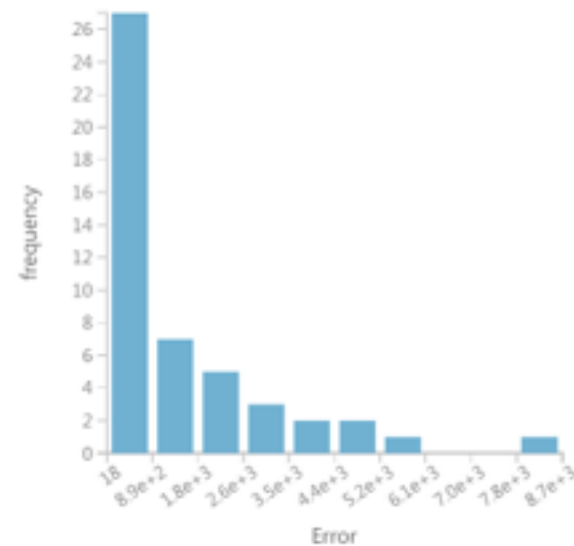
Error Histogram



Metrics

Mean Absolute Error	1451.671285
Root Mean Squared Error	2258.614346
Relative Absolute Error	0.242455
Relative Squared Error	0.075723
Coefficient of Determination	0.924277

Error Histogram



+ NEW

RUN HISTORY

SAVE

DISCARD CHANGES

RUN

SET UP WEB SERVICE

PUBLISH TO GALLERY

Web Services



EXPERIMENTS



WEB SERVICES



NOTEBOOKS



DATASETS



TRAINED MODELS



SETTINGS

web services

NAME	CREATED ON
Automobile Price Prediction [Scoring Exp.]	6/2/2015 2:53:55 PM
Credit Risk - Scoring [Scoring Exp.]	4/19/2015 3:36:28 PM



NEW



DELETE

Notebooks

Microsoft Azure Machine Learning

Home

Studio

Gallery PREVIEW

Demo ▾



EXPERIMENTS



WEB SERVICES



NOTEBOOKS



DATASETS



TRAINED MODELS



SETTINGS

notebooks preview

NAME

LANGUAGE

LAST MODIFIED



MyFirstNotebook.ipynb

Python 2

11/3/2015 9:14:42 AM



NEW



DELETE



RENAME

Datasets



EXPERIMENTS



WEB SERVICES



NOTEBOOKS



DATASETS



TRAINED MODELS



SETTINGS

datasets

MY DATASETS SAMPLES

NAME	SUBMITTED BY	DESCRIPTION	DATA TYPE	CREATED	SIZE	
AzureML-RPackages.csv	cmchenry		GenericCSV	9/19/2015 9:00:47 PM	64.49 KB	
utilities.zip	cmchenry		Zip	6/12/2015 9:08:49 PM	1.95 KB	
msftNews.csv	cmchenry		GenericCSV	6/2/2015 5:48:25 PM	96.69 KB	
msftPrice.csv	cmchenry		GenericCSV	5/31/2015 3:58:22 PM	648.67 KB	
german.csv	cmchenry	Downloaded from http://archive.ics.uci.edu/	GenericCSV	4/7/2015 9:08:59 PM	77.92 KB	

Trained Models



EXPERIMENTS



WEB SERVICES



NOTEBOOKS



DATASETS



TRAINED MODELS



SETTINGS

trained models

NAME	SUBMITTED BY	DESCRIPTION	DATA TYPE	CREATED	⌵ 🔍
Naive Bayes Classifier R Model [trained model]	cmchenry		ILearnerDotNet	9/23/2015 11:45:09 AM	
Automobile Price Prediction [trained model]	cmchenry		ILearnerDotNet	6/2/2015 2:46:57 PM	
Credit Risk - Scoring [trained model]	cmchenry		ILearnerDotNet	4/19/2015 3:28:35 PM	



NEW



DELETE

Settings



EXPERIMENTS



WEB SERVICES



NOTEBOOKS



DATASETS



TRAINED MODELS



SETTINGS

settings

NAME

AUTHORIZATION TOKENS

USERS

WORKSPACE NAME

Demo

WORKSPACE DESCRIPTION

Default workspace.

WORKSPACE TYPE

Free

[Learn More](#)

WORKSPACE ID



WORKSPACE STORAGE

 USED  AVAILABLE

0.07 GB

1% of 10 GIGABYTES

Want more storage? Get the standard version [learn more](#)

R Model

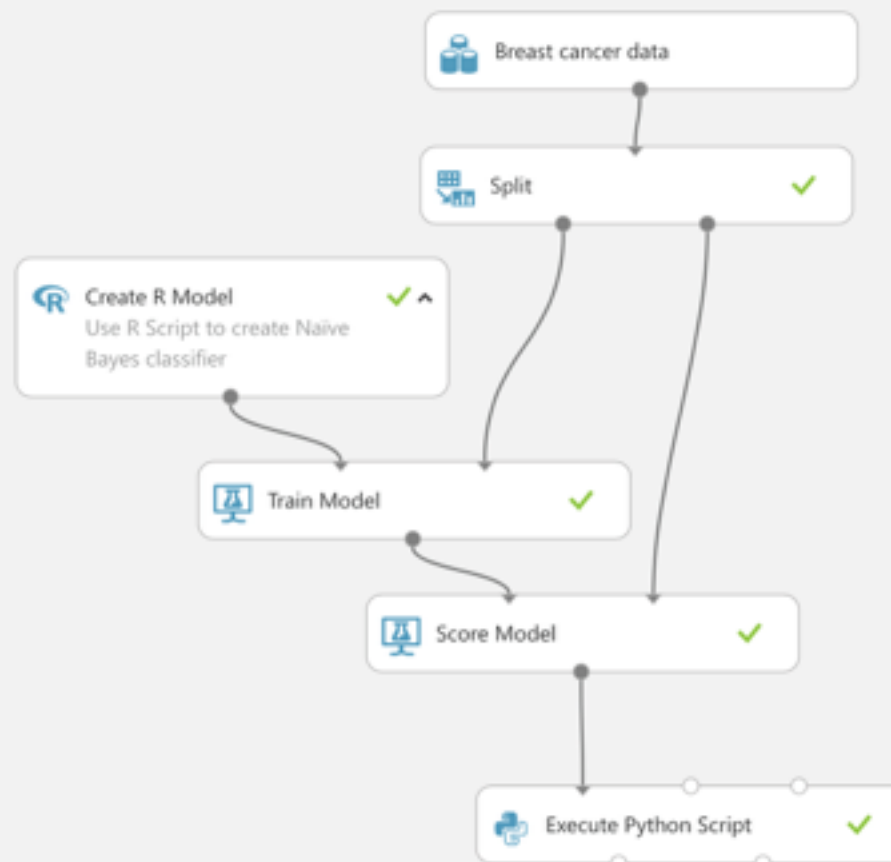


Search experiment items 🔍

- ▶ Saved Datasets
- ▶ Trained Models
- ▶ Data Format Conversions
- ▶ Data Input and Output
- ▶ Data Transformation
 - ▶ Filter
 - ▶ Learning with Counts
- ▶ Manipulation
 - Add Columns
 - Add Rows
 - Apply SQL Transformation
 - Clean Missing Data
 - Group Categorical Values
 - Indicator Values
 - Join
 - Metadata Editor
 - Project Columns
 - Remove Duplicate Rows
 - Select Columns Transform
 - SMOTE
- ▶ Sample and Split

Naive Bayes Classifier R Model

Finished running ✓



Properties

Experiment Properties

START TIME 9/23/2015 11:44:47 AM
END TIME 9/23/2015 11:44:50 AM
STATUS CODE Finished
STATUS DETAILS None

[Prior Run](#)

Summary

This experiment demonstrates how to use the "Create R Model" module to train and score a model, and use "Execute Python Script" to evaluate a model using breast cancer classification as an example.

Description

Enter the detailed description for your experiment.

Quick Help ▾

Split Module



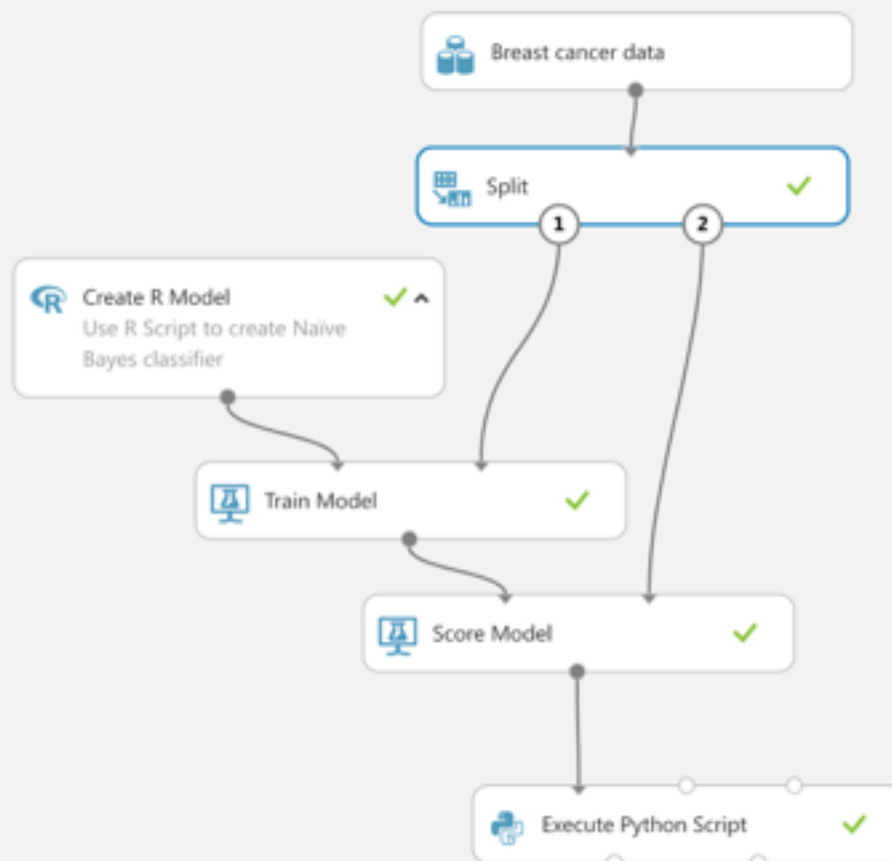
Search experiment items

- ▶ Saved Datasets
- ▶ Trained Models
- ▶ Data Format Conversions
- ▶ Data Input and Output
- ▶ Data Transformation
 - ▶ Filter
 - ▶ Learning with Counts
- ▶ Manipulation
 - Add Columns
 - Add Rows
 - Apply SQL Transformati...
 - Clean Missing Data
 - Group Categorical Values
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 - Join
 - Metadata Editor
 - Project Columns
 - Remove Duplicate Rows
 - Select Columns Transform
 - SMOTE

▶ Sample and Split

Naive Bayes Classifier R Model

Finished running ✓



Properties

Split

Splitting mode

Split Rows

Fraction of rows in the first output dataset

0.75

☒ Randomized split

Random seed

0

Stratified split

False

START TIME 9/23/2015 11:44:47 AM

END TIME 9/23/2015 11:44:47 AM

ELAPSED TIME 0:00:00.000

STATUS CODE Finished

STATUS DETAILS Task output was present in output cache

Quick Help

Partitions the rows of a dataset into two distinct sets
([more help...](#))

R Training Model



Search experiment items

Saved Datasets

Trained Models

Data Format Conversions

Data Input and Output

Data Transformation

Filter

Learning with Counts

Manipulation

Add Columns

Add Rows

Apply SQL Transformation

Clean Missing Data

Group Categorical Values

Indicator Values

Join

Metadata Editor

Project Columns

Remove Duplicate Rows

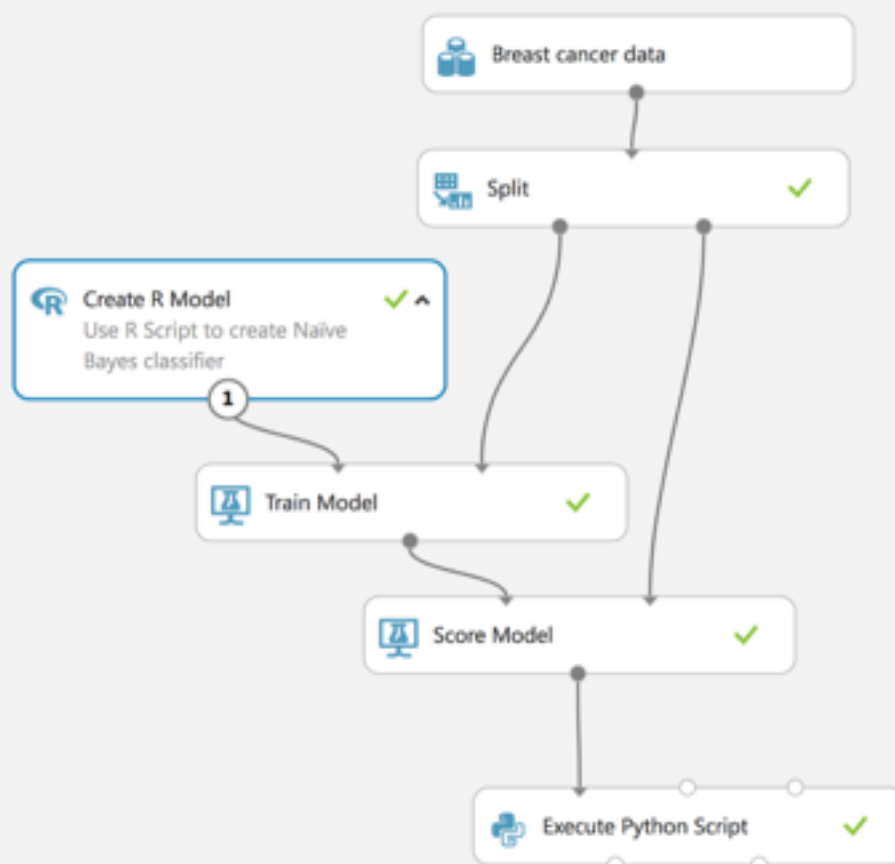
Select Columns Transform

SMOTE

Sample and Split

Naive Bayes Classifier R Model

Finished running ✓



Properties

Create R Model

Trainer R script

```
1 # Input: dataset
2 # Output: model
3
4 # The code below is an example which can be replaced with your own code.
5 # See the help page of "Create R Model" module for the list of predefined functions.
6
7 library(e1071)
8 features <- get.feature.columns(dataset)
9 labels <- as.factor(get.label.column(dataset))
10 train.data <- data.frame(features, labels)
11 feature.names <- get.feature.column.names(dataset)
12 names(train.data) <- c(feature.names, "Class")
13 model <- naiveBayes(Class ~ ., train.data)
14
```

Scorer R script

```
1 # Input: model, dataset
2 # Output: scores
3
4 # The code below is an example which can be replaced with your own code.
5 # See the help page of "Create R Model" module for the list of predefined functions.
6
```

Quick Help

Creates an R model using custom resources
([more help...](#))

R Scoring Model



Search experiment items

- ▶ Saved Datasets
- ▶ Trained Models
- ▶ Data Format Conversions
- ▶ Data Input and Output

Data Transformation

- ▶ Filter
- ▶ Learning with Counts

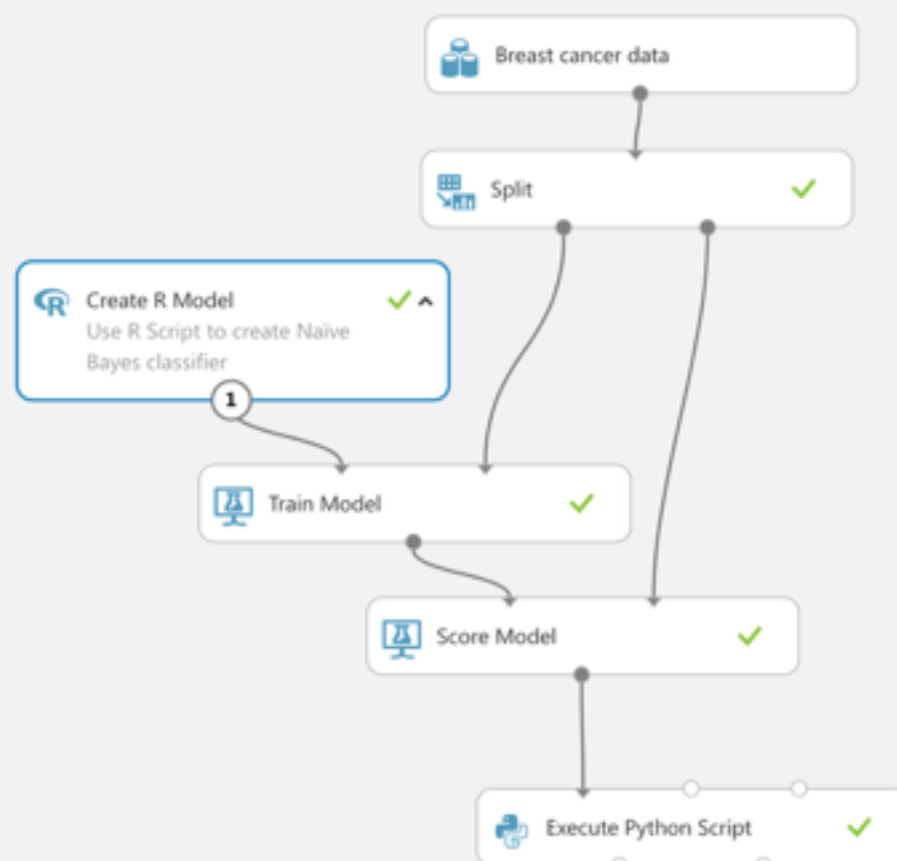
Manipulation

- Add Columns
- Add Rows
- Apply SQL Transformati...
- Clean Missing Data
- Group Categorical Values
- Indicator Values
- Join
- Metadata Editor
- Project Columns
- Remove Duplicate Rows
- Select Columns Transform
- SMOTE

Sample and Split

Naive Bayes Classifier R Model

Finished running ✓



Properties

Create R Model

Trainer R script

```
1 # Input: dataset
2 # Output: model
3
4 # The code below is an example which can be replaced with your own code.
5 # See the help page of "Create R Model" module for the list of predefined functions.
6
```

Scorer R script

```
1 # Input: model, dataset
2 # Output: scores
3
4 # The code below is an example which can be replaced with your own code.
5 # See the help page of "Create R Model" module for the list of predefined functions.
6
7 library(e1071)
8 probabilities <- predict(model, dataset, type="raw")[,2]
9 classes <- as.factor(as.numeric(probabilities >= 0.5))
10 scores <- data.frame(classes, probabilities)
11
```

Quick Help

Creates an R model using custom resources
(more help...)

Python Eval of R Model

Python script

```
1 def azureml_main(dataframe):
2     import matplotlib
3     matplotlib.use("agg")
4
5     from sklearn.metrics import accuracy_score, precision_score, recall_score, roc_auc_score, roc_curve
6     import pandas as pd
7     import numpy as np
8     import matplotlib.pyplot as plt
9
10    scores = dataframe.ix[:, ("Class", "classes", "probabilities")]
11    ytrue = scores["Class"]
12    ypred = np.array([float(val) for val in scores["classes"]])
13    probabilities = scores["probabilities"]
14
15    accuracy, precision, recall, auc = \
16    accuracy_score(ytrue, ypred), \
17    precision_score(ytrue, ypred), \
18    recall_score(ytrue, ypred), \
19    roc_auc_score(ytrue, probabilities)
20
21    metrics = pd.DataFrame();
22    metrics["Metric"] = ["Accuracy", "Precision", "Recall", "AUC"];
23    metrics["Value"] = [accuracy, precision, recall, auc]
24
25    # Plot ROC Curve
26    fpr, tpr, thresholds = roc_curve(ytrue, probabilities)
27    fig = plt.figure()
28    axis = fig.gca()
29    axis.plot(fpr, tpr, linewidth=8)
30    axis.grid("on")
31    axis.set_xlabel("False positive rate")
```

R Model Evaluate



Naive Bayes Classifier R Model

In draft

Properties

Naive Bayes Classifier R Model > Execute Python Script > Results dataset

rows 4
columns 2

	Metric	Value
view as		
	Accuracy	0.97076
	Precision	0.916667
	Recall	1
	AUC	0.987069

Statistics

Visualizations

To create a graph, select a column in the table

R Model ROC Curve

Naive Bayes Classifier R Model

In draft

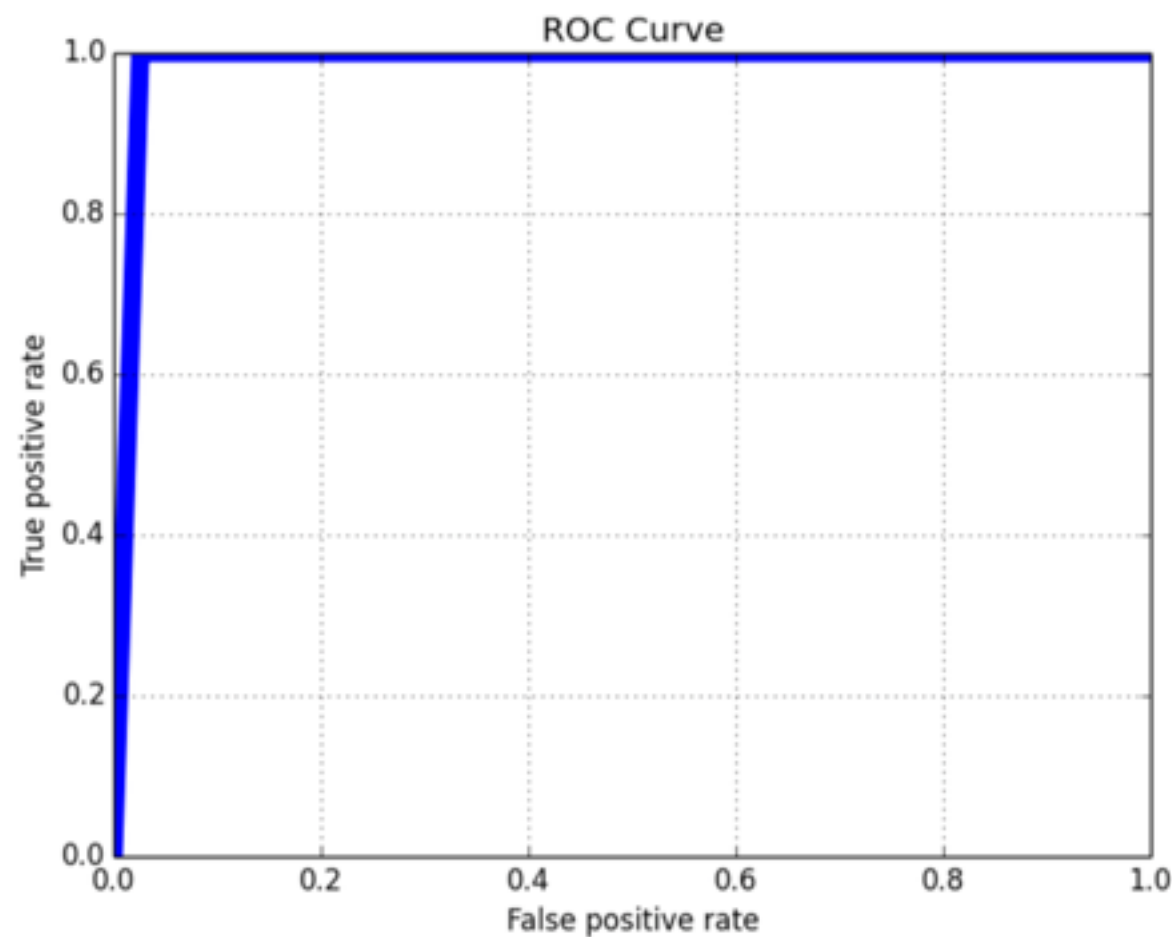
Properties

Search explorer

Naive Bayes Classifier R Model ▶ Execute Python Script ▶ Python device

Interpreter produced no output.

Graphics



R Model Create Scoring

Microsoft Azure Machine Learning | Home Studio Gallery PREVIEW Demo

Naive Bayes Classifier R Model

Finished running ✓

Search experiment items

- Saved Datasets
- Trained Models
- Data Format Conversions
- Data Input and Output
- Data Transformation
 - Filter
 - Learning with Counts
 - Manipulation
 - Add Columns
 - Add Rows
 - Apply SQL Transformati...
 - Clean Missing Data
 - Group Categorical Values
 - Indicator Values
 - Join
 - Metadata Editor
 - Project Columns
 - Remove Duplicate Rows
 - Select Columns Transform
 - SMOTE
- Sample and Split

Breast cancer data

Split ✓

Create R Model ✓
Use R Script to create Naive Bayes classifier

Train Model ✓

Score Model ✓

Execute Python Script ✓

Predictive Web Service [Recommended]

Retraining Web Service

Properties

Experiment Properties

START TIME	9/23/2015 2:05:24 PM
END TIME	9/23/2015 2:05:27 PM
STATUS CODE	Finished
STATUS DETAILS	None

[Prior Run](#)

Summary

This experiment demonstrates how to use the "Create R Model" module to train and score a model, and use "Execute Python Script" to evaluate a model using breast cancer classification as an example.

Description

Enter the detailed description for your experiment.

Quick Help

+ NEW RUN HISTORY SAVE DISCARD CHANGES RUN SET UP WEB SERVICE PUBLISH TO GALLERY

R Model Scoring Exp

Microsoft Azure Machine Learning | Home Studio Gallery PREVIEW Demo

Search experiment items

- ▶ Saved Datasets
- ▶ Trained Models
- ▶ Data Format Conversions
- ▶ Data Input and Output
- ▶ Data Transformation
- ▶ Feature Selection
- ▶ Machine Learning
- ▶ OpenCV Library Modules
- ▶ Python Language Modules
- ▶ R Language Modules
- ▶ Statistical Functions
- ▶ Text Analytics
- ▶ **Web Service**
 - Input
 - Output
- ▶ Deprecated

Training experiment Predictive experiment

Naive Bayes Classifier R Model [Scoring Exp.]

In draft
Draft saved at 2:07:51 PM MDT

```
graph TD; A[Breast cancer data] --> D[Score Model]; B[Naive Bayes Classifier R Mo...] --> D; C[Web service input 1] --> D; D --> E[Web service output];
```

The diagram illustrates a scoring experiment workflow. It starts with three input sources: 'Breast cancer data' (a dataset icon), 'Naive Bayes Classifier R Mo...' (a model icon), and 'Web service input' (a blue box with a '1' in a circle). All three inputs feed into a 'Score Model' module (a box with a monitor icon). The output of the 'Score Model' module is a 'Web service output' (a blue box with a document icon). The workflow is shown in a 'Predictive experiment' tab.

Properties

Web service input

Name

input1






Quick Help

Web service input

+ NEW RUN HISTORY SAVE DISCARD CHANGES RUN DEPLOY WEB SERVICE PUBLISH TO GALLERY

2

R Model Scoring Results

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Training experiment Predictive experiment Properties

Naive Bayes Classifier R Model [Scoring Exp.] > Score Model > Scored dataset

rows 683 columns 12

age	menopause	tumor-size	inv-nodes	node-caps	deg-malig	breast	breast-quad	irradiat	classes	probabilities
5	1	1	1	2	1	3	1	1	0	0
5	4	4	5	7	10	3	2	1	1	1
3	1	1	1	2	2	3	1	1	0	0
6	8	8	1	3	4	3	7	1	1	1
4	1	1	3	2	1	3	1	1	0	0
8	10	10	8	7	10	9	7	1	1	1
1	1	1	1	2	10	3	1	1	1	0.999954
2	1	2	1	2	1	3	1	1	0	0
2	1	1	1	2	1	1	1	5	1	1
4	2	1	1	2	1	2	1	1	0	0
1	1	1	1	1	1	3	1	1	0	0
2	1	1	1	2	1	2	1	1	0	0
5	3	3	3	2	3	4	4	1	0	0.036519
1	1	1	1	2	3	3	1	1	0	0
8	7	5	10	7	9	5	5	4	1	1
7	4	6	4	6	1	4	3	1	1	1

Statistics

Visualizations

To create a graph, select a column in the table

+ NEW RUN HISTORY SAVE DISCARD CHANGES RUN DEPLOY WEB SERVICE PUBLISH TO GALLERY 2 !

R Model Publish



Search experiment items

- ▶ Saved Datasets
- ▶ Trained Models
- ▶ Data Format Conversions
- ▶ Data Input and Output
- ▶ Data Transformation
- ▶ Feature Selection
- ▶ Machine Learning
- ▶ OpenCV Library Modules
- ▶ Python Language Modules
- ▶ R Language Modules
- ▶ Statistical Functions
- ▶ Text Analytics
- ▶ **Web Service**
 - Input
 - Output
- ▶ Deprecated

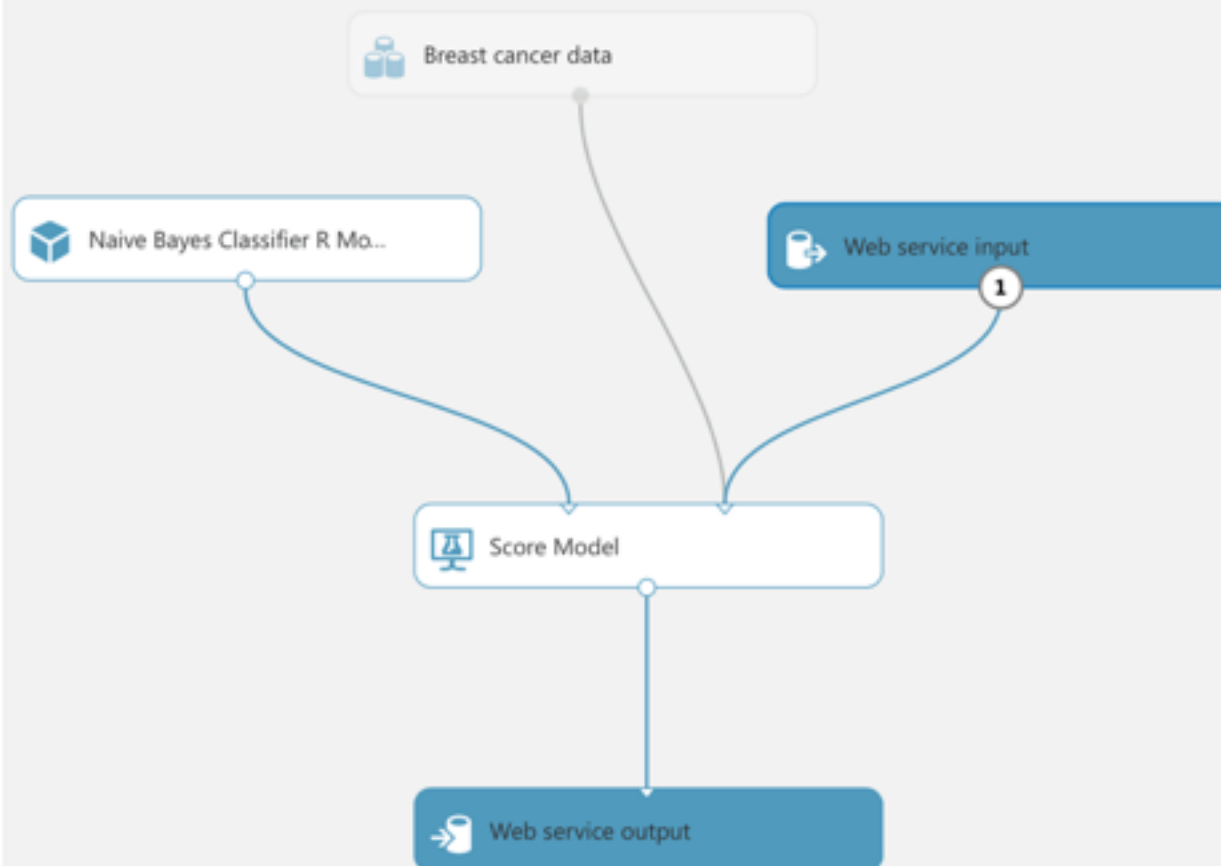
Training experiment

Predictive experiment

Naive Bayes Classifier R Model [Scoring Exp.]

In draft

Draft saved at 2:07:51 PM MDT



Properties

Web service input

Name

input1

Quick Help

Web service input



NEW



RUN HISTORY



SAVE



DISCARD CHANGES



RUN



DEPLOY WEB SERVICE



PUBLISH TO GALLERY

R Model Service



naive bayes classifier r model [scoring exp.]

DASHBOARD CONFIGURATION

General

Published experiment

[View snapshot](#) [View latest](#)

Description

No description provided for this web service.

API key

Default Endpoint

API HELP PAGE

TEST

APPS

LAST UPDATED



REQUEST/RESPONSE

Test

 [Download Excel Workbook](#)

9/23/2015 2:10:47 PM

BATCH EXECUTION

9/23/2015 2:10:47 PM

R Model Req/Resp

Request Response API Documentation for Naive Bayes Classifier R Model [Scoring Exp.]

Updated: 09/23/2015 20:10

No description provided for this web service.

- [Previous version of this API](#)
- [Submit a request](#)
- [Input Parameters](#)
- [Output Parameters](#)
- [ASP.Net App Template for RRS](#)
- [Sample Code](#)

OData Endpoint Address

Request

Method	Request URI	HTTP Version
--------	-------------	--------------

*Note: You may omit the **details** parameter from the query string. This would cause **ColumnTypes** to be omitted from the output*

Request Headers

Request Header	Description
----------------	-------------

<i>Authorization:Bearer abc123</i>	Required. Pass the API Key here. Obtain this key from the publisher of the API.
------------------------------------	---

<i>Content-Length</i>	Required. The length of the content body.
-----------------------	---

R Model Sample Code

classes	Categorical	0, 1
probabilities	Numeric	

Sample Code

C# Python R

Select sample code

```
// This code requires the Nuget package Microsoft.AspNet.WebApi.Client to be installed.  
// Instructions for doing this in Visual Studio:  
// Tools -> Nuget Package Manager -> Package Manager Console  
// Install-Package Microsoft.AspNet.WebApi.Client
```

```
using System;  
using System.Collections.Generic;  
using System.IO;  
using System.Net.Http;  
using System.Net.Http.Formatting;  
using System.Net.Http.Headers;  
using System.Text;  
using System.Threading.Tasks;
```

```
namespace CallRequestResponseService  
{
```

```
    public class StringTable  
    {  
        public string[] ColumnNames { get; set; }  
        public string[,] Values { get; set; }  
    }
```

```
    class Program  
    {  
        static void Main(string[] args)  
        {
```


Invoking R Model

Microsoft Azure Machine Learning | Home Studio Gallery PREVIEW

Demo ▾



naive bayes classifier r model [scoring exp.]

DASHBOARD CONFIGURATION

General

Published experiment

View snapshot View latest

Description

No description provided for this web service.

API key

Default Endpoint

API HELP PAGE

TEST

REQUEST/RESPONSE

Test

BATCH EXECUTION

Test Naive Bayes Classifier R Model [Scoring Exp.] Service

Enter data to predict

CLASS

0

AGE

2

MENOPAUSE

2

TUMOR-SIZE

2

INV-NODES

2

LAST UPDATED



9/23/2015 2:10:47 PM

9/23/2015 2:10:47 PM



NEW



DELETE

Testing a Web Service



naive bayes classifier r model [scoring exp.]

DASHBOARD CONFIGURATION

General

Published experiment

[View snapshot](#) [View latest](#)

Description

No description provided for this web service.

API key

Default Endpoint

API HELP PAGE

TEST

APPS

LAST UPDATED



[REQUEST/RESPONSE](#)

Test

 [Download Excel Workbook](#)

9/23/2015 1:14:57 PM

[BATCH EXECUTION](#)

9/23/2015 1:14:57 PM

2 OPERATIONS HAVE COMPLETED

DISMISS COMPLETED  

✓ 'Naive Bayes Classifier R Model [Scoring Exp.]' test returned ["0","3","3","3","3","3","3","3","3","3","3","1","0.889107275793569"]...

DETAILS  CLOSE 

✓ 'Naive Bayes Classifier R Model [Scoring Exp.]' test returned ["0","2","2","2","2","2","2","2","2","2","2","0","6.47109617714045E-08"]...

DETAILS  CLOSE 

+ NEW



DELETE

2  2 