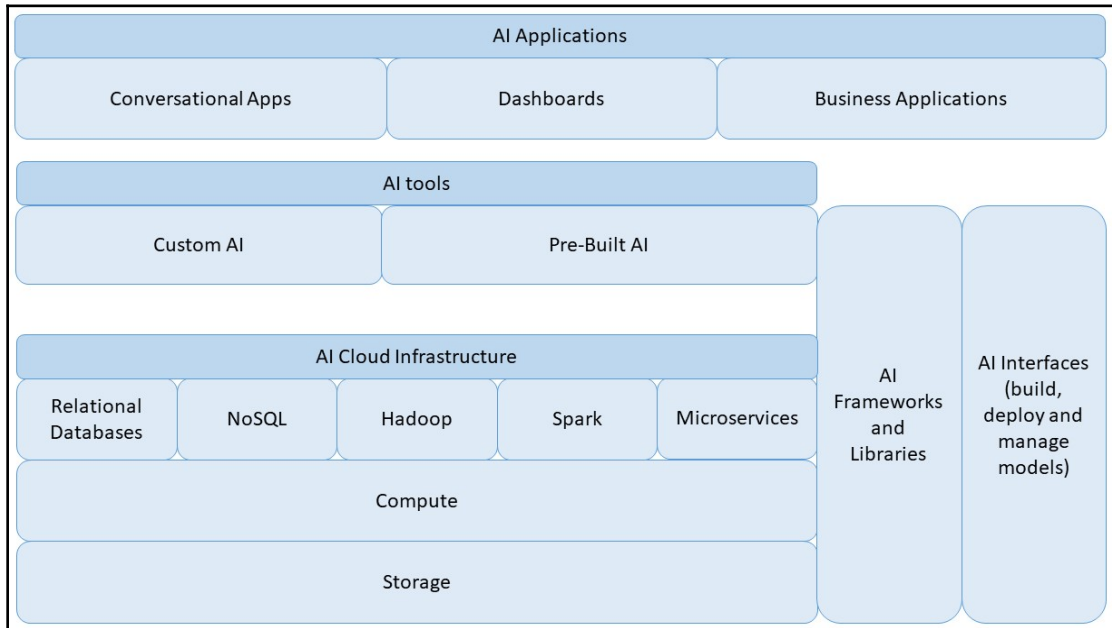
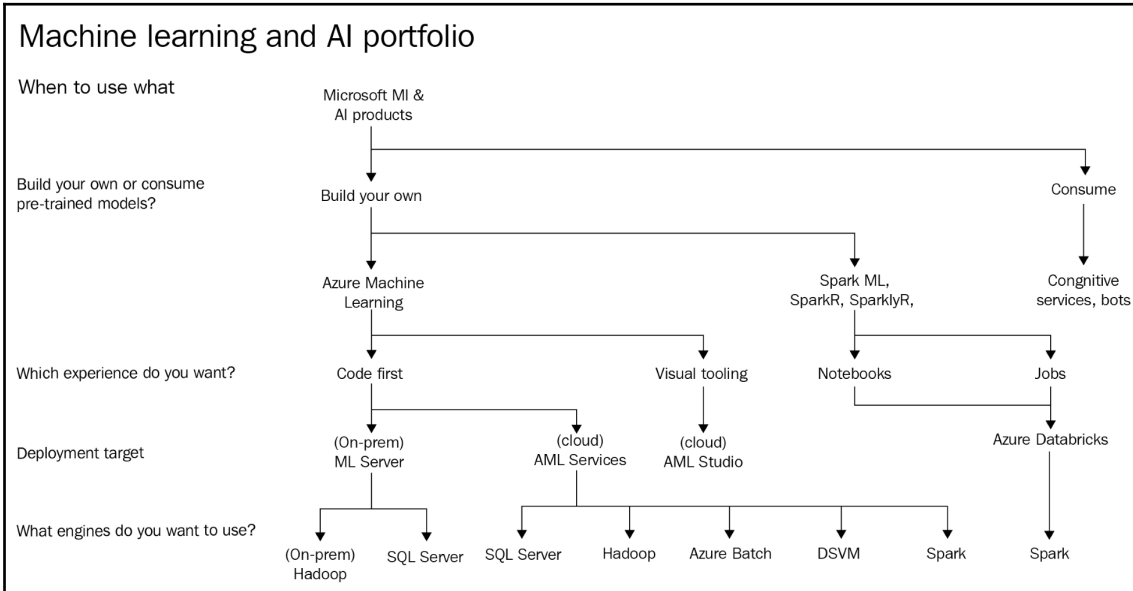


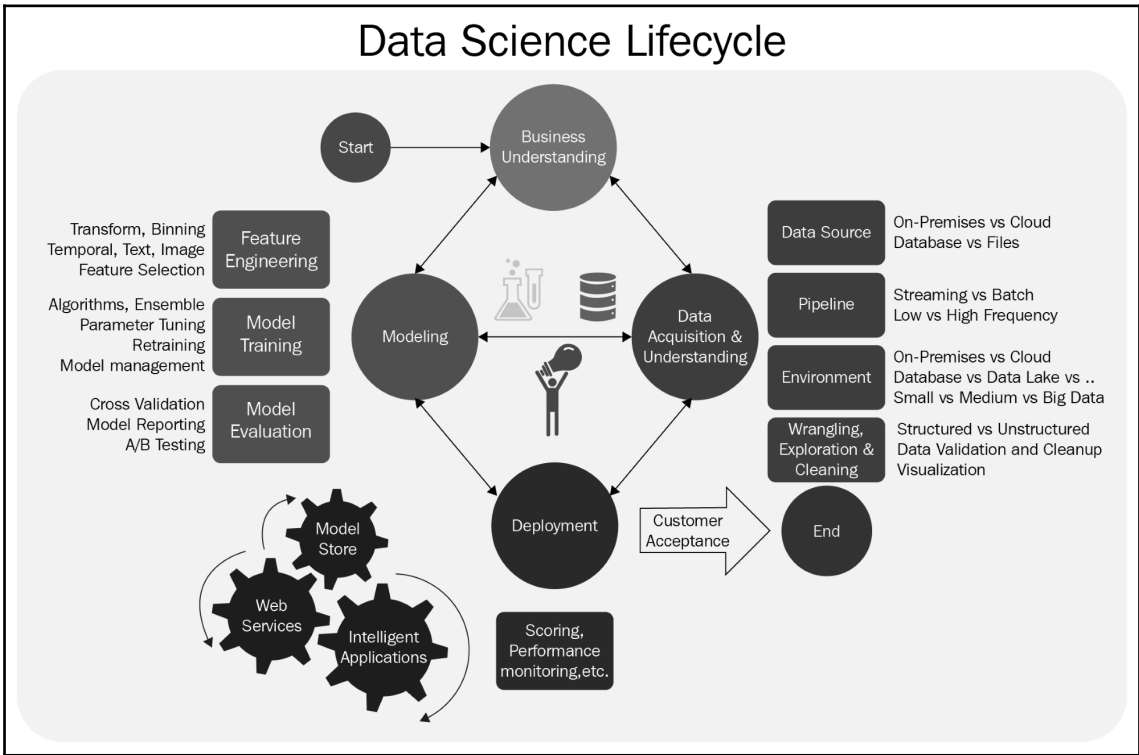
Chapter 1: AI Cloud Foundations



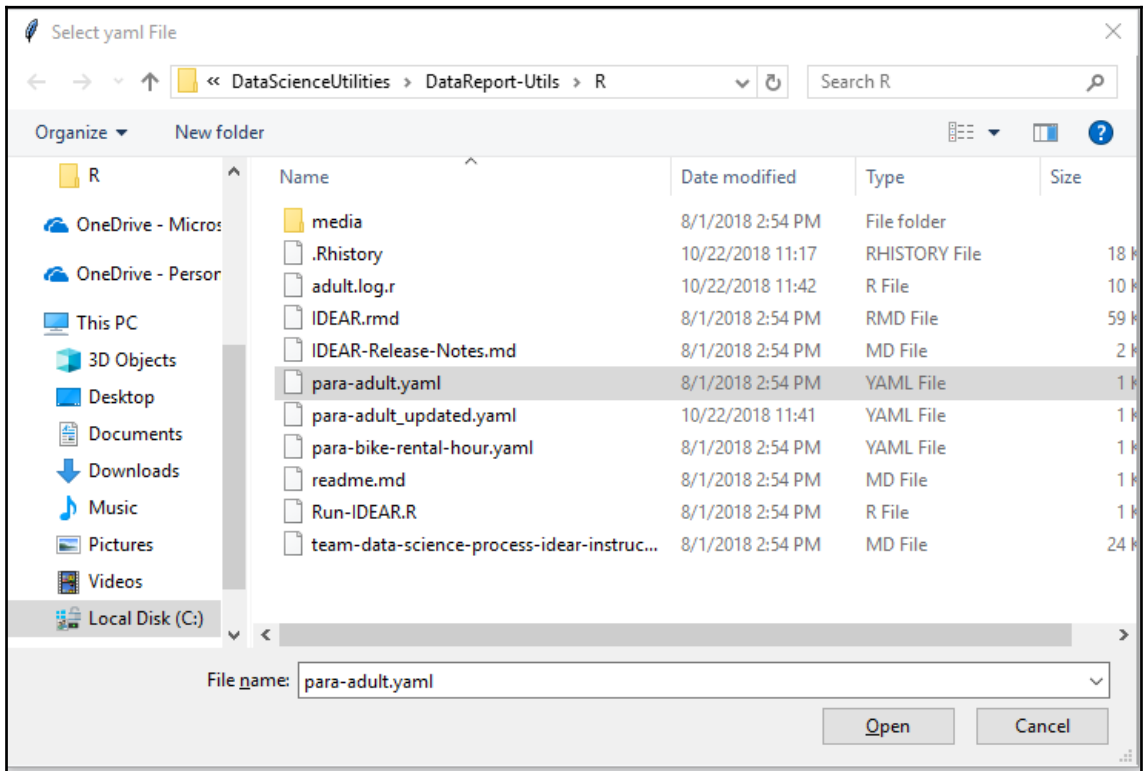
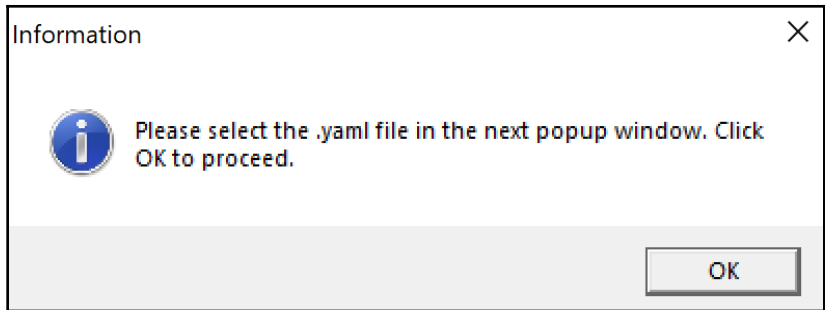
	Azure Service	Azure Marketplace
Storage	File, Disk, Blob (Hot/Cool), Queue, Table, Archive	
Compute	VMs (CPU, GPU, FPGA), Functions, Batch, Cloud Services	Data Science VM (DSVM)
Relational Databases	SQL, SQL DW, PostgreSQL, MySQL	Oracle, MySQL, PostgreSQL
NoSQL Databases	CosmosDB, Table Storage	MongoDB, Cassandra
Hadoop	HDInsight (HBase, Hive LLAP, Kafka, Storm)	
Spark	Databricks, HDInsight Spark	
Microservices	Service Fabric, Kubernetes Service, Container Instances	
Custom AI	ML Services, ML Studio, Batch AI, Bot Service	ML Server
Pre-Built AI	Search, Custom Speech, Custom Vision, Language Understanding, Linguistic Analysis, Text Analytics	
Conversational Apps	Bot Service	
Dashboards	Power BI, Time Series Insights	Tableau, Qlikview
Business Applications	Logic Apps, Web Apps	



Chapter 2: Data Science Process



```
RStudio
File Edit Code View Plots Session Build Debug Profile Tools Help
Go to file/function Addins
Run-IDEAR.R
Source on Save Run Source
1 repos.date <- "2017-08-01"
2 options(repos = c(CRAN = paste("https://mran.revolutionanalytics.com/snapshot/",
3                               repos.date, sep="")))
4
5 installed_packages <- rownames(installed.packages())
6 # install knitr
7 - if (!'knitr' %in% installed_packages){
8   install.packages('knitr')
9 - } else if ('1.16' != installed.packages()['knitr', 'Version']){
10  remove.packages('knitr')
11  install.packages('knitr')
12 }
13
14 - if (!"rmarkdown" %in% installed_packages){
15   install.packages("rmarkdown")
16 }
17
18 - if (!"shiny" %in% installed_packages){
```



~/Azure-TDSP-Utilities-master/DataScienceUtilities/DataReport-Utils/Run-IDEAR.R - Shiny
 http://127.0.0.1:3093/IDEAR.rmd Open in Browser Publish

- 1 Task Summary
- 2 Data Summary
- 3 Dive deeper into each individual variable
- 4 Investigate Multiple Variable Interactions
- 5 Final Report

Data Quality Report

Team Data Science Process by Microsoft
 October 22, 2018

1 Task Summary

- The metadata (categorical columns, numerical columns, target, etc.) is specified in - *C:/Users/thabraha/Documents/Azure-TDSP-Utilities-master/DataScienceUtilities/DataReport-Utils/R/para-adult.yaml*
- The data location is - *../Data/Common/UCI_Income/train*.
- The target is - *label_IsOver50K*.
- The task type is - *classification*.
- The numerical variables are - *age, fnlwgt, educationnum, capitalgain, capitalloss, hoursperweek*.

1 Task Summary

- The metadata (categorical columns, numerical columns, target, etc.) is specified in - *C:/Users/thabraha/Documents/Azure-TDSP-Utilities-master/DataScienceUtilities/DataReport-Utils/R/para-adult.yaml*
- The data location is - *../Data/Common/UCI_Income/train*.
- The target is - *label_IsOver50K*.
- The task type is - *classification*.
- The numerical variables are - *age, fnlwgt, educationnum, capitalgain, capitalloss, hoursperweek*.
- The categorical variables are - *workclass, education, maritalstatus, occupation, relationship, race, sex, nativecountry, label_IsOver50K*.

2.1 Take a peek of the data by showing the top rows of the data

Top Rows:

age	workclass	fnlwgt	education	educationnum	maritalstatus	occupation	relationship	race
39	State-gov	77516	Bachelors	13	Never-married	Adm-clerical	Not-in-family	Wh
50	Self-emp-not-inc	83311	Bachelors	13	Married-civ-spouse	Exec-managerial	Husband	Wh
38	Private	215646	HS-grad	9	Divorced	Handlers-cleaners	Not-in-family	Wh
53	Private	234721	11th	7	Married-civ-spouse	Handlers-cleaners	Husband	Bla
28	Private	338409	Bachelors	13	Married-civ-spouse	Prof-specialty	Wife	Bla

2.2 The dimensions of the data (Rows, Columns)

Number of Rows Number of Columns

32561

15

Export

2.3 Names and types of the columns

Show Columns:

10

Column_Name Column_Type

age integer

workclass factor

fnlwtg integer

education factor

educationnum integer

maritalstatus factor

occupation factor

relationship factor

race factor

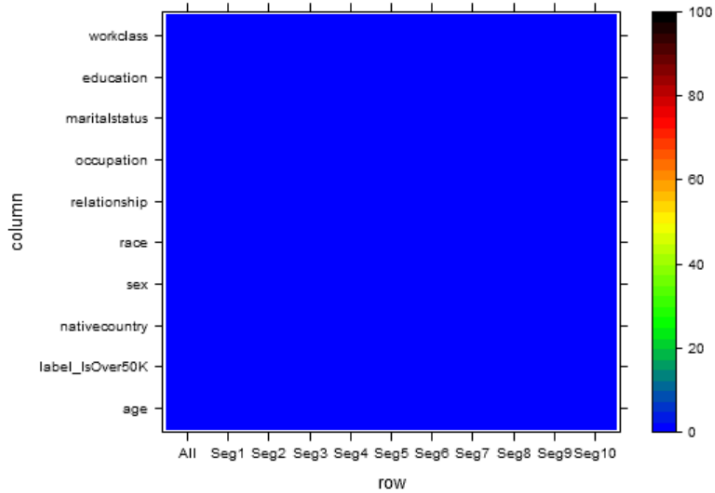
sex factor

2.4 Check the data quality

You can select the number of top variables with the highest rates of missing data, and the number of segments you want to split the data in order to know roughly where missing values exist.

Show Top Variables: **Data Split Segments:** **Missing Value Symbol:**

Missing Value Rate (0%)



Export

2.5 Summarize basic statistics of the data

Var1	Var2	Freq
	age	Min. :17.00
	age	1st Qu.:28.00
	age	Median :37.00
	age	Mean :38.58
	age	3rd Qu.:48.00
	age	Max. :90.00
	age	NA
	workclass	Private :22696
	workclass	Self-emp-not-inc: 2541
	workclass	Local-gov : 2093
	workclass	? : 1836
	workclass	State-gov : 1298
	workclass	Self-emp-inc : 1116
	workclass	(Other) : 981

3.1 More detailed statistics of each variable

```

age
  n missing distinct      Info      Mean      Gmd      .05      .10      .25      .50
  .75      .90
32561      0      73      1      38.58      15.4      19      22      28      37
  48      58
  .95
  63

lowest : 17 18 19 20 21, highest: 85 86 87 88 90
-----

workclass
  n missing distinct
  32561      0      9

Value      ?      Federal-gov      Local-gov      Never-worked      Pri
vate
Frequency      1836      960      2093      7      2
2696
Proportion      0.056      0.029      0.064      0.000      0
.697

Value      Self-emp-inc      Self-emp-not-inc      State-gov      Without-pay
Frequency      1116      2541      1298      14
Proportion      0.034      0.078      0.040      0.000
-----

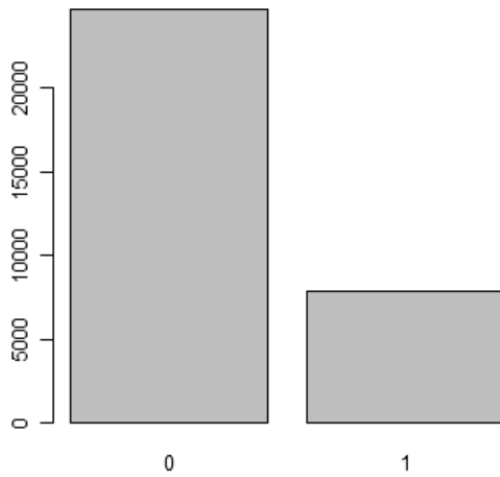
```

3.2 Visualize the target variable

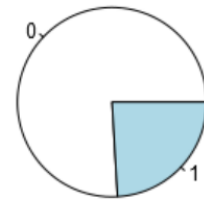
Target:

label_IsOver50K

Bar Plot of label_IsOver50K



Pie Chart of label_IsOver50K



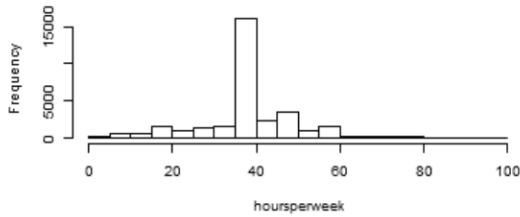
3.3 Visualize the numerical variables

You can select the variable from the drop list.

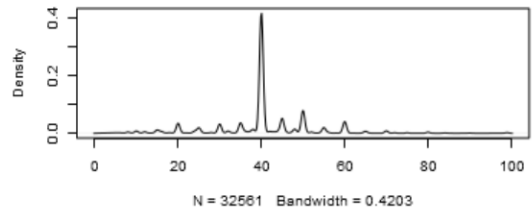
hoursperweek

Normality test of hoursperweek rejected. (p-value= 0)

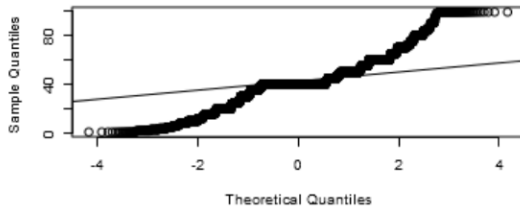
Histogram of hoursperweek



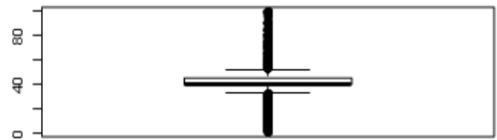
Density Plot of hoursperweek



QQ Plot of hoursperweek



Boxplot of hoursperweek



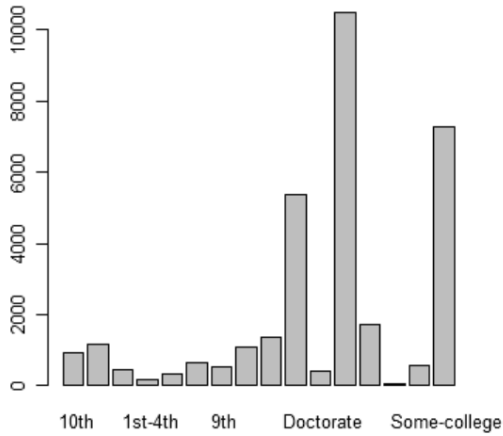
3.4 Visualize the categorical variables

You can select the variable from the drop list.

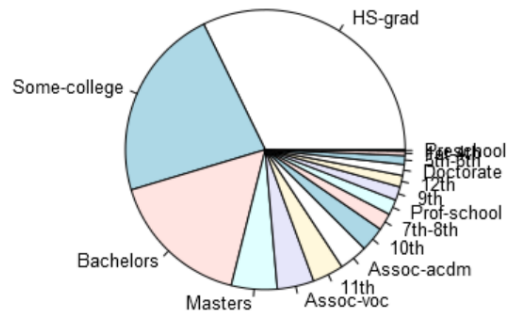
Categorical Variable:

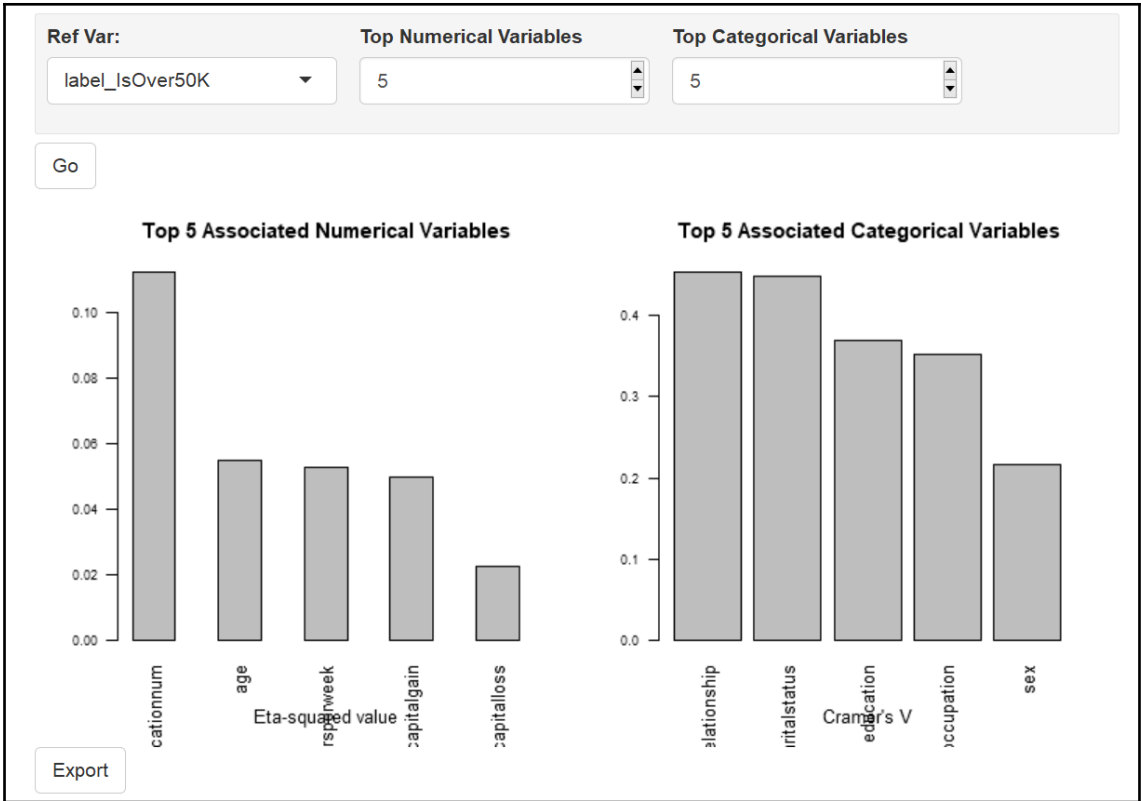
education

Bar Plot of education



Pie Chart of education





4.2 Visualize interactions between two categorical variables

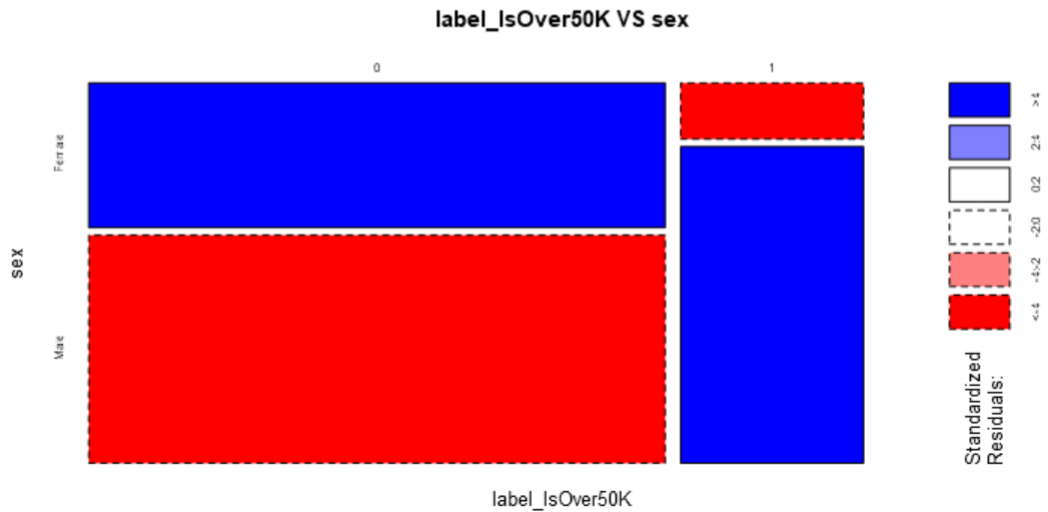
You can select the two variables from the drop lists.

Categorical Variable:

label_IsOver50K

Categorical Variable:

sex



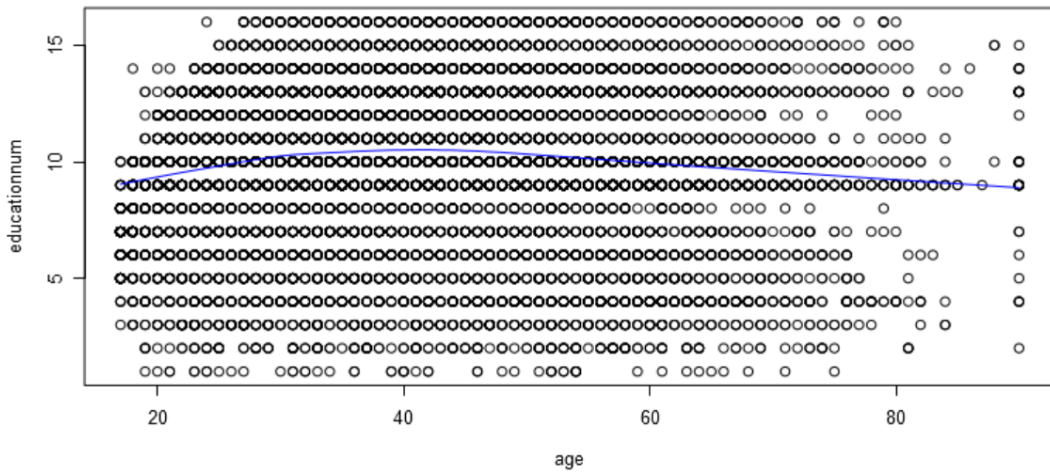
Numerical Variable:

age

Numerical Variable:

educationnum

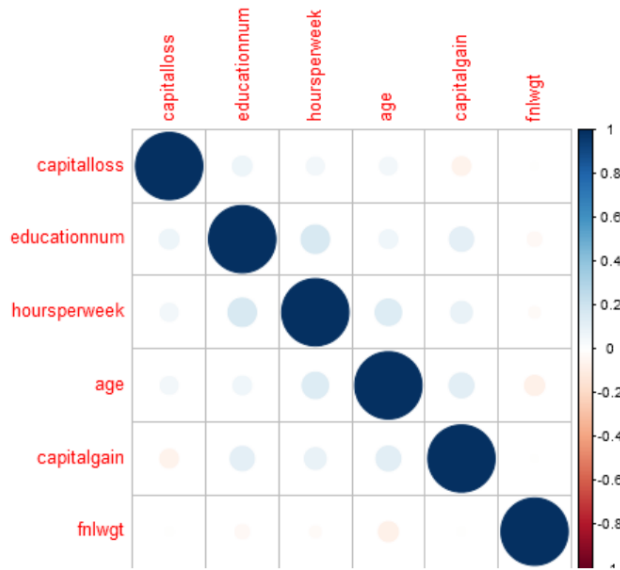
age VS educationnum correlation = 0.0365

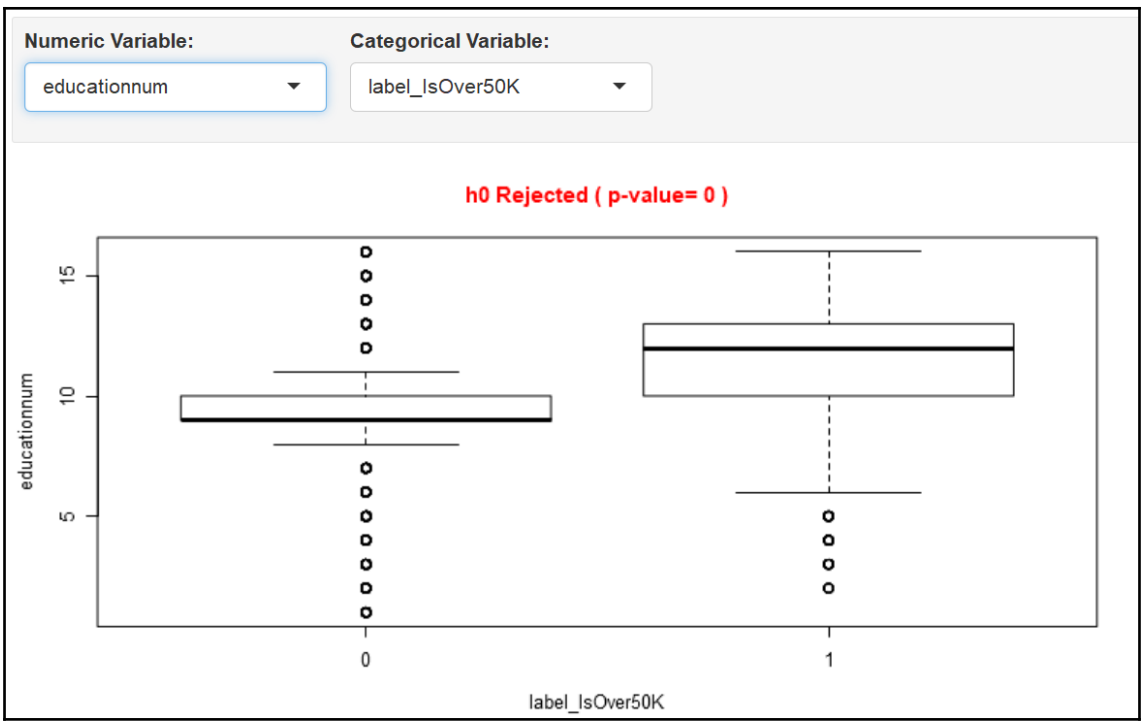


4.4 Calculate the correlations between numerical variables

Correlation Method: Order: Shape:

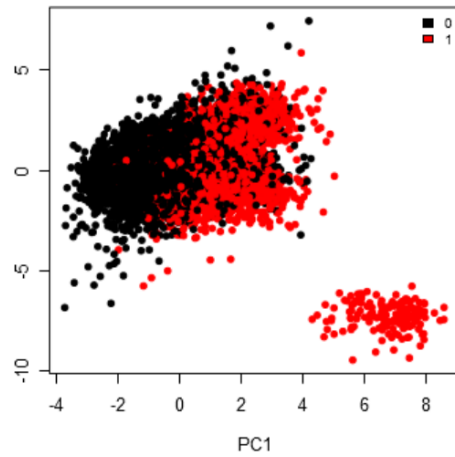
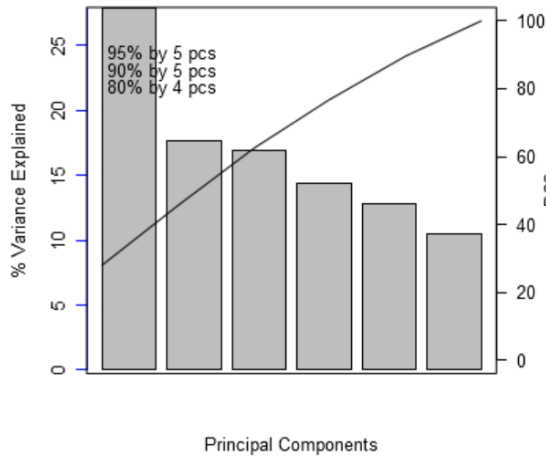
Layout:





4.6 Project numerical variables to principal components, and visualize

Color by categorical variable:
Principal component at x axis:
Principal component at y axis:



4.8 Project mixture of numerical and categorical variables to principal components, and visualize

Color by categorical variable

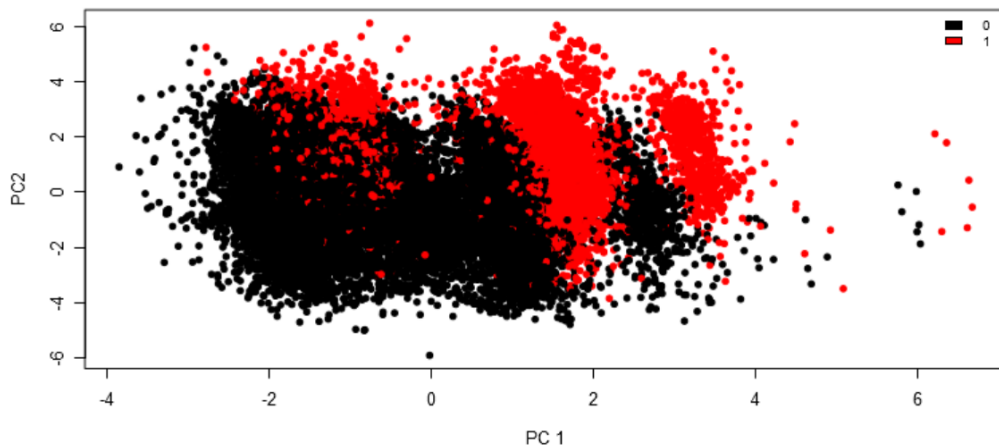
label_IsOver50K

Principal component at x axis

1

Principal component at y axis

2



```
RegressionModelSelection.rmd x
---
title: "Automated Model Selection: Regression"
date: "`r format(Sys.time(), '%B %d, %Y')`"
author: "Team Data Science Process by Microsoft"
output:
  html_document:
    fig_caption: yes
    number_sections: yes
    toc: yes
```

Automated Model training: Binary classification

Team Data Science Process by Microsoft

September 23, 2016

0.1 Introduction

This R Markdown performs **exploratory** model training and evaluation for **binary classification** tasks using the **Caret package**, which has convenient functions for resampling, hyper-parameter sweeping, and model accuracy comparison. The user can use Caret with R machine learning packages (such as, **glmnet**, **RandomForest**, **xgboost**, etc.). We use these three algorithms with limited parameters. Users can customize this template to create their own model training and evaluation process for binary classification tasks.

```
## package 'pROC' successfully unpacked and MD5 sums checked
## package 'ROCR' successfully unpacked and MD5 sums checked
##
## The downloaded binary packages are in
## C:\Users\remoteuser\AppData\Local\Temp\2\RtmpExHP1\downloaded_packages
```

0.2 Specify YAML parameter file for input data and modeling

Specify the file which contains the parameter set to train the ML models with. If there are multiple values for each parameter file, then modes ML algorithms will be run with a specified number of random combination of these parameters (currently set to 59).

```
## [1] "Yaml file loc: C:\\Users\\remoteuser\\Source\\Repos\\DGADSCCommonUtilities\\DataScienceUtilities\\Modeling\\BinaryClassification\\YamlFiles\\BinaryClassification_UCI_Income.yaml"
```

0.3 Input data, and splitting data into train/test

Once the data is read in, it is split into training and testing. Modeling is run on training data (using CV/bootstrapping and parameter sweeping), and evaluated on the test data.

```
## [1] "Input data description: UCI Adult Census & Income Binary Classification Dataset"
```

```
## [1] "Train/test split percent: 0.75"
```

```
##  income age  type_employer  fnlwgt education education_num
## 1   X0  39      State.gov  77516 Bachelors          13
## 2   X0  50 Self.emp.not.inc  83311 Bachelors          13
## 3   X0  38      Private  215646 HS.grad            9
##      marital      occupation relationship race sex
## 1  Never.married  Adm.clerical Not.in.family White Male
## 2 Married.civ.spouse Exec.managerial      Husband White Male
## 3      Divorced Handlers.cleaners Not.in.family White Male
##  capital_gain capital_loss hr_per_week country
## 1         2174           0         40 Vietnam
## 2           0           0         13 Vietnam
## 3           0           0         40 Vietnam
```

0.4 Model training

0.4.1 Define hyper-parameter sets for glmnet, randomForest and xgBoost

Create the control object for cross validation and parameter sweeping. Here we can use **OneSE** (one standard error) as selection function. By default, Caret's train uses 'best' model, i.e. the tuning parameters associated with the largest (or lowest for "RMSE") performance. oneSE is a rule in the spirit of the "one standard error" rule of Breiman et al. (1984), who suggest that the tuning parameter associated with the best performance may over fit. They suggest that the simplest model within one standard error of the empirically optimal model is the better choice.

Also, for hyper-parameter sweeping, within a fixed computational time, selecting a random set of parameters (or 'random' search option) is typically a better choice than entire grid search for identifying parameter-set that will provide an optimal model, [Bergstra and Bengio, 2012](#). Therefore, we use a 59 point random grid sample of hyper-parameters. Choosing 59 random points from a hyper-parameter grid will guarantee with 95% confidence that one of the hyper-parameter set will provide a model with accuracy that is within top 5% of the accuracy of all the grid hyper-parameters.

0.4.2 Define train formula based on target and features in parameters file

```
## income ~ age + type_employer + fnlwgt + education + education_num +  
##   marital + occupation + relationship + race + sex + capital_gain +  
##   capital_loss + hr_per_week + country
```

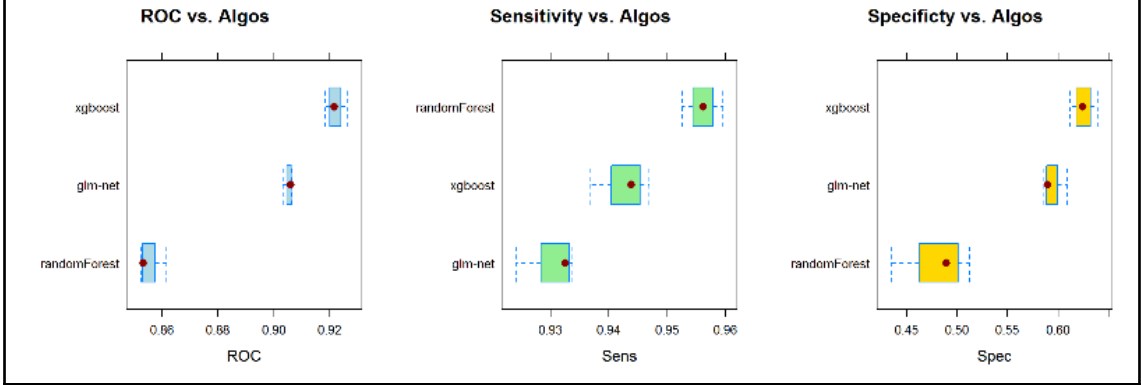
0.4.3 Train glmnet, randomForest, and xgBoost with parameter sweeping

```
## [1] "Train GlmNet Model: TRUE"
```

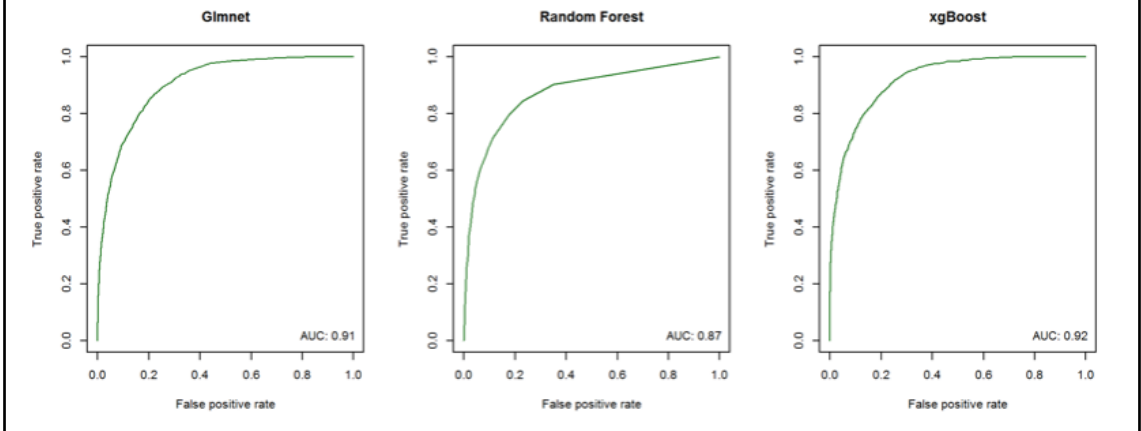
```
## [1] "Train RandomForest Model: TRUE"
```

```
## [1] "Train xgBoost Model: TRUE"
```

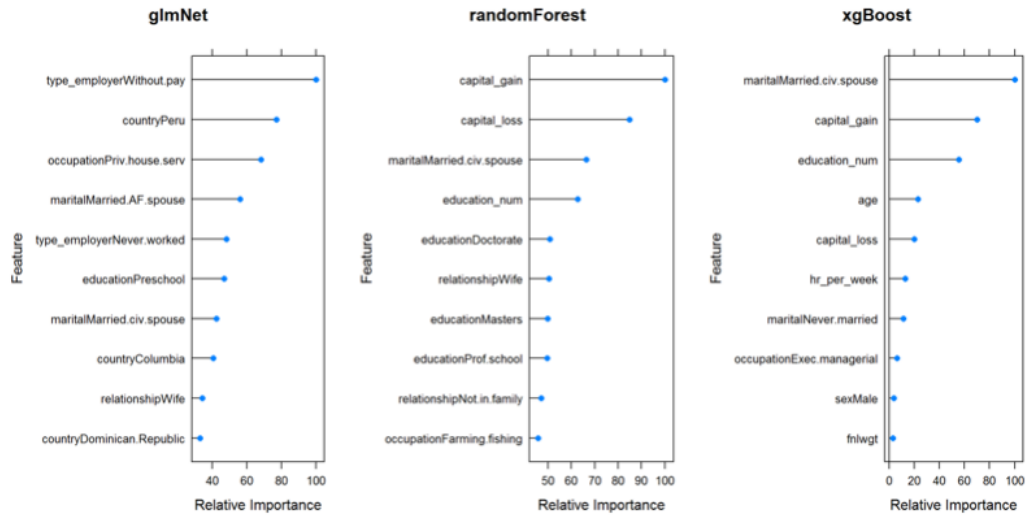
0.5.1 Plot accuracy in test data vs. algorithms



0.5.2 Visualize scatterplot of actual vs. predicted values in the test data from different models



0.5.3 Variable importance: Plot top 20 relative variable importances for different models



Chapter 3: Cognitive Services



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RESOURCE MANAGEMENT

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Pricing tier

Billing By Subscription

Properties

Locks

Automation script

MONITORING

Metrics

Alerts (classic)

SUPPORT + TROUBLESHOOTING

Resource health

Congratulations! Your keys are ready.

Now explore the Quickstart guidance to get up and running with Computer Vision.

- 1** Grab your keys

Every call to the Computer Vision API requires a subscription key. This key needs to be either passed through a query string parameter or specified in the request header. You can find your keys in the API resource 'Overview' or 'Keys' from the left menu.

[Keys](#)
- 2** Make an API call to endpoint <https://westus2.api.cognitive.microsoft.com/vision/v1.0>

Get in-depth information about each properties and methods of the API. Test your keys with the built-in testing console without writing a single line of code. Once you have the API running, you can check your consumption and the API health on Azure portal in your API 'Overview'.

[Computer Vision API reference](#)

[Realtime API usage](#)

[API metrics alert](#)

[Billing by subscription](#)

[Resource health status](#)
- 3** Enjoy coding

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Unavailable setting Delete

Essentials

API type
Computer Vision

Pricing tier
Free

Endpoint
<https://westus2.api.cognitive.microsoft.com/vision/v1...>

Manage keys

[Show access keys ...](#)

Monitoring

Total Calls and Total Errors

TOTAL CALLS 1

TOTAL ERRORS 0





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Quickstart tutorial
- Face**
Quickstart tutorial
- Text Analytics**
Quickstart tutorial
- Language Understanding**
Quickstart tutorial
- Translator Speech**
Quickstart tutorial

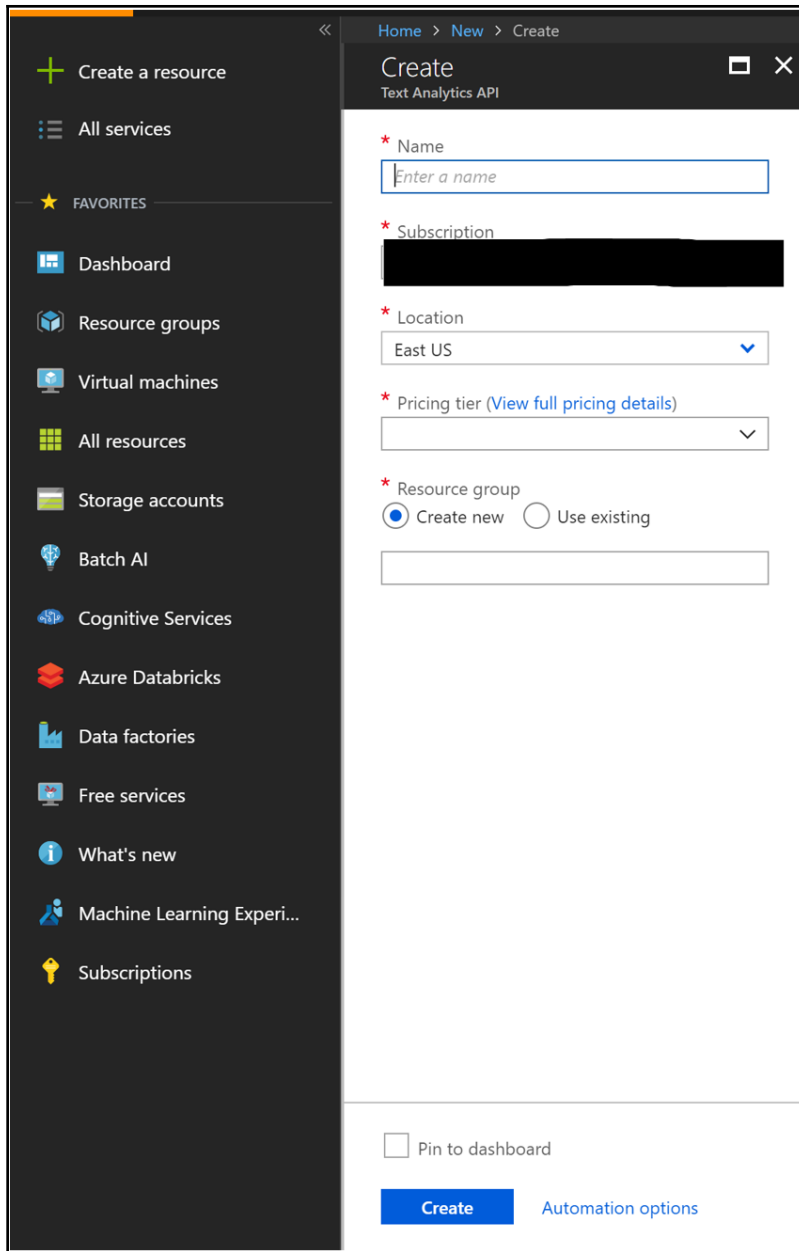
AI + Machine Learning

Filter

Text Analytics

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NAME	PUBLISHER	CATEGORY
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- Quick start**
- Pricing tier
- Billing By Subscription
- Properties
- Locks
- Automation script

MONITORING

- Metrics
- Alerts (classic)

SUPPORT + TROUBLESHOOTING

- Resource health

Congratulations! Your keys are ready.
Now explore the Quickstart guidance to get up and running with Text Analytics API.

- 1 Grab your keys**
Every call to Text Analytics API requires a subscription key. This key needs to be either passed through a query string parameter or specified in the request header. You can find your keys in the API resource 'Overview' or 'Keys' from the left menu.
[Keys](#)
- 2 Make an API call to endpoint <https://westus2.api.cognitive.microsoft.com/text/analytics/v2.0>**
Get in-depth information about each properties and methods of the API. Test your keys with the built-in testing console without writing a single line of code. Once you have the API running, you can check your consumption and the API health on Azure portal in your API 'Overview'.
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demotextanalytics
Cognitive Services

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Unavailable setting Delete

Essentials

Status: Active
Location: West US 2

API type: Text Analytics API
Pricing tier: Free
Endpoint: https://westus2.api.cognitive.microsoft.com/text/analytics/v2.0
Manage keys
[Show access keys ...](#)

RESOURCE MANAGEMENT

- Keys
- Quick start
- Pricing tier
- Billing By Subscription
- Properties
- Locks
- Automation script

MONITORING

- Metrics
- Alerts (classic)

Monitoring

Total Transactions

Latency

Total Calls and Total E...

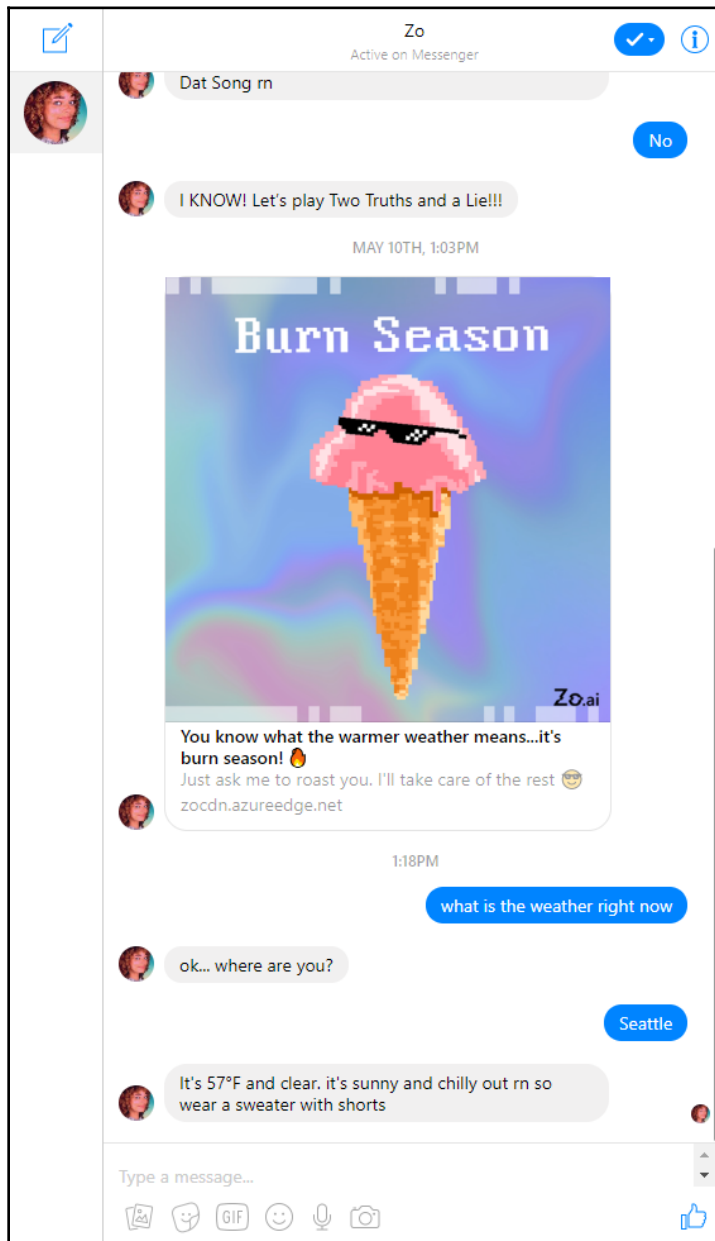
Preview JSON

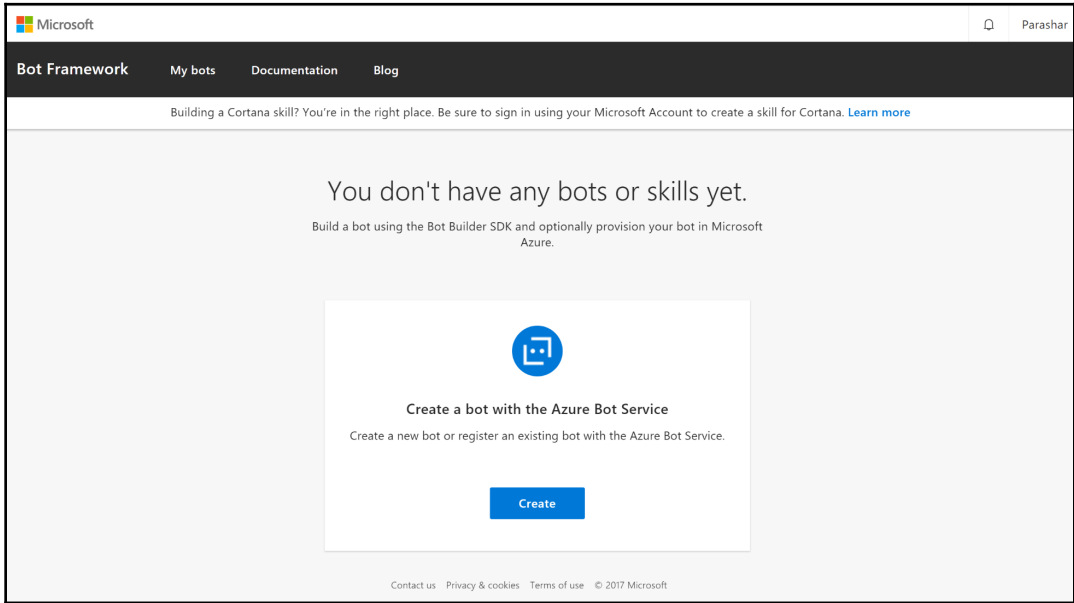
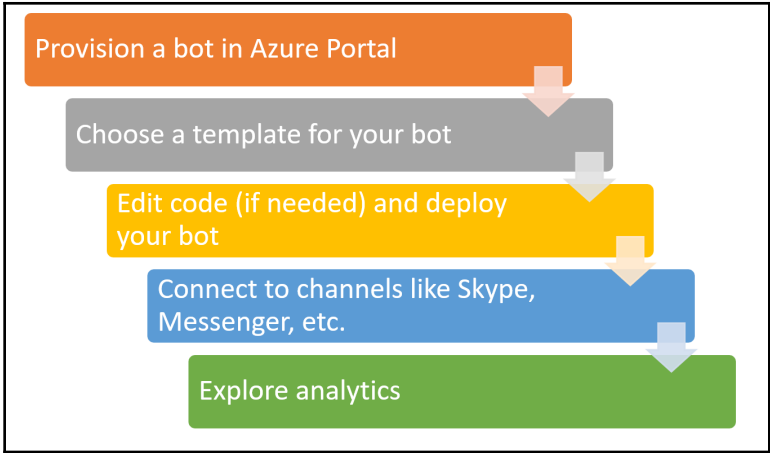
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USD 331.99

Pair of Guillemette et Chambron Black Cerused Oak 'Edouard ...'
USD 8600

Chapter 4: Bot Framework Name





The screenshot shows the Azure Marketplace interface for AI + Machine Learning. The left sidebar contains navigation options such as 'All services', 'Favorites', 'Dashboard', 'Resource groups', 'Virtual machines', 'All resources', 'Storage accounts', 'Batch AI', 'Cognitive Services', 'Azure Databricks', 'Data factories', 'Free services', 'What's new', 'Machine Learning Experi...', and 'Subscriptions'. The main area is titled 'AI + Machine Learning' and features a search bar with the text 'bot service'. Below the search bar, a table displays the search results.

NAME	PUBLISHER	CATEGORY
Web App Bot	Microsoft	Bot Service
Functions Bot	Microsoft	Bot Service
Bot Channels Registration	Microsoft	Bot Service
QnA Maker	Microsoft	Cognitive Service
Language Understanding	Microsoft	Cognitive Service
Speech (preview)	Microsoft	Cognitive Service
Data Science Virtual Machine - Windows 2016	Microsoft	Machine Learning
Translator Text	Microsoft	Cognitive Service
Data Science Virtual Machine - Windows 2012	Microsoft	Machine Learning

Home > Bot Service > Web App Bot

Bot Service

- Web App Bot
Microsoft
- Bot Channels Registration
Microsoft
- Functions Bot
Microsoft

Web App Bot

Microsoft

An Azure Bot Service Bot deployed to an Azure App Service Web App. Build, connect, deploy and manage Bots to interact with your users wherever they are - from your app or website to Cortana, Skype, Messenger and many other services.

[Save for later](#)

PUBLISHER: Microsoft

USEFUL LINKS:
[Documentation](#)
[Solution Overview](#)
[Pricing Details](#)

[Create](#)

The screenshot displays the Azure portal interface for configuring a Web App Bot. The left sidebar shows navigation options like 'Create a resource', 'All services', and 'FAVORITES'. The main area is split into two panes:

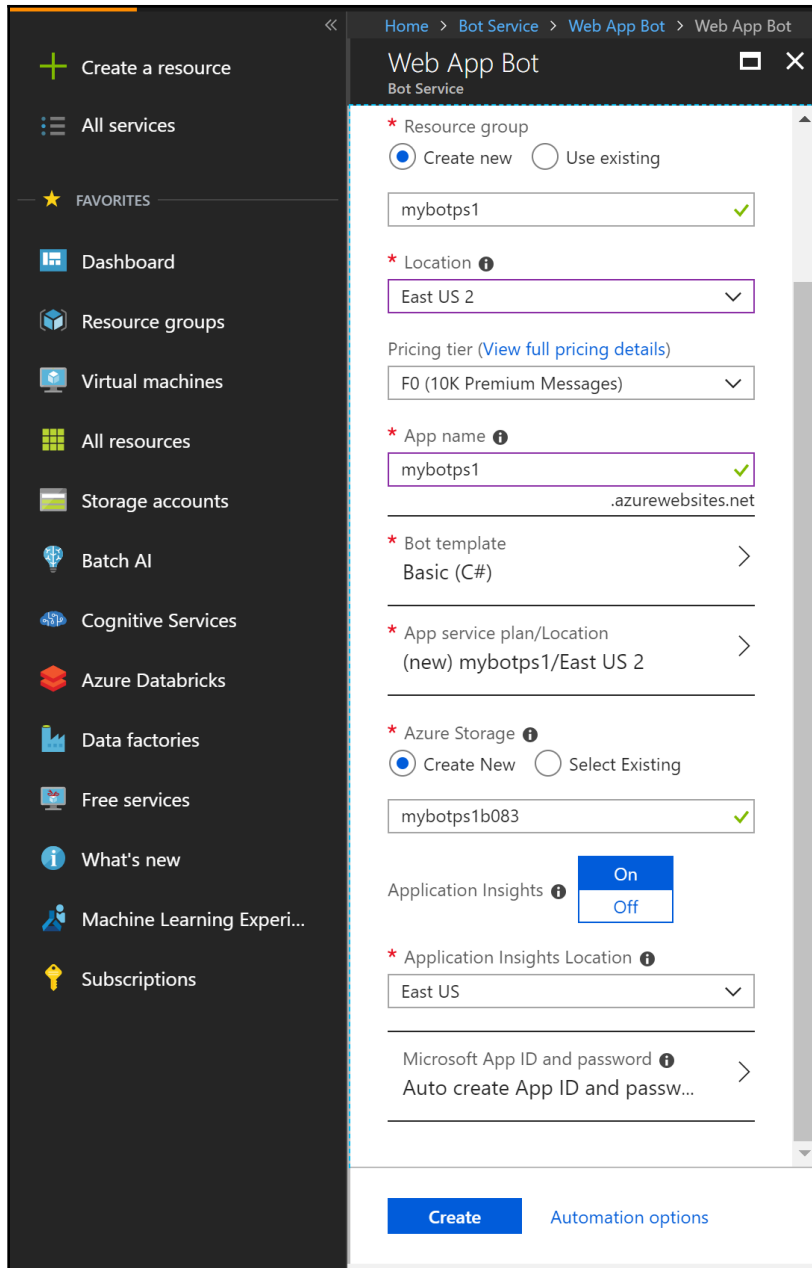
- Web App Bot (Bot Service):** This pane contains configuration fields:
 - Bot name:** mybotps1
 - Subscription:** (empty)
 - Resource group:** mybotps1
 - Location:** East US 2
 - Pricing tier:** F0 (10K Premium Messages)
 - App name:** mybotps1.azurewebsites.net
 - Bot template:** Basic (C#)
 - App service plan/Location:** Configure required settings
 - Azure Storage:** Create New (selected), mybotps1b083
 - Application Insights:** On (selected)
 - Application Insights Location:** (empty)
- Bot template (Choose a template):** This pane shows a grid of templates:
 - Basic (C#):** A bot with a single dialog that echoes back the user input.
 - Form (C#):** A bot that shows how to collect input from a user using a guided conversation using FormFlow.
 - Language understanding (C#):** A bot that shows how to handle natural language using the Cognitive Services LUIS API.
 - Question and Answer (C#):** A bot that distills information into conversational, easy-to-navigate answers.
 - Proactive (C#):** A bot that shows how to use Azure Functions to trigger events in Azure bots.

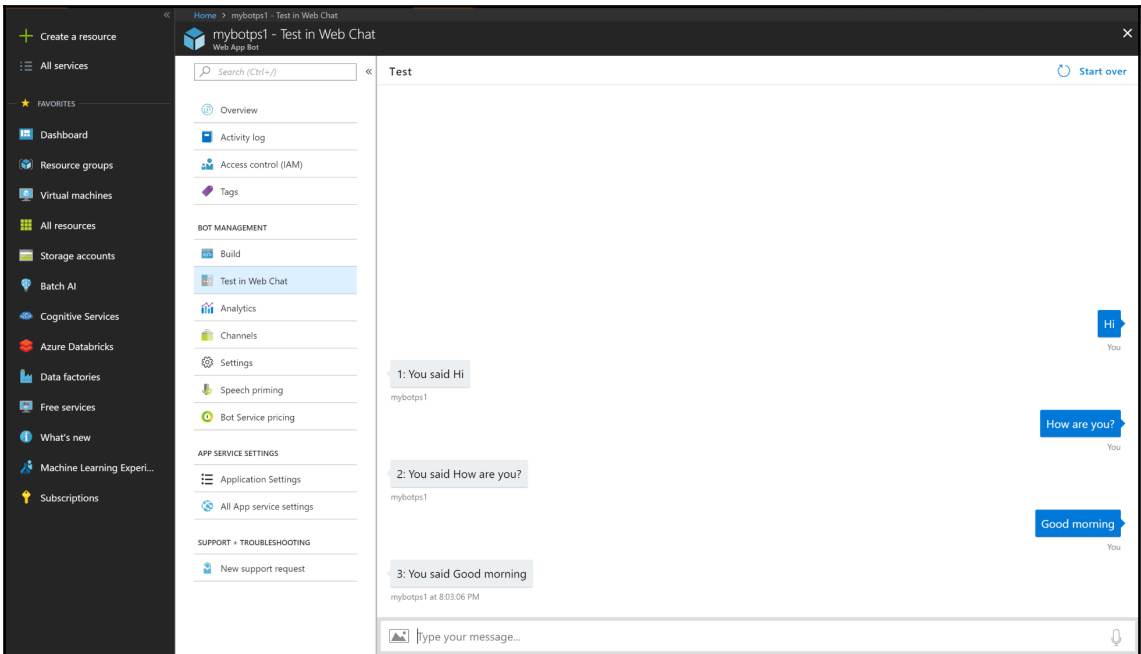
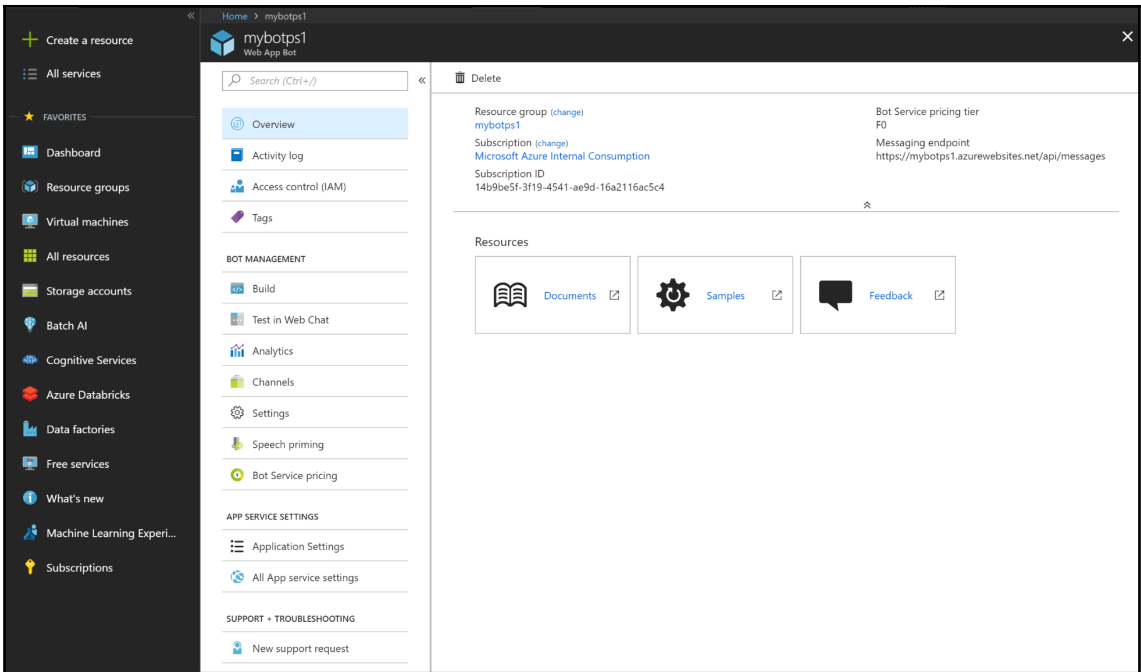
Buttons for 'Create' and 'Select' are visible at the bottom of their respective panes.

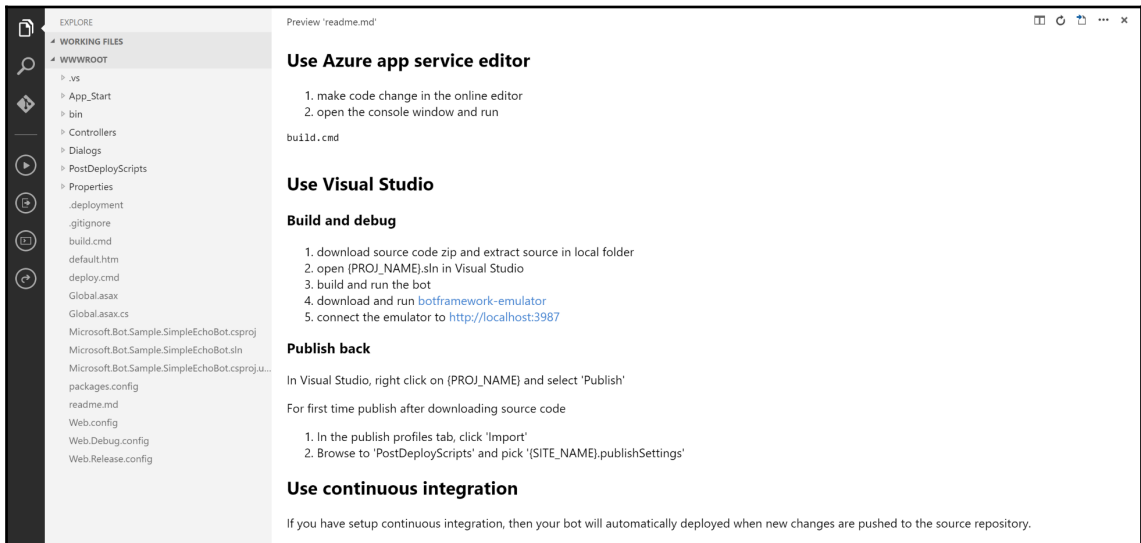
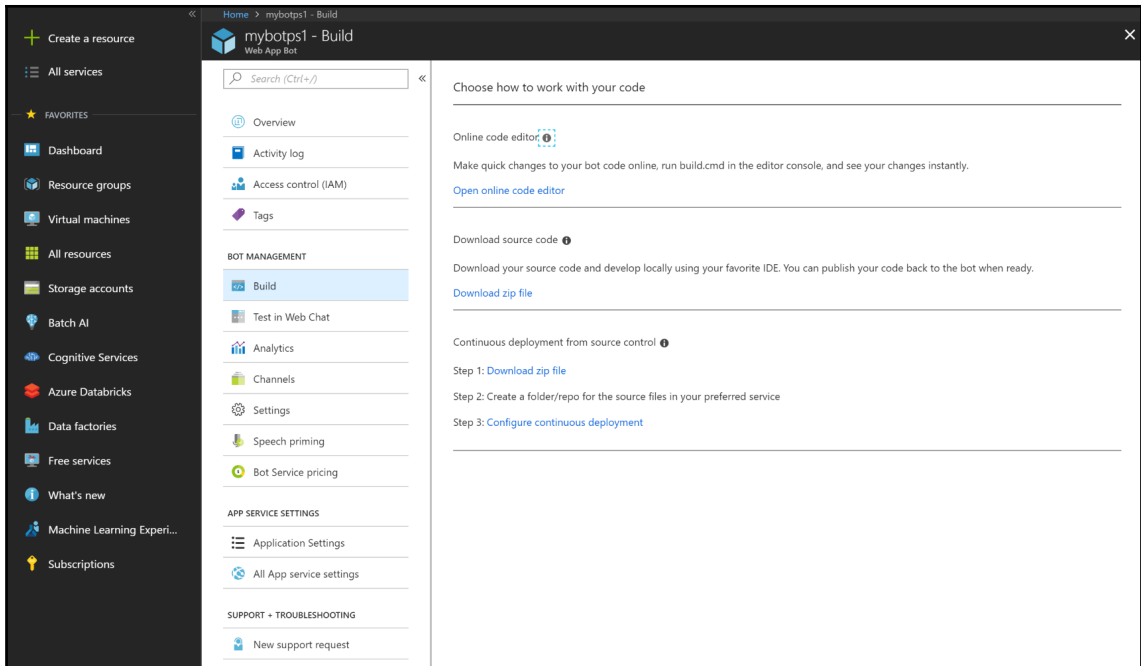
The screenshot displays the Azure portal interface for configuring a Web App Bot and its associated App Service Plan. The left sidebar shows navigation options like 'Create a resource', 'All services', and 'FAVORITES'. The main area is divided into three panels:

- Web App Bot (Bot Service):** This panel contains configuration fields for the bot:
 - Bot name:** mybotps1
 - Subscription:** Microsoft Azure Internal Consumption
 - Resource group:** mybotps1 (with 'Create new' selected)
 - Location:** East US 2
 - Pricing tier:** FO (10K Premium Messages)
 - App name:** mybotps1 (with domain .azurewebsites.net)
 - Bot template:** Basic (C#)
 - App service plan/Location:** Configure required settings (with an error icon)
 - Azure Storage:** mybotps1b083 (with 'Create New' selected)
 - Application Insights:** On
 - Application Insights Location:** (empty)
- App service plan:** This panel shows a search for an existing plan, resulting in 'No result'. A '+ Create New' button is visible.
- New app service plan:** This panel shows the configuration for a new plan:
 - App service plan name:** mybotps1
 - Location:** East US 2
 - Information:** A note states: 'The pricing tier currently defaults to 'S1 Standard'. It can be modified by visiting the app service plan resource page once the resource has been created, or you can choose an existing plan in your subscription.'

At the bottom of each panel, there are 'Create' and 'Automation options' buttons for the Web App Bot, and an 'OK' button for the New app service plan panel.







```

EXPLORE
WORKING FILES
WWWROOT
  .vs
  App_Start
  bin
  Controllers
    MessengerController.cs
  Dialogs
    EchoDialog.cs
  PostDeployScripts
  Properties
    .deployment
    .gitignore
    build.cmd
    default.htm
    deploy.cmd
    Global.asax
    Global.asax.cs
    Microsoft.Bot.Sample.SimpleEchoBot.csproj
    Microsoft.Bot.Sample.SimpleEchoBot.sln
    Microsoft.Bot.Sample.SimpleEchoBot.csproj.u...
    packages.config
    readme.md
    Web.config
    Web.Debug.config
    Web.Release.config

MessengerController.cs Controllers
1 using System.Threading.Tasks;
2 using System.Web.Http;
3
4 using Microsoft.Bot.Connector;
5 using Microsoft.Bot.Builder.Dialogs;
6 using System.Web.Http.Description;
7 using System.Net.Http;
8
9 namespace Microsoft.Bot.Sample.SimpleEchoBot
10 {
11     [BotAuthentication]
12     public class MessagesController : ApiController
13     {
14         /// <summary>
15         /// POST: api/Messages
16         /// receive a message from a user and send replies
17         /// </summary>
18         /// <param name="activity"></param>
19         [ResponseType(typeof(void))]
20         public virtual async Task<HttpResponseMessage> Post([FromBody] Activity activity)
21         {
22             // check if activity is of type message
23             if (activity != null && activity.GetActivityType() == ActivityTypes.Message)
24             {
25                 await Conversation.SendAsync(activity, () => new EchoDialog());
26             }
27             else
28             {
29                 HandleSystemMessage(activity);
30             }
31             return new HttpResponseMessage(System.Net.HttpStatusCode.Accepted);
32         }
33
34         private Activity HandleSystemMessage(Activity message)
35         {
36             if (message.Type == ActivityTypes.DeleteUserData)
37             {
38                 // Implement user deletion here
39                 // If we handle user deletion, return a real message
40             }
41             else if (message.Type == ActivityTypes.ConversationUpdate)
42             {
43                 // Handle conversation state changes, like members being added and removed
44                 // Use Activity.MembersAdded and Activity.MembersRemoved and Activity.Action for info

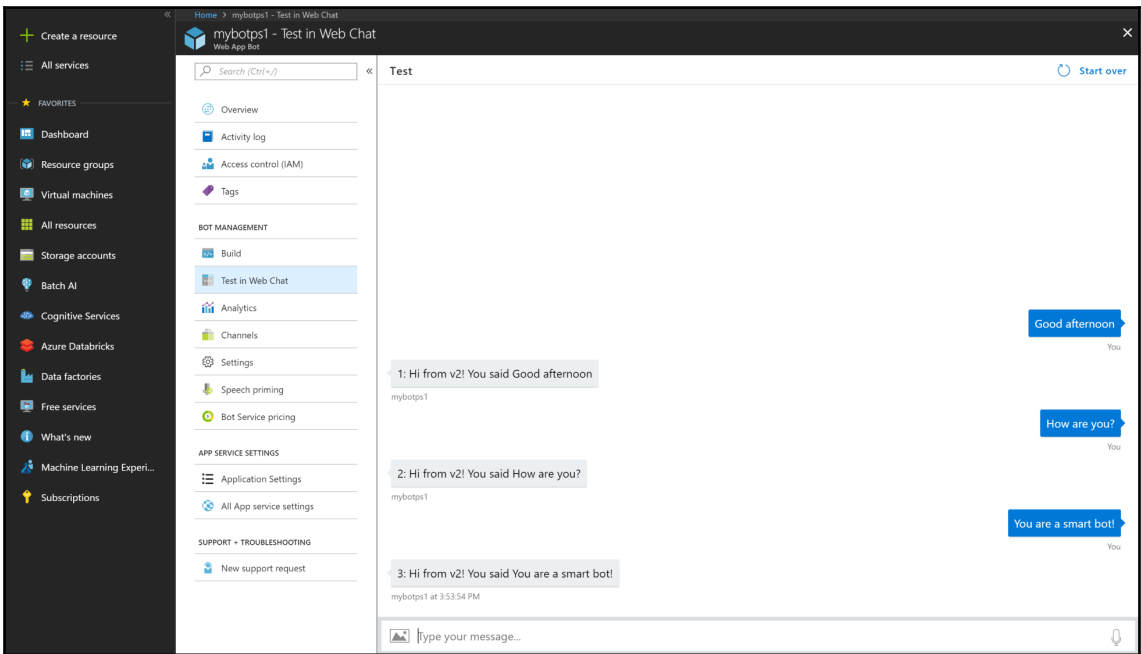
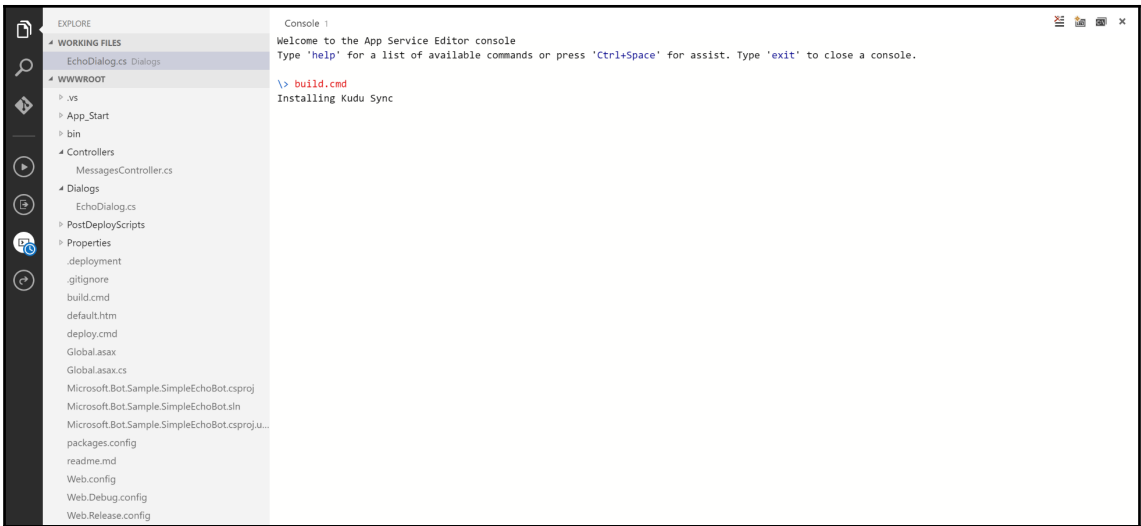
```

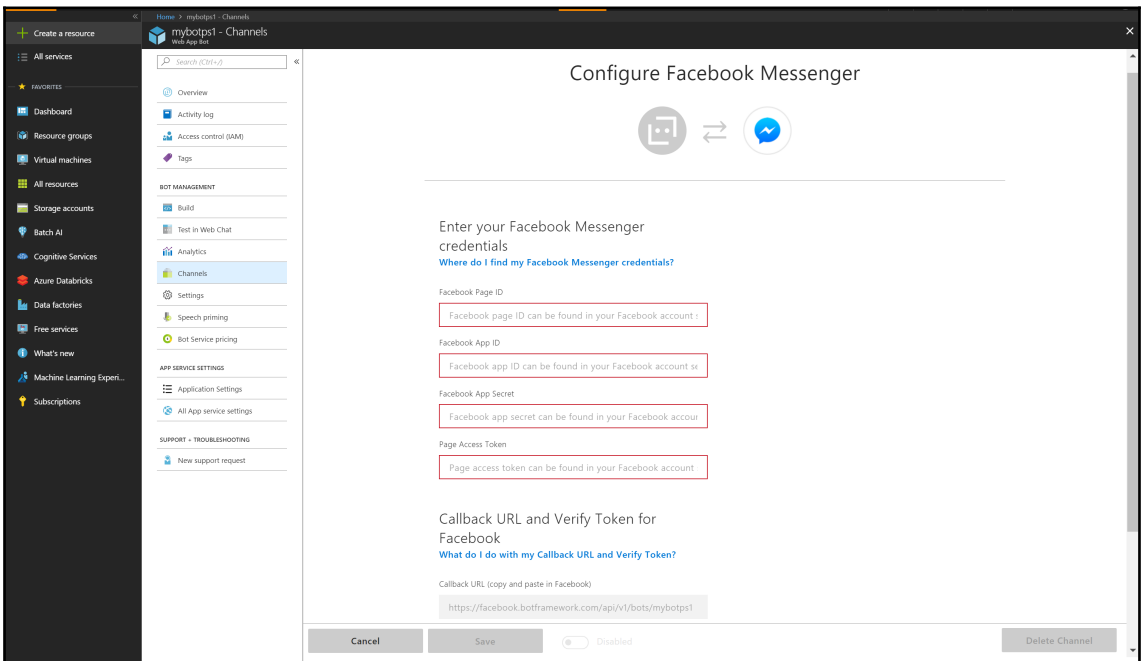
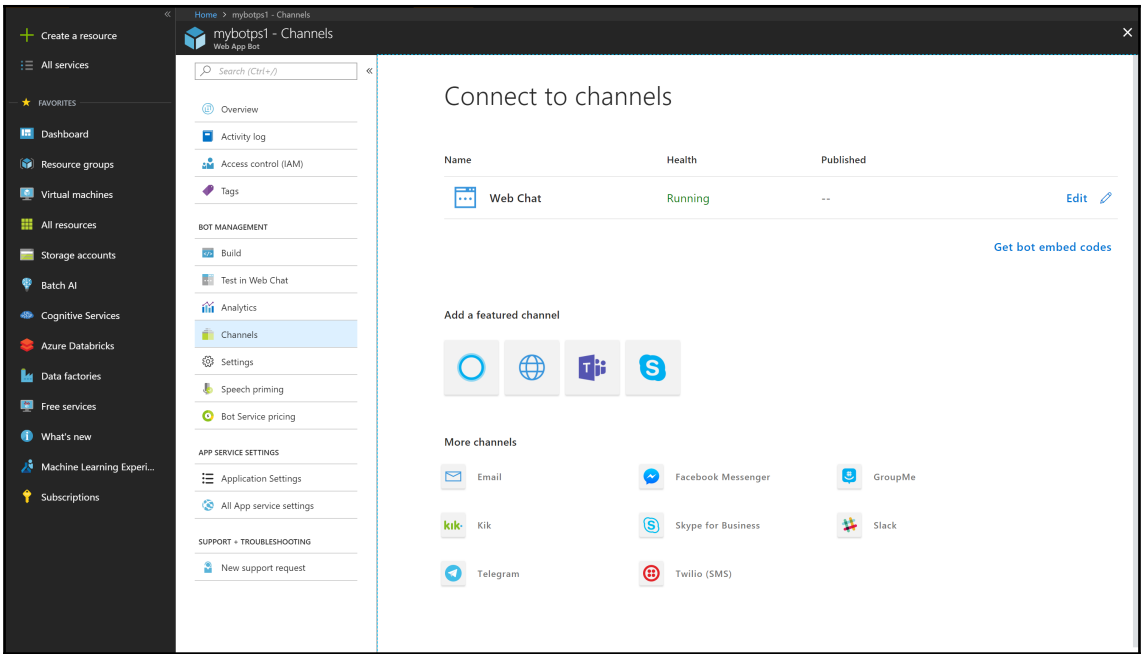
```

EXPLORE
WORKING FILES
EchoDialog.cs Dialogs
WWWROOT
  .vs
  App_Start
  bin
  Controllers
    MessengerController.cs
  Dialogs
    EchoDialog.cs
  obj
  packages
  PostDeployScripts
  Properties
    .deployment
    .gitignore
    build.cmd
    default.htm
    deploy.cmd
    Global.asax
    Global.asax.cs
    Microsoft.Bot.Sample.SimpleEchoBot.csproj
    Microsoft.Bot.Sample.SimpleEchoBot.sln
    Microsoft.Bot.Sample.SimpleEchoBot.csproj.u...
    packages.config
    readme.md
    Web.config
    Web.Debug.config
    Web.Release.config

EchoDialog.cs Dialogs
6 using System.Net.Http;
7
8
9 namespace Microsoft.Bot.Sample.SimpleEchoBot
10 {
11     [Serializable]
12     public class EchoDialog : IDialog<object>
13     {
14         protected int count = 1;
15
16         public async Task StartAsync(IDialogContext context)
17         {
18             context.Wait(MessageReceivedAsync);
19         }
20
21         public async Task MessageReceivedAsync(IDialogContext context, IAwaitable<IMessageActivity> argument)
22         {
23             var message = await argument;
24
25             if (message.Text == "reset")
26             {
27                 PromptDialog.Confirm(
28                     context,
29                     AfterResetAsync,
30                     "Are you sure you want to reset the count?",
31                     "Didn't get that!",
32                     promptStyle: PromptStyle.Auto);
33             }
34             else
35             {
36                 await context.PostAsync($"this.count++; Hi from v2! You said {message.Text}");
37                 context.Wait(MessageReceivedAsync);
38             }
39         }
40
41         public async Task AfterResetAsync(IDialogContext context, IAwaitable<bool> argument)
42         {
43             var confirm = await argument;
44             if (confirm)
45             {
46                 this.count = 1;
47                 await context.PostAsync("Reset count.");
48             }
49             else

```





The screenshot shows the Azure portal interface for configuring a Web App Bot's speech priming. The left sidebar contains navigation options such as 'Create a resource', 'All services', and 'FAVORITES'. The main content area is titled 'mybotps1 - Speech priming' and includes a search bar and a list of management options like 'Overview', 'Activity log', and 'Speech priming'. The 'Speech priming' section is active, displaying the heading 'Improve speech recognition accuracy' and a note about associating a LUIS app. Below this, the 'LuisBot' field is populated with 'YourLuisApp-2017-01-13T05:20:52.3383434+00:00'. A text input field labeled 'Enter a LUIS application ID' is highlighted with a dashed blue border and contains a checkmark, indicating that the LUIS app ID has been successfully linked.

Chapter 5: Azure Machine Learning Studio

The screenshot displays the Azure Machine Learning Studio interface. On the left is a navigation sidebar with the following items: NEW, DATASET, MODULE, PROJECT (PREVIEW), EXPERIMENT (highlighted), and NOTEBOOK (PREVIEW). The main area features a search bar for experiment templates and a grid of available samples under the heading "Microsoft Samples".

- Blank Experiment:** A white card with a grey circle containing a white plus sign and the text "Blank Experiment".
- Experiment Tutorial:** A green card with the text "Experiment Tutorial" and a white arrow pointing right.
- Sample 1: Download dataset from UCI: Adult 2 class dataset:** A white card with a database cylinder icon and a green arrow pointing down. It includes a description: "Sample 1: Download dataset from UCI: Adult 2 class dataset" and a button labeled "OPEN IN STUDIO". Below the button is a link "View in Gallery" and a paragraph: "This sample demonstrates how to use the Metadata Editor, Clean Missing Data, Project Columns modules for basic data processing and compute basic...".
- Sample 7: Train, Test, Evaluate for Multiclass Classification: Letter:** A white card with an image of letters A, B, and C in boxes and a green gear icon. The text below reads: "Sample 7: Train, Test, Evaluate for Multiclass Classification: Letter" and "Multiclass Decision Jungle, One-vs-All".
- Sample 8: Apply SQL transformation:** A white card with an image of a computer monitor displaying "SQL".
- Sample 9: Split, partition and sample system:** A white card with a diagram showing data blocks being split into smaller pieces.
- Anomaly Detection: Credit Risk:** A white card with a line graph showing a spike in a signal labeled "vnl" over "time". The text below reads: "Anomaly Detection: Credit Risk" and "PCA-Based Anomaly Detection, One-Class".

EXPERIMENT

Clustering: Find similar companies

By AzureML Team for Microsoft · September 2, 2014

22 likes



Summary

This experiment clusters similar companies into same group given their Wikipedia articles and can be used to assign cluster to new company.

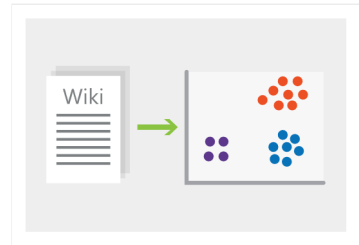
Description

This experiment demonstrates how to use the K-Means clustering algorithm to perform segmentation on companies from the Standard & Poor (S&P) 500 index, based on the text of Wikipedia articles about each company.

Data

The articles from Wikipedia were pre-processed outside Azure ML Studio to extract and partially clean text content related to each company. The processing included:

- Removing wiki formatting
- Removing non-alphanumeric characters
- Converting all text to lowercase

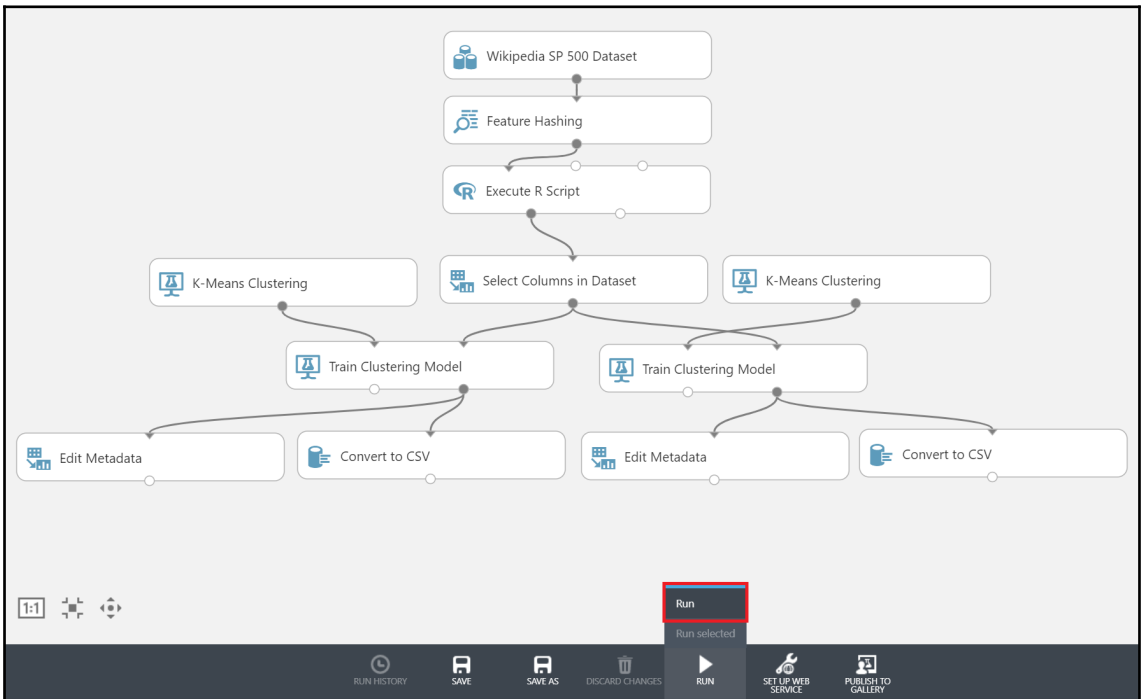


Open in Studio


+ Add to Collection



29879 views

18779 downloads





NEW


 DATASET


 FROM LOCAL FILE 


Upload a new dataset from a local file

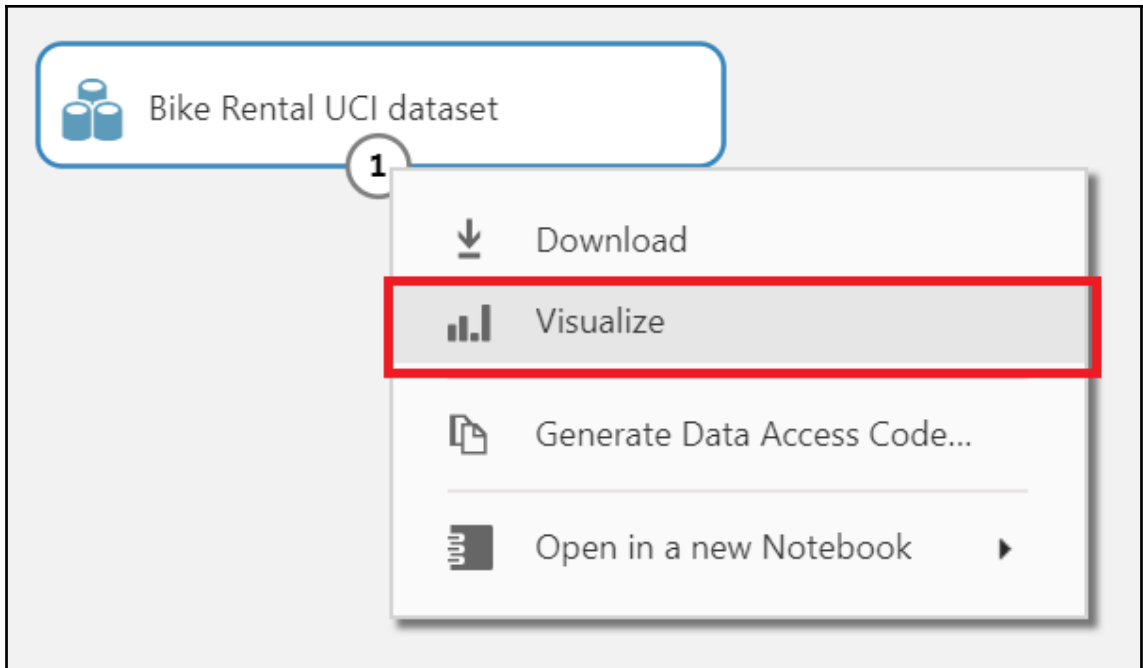
 MODULE

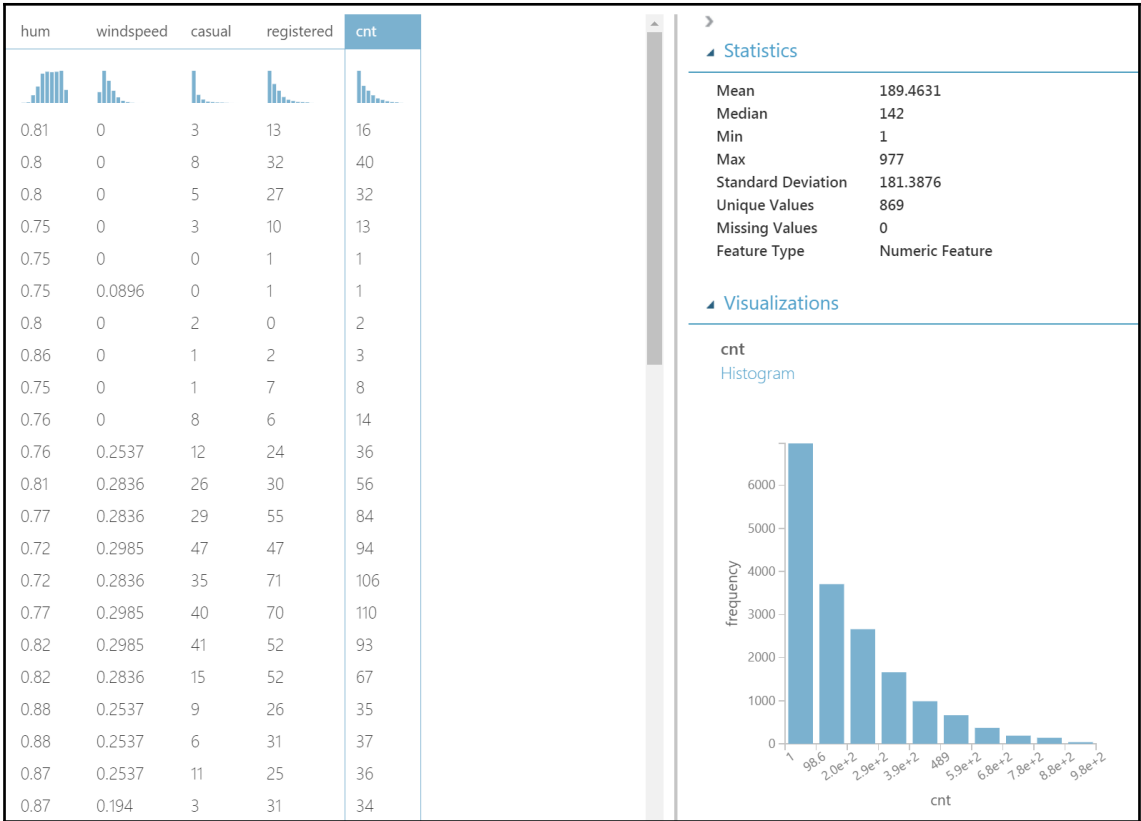
 PROJECT
PREVIEW

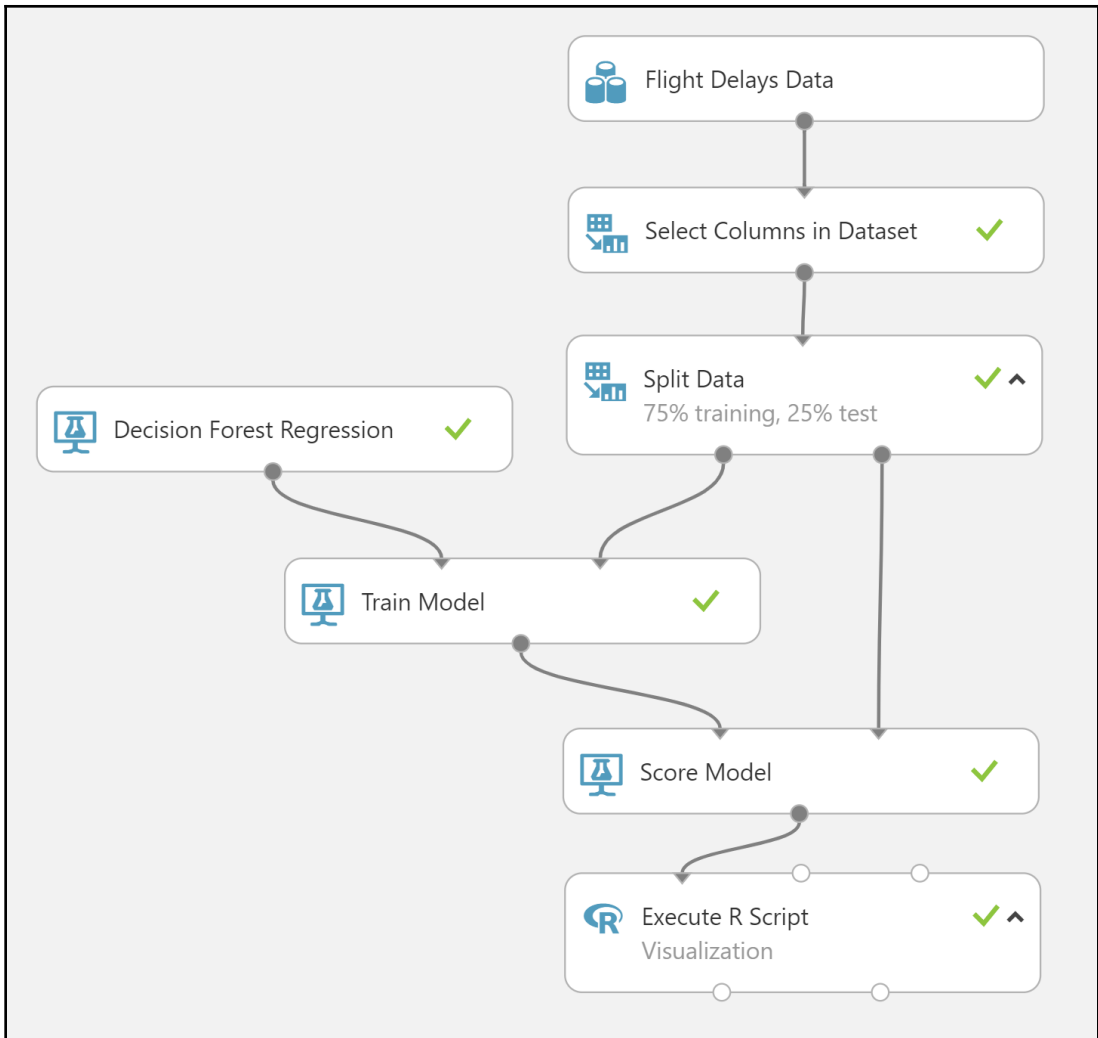
 EXPERIMENT

 NOTEBOOK
PREVIEW

 NEW







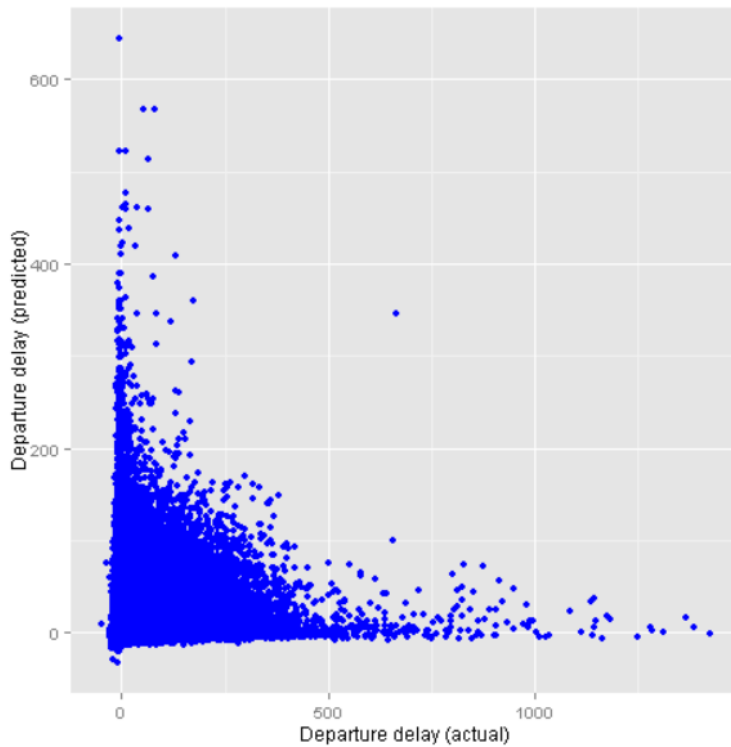
Flight delay prediction - Decision Forest ▶ Execute R Script ▶ R Device

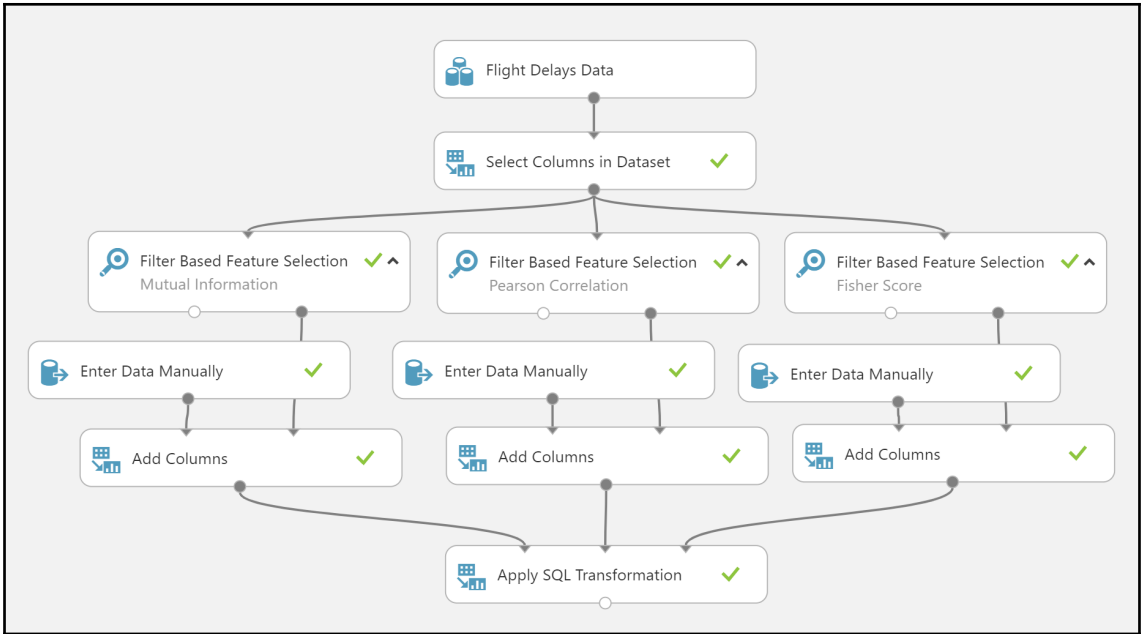
[1] "Saving the following item(s): .maml.oport1"

▸ Standard Error

R reported no errors.

▸ Graphics

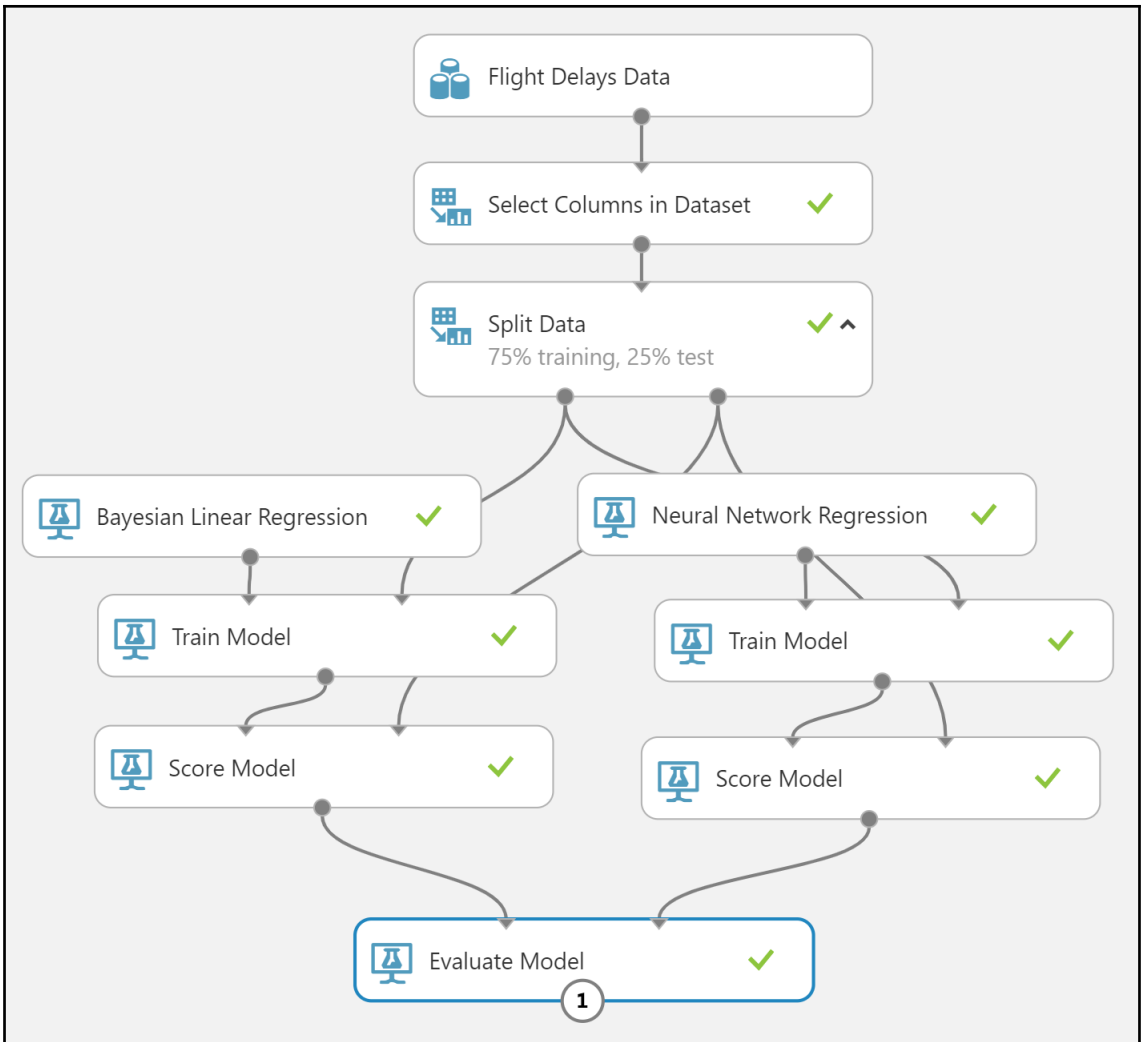




Feature selection > Apply SQL Transformation > Results dataset








rows 3
columns 7

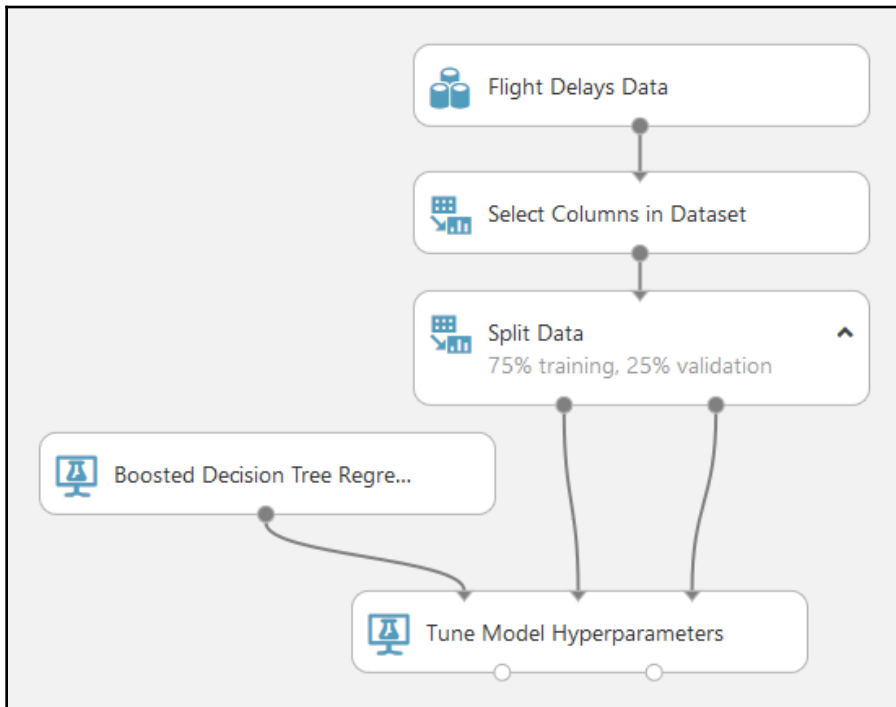
	CorrelationMetric	Carrier	OriginAirportID	Month	DayOfWeek	CRSDepTime	DepDelay
view as							
	Fisher Score	0	0.003502	0.004169	0.000445	0.066668	1
	Mutual Information	0.065922	0.005257	0.007605	0.002801	0.036812	1
	Pearson Correlation	0	0.018913	0.051139	0.00586	0.155088	1



Flight delay prediction - Compare > Evaluate Model > Evaluation results

rows 2
columns 6

	Negative Log Likelihood	Mean Absolute Error	Root Mean Squared Error	Relative Absolute Error	Relative Squared Error	Coefficient of Determination
view as 						
	5492524.863344	18.180083	35.405725	0.949358	0.963773	0.036227
	Infinity	18.831896	35.370147	0.983395	0.961837	0.038163



Properties Project

▲ Boosted Decision Tree Regression

Create trainer mode

Parameter Range

Maximum number of leaves per tree

Use Range Builder

2, 8, 32, 128

Minimum number of samples per leaf node

Use Range Builder

1, 10, 50

Learning rate

Use Range Builder

Parameter Range: 2.50e-2 - 5.00e-1

Number of points: 10

Log Scale

Number of trees constructed

Use Range Builder

20, 100, 500

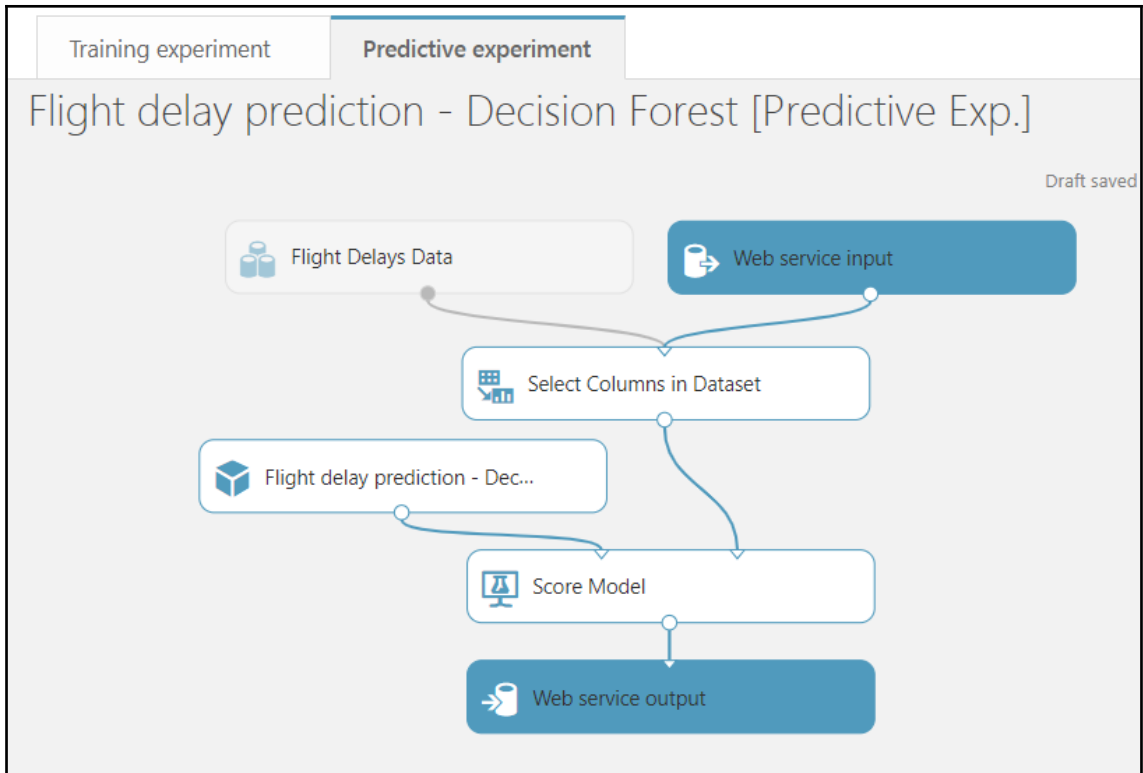
Random number seed

Allow unknown categorical levels

Flight delay prediction - Parameter tuning > Tune Model Hyperparameters > Sweep results

rows 10
columns 9

	Number of leaves	Minimum leaf instances	Learning rate	Number of trees	Mean Absolute Error	Root Mean Squared Error	Relative Absolute Error	Relative Squared Error	Coefficient of Determination
view as									
	2	50	0.31	20	18.227407	35.403769	0.951829	0.963666	0.036334
	8	1	0.2625	20	17.749433	35.018912	0.926869	0.942829	0.057171
	32	1	0.405	20	17.501632	34.767904	0.913929	0.929361	0.070639
	8	50	0.215	500	17.389526	34.64951	0.908075	0.923043	0.076957
	128	1	0.405	500	17.382583	35.592165	0.907712	0.973949	0.026051
	32	1	0.405	100	17.351234	34.671923	0.906075	0.924237	0.075763



Minimum missing value ratio

Maximum missing value ratio

Cleaning mode

Replacement value

Generate

Web Service

Minimum m

Maximum m

- Set as web service parameter
- Set to Minimum missing value ratio
- Set to Maximum missing value ratio
- Unset parameter

← Web Services

Flight delay prediction - Bayesian Regression [Predictive Exp.]

Request-Response **Batch**

input1



output1

Year	<input type="text" value="1"/>
Month	<input type="text" value="5"/>
DayofMonth	<input type="text" value="1"/>
DayOfWeek	<input type="text" value="1"/>
Carrier	<input type="text" value="DL"/>
OriginAirportID	<input type="text" value="11433"/>
DestAirportID	<input type="text" value="1"/>
CRSDepTime	<input type="text" value="1500"/>
DepDelay	<input type="text" value="1"/>

Month	5
DayOfWeek	1
Carrier	DL
OriginAirportID	11433
CRSDepTime	1500
DepDelay	1
Scored Label Mean	11.860744438084
Scored Label Standard Deviation	11.4193378412319

← Web Services

Flight delay prediction - Bayesian Regression [Predictive Exp.]

Web service consumption options



Excel 2013 or later



Excel 2010 or earlier

Basic consumption info

Want to see how to consume this information? [Check out this easy tutorial.](#)

Primary Key

Secondary Key

Request-Response [https://europewest.services.azureml.net/subscriptions/\[redacted\]/services/\[redacted\]/execute?api-version=2.0&format=swagger](https://europewest.services.azureml.net/subscriptions/[redacted]/services/[redacted]/execute?api-version=2.0&format=swagger)

[Documentation](#)

Batch Requests [https://europewest.services.azureml.net/subscriptions/\[redacted\]/services/\[redacted\]/jobs?api-version=2.0](https://europewest.services.azureml.net/subscriptions/[redacted]/services/[redacted]/jobs?api-version=2.0)

[Documentation](#)

Sample Code

Request-Response

Batch

C# Python Python 3+ R

```
// 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;
```

← Web Services

Flight delay prediction - Bayesian Regression [Predictive Exp.]

Request-Response

Submit request

POST /execute?api-version=2.0&format=swagger

Parameters

Execution request

body

```
{
  "Inputs": {
    "input1": [
      {
        "Year": 1,
        "Month": 1,
        "DayOfMonth": 1,
        "DayOfWeek": 1,
        "Carrier": "",
        "OriginAirportID": 1,
        "DestAirportID": 1,
        "CRSDepTime": 1,
        "DepDelay": 1,
        "DepDel15": 1,
        "CRSArrTime": 1,
        "ArrDelay": 1,
        "ArrDel15": 1,
        "Cancelled": 1
      }
    ]
  },
  "GlobalParameters": {}
}
```

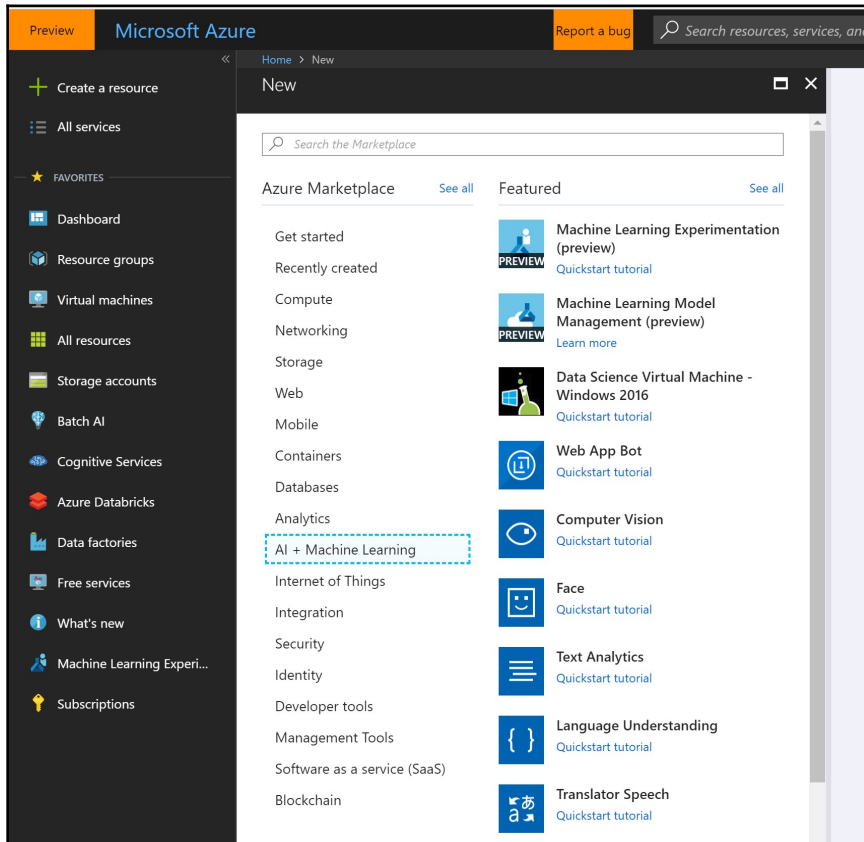
Response

ExecutionResults

body

```
{
  "ExecutionResults": {
    "Results": {
      "ExecutionOutputs": {
        "output1": [
          {
            "items": {
              "outputItem": {
                "Month": "Integer",
                "DayOfWeek": "Integer",
                "Carrier": "String",
                "OriginAirportID": "Integer",
                "CRSDepTime": "Integer",
                "DepDelay": "Number",
                "Scored Label Mean": "Number",
                "Scored Label Standard Deviation": "Number"
              }
            }
          }
        ]
      }
    }
  }
}
```

Chapter 6: Scalable Computing for Data Science










Everything 🔖 □

Filter

data science virtual machine ✕

Results

NAME	PUBLISHER	CATEGORY	
 Data Science Virtual Machine - Windows 2012	Microsoft	Compute	
 (CSP)Data Science Virtual Machine - Windows 2012	Microsoft	Compute	
 Data Science Virtual Machine for Linux (CentOS)	Microsoft	Compute	
 Data Science Virtual Machine for Linux (Ubuntu)	Microsoft	Compute	
 Data Science Virtual Machine - Windows 2016	Microsoft	Compute	♥
 Data Science Virtual Machine - Windows 2016	Microsoft	Compute	
 Data Science Virtual Machine for Linux (Ubuntu)	Microsoft	Compute	

Data Science Virtual Machine - Windows 2016 ↗ □

Microsoft

The '**Data Science Virtual Machine (DSVM)**' is a 'Windows Server 2016 with Containers' VM & includes popular tools for data exploration, analysis, modeling & development.

Highlights:

- [Microsoft ML Server - Dev Edition](#) (Scalable R & Python)
- [Azure Machine Learning Workbench](#)
- Anaconda Python
- SQL Server 2017 Dev. Edition - With In-Database R and Python analytics
- Microsoft Office 365 ProPlus BYOL - Shared Computer Activation
- Julia Pro + Juno Editor
- Jupyter notebooks
- Visual Studio Community Ed. + Python, R & node.js tools
- Power BI Desktop
- Deep learning tools e.g. Microsoft Cognitive Toolkit (CNTK, TensorFlow, Chainer, & mxnet
- ML algorithm libraries e.g. xgboost, Vowpal Wabbit
- Azure SDKs + libraries for various Azure Cloud offerings. Integration tools are included for:
 1. Azure Machine Learning
 2. Azure Data Factory
 3. Stream Analytics
 4. SQL Data Warehouse
 5. Hadoop + Apache Spark (HDICluster)
 6. Data Lake
 7. Blob storage
 8. ML & Data Science tutorials as Jupyter notebooks

This image also includes tools for ML model operationalization as web services in the cloud, using Azure ML or Microsoft R Server.

This image is pre-configured with Nvidia drivers, CUDA Toolkit, & cuDNN library for GPU workloads available if using [NC class VM SKUs](#).

Legal Terms

By clicking the Create button, I acknowledge that I am getting this software from Microsoft and that the [legal terms](#) of Microsoft apply to it. Microsoft does not provide rights for third-party

Select a deployment model ⓘ

Resource Manager ▼

Create

Create a virtual machine

Basics Disks Networking Management Guest config Tags Review + create

Create a virtual machine that runs Linux or Windows. Select an image from Azure marketplace or use your own customized image. Complete the Basics tab then Review + create to provision a virtual machine with default parameters or review each tab for full customization.

Looking for classic VMs? [Create VM from Azure Marketplace](#)

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](#)

INSTANCE DETAILS

* Virtual machine name ⓘ

* Region ⓘ ▾

Availability options ⓘ ▾

* Image ⓘ ▾

[Browse all images and disks](#)

* Size ⓘ **Standard DS4 v2**
8 vcpus, 28 GB memory
[Change size](#)

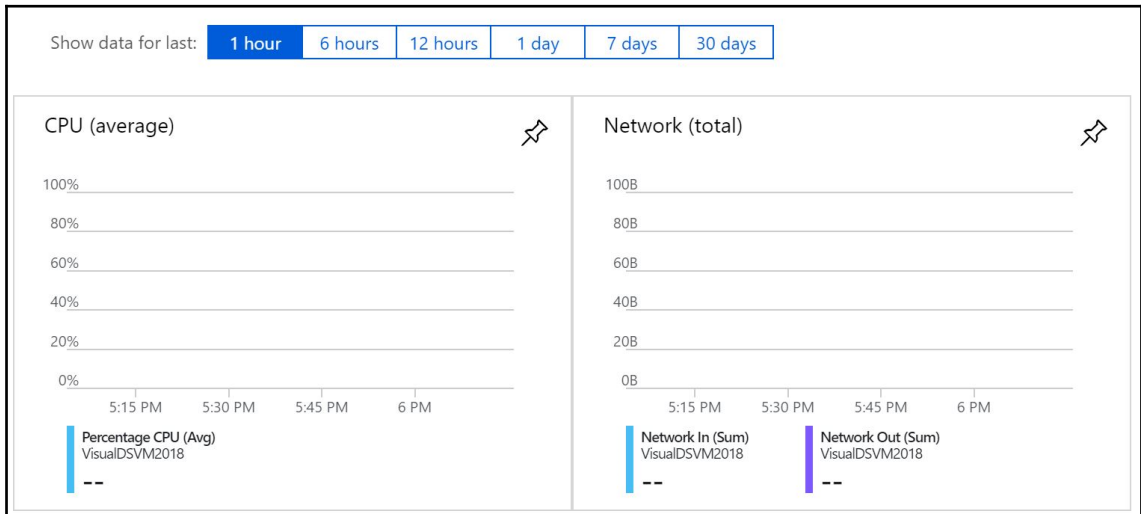
ADMINISTRATOR ACCOUNT

* Username ⓘ

* Password ⓘ

[Review + create](#) [Previous](#) [Next : Disks >](#)

VM SIZE ↑↓	OFFERING ↑↓	FAMILY ↑↓	VCPUS ↑↓	RAM (GB) ↑↓	DATA DISKS ↑↓	MAX IOPS ↑↓	TEMPORARY STOR... ↑↓	PREMIUM DISK SU... ↑↓
D16_v3	Standard	General purpose	16	64	32	32x500	400 GB	No
D16s_v3	Standard	General purpose	16	64	32	25600	128 GB	Yes
D2_v3	Standard	General purpose	2	8	4	4x500	50 GB	No
D2s_v3	Standard	General purpose	2	8	4	3200	16 GB	Yes
D32_v3	Standard	General purpose	32	128	32	32x500	800 GB	No
D32s_v3	Standard	General purpose	32	128	32	51200	256 GB	Yes
D4_v3	Standard	General purpose	4	16	8	8x500	100 GB	No
D4s_v3	Standard	General purpose	4	16	8	6400	32 GB	Yes
D64_v3	Standard	General purpose	64	256	32	32x500	1600 GB	No
D64s_v3	Standard	General purpose	64	256	32	80000	512 GB	Yes
D8_v3	Standard	General purpose	8	32	16	16x500	200 GB	No
D8s_v3	Standard	General purpose	8	32	16	12800	64 GB	Yes
E16_v3	Standard	Memory optimized	16	128	32	32x500	400 GB	No
E16-4s_v3	Standard	Memory optimized	4	128	32	25600	256 GB	Yes
E16-8s_v3	Standard	Memory optimized	8	128	32	25600	256 GB	Yes



Search (Ctrl+J) Save Discard Feedback

Like auto-shutdown? DevTest Labs has more features to control costs and streamline your development workflows. [Learn more.](#)

Enabled
 On Off

Scheduled shutdown
7:00:00 PM

Time zone
(UTC-08:00) Pacific Time (US & Canada)

Send notification before auto-shutdown?
 Yes No

Webhook URL ⓘ

Email address ⓘ

Overview
Activity log
Access control (IAM)
Tags
Diagnose and solve problems

Settings

Networking
Disks
Size
Security
Extensions
Continuous delivery (Preview)
Availability set
Configuration
Identity (Preview)
Properties
Locks
Automation script

Operations

Auto-shutdown
Backup
Disaster recovery

Create Deep Learning Virtual Machine > Settings > Choose a size

Choose a size

Browse the available sizes and their features

Search Compute type: Current generation Disk type: All disk types vCPUs: 1

RECOMME...	SKU	TYPE	COMPUTE ...	VCPUS	GB RAM	DATA DISKS	MAX IOPS	LOCAL SSD	PREMIUM ...	ADDITION...
Available										
★	NC6	Standard	GPU	6	56	24	20000	380 GB	No	1x K80
★	NC12	Standard	GPU	12	112	48	40000	680 GB	No	2x K80
	NC24	Standard	GPU	24	224	64	80000	1440 GB	No	4x K80
★	NC24r	Standard	GPU	24	224	64	80000	1440 GB	No	4x K80
Size not available										
	NC6s_v3	Standard	GPU	6	112	12	20000		Yes	1 V100 (PCIe)
	NC12s_v3	Standard	GPU	12	224	24	40000		Yes	2 V100 (PCIe)

Home > New > Marketplace > Everything

Marketplace

My Saved List

- Everything
- Compute
- Networking
- Storage
- Web
- Mobile
- Containers
- Databases

Everything

Filter

batch a

NAME	PUBLISHER	CATEGORY
Batch AI Service	Microsoft	Analytics
Azure Batch Rendering For Windows 2016	Microsoft Azure Batch	Compute
Azure Batch Rendering (CentOS 7.3)	Microsoft Azure Batch	Compute
Azure ML Batch Execution Service Web App Template	Microsoft	Web

Batch AI Cluster □ ×

Create Batch AI Cluster

Basic information *
Node setup
Operating system
Review template

* Cluster name ⓘ

* VM size (View full pricing details)

* VM priority types ⓘ

* Scale mode ⓘ Manual Auto scale

* Target number of nodes ⓘ

* Default deallocation option ⓘ

USER ACCOUNT

* Admin username ⓘ

Admin user password ⓘ

SSH key ⓘ

NETWORK CONFIGURATION

Virtual network

Subnet

Create Cluster

Next: Node setup

Batch AI Cluster

Create Batch AI Cluster

Basic information *
Node setup
Operating system
Review template

* Cluster name ?

* VM size [\(View full pricing details\)](#)

* VM priority types ?

* Scale mode ?

* Target number of nodes ?

* Default deallocation option ?

USER ACCOUNT

* Admin username ?

Admin user password ?

SSH key ?

NETWORK CONFIGURATION

Virtual network

Subnet

Create Cluster

N

^
v

- Standard D14_v2 (16 Cores, 112 GB)
- Standard D2 (2 Cores, 7 GB)
- Standard D2_v2 (2 Cores, 7 GB)
- Standard D3 (4 Cores, 14 GB)
- Standard D3_v2 (4 Cores, 14 GB)
- Standard D4 (8 Cores, 28 GB)
- Standard D4_v2 (8 Cores, 28 GB)
- Standard F16s_v2 (16 Cores, 32 GB)
- Standard F2s_v2 (2 Cores, 4 GB)
- Standard F32s_v2 (32 Cores, 64 GB)
- Standard F4s_v2 (4 Cores, 8 GB)
- Standard F64s_v2 (64 Cores, 128 GB)
- Standard F72s_v2 (72 Cores, 144 GB)
- Standard F8s_v2 (8 Cores, 16 GB)
- Standard NC12 (12 Cores, 112 GB)
- Standard NC12s_v2 (12 Cores, 224 GB)
- Standard NC12s_v3 (12 Cores, 224 GB)
- Standard NC24 (24 Cores, 224 GB)
- Standard NC24r (24 Cores, 224 GB)
- Standard NC24rs_v2 (24 Cores, 448 GB)
- Standard NC24rs_v3 (24 Cores, 448 GB)
- Standard NC24s_v2 (24 Cores, 448 GB)
- Standard NC24s_v3 (24 Cores, 448 GB)
- Standard NC6 (6 Cores, 56 GB)
- Standard NC6s_v2 (6 Cores, 112 GB)
- Standard NC6s_v3 (6 Cores, 112 GB)
- Standard ND12s (12 Cores, 224 GB)
- Standard ND24rs (24 Cores, 448 GB)
- Standard ND24s (24 Cores, 448 GB)
- Standard ND6s (6 Cores, 112 GB)

* VM priority types ⓘ

* Scale mode ⓘ

* Minimum nodes ⓘ

* Maximum nodes ⓘ

Initial node count ⓘ

Batch AI File Server □

Create Batch AI File Server

Basic information * [Review template](#)

* File server name ⓘ

* VM size (View full pricing details)

* Disk Size (GB) ⓘ

* Number of disks ⓘ

* Storage account type ⓘ

Caching type

SSH CONFIGURATION

Public IPs to allow

USER ACCOUNT

* Admin username ⓘ

Admin user password ⓘ

SSH key ⓘ

Batch AI Job

Create Batch AI Job

Basic information * Mount volumes Advanced settings Review template

* Job name ?

* Experiment ?

* Experiment ? **test1** >

* Schedule priority ? ▾

Node count ?

Cluster ? * Cluster **n/a** >

* Stdout/stderr Path Prefix ?

TOOL TYPE

* Tool type ?

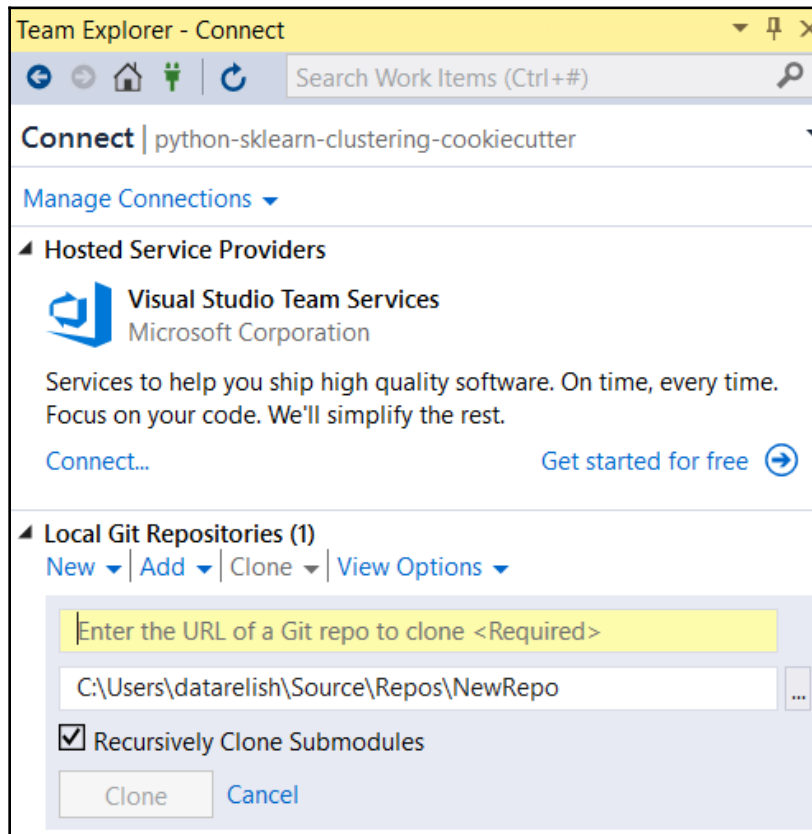
- Tensorflow
- Caffe
- Caffe2
- Chainer
- Custom
- Pytorch
- Custom Mpi
- Horovod

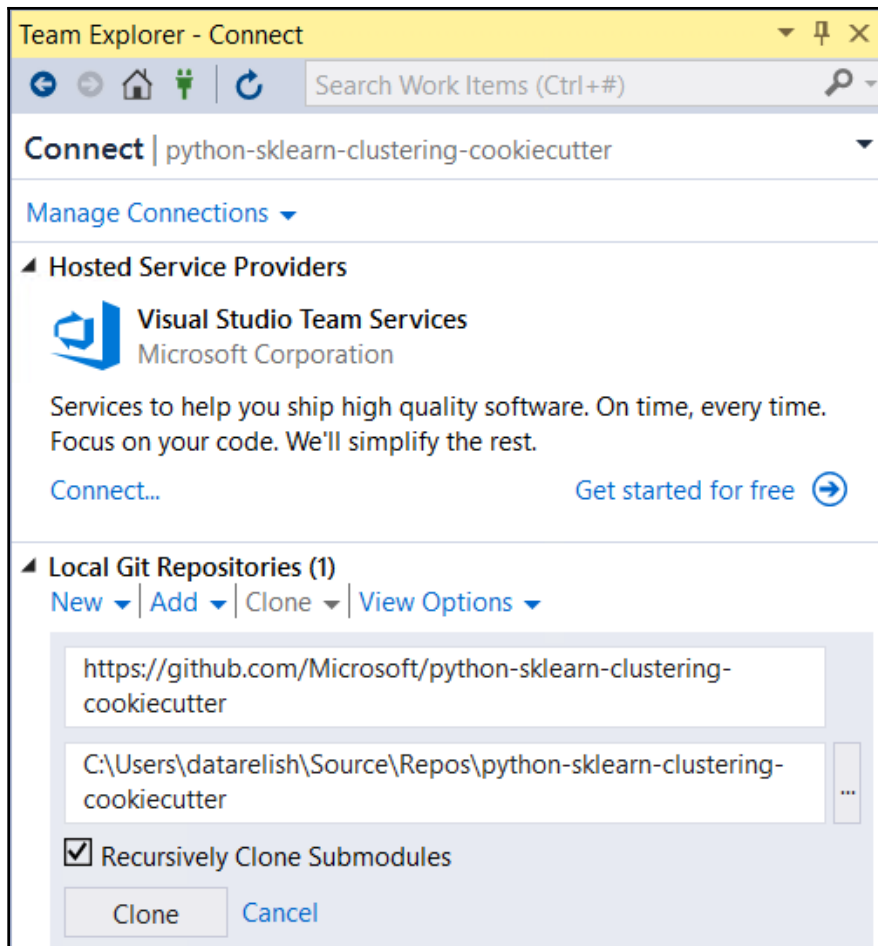
Batch AI Job □ ×
Create Batch AI Job

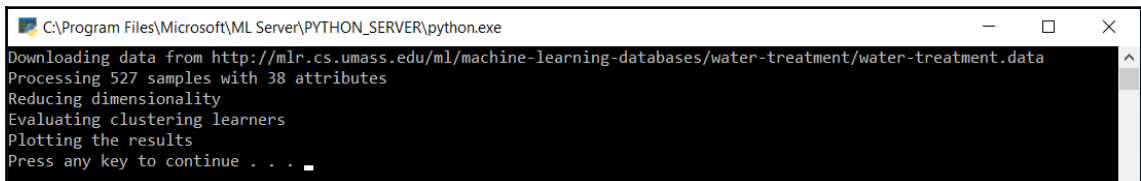
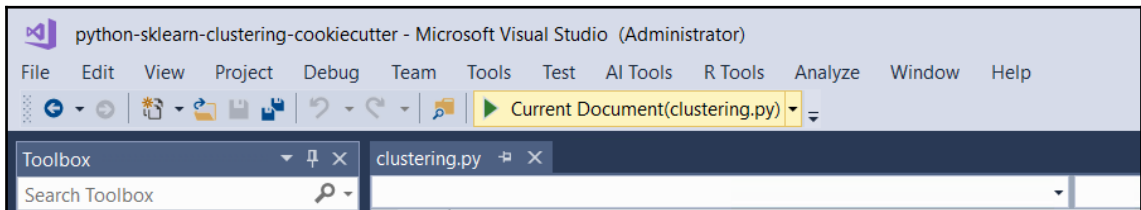
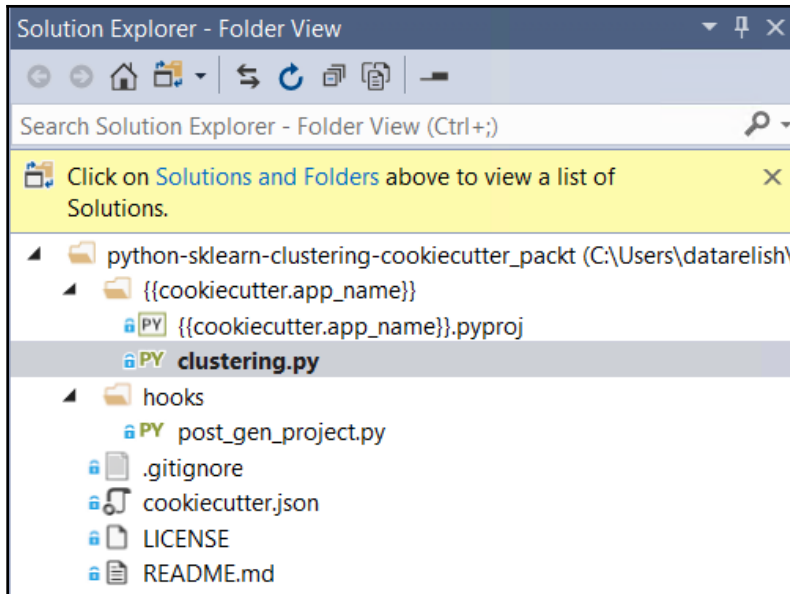
[Basic information *](#) [Mount volumes](#) [Advanced settings](#) [Review template](#)

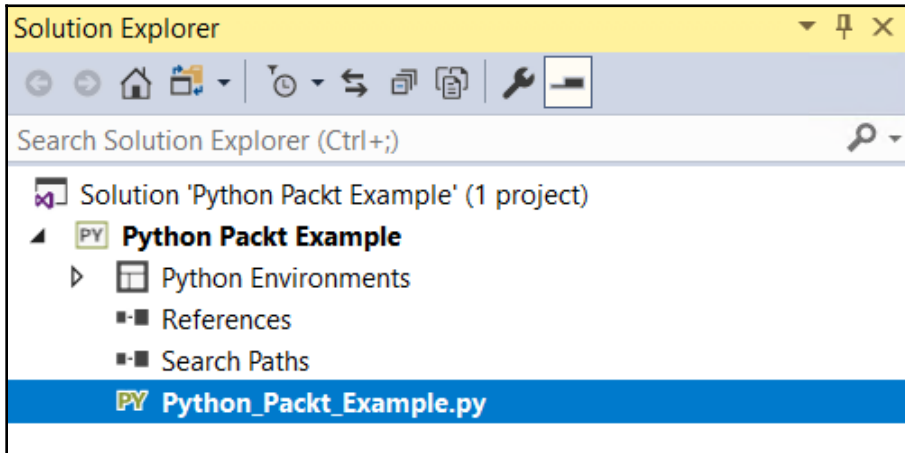
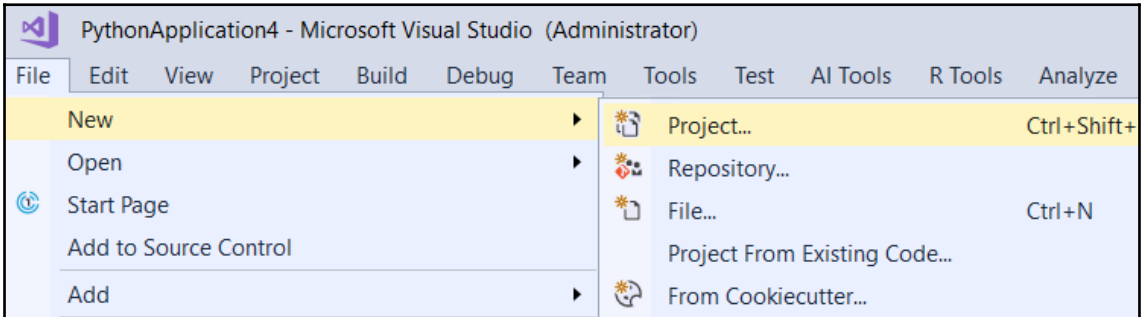
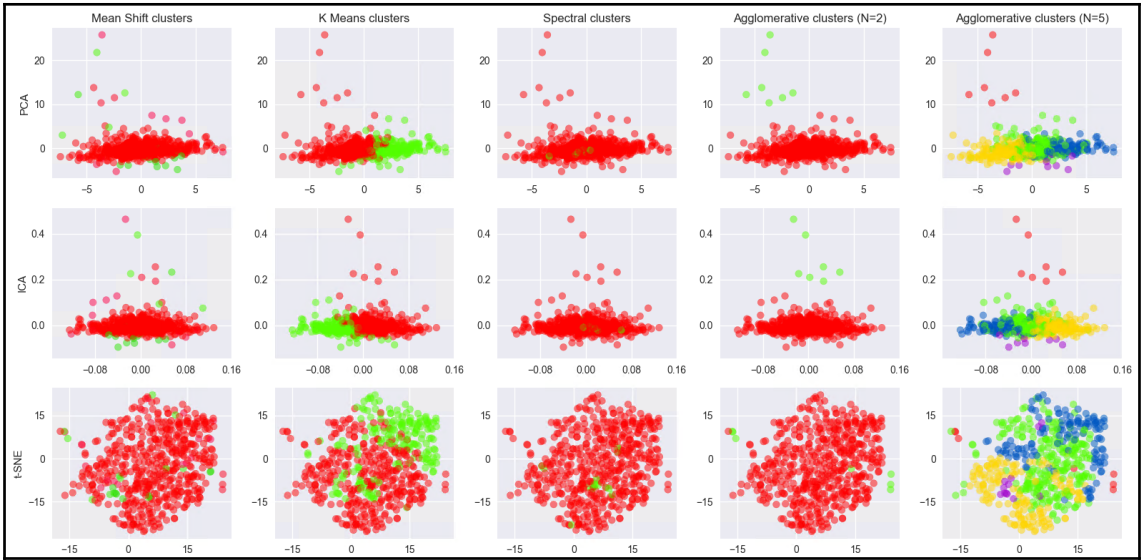
Azure file share references	Azure file share references ⓘ 0 azure file share reference >
Azure blob file system reference	Azure blob file system reference ⓘ 0 azure blob file system reference >
File server references	File server references ⓘ 0 file server reference >
Unmanaged file systems	Unmanaged file systems ⓘ 0 unmanaged file system >

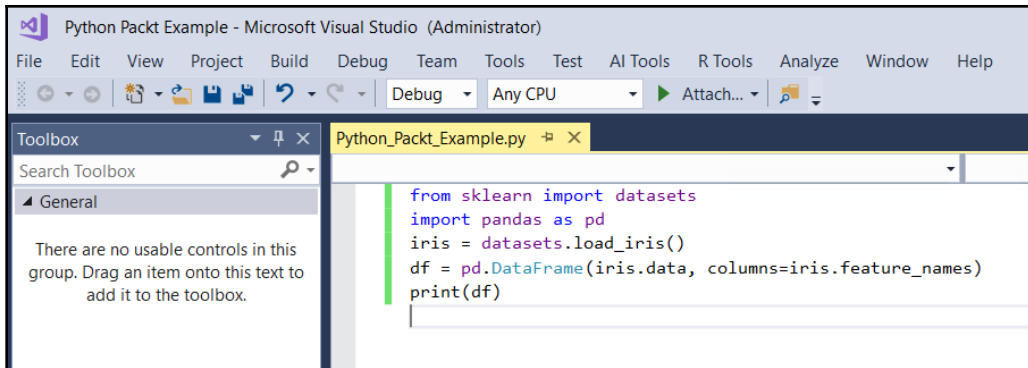
Chapter 7: Machine Learning Server





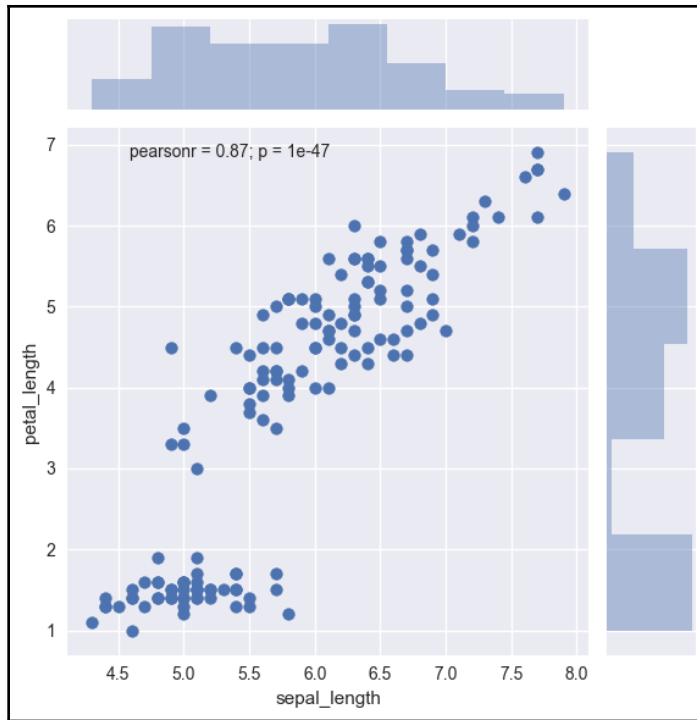






```
C:\Program Files\Microsoft\ML Server\PYTHON_SERVER\python.exe
123      6.3      2.7      4.9      1.8
124      6.7      3.3      5.7      2.1
125      7.2      3.2      6.0      1.8
126      6.2      2.8      4.8      1.8
127      6.1      3.0      4.9      1.8
128      6.4      2.8      5.6      2.1
129      7.2      3.0      5.8      1.6
130      7.4      2.8      6.1      1.9
131      7.9      3.8      6.4      2.0
132      6.4      2.8      5.6      2.2
133      6.3      2.8      5.1      1.5
134      6.1      2.6      5.6      1.4
135      7.7      3.0      6.1      2.3
136      6.3      3.4      5.6      2.4
137      6.4      3.1      5.5      1.8
138      6.0      3.0      4.8      1.8
139      6.9      3.1      5.4      2.1
140      6.7      3.1      5.6      2.4
141      6.9      3.1      5.1      2.3
142      5.8      2.7      5.1      1.9
143      6.8      3.2      5.9      2.3
144      6.7      3.3      5.7      2.5
145      6.7      3.0      5.2      2.3
146      6.3      2.5      5.0      1.9
147      6.5      3.0      5.2      2.0
148      6.2      3.4      5.4      2.3
149      5.9      3.0      5.1      1.8

[150 rows x 4 columns]
Press any key to continue . . . _
```

```

Python Packt Example - Microsoft Visual Studio (Administrator)
File Edit View Project Build Debug Team Tools Test AI Tools R Tools Analyze Window Help
Debug Any CPU Attach...

Python_Packt_Example.py
# from sklearn import datasets
# import pandas as pd
# iris = datasets.load_iris()
# df = pd.DataFrame(iris.data, columns=iris.feature_names)

import seaborn as sns
sns.set()

# Load the iris dataset
iris = sns.load_dataset("iris")

# Set the colour scheme
colours = ['#066082', '#b12acf', '#808080']

# This code will generate a joint plot using the Iris dataset.
sns_pairplot = sns.pairplot(iris, hue='species', size=2.5, palette=colours)

# Save the output to an image

```

```
C:\Program Files\Microsoft\ML Server\PYTHON_SERVER\python.exe
Produced Pairplot Image
Produced Jointplot Image
Produced Linear Regression Image
Press any key to continue . . .
```



Chapter 8: HDInsight

Cluster configuration

Learn about HDInsight and cluster versions. →

Cluster configuration

* Cluster type	* Operating system	* Version
ML Services (R Server) ▾	Linux	ML Services 9.3 (HDI 3.... ▾)

ML Services : Analyze data at scale, build intelligent apps and discover valuable insights across your business using both R and Python.

Configuration Options:

- ML Services 9.3 on Spark 2.2 with Java 8
- R Server 9.1 on Spark 2.1 with Java 8

Adds 0.011924944 GBP per Core-Hour.

Basics

* Cluster name
packtml
.azurehdinsight.net

* Subscription
Microsoft Azure Sponsorship

* Cluster type ⓘ
ML Services 9.3 (HDI 3.6)

* Cluster login username ⓘ
admin


* Cluster login password ⓘ
●●●●●●●● ✓

Secure Shell (SSH) username ⓘ
sshuser

Use same password as cluster login ⓘ


* Resource group
(New) PacktMLResourceGroup
[Create new](#)

* Location
East US 2

 [Click here to view cores usage.](#)


[Next](#)

Cluster configuration

 Learn about HDInsight and cluster versions. [→](#)

Cluster configuration


* Cluster type 

ML Services (R Server) 

* Operating system

Linux

* Version

ML Services 9.3 (HDI 3... 


ML Services : Analyze data at scale, build intelligent apps and discover valuable insights across your business using both R and Python.

Configuration Options:

- ML Services 9.3 on Spark 2.2 with Java 8
- R Server 9.1 on Spark 2.1 with Java 8

Adds 0.011924944 GBP per Core-Hour.

Storage □



To request access for Azu... Data Lake Storage Gen2 (Preview), click here. ✉

Storage Account Settings

* Primary storage type ?
Azure Storage ▼

* Selection method ?
 My subscriptions Access key


* Create a new Storage account
packtmlstorage ✓
[Select existing](#)

* Default container ?
packtmlcontainer

Additional storage accounts >
Optional

Metastore Settings (optional)

Filtered to location and subscription of cluster.



To preserve your metadata outside this cluster, link a SQL database to this account.

Select a SQL database for Hive
No database in eastus2 for subscription. ▼

Select a SQL database for Oozie
No database in eastus2 for subscription. ▼

[Next](#)

packtml
HDInsight cluster

Search (Ctrl+/) << → Move Delete Refresh

Resource group [\(change\)](#)
PacktMLResourceGroup

Status
Running

Location
East US 2

Subscription [\(change\)](#)
Microsoft Azure Sponsorship

Subscription ID
80c504de-6bcd-4f89-a1f4-e1454d6d309b

Tags [\(change\)](#)
[Click here to add tags](#)

Learn more
[Documentation](#)
Cluster type, HDI version
ML Services (HDI 3.6)
URL
<https://packtml.azurehdinsight.net>
Getting started
[Quickstart](#)

ML Services dashboards
Cluster management interfaces

- [Ambari home](#)
- [Zeppelin notebook](#)
- [Jupyter notebook](#)
- [R Studio server](#)
- [Spark history server](#)
- [Yarn](#)

Cluster size

10 nodes

TYPE	SIZE	CORES	NODES
Head	D12 v2	8	2

packtmlstorage
Storage account

Search (Ctrl+/) << Open in Explorer → Move Delete Refresh

Resource group [\(change\)](#)
PacktMLResourceGroup

Status
Primary: Available

Location
East US 2

Subscription [\(change\)](#)
Microsoft Azure Sponsorship

Subscription ID
80c504de-6bcd-4f89-a1f4-e1454d6d309b

Tags [\(change\)](#)
[Click here to add tags](#)

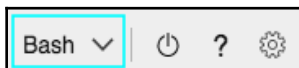
Performance
Standard

Replication
Locally-redundant storage (LRS)

Account kind
Storage (general purpose v1)

Services

- Blobs**
REST-based object storage for unstructured data
[Learn more](#)
- Files**
File shares that use the standard SMB 3.0 protocol
[Learn more](#)
- Tables**
Tabular data storage
[Learn more](#)
- Queues**
Effectively scale apps according to traffic
[Learn more](#)



```
Bash  ▾ | 🔌 ? ⚙️ 📄 📁 {}
See "man sudo_root" for details.

sshuser@hn0-packtm:~$ R

R version 3.4.3 (2017-11-30) -- "Kite-Eating Tree"
Copyright (C) 2017 The R Foundation for Statistical Computing
Platform: x86_64-pc-linux-gnu (64-bit)

R is free software and comes with ABSOLUTELY NO WARRANTY.
You are welcome to redistribute it under certain conditions.
Type 'license()' or 'licence()' for distribution details.

Natural language support but running in an English locale

R is a collaborative project with many contributors.
Type 'contributors()' for more information and
'citation()' on how to cite R or R packages in publications.

Type 'demo()' for some demos, 'help()' for on-line help, or
'help.start()' for an HTML browser interface to help.
Type 'q()' to quit R.

Microsoft R Open 3.4.3
The enhanced R distribution from Microsoft
Microsoft packages Copyright (C) 2018 Microsoft

Loading Microsoft R Server packages, version 9.3.0.
Type 'readme()' for release notes, privacy() for privacy policy, or
'RevoLicense()' for licensing information.

Using the Intel MKL for parallel mathematical computing(using 4 cores).
Default CRAN mirror snapshot taken on 2018-01-01.
See: https://mran.microsoft.com/.
```



```

> rxHadoopListFiles("/")
[1] "Found 16 items"
[2] "drwxr-xr-x - root supergroup 0 2018-09-27 12:55 /HdiNotebooks"
[3] "drwxr-xr-x - root supergroup 0 2018-09-27 13:08 /HdiSamples"
[4] "drwxr-xr-x - hdfs supergroup 0 2018-09-27 12:47 /ams"
[5] "drwxr-xr-x - hdfs supergroup 0 2018-09-27 12:47 /amshbase"
[6] "drwxrwxrwx - yarn hadoop 0 2018-09-27 12:47 /app-logs"
[7] "drwxr-xr-x - hdfs supergroup 0 2018-09-27 12:47 /apps"
[8] "drwxr-xr-x - yarn hadoop 0 2018-09-27 12:47 /atshistory"
[9] "drwxr-xr-x - root supergroup 0 2018-09-27 13:00 /custom-scriptaction-logs"
[10] "drwxr-xr-x - root supergroup 0 2018-09-27 13:07 /example"
[11] "drwxr-xr-x - hbase supergroup 0 2018-09-27 12:47 /hbase"
[12] "drwxr-xr-x - hdfs supergroup 0 2018-09-27 12:47 /hdp"
[13] "drwxr-xr-x - hdfs supergroup 0 2018-09-27 12:47 /hive"
[14] "drwxr-xr-x - mapred supergroup 0 2018-09-27 12:47 /mapred"
[15] "drwxrwxrwx - mapred hadoop 0 2018-09-27 12:47 /mr-history"
[16] "drwxrwxrwx - hdfs supergroup 0 2018-09-27 12:47 /tmp"
[17] "drwxr-xr-x - hdfs supergroup 0 2018-09-27 12:47 /user"
[1] TRUE

```

```

Bash
> iris
  Sepal.Length Sepal.Width Petal.Length Petal.Width Species
1           5.1           3.5           1.4           0.2   setosa
2           4.9           3.0           1.4           0.2   setosa
3           4.7           3.2           1.3           0.2   setosa
4           4.6           3.1           1.5           0.2   setosa
5           5.0           3.6           1.4           0.2   setosa
6           5.4           3.9           1.7           0.4   setosa
7           4.6           3.4           1.4           0.3   setosa
8           5.0           3.4           1.5           0.2   setosa
9           4.4           2.9           1.4           0.2   setosa
10          4.9           3.1           1.5           0.1   setosa
11          5.4           3.7           1.5           0.2   setosa
12          4.8           3.4           1.6           0.2   setosa
13          4.8           3.0           1.4           0.1   setosa
14          4.3           3.0           1.1           0.1   setosa
15          5.8           4.0           1.2           0.2   setosa
16          5.7           4.4           1.5           0.4   setosa
17          5.4           3.9           1.3           0.4   setosa
18          5.1           3.5           1.4           0.3   setosa
19          5.7           3.8           1.7           0.3   setosa
20          5.1           3.8           1.5           0.3   setosa
21          5.4           3.4           1.7           0.2   setosa
22          5.1           3.7           1.5           0.4   setosa

```

```

> lsfit(iris$Petal.Length, iris$Petal.Width)$coefficients
Intercept      X
-0.3630755  0.4157554

```

```

> summary(lm(Sepal.Length ~ Sepal.Width, data=iris))

Call:
lm(formula = Sepal.Length ~ Sepal.Width, data = iris)

Residuals:
    Min       1Q   Median       3Q      Max
-1.5561 -0.6333 -0.1120  0.5579  2.2226

Coefficients:
            Estimate Std. Error t value Pr(>|t|)
(Intercept)  6.5262     0.4789   13.63  <2e-16 ***
Sepal.Width  -0.2234     0.1551   -1.44   0.152
---
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Residual standard error: 0.8251 on 148 degrees of freedom
Multiple R-squared:  0.01382,    Adjusted R-squared:  0.007159
F-statistic: 2.074 on 1 and 148 DF,  p-value: 0.1519

```

```

> summary(lm(Sepal.Length ~ Sepal.Width, data=iris))

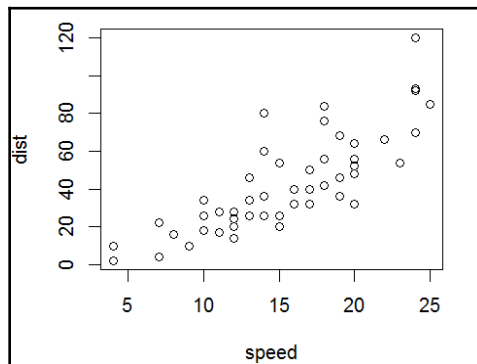
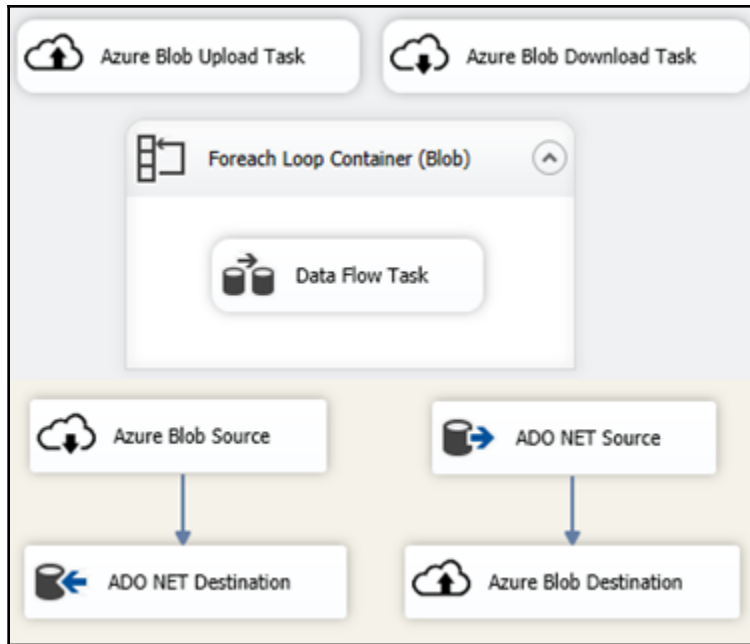
Call:
lm(formula = Sepal.Length ~ Sepal.Width, data = iris)

Residuals:
    Min       1Q   Median       3Q      Max
-1.5561 -0.6333 -0.1120  0.5579  2.2226

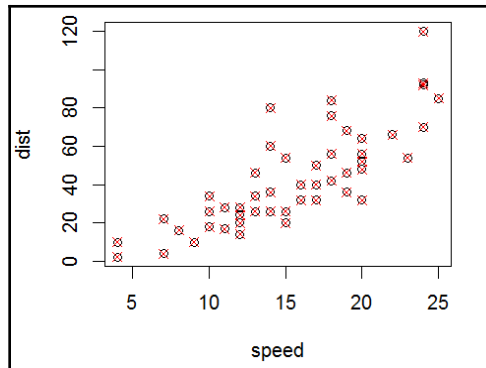
Coefficients:
            Estimate Std. Error t value Pr(>|t|)
(Intercept)  6.5262     0.4789   13.63  <2e-16 ***
Sepal.Width  -0.2234     0.1551   -1.44   0.152
---
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Residual standard error: 0.8251 on 148 degrees of freedom
Multiple R-squared:  0.01382,    Adjusted R-squared:  0.007159
F-statistic: 2.074 on 1 and 148 DF,  p-value: 0.1519

```



```
> json_cars
[1] "{\"speed\": [4,4,7,7,8,9,10,10,10,11,11,12,12,12,12,13,13,13,13,14,14,14,14,15,15,15,16
> |
```



```
> IrisDataCrossTabs <- rxCrossTabs(  
+   Petal.Width ~ Species,  
+   data = iris  
+ )  
Rows Read: 150, Total Rows Processed: 150, Total Chunk Time: 0.056 seconds  
Computation time: 0.080 seconds.  
> IrisDataCrossTabs  
Call:  
rxCrossTabs(formula = Petal.Width ~ Species, data = iris)  
  
Cross Tabulation Results for: Petal.Width ~ Species  
Data: iris  
Dependent variable(s): Petal.Width  
Number of valid observations: 150  
Number of missing observations: 0  
Statistic: sums  
  
Petal.Width (sums):  
  
setosa      12.3  
versicolor 66.3  
virginica  101.3  
>
```

```

> IrisDataCube
Call:
rxCube(formula = Petal.Width ~ Species, data = iris)

Cube Results for: Petal.Width ~ Species
Data: iris
Dependent variable(s): Petal.Width
Number of valid observations: 150
Number of missing observations: 0
Statistic: Petal.Width means

  Species    Petal.Width Counts
1 setosa     0.246      50
2 versicolor 1.326      50
3 virginica  2.026      50
> |

```

```

> rxSummary(~Petal.Length, data = iris)
Call:
rxSummary(formula = ~Petal.Length, data = iris)

Summary Statistics Results for: ~Petal.Length
Data: iris
Number of valid observations: 150

Name          Mean  StdDev  Min Max ValidObs MissingObs
Petal.Length 3.758 1.765298 1 6.9 150 0

```

```

> rxQuantile("Petal.Length", iris)
  0%  25%  50%  75% 100%
1.000 1.507 4.300 5.056 6.900

```

```

> irisGLM
Generalized Linear Model Results for: Petal.Width ~ Species
Data: iris
Dependent variable(s): Petal.Width
Total independent variables: 4 (Including number dropped: 1)
Number of valid observations: 150
Number of missing observations: 0
Family-link: Gamma-inverse

Coefficients:
                Petal.Width
(Intercept)      4.065041
Species=setosa   Dropped
Species=versicolor -3.310893
Species=virginica -3.571457

```

```

> exp(coef(irisGLM))
(Intercept) Species=setosa Species=versicolor Species=virginica
58.26727706 NA 0.03648359 0.02811485

```

```

> rxPredict(irisGLM, data = iris, writeModelVars = TRUE, computeResiduals = TRUE, overwrite = TRUE)
Rows Read: 150, Total Rows Processed: 150, Total Chunk Time: 0.005 seconds

```

	Petal.Width_Pred	Petal.Width_Resid	Petal.Width	Species
1	0.246	-0.046	0.2	setosa
2	0.246	-0.046	0.2	setosa
3	0.246	-0.046	0.2	setosa
4	0.246	-0.046	0.2	setosa
5	0.246	-0.046	0.2	setosa
6	0.246	0.154	0.4	setosa
7	0.246	0.054	0.3	setosa
8	0.246	-0.046	0.2	setosa
9	0.246	-0.046	0.2	setosa
10	0.246	-0.146	0.1	setosa
11	0.246	-0.046	0.2	setosa
12	0.246	-0.046	0.2	setosa
13	0.246	-0.146	0.1	setosa
14	0.246	-0.146	0.1	setosa
15	0.246	-0.046	0.2	setosa

```

> summary(irisGLM)
Call:
rxGlm(formula = Petal.Width ~ Species, data = iris, family = Gamma,
       dropFirst = TRUE)

Generalized Linear Model Results for: Petal.Width ~ Species
Data: iris
Dependent variable(s): Petal.Width
Total independent variables: 4 (Including number dropped: 1)
Number of valid observations: 150
Number of missing observations: 0
Family-link: Gamma-inverse

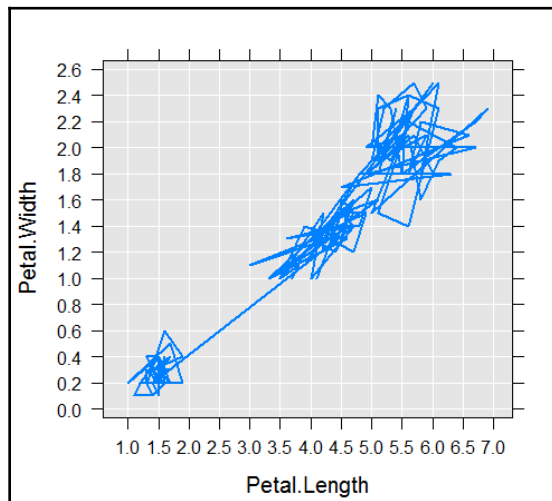
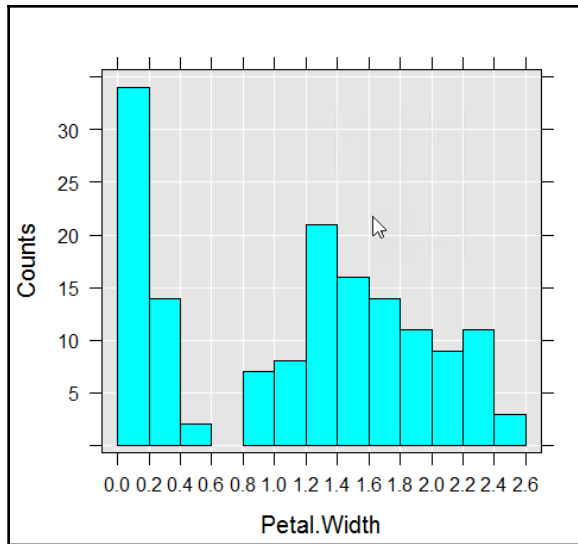
Residual deviance: 10.2775 (on 147 degrees of freedom)

Coefficients:
                Estimate Std. Error t value Pr(>|t|)
(Intercept)      4.0650     0.1571  25.87 2.22e-16 ***
Species=setosa   Dropped      Dropped Dropped Dropped
Species=versicolor -3.3109     0.1598  -20.72 2.22e-16 ***
Species=virginica -3.5715     0.1583  -22.56 2.22e-16 ***
---
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

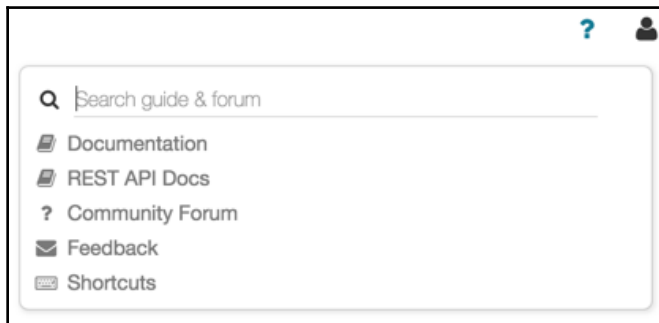
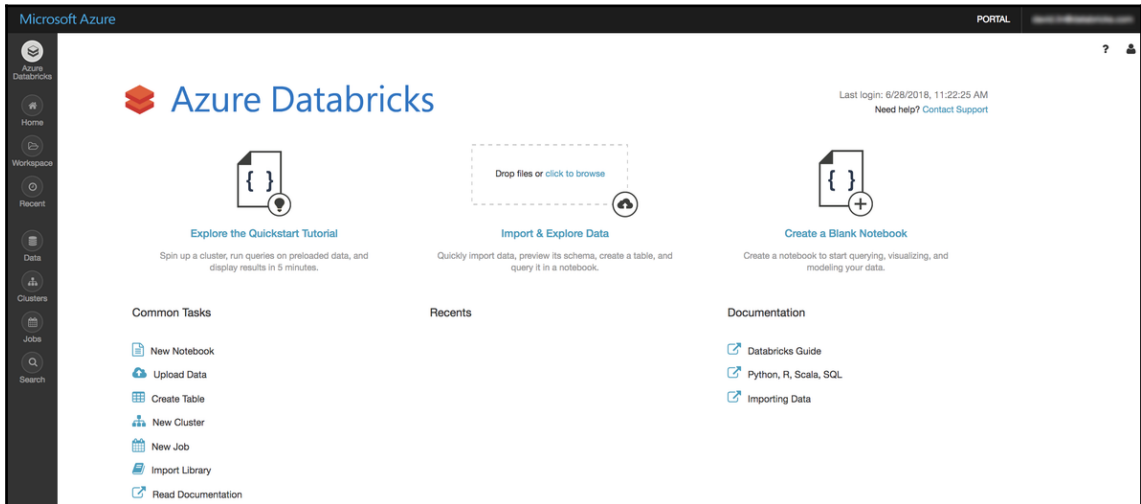
(Dispersion parameter for Gamma family taken to be 0.07471402)

Condition number of final variance-covariance matrix: 82.5219
Number of iterations: 5
> |

```



Chapter 9: Machine Learning with Spark



Create Cluster

New Cluster | Cancel | Create Cluster ²⁻⁸_{1 D}

Cluster Mode

Serverless Pool (beta, R/Python/SQL) | Standard

Cluster Name

Quickstart

Databricks Runtime Version ⓘ

4.2 (includes Apache Spark 2.3.1, Scala 2.11) ▾

Workspace ▾ | Users ▾ | [blurred]


? Documentation | Create ▶ | Notebook 🖱️

```
1 DROP TABLE IF EXISTS diamonds;  
2  
3 CREATE TABLE diamonds  
4 USING csv  
5 OPTIONS (path "/databricks-datasets/Rdatasets/data-001/csv/ggplot2/diamonds.csv", header "true")
```

OK

OK

Command took 8.48 seconds

Shift+Enter to run [shortcuts](#)  Insert a new cell

color	price
D	3169.9540959409596
E	3076.7524752475247
F	3724.886396981765
G	3999.135671271697
H	4486.669195568401
I	5091.874953891553
J	5323.81801994302

Grid | Bar | Chart | Download

Customize Plot

All fields:

- color
- price
- <id>

Keys:

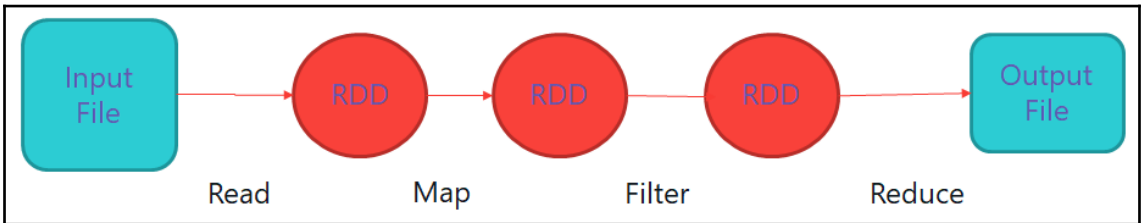
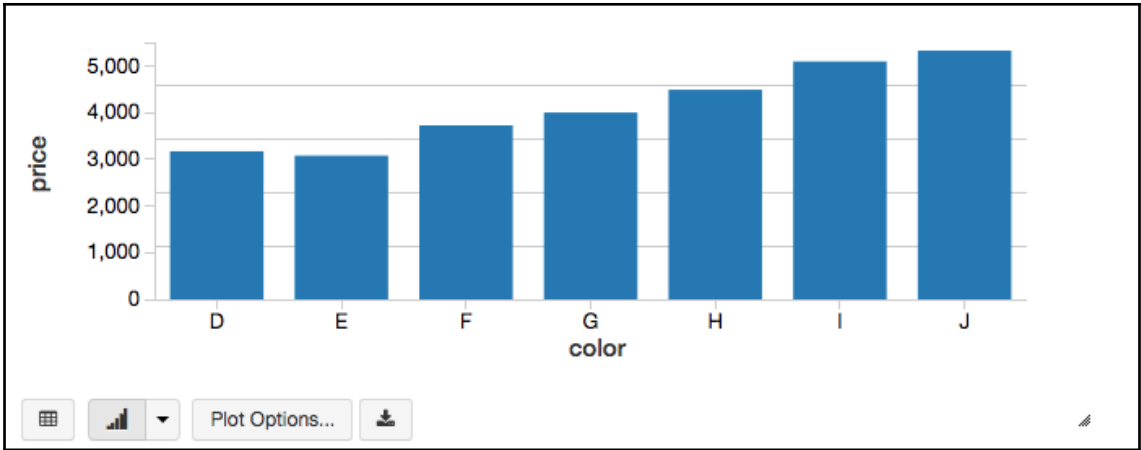
- color

Series groupings:

Values:

- price

Aggregation: AVG



```

Jupyter
[I 11:20:21.408 NotebookApp] [nb_conda_kernels] enabled, 4 kernels found
[I 11:20:35.780 NotebookApp] JupyterLab beta preview extension loaded from C:\Anaconda\lib\site-packages\jupyterlab
[I 11:20:35.780 NotebookApp] JupyterLab application directory is C:\Anaconda\share\jupyter\lab
[I 11:20:39.558 NotebookApp] [nb_anacondacloud] enabled
[I 11:20:39.597 NotebookApp] [nb_conda] enabled
[I 11:20:40.364 NotebookApp] [nbpresent HTML export ENABLED
[W 11:20:40.364 NotebookApp] [nbpresent PDF export DISABLED: No module named 'nbbrowserpdf'
[I 11:20:40.499 NotebookApp] Serving notebooks from local directory: C:\Users\datarelish\notebooks
[I 11:20:40.499 NotebookApp] 0 active kernels
[I 11:20:40.499 NotebookApp] The Jupyter Notebook is running at:
[I 11:20:40.500 NotebookApp] http://localhost:8888/?token=4b9a4d22f86cd576c37882fa5bfc1a7c123f7401bd5984d2
[I 11:20:40.500 NotebookApp] Use Control-C to stop this server and shut down all kernels (twice to skip confirmation).
[C 11:20:40.505 NotebookApp]

Copy/paste this URL into your browser when you connect for the first time,
to login with a token:
    http://localhost:8888/?token=4b9a4d22f86cd576c37882fa5bfc1a7c123f7401bd5984d2
[I 11:20:42.902 NotebookApp] Accepting one-time-token-authenticated connection from ::1
  
```

Browser address bar: <http://localhost:8888/tree> Home

Jupyter logo Logout

Files **Running** Clusters Conda

Select items to perform actions on them. Upload New ↕

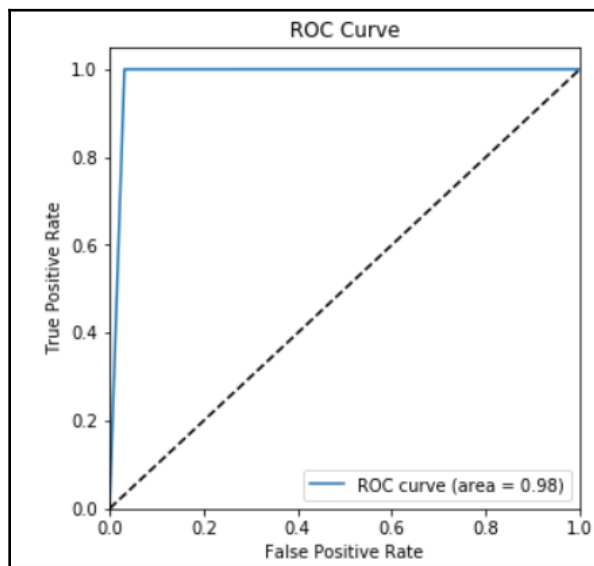
<input type="checkbox"/> 0	Name ↓	Last Modified
<input type="checkbox"/> /		
<input type="checkbox"/>	Chainer	6 days ago
<input type="checkbox"/>	cntk	6 days ago
<input type="checkbox"/>	Julia_notebooks	6 days ago
<input type="checkbox"/>	MMLSpark	6 days ago
<input type="checkbox"/>	SparkML	6 days ago
<input type="checkbox"/>	TensorFlow	6 days ago
<input type="checkbox"/>	Analyzing PyPI Data to Determine Python 3 Support.ipynb	4 months ago
<input type="checkbox"/>	Comparing_Base_R_to_MRO_and_MRS.ipynb	4 months ago
<input type="checkbox"/>	DocumentDBSample.ipynb	4 months ago
<input type="checkbox"/>	Introduction to Azure ML R notebooks.ipynb	4 months ago
<input type="checkbox"/>	Introduction to Microsoft R Operationalization.ipynb	4 months ago

Kernel not found ✕

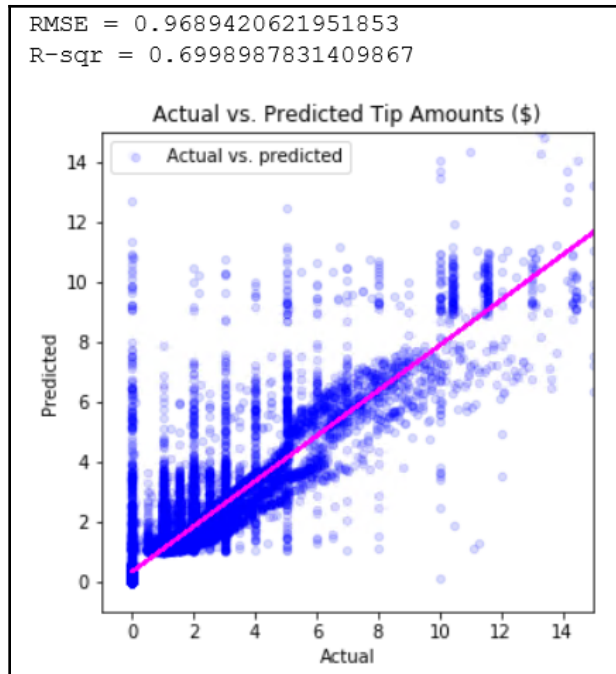
Could not find a kernel matching Spark - python. Please select a kernel:

ML Server Python ▼

Continue Without Kernel
Set Kernel

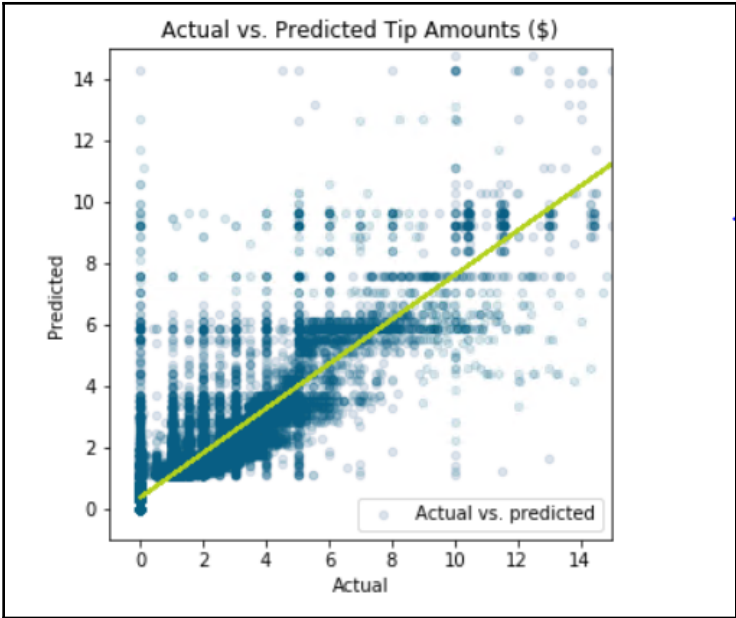


RMSE = 0.9689420621951853
R-sqr = 0.6998987831409867

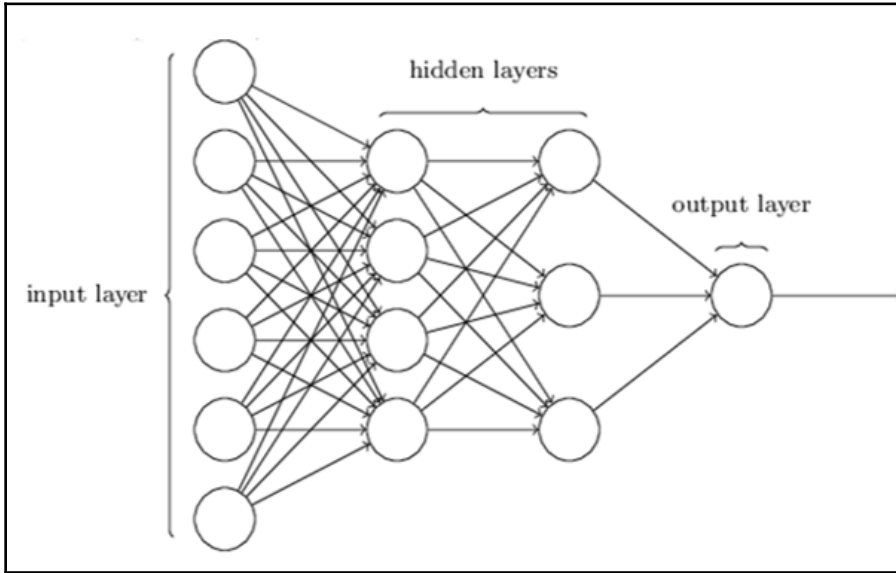


```
In [20]: predictionsPD = predictions.select("label", "prediction").toPandas()

ax = predictionsPD.plot(kind='scatter', figsize = (5,5), x='label', y='prediction', color='#066083',
fit = np.polyfit(predictionsPD['label'], predictionsPD['prediction'], deg=1)
ax.set_title('Actual vs. Predicted Tip Amounts ($)')
ax.set_xlabel("Actual"); ax.set_ylabel("Predicted");
ax.plot(predictionsPD['label'], fit[0] * predictionsPD['label'] + fit[1], color='b4d11e')
plt.axis([-1, 15, -1, 15])
plt.show(ax)
```



Chapter 10: Building Deep Learning Solutions

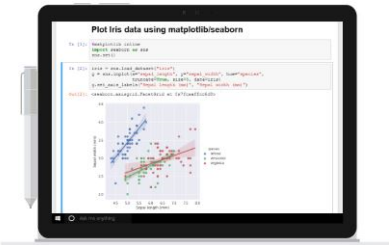


Secure | <https://notebooks.azure.com>

Microsoft Azure Notebooks Preview Sign In

Libraries What's New Status Help

Featured: Dr. Garth Wells' Eng101 @ Cambridge University



Plot Iris data using matplotlib/seaborn

Interactive coding in your browser

Free, in the cloud,
powered by Jupyter

[Get Started](#)

Powerful
Languages

Numerous Charting
Libraries


Built for
Sharing

Use the languages of Data Science

Azure Notebooks provides execution environments for Python 2, Python 3, F#, and R.


Featured Libraries

Introduction to
Python




Learn the basics of Python 3 in Azure Notebooks. Learn Python syntax, standard data types, as well as how to write a simple program.

Introduction to
R




Get a brief introduction to charting and graphing capabilities of R in the Jupyter Notebook. You will learn how to make line charts, pie charts and scatter plots.

Introduction to
F#



Get a brief introduction to using F# in the Jupyter Notebook.

Introduction to
Python 3



Learn the basics of Python 3 in Azure Notebooks. Learn Python syntax, standard data types, as well as how to write a simple program.

Jupyter Intro-Python-Notebook (unsaved changes) Azure Notebooks My Libraries cntk-aznotebo

File Edit View Insert Cell Kernel Data Widgets Help Not Trusted | P

+ ⌂ 📁 📄 ⬆️ ⬇️ ▶️ Run ⏹️ 🔄

Upload... Download... Enter/Exit RISE Slideshow

```

In [1]: import numpy as np
import random

## import Matplotlib with PyQt4 Backend
import matplotlib
  
```

Microsoft Azure Notebooks Preview

Libraries What's New Status Help

cntk-aznotebooksdemo

imcuteani > Libraries > cntk-aznotebookdemo > Population_Growth_Estimation_Demo

Run + New Settings Share Clone 0 Clones Star (0) Terminal Shutdown Preview Edit File Download

Search Show hidden items

FILE NAME	FILE TYPE
PopulationGrowth.ipynb	Notebook

Showing 1 file

https://cntkaznotebookdemo-imcuteani.notebooks.azure.com/j/notebooks/Population_Growth_Estimation_Demo/PopulationGrowth.ipynb

jupyter PopulationGrowth Last Checkpoint: an hour ago (autosaved) Azure Notebooks My Libraries cntk-aznotebooksdemo

File Edit View Insert Cell Kernel Data Widgets Help Trusted Python 3

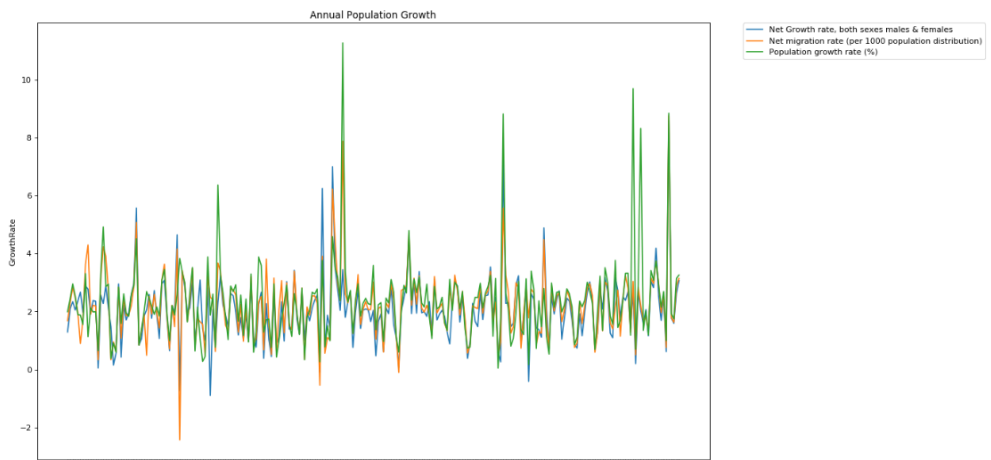
Enter/Exit RISE Slideshow

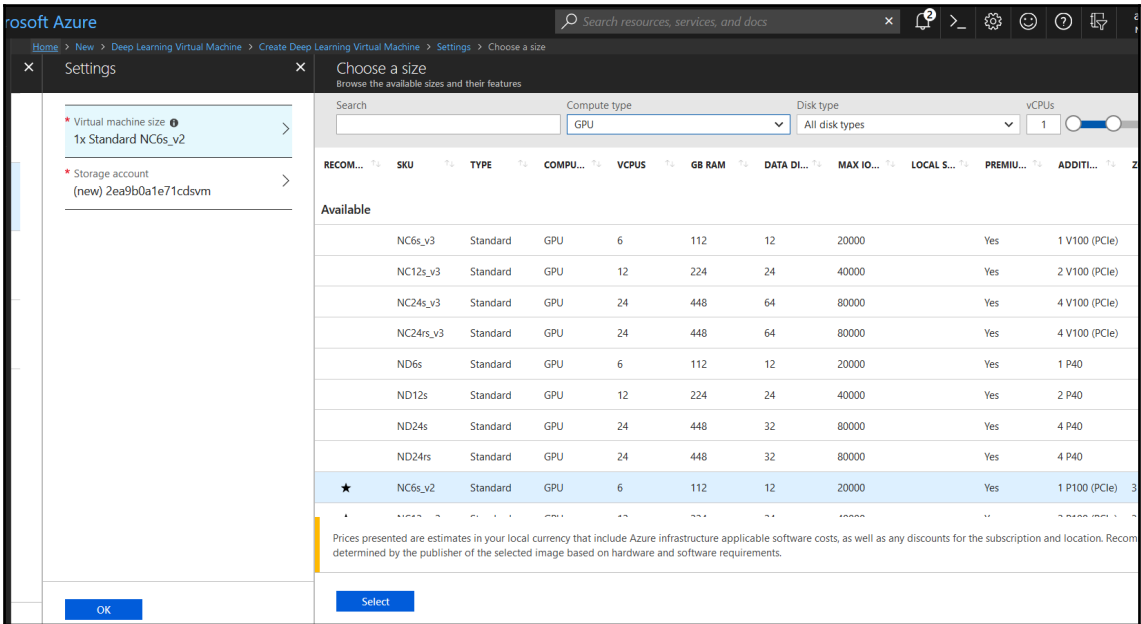
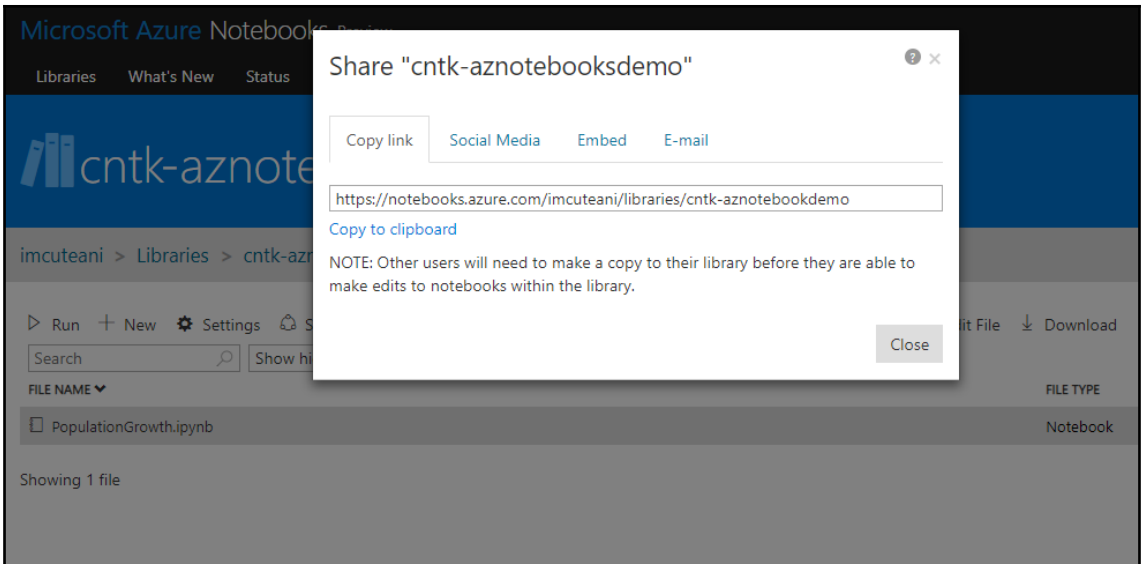
```
In [7]: filtered_cells_df = df_population_density[['Location','Time','Births','Deaths','GrowthRate']].dropna(how="any")
filtered_cells_df
```

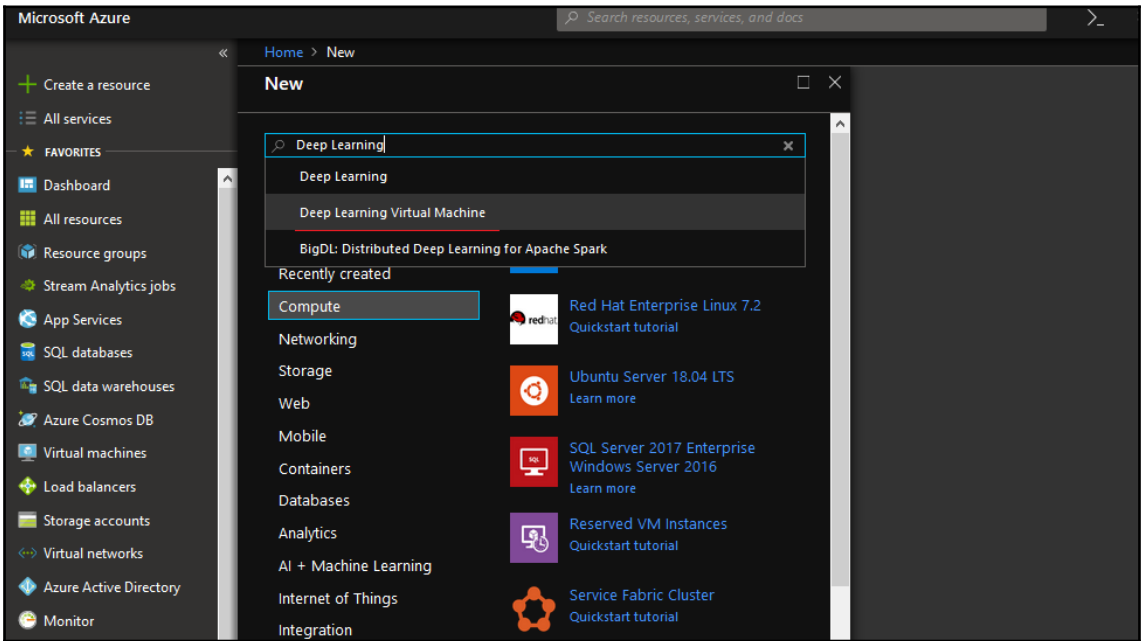
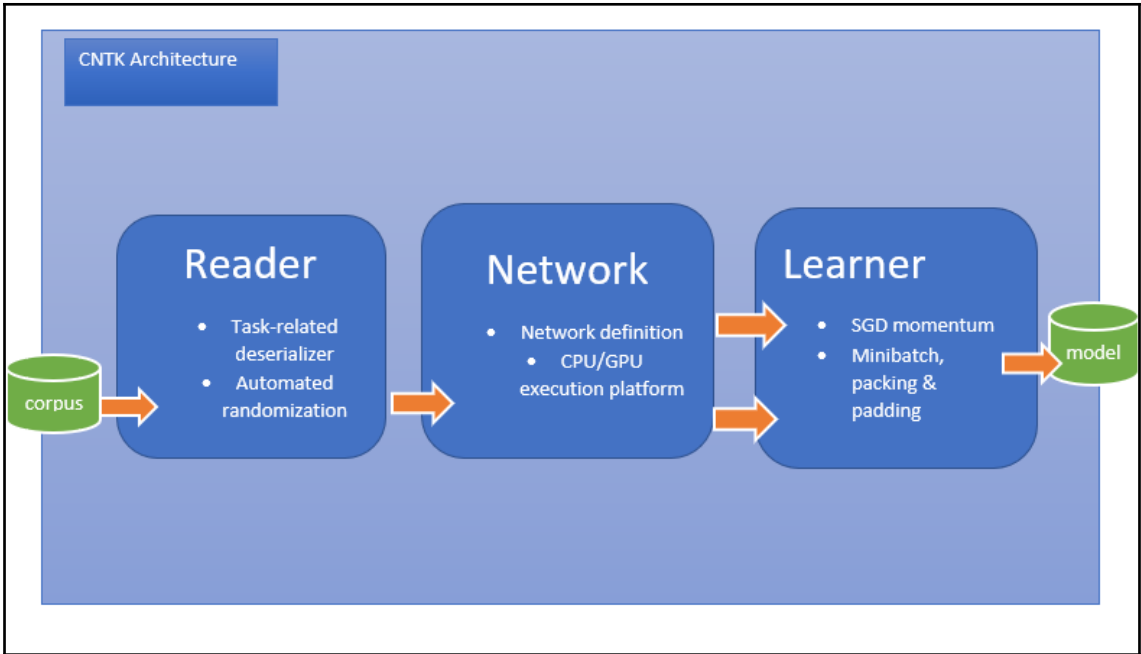
Out[7]:

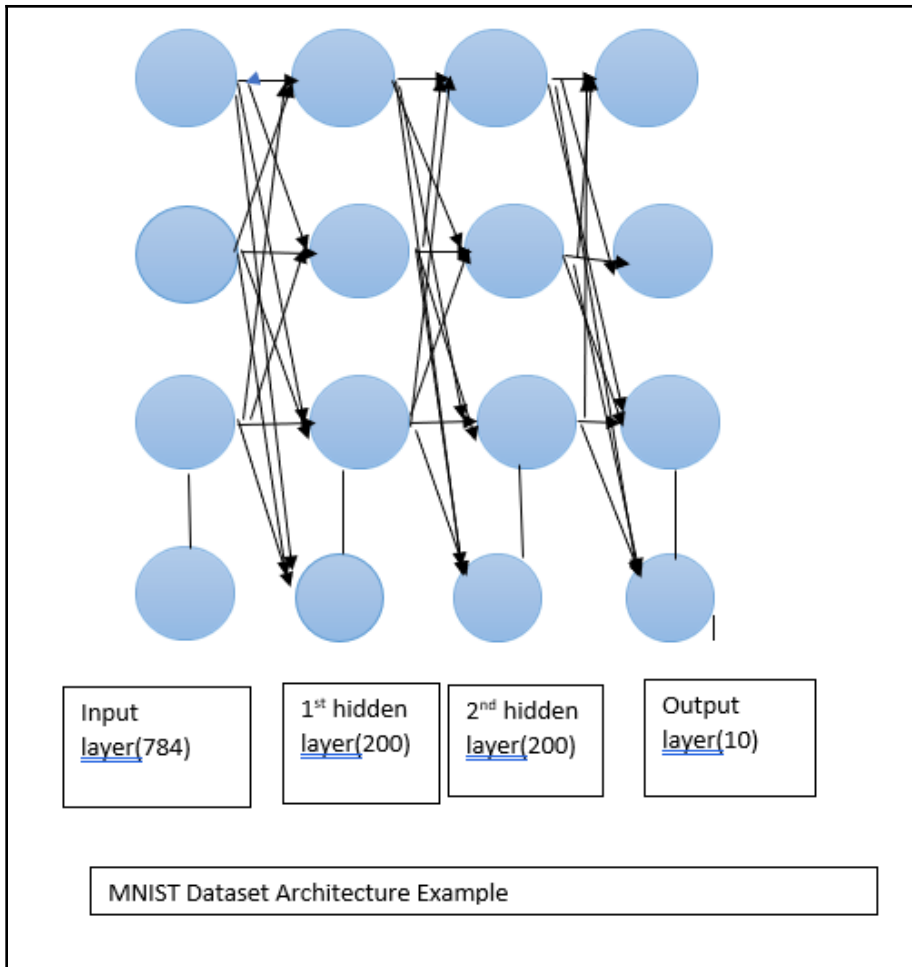
	Location	Time	Births	Deaths	GrowthRate
0	Afghanistan	1950-1955	2015.476	1477.014	1.295
1	Afghanistan	1955-1960	2201.589	1455.821	1.682
2	Afghanistan	1960-1965	2438.489	1476.423	1.992
3	Afghanistan	1965-1970	2725.445	1517.733	2.258
4	Afghanistan	1970-1975	3048.468	1564.313	2.473
5	Afghanistan	1975-1980	3284.102	1533.549	1.019
6	Afghanistan	1980-1985	3149.701	1296.726	-2.344
7	Afghanistan	1985-1990	2982.985	1032.727	0.776
8	Afghanistan	1990-1995	3570.874	1047.923	6.672
9	Afghanistan	1995-2000	4569.075	1195.382	3.227
10	Afghanistan	2000-2005	5287.210	1239.292	4.426
11	Afghanistan	2005-2010	5709.012	1199.152	2.776
12	Afghanistan	2010-2015	5651.992	1166.668	3.162
13	Afghanistan	2015-2020	5789.812	1171.363	2.409

```
In [22]: import numpy as np
import matplotlib.pyplot as plt
plt.figure(figsize=(15,10),dpi = 80)
plt.plot(df_population_pivot.ix[:,0:1], label="Net Growth rate, both sexes males & females")
plt.plot(df_population_pivot.ix[:,1:2], label="Net migration rate (per 1000 population distribution)")
plt.plot(df_population_pivot.ix[:,2:3],label="Population growth rate (%)")
plt.xlabel('Location')
plt.ylabel('GrowthRate')
plt.title("Annual Population Growth")
xvalues = list(df_population_pivot.index)
x = np.array(range(0,len(xvalues)))
plt.xticks(x,xvalues,rotation=70)
plt.legend(bbox_to_anchor=(1.05,1),loc=2, borderaxespad=0.)
plt.show()
```









```
C:\Anaconda\python.exe
Selected CPU as the process wide default device.
-----
Build info:

    Built time: Apr 13 2018 22:35:30
    Last modified date: Fri Apr 13 17:13:20 2018
    Build type: Release
    Build target: GPU
    With ASGD: yes
    Math lib: mkl
    CUDNN version: 7.0.5
    Build Branch: HEAD
    Build SHA1: 11c82c8019b78323b4f5169a2d8c90fba5ae49da
    MPI distribution: Microsoft MPI
    MPI version: 7.0.12437.6
-----

Learning rate per 1 samples: 1.0
Finished Epoch[1 of 10]: [Training] loss = 0.303444 * 60032, metric = 8.63% * 60032 7.879s (7619.2 samples/s);
Finished Epoch[2 of 10]: [Training] loss = 0.139705 * 59968, metric = 4.07% * 59968 4.030s (14880.4 samples/s);
Finished Epoch[3 of 10]: [Training] loss = 0.101490 * 60032, metric = 3.00% * 60032 3.534s (16987.0 samples/s);
Finished Epoch[4 of 10]: [Training] loss = 0.080002 * 59968, metric = 2.33% * 59968 3.592s (16694.9 samples/s);
=
```

```
repos1 (Running) - Microsoft Visual Studio (Administrator)
File Edit View Project Build Debug Team Tools Test AI Tools R Tools Analyze Window Help
Process: [1632] python.exe
cntkdemo.py | Tensorflow-Demo.py
1 # CNTK end to end sample demo
2 import os
3 import cntk as Cognitive
4 from cntk.train import Trainer
5 from cntk.io import MinibatchSource, CTFDeserializer, StreamDef, StreamDefs
6 from cntk.learners import adadelata, learning_rate_schedule, UnitType
7 from cntk.ops import relu, element_times, constant
8 from cntk.layers import Dense, Sequential, For, default_options
9 from cntk.losses import cross_entropy_with_softmax
10 from cntk.metrics import classification_error
11 from cntk.train.training_session import *
12 from cntk.logging import ProgressPrinter
13
14 input_dimension = 784
15 number_output_classes = 10
16 number_hidden_layers = 2
17 hidden_layers_dimension=200
18 feature_val = Cognitive.input_variable(input_dimension)
19 label_val = Cognitive.input_variable(number_output_classes)
20
21 def simple_mnist():
22     input_dimension = 784
23     number_output_classes = 10
24     number_hidden_layers = 2
25     hidden_layers_dimension = 200
26
27     # Instantiate the feedforward classification model
28     scaled_input = element_times(constant(0.00390625), feature_val)
29
30     with default_options(activation=relu, init=Cognitive.glorot_uniform()):
31         f = Sequential(For(range(number_hidden_layers),
```



```

anbasa@dsvm-ubuntu: ~
root@dsvm-ubuntu:/home/anbasa# docker pull microsoft/cntk
Using default tag: latest
latest: Pulling from microsoft/cntk
3b37166ec614: Pull complete
504facff238f: Pull complete
ebbcacd28e10: Pull complete
c7fb3351ecad: Pull complete
2e3debadcbf7: Pull complete
05448701b97f: Pull complete
5ae481ed00fd: Pull complete
6a7d72f99d0e: Pull complete
ec49014d6ac0: Extracting 325.9MB/473.9MB
20287b0857db: Downloading 8.583MB/62.83MB
ee2b81267240: Downloading 8.583MB/3.85GB

```

The screenshot displays a JupyterLab web interface on the left and a terminal window on the right. The JupyterLab interface shows a file browser with a list of notebooks, including 'CNTK_101_LogisticRegression.ipynb' through 'CNTK_103D_MNIST_ConvolutionalNeuralNetwork.ipynb'. The terminal window shows the following commands and output:

```

root@dsvm-ubuntu:/home/anbasa# docker run -d -p 8888:8888 --name cntk-jupyter-notebooks -t microsoft/cntk
75bd1a07db452e5a6d11a526a15029bb0ee566cd355c7d1606d0f047a29d23
root@dsvm-ubuntu:/home/anbasa# docker exec -it cntk-jupyter-notebooks bash -c "source /cntk/activate-cntk 44 jupyter-notebook --no-browser --port=8888 --ip=0.0.0.0 --notebook-dir=/cntk/Tutorials --allow-root"
*****
CNTK is activated.

Please checkout tutorials and examples here:
/cntk/Tutorials
/cntk/Examples

To deactivate the environment run

source /root/anaconda3/bin/deactivate
*****
[11:10:44.650 NotebookApp] Writing notebook server cookie secret to /root/.local/share/jupyter/runtime/notebook_cookie_secret
[11:10:44.723 NotebookApp] Serving notebooks from local directory: /cntk/Tutorials
[11:10:44.723 NotebookApp] 0 active kernels
[11:10:44.723 NotebookApp] The Jupyter Notebook is running at: http://0.0.0.0:8888/?token=b0e2be0534f1e0e053aaeb0f1e350813106622769aa38a
[11:10:44.723 NotebookApp] Use Control-C to stop this server and shut down all kernels (twice to skip confirmation).
[C 11:10:44.724 NotebookApp]

Copy/paste this URL into your browser when you connect for the first time,
to login with a token:
http://0.0.0.0:8888/?token=b0e2be0534f1e0e053aaeb0f1e350813106622769aa38a

```

```

> Administrator: Windows PowerShell
PS C:\WINDOWS\system32> docker run -d --name my-mmlsparkbook -p 8888:8888 -e ACCEPT_EULA=yes microsoft/mmlspark 6d5a6d141474780b8a3e4ae4d8614da40fb28ad94004431d35d59efceac4cb1a
PS C:\WINDOWS\system32>

```

The image shows a Jupyter Notebook interface with a Windows PowerShell terminal window overlaid on the right side. The notebook title is "201 - Amazon Book Reviews - TextFeaturizer". The terminal window shows the following commands and output:

```
PS C:\WINDOWS\system32> docker run -d --name my-mm1sp
6d5a6d141474780b8a3e4ae4d8614da40fb28ad94004431d35d59
PS C:\WINDOWS\system32> docker start my-mm1sparkbook
my-mm1sparkbook
PS C:\WINDOWS\system32>
```

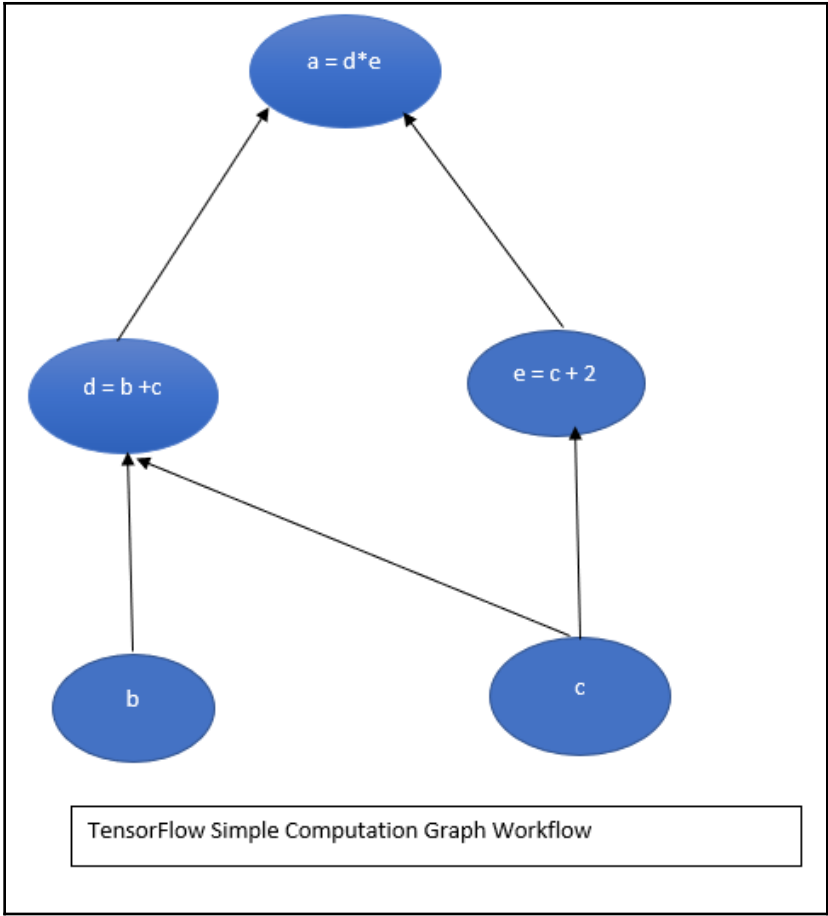
The notebook content includes the following code blocks:

```
In [ ]: import pandas as pd
import mm1spark
from pyspark.sql.types import IntegerType, StringType, StructType,
```

```
In [ ]: dataFile = "BookReviewsFromAmazon10K.tsv"
textSchema = StructType([StructField("rating", IntegerType(), False),
                          StructField("text", StringType(), False)])
import os, urllib
if not os.path.isfile(dataFile):
    urllib.request.urlretrieve("https://mm1spark.azureedge.net/data/BookReviewsFromAmazon10K.tsv", dataFile)
data = spark.createDataFrame(pd.read_csv(dataFile, sep="\t", header=0), textSchema)
data.limit(10).toPandas()
```

Use TextFeaturizer to generate our features column. We remove stop words, and use TF-IDF to generate sparse features.

```
In [ ]: from mm1spark.TextFeaturizer import TextFeaturizer
textFeaturizer = TextFeaturizer() \
    .setInputCol("text").setOutputCol("features") \
    .setUseStopWordsRemover(True).setUseIDF(True).setMinDocFreq(5).setNumFeatures(1 << 16).fit(data)
```



```
C:\Anaconda\python.exe
Please use tf.one_hot on tensors.
Extracting MNIST_data/t10k-images-idx3-ubyte.gz
Extracting MNIST_data/t10k-labels-idx1-ubyte.gz
WARNING:tensorflow:From C:\Anaconda\lib\site-packages\tensorflow\contrib\learn\python\learn\datasets\mnist.py:290: DataS
et.__init__ (from tensorflow.contrib.learn.python.learn.datasets.mnist) is deprecated and will be removed in a future ve
rsion.
Instructions for updating:
Please use alternatives such as official/mnist/dataset.py from tensorflow/models.
2018-09-23 11:14:56.945713: I T:\src\github\tensorflow\tensorflow\core\platform\cpu_feature_guard.cc:140] Your CPU suppo
rts instructions that this TensorFlow binary was not compiled to use: AVX2
2018-09-23 11:14:57.329082: E T:\src\github\tensorflow\tensorflow\stream_executor\cuda\cuda_driver.cc:406] failed call t
o cuInit: CUDA_ERROR_UNKNOWN
2018-09-23 11:14:57.339371: I T:\src\github\tensorflow\tensorflow\stream_executor\cuda\cuda_diagnostics.cc:158] retrievi
ng CUDA diagnostic information for host: dsvm-packt
2018-09-23 11:14:57.346002: I T:\src\github\tensorflow\tensorflow\stream_executor\cuda\cuda_diagnostics.cc:165] hostname
: dsvm-packt
Epoch: 1 cost = 0.605
Epoch: 2 cost = 0.237
Epoch: 3 cost = 0.173
Epoch: 4 cost = 0.140
Epoch: 5 cost = 0.115
Epoch: 6 cost = 0.096
Epoch: 7 cost = 0.086
Epoch: 8 cost = 0.069
Epoch: 9 cost = 0.065
Epoch: 10 cost = 0.051


Training complete!
0.9788
Press any key to continue . . .
```

```
anbasa@dsvm-ubuntu: ~
root@dsvm-ubuntu:/home/anbasa# docker run -d -p 8888:8888 -v /notebook:/notebook xblaster/tensorflow-jupyter
```

Extensions and Updates

Installed Sort by: Most Recent

- All
- Controls
- Templates
- SDKs



Microsoft Visual Studio Tools for AI
Visual Studio Tools for AI is an extension to build, test, and deploy Deep Learning / AI solutions. It sea...

Tools for AI Installation Page

Congratulations!

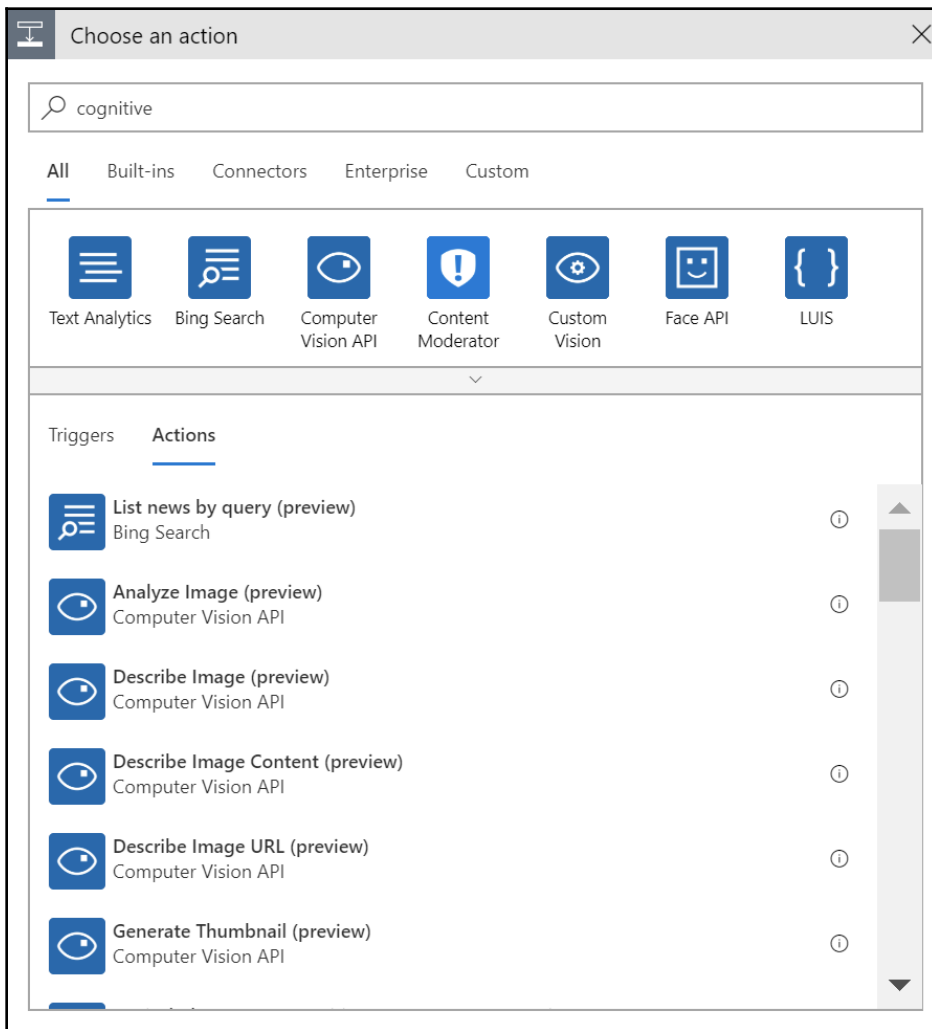
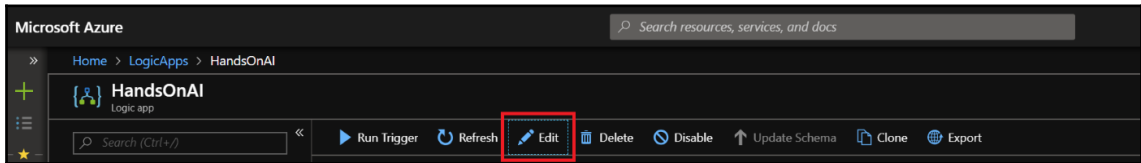
You have successfully installed the Tools for AI extension

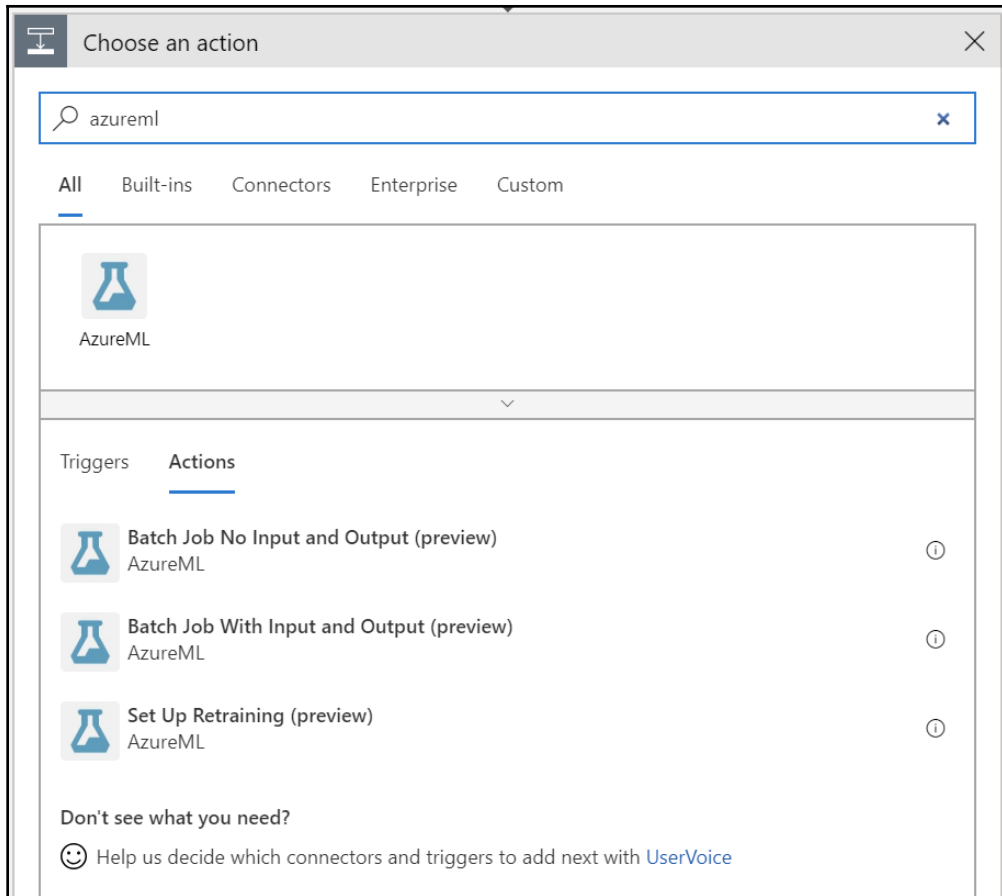
Just complete steps below, then you can train and use the DL model in your app.

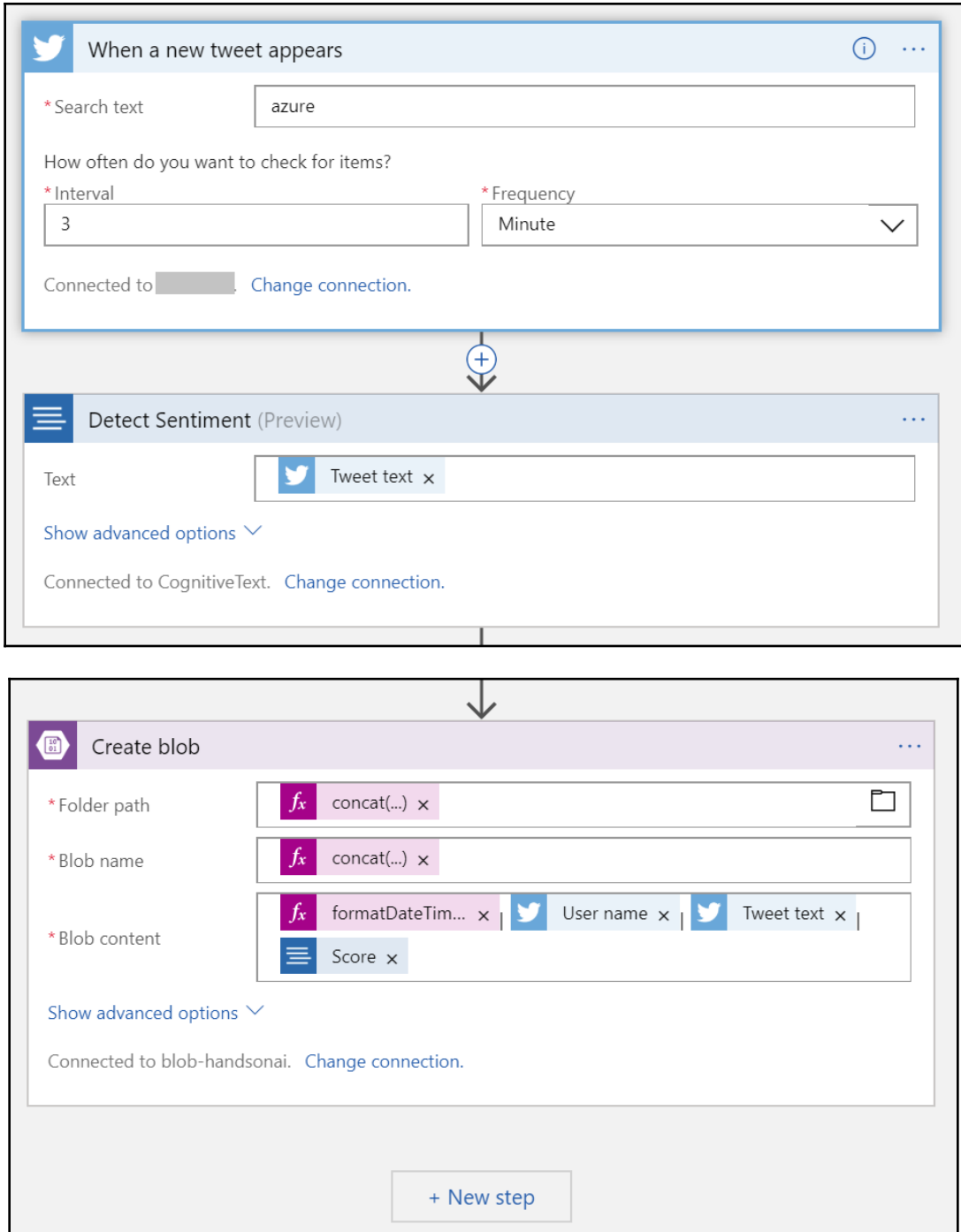
- (Optional) Follow the [instructions](#) to install NVIDIA GPU driver, and GPU-accelerated library for parallel computing and deep neural network.
(Please skip this step if there's no NVidia GPU with your machine)
- Click [here to run the script](#) to install the AI development dependent environment. The libraries to be installed includes:
 - NumPy and SciPy
 - Jupyter Notebook
 - Pandas
 - Matplotlib
 - Deep learning and machine learning frameworks.

```
C:\Program Files (x86)\Microsoft Visual Studio\Shared\Python36_64\python.exe
18:42:41 [INFO] [Microsoft Visual Studio Tools for AI] Detecting system information ...
18:42:41 [INFO] [Microsoft Visual Studio Tools for AI] Python: 3.6.6, 64bit
18:42:41 [INFO] [Microsoft Visual Studio Tools for AI] OS: Windows-10, 64bit
18:42:41 [INFO] [Microsoft Visual Studio Tools for AI] NVIDIA GPU: None
18:42:42 [INFO] [Microsoft Visual Studio Tools for AI] Git: True
18:42:42 [INFO] [Microsoft Visual Studio Tools for AI] Visual Studio: VS2017
18:42:42 [INFO] [Microsoft Visual Studio Tools for AI] Begin to install scipy(numpy, scipy) ...
18:42:42 [INFO] [Microsoft Visual Studio Tools for AI] Begin to install CNTK(BrainScript) ...
18:42:42 [INFO] [Microsoft Visual Studio Tools for AI] Begin to pip-install numpy 1.14.3 ...
18:42:42 [INFO] [Microsoft Visual Studio Tools for AI] CNTK(BrainScript)-2.5.1 is already installed.
18:43:20 [INFO] [Microsoft Visual Studio Tools for AI] Pip-install numpy 1.14.3 successfully!
18:43:20 [INFO] [Microsoft Visual Studio Tools for AI] Begin to pip-install scipy 1.1.0 ...
18:44:52 [INFO] [Microsoft Visual Studio Tools for AI] Pip-install scipy 1.1.0 successfully!
18:44:52 [INFO] [Microsoft Visual Studio Tools for AI] Begin to pip-install cntk 2.5.1 ...
18:45:34 [INFO] [Microsoft Visual Studio Tools for AI] Pip-install cntk 2.5.1 successfully!
18:45:34 [INFO] [Microsoft Visual Studio Tools for AI] Begin to pip-install tensorflow 1.5.0 ...
18:50:55 [INFO] [Microsoft Visual Studio Tools for AI] Pip-install tensorflow 1.5.0 successfully!
18:50:55 [INFO] [Microsoft Visual Studio Tools for AI] Begin to pip-install torch 0.4.0 ...
18:52:39 [INFO] [Microsoft Visual Studio Tools for AI] Pip-install torch 0.4.0 successfully!
18:52:39 [INFO] [Microsoft Visual Studio Tools for AI] Begin to pip-install torchvision 0.2.1 ...
18:53:21 [INFO] [Microsoft Visual Studio Tools for AI] Pip-install torchvision 0.2.1 successfully!
18:53:21 [INFO] [Microsoft Visual Studio Tools for AI] Begin to pip-install mxnet 1.2.0 ...
18:55:54 [INFO] [Microsoft Visual Studio Tools for AI] Pip-install mxnet 1.2.0 successfully!
18:55:54 [INFO] [Microsoft Visual Studio Tools for AI] Begin to install chainer(cupy, chainer) ...
18:55:54 [INFO] [Microsoft Visual Studio Tools for AI] Begin to pip-install chainer 4.1.0 ...
18:57:05 [INFO] [Microsoft Visual Studio Tools for AI] Pip-install chainer 4.1.0 successfully!
18:57:05 [INFO] [Microsoft Visual Studio Tools for AI] Begin to pip-install Theano 1.0.2 ...
```

Chapter 11: Integration with Other Azure Services







The image shows a workflow configuration interface with two main sections. The top section is a trigger titled "When a new tweet is posted" with a Twitter icon. It includes a search text field containing "azure", a frequency setting of 3 minutes, and is connected to a user named "laurilehm". The bottom section is an action titled "Detect Language (Preview)" with a hamburger menu icon. It has a text input field containing "Tweet text" with a Twitter icon and a close button. It includes a "Show advanced options" link and is connected to "CognitiveText". A downward-pointing arrow connects the trigger to the action.

When a new tweet is posted

*Search text: azure

How often do you want to check for items?

*Interval: 3

*Frequency: Minute

Connected to laurilehm. [Change connection.](#)

Detect Language (Preview)

Text: Tweet text

[Show advanced options](#)

Connected to CognitiveText. [Change connection.](#)

For each

*Select an output from previous steps

detectedLangu... x

Condition

And

Language... x is equal to en

+ Add

If true

Detect Sentiment (Preview)

Text: Tweet text x

Show advanced options

Connected to CognitiveText. Change connection.

Create blob

*Folder path: concat(...) x

*Blob name: concat(...) x

*Blob content: formatDateTim... x | User name x | Tweet text x | Score x

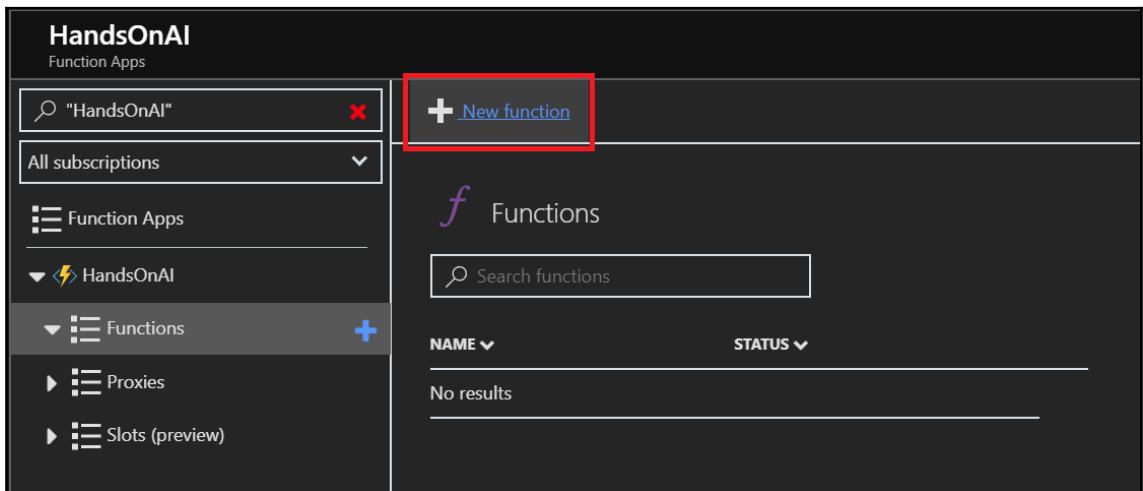
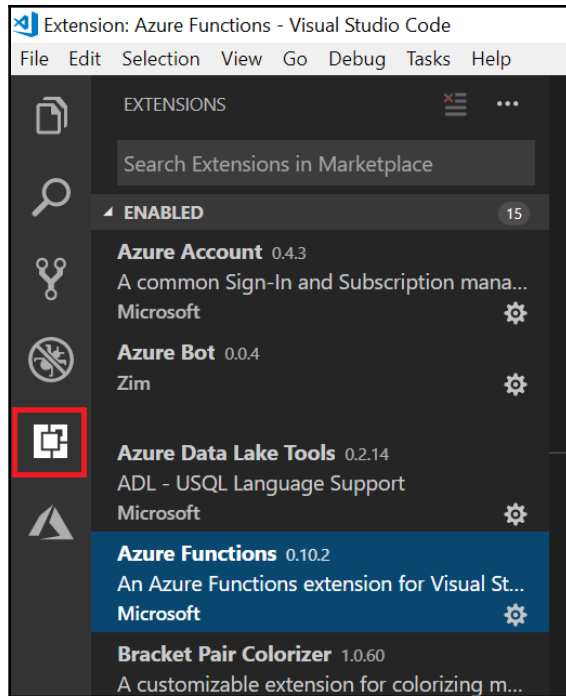
Show advanced options

Connected to blob-handsonal. Change connection.

If false

Add an action

The image shows a workflow editor interface. At the top, there's a 'For each' loop. Below it, a 'Condition' step is configured with an 'And' operator and a single condition: 'Language...' is equal to 'en'. The 'If true' branch contains two actions: 'Detect Sentiment (Preview)' which takes 'Tweet text' as input, and 'Create blob' which uses 'concat(...)' for folder path and blob name, and a concatenation of 'formatDateTim...', 'User name', 'Tweet text', and 'Score' for the blob content. The 'If false' branch is currently empty, showing an 'Add an action' button.





New Function

Language:

C#

Name:

BlobTriggered

Azure Blob Storage trigger

Path ⓘ

handsonai/{name}

Storage account connection ⓘ

[new](#) [show value](#)

AzureWebJobsStorage

Create

Cancel

Home > HandsOnAI

HandsOnAI

Function Apps

Visual Studio Enterprise – MPN

Function Apps

HandsOnAI

Functions

- (disabled) BlobTriggered
 - Integrate
 - Manage
 - Monitor
- Proxies
- Slots (preview)

+ New function

Functions

Search functions

NAME	STATUS
BlobTriggered	<input type="checkbox"/> Disabled

handsonai - Data sources

Data Lake Analytics

Search (Ctrl+/)

Add data source

Overview

Activity log

Access control (IAM)

Tags

Diagnose and solve problems

Settings

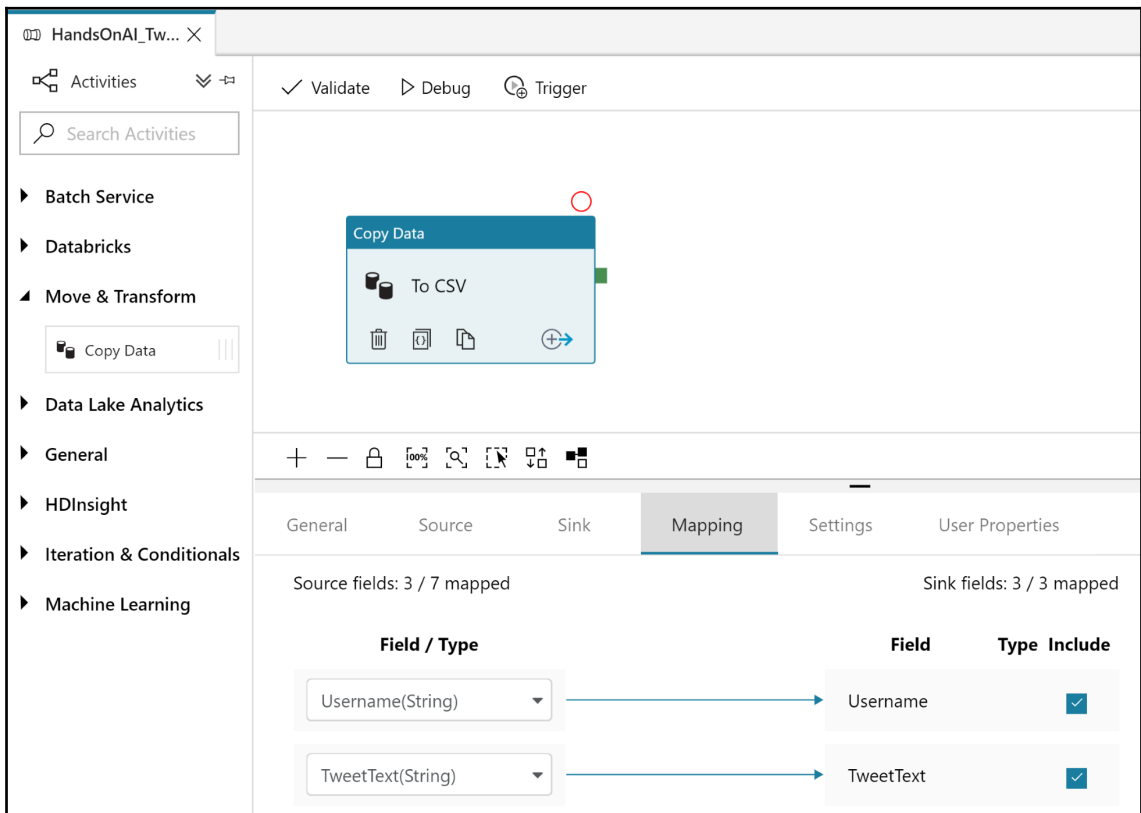
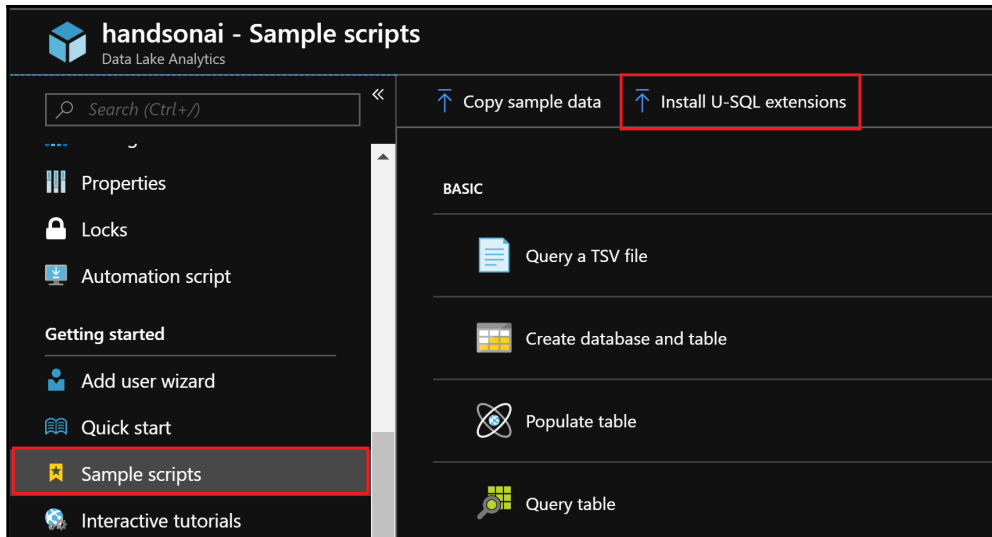
Firewall

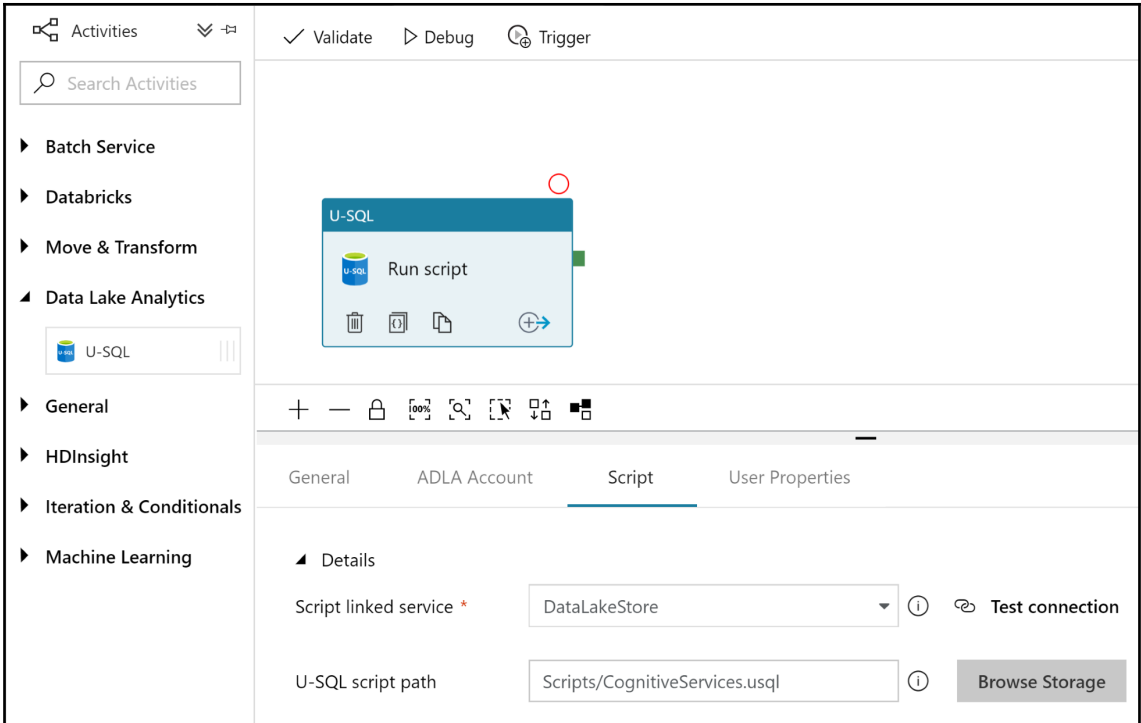
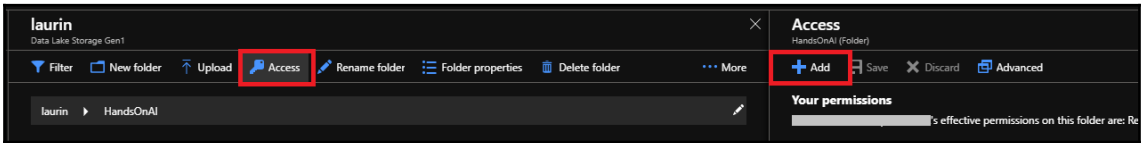
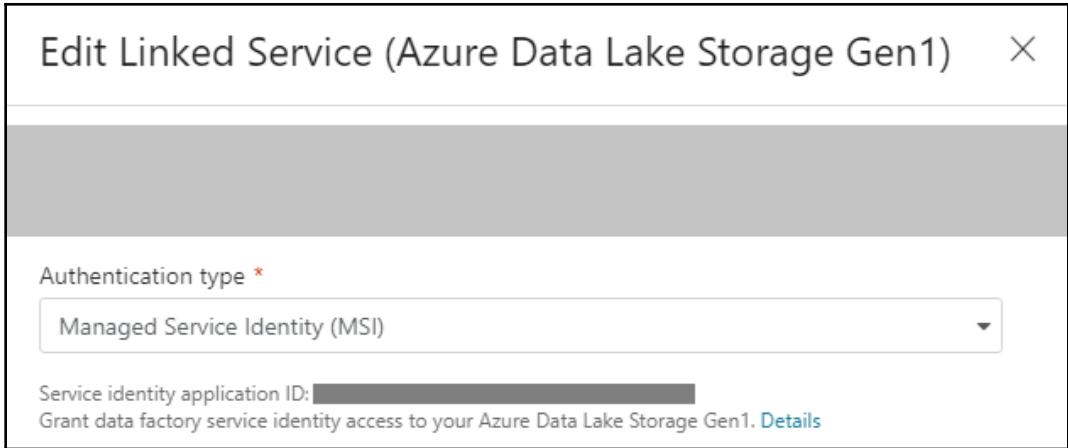
Data sources

Pricing tier

Data sources

NAME	TYPE
laurin (default)	Azure Data Lake Storage Gen1
handsonai	Azure Storage





Select cluster

New job cluster Existing interactive cluster

Domain/Region * (i)

Access token Azure Key Vault

Access token * Click to generate access token (i)

Activities
Validate Debug Trigger

- ▶ Batch Service
- ▲ Databricks
 - Notebook
 - Jar
 - Python
- ▶ Move & Transform
- ▶ Data Lake Analytics
- ▶ General
- ▶ HDInsight
- ▶ Iteration & Conditionals
- ▶ Machine Learning

Notebook

HandsOnAI

+ - lock 100% search refresh undo redo

General
Azure Databricks
Settings
User Properties

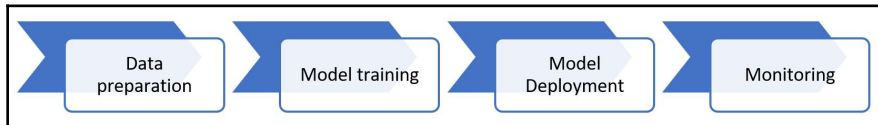
Notebook path * Browse

▲ Base Parameters

+ New | Delete

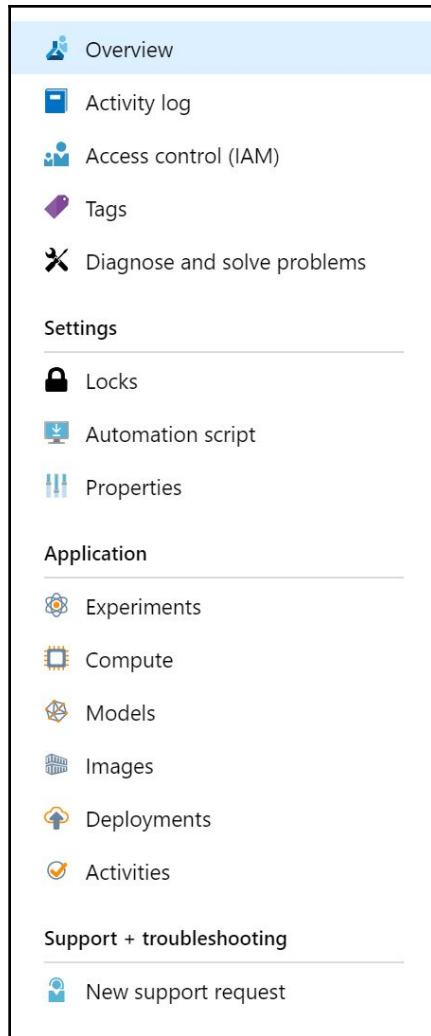
<input type="checkbox"/> NAME	VALUE
FileName	/dbfs/HandsOnAI.csv

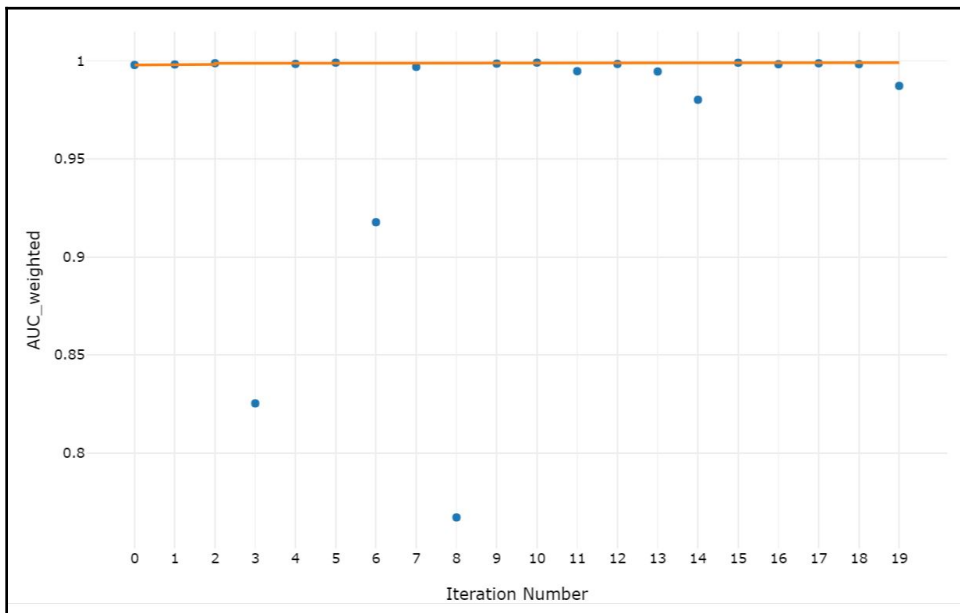
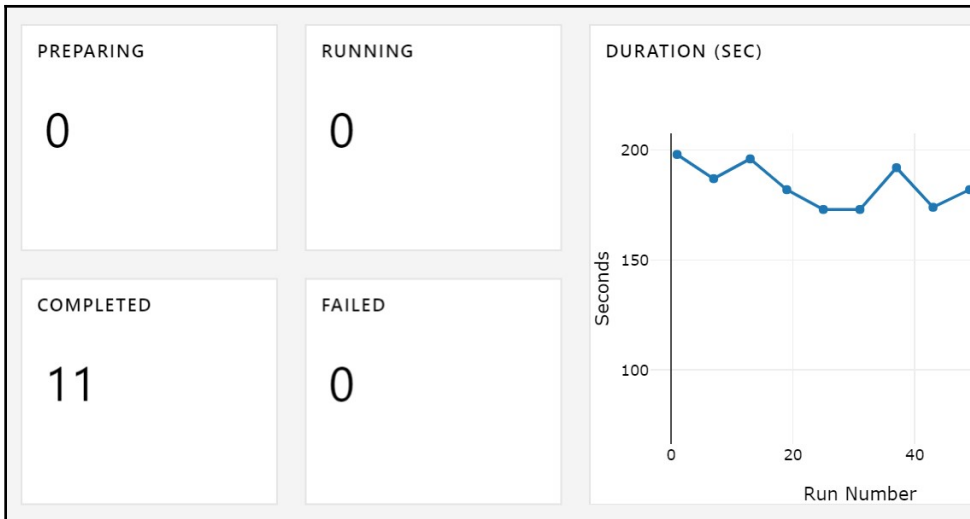
Chapter 12: End-to-End Machine Learning



```
from azureml.core import Workspace

ws = Workspace.create(name = workspace_name,
                    subscription_id = subscription_id,
                    resource_group = resource_group,
                    location = workspace_region,
                    exist_ok=True)
```





```
best_run_id = max(child_run_metrics, key = lambda k: child_run_metrics[k]['au_roc'])
best_run = child_runs[best_run_id]
print('Best run is:', best_run_id)
print('Metrics:', child_run_metrics[best_run_id])
```

```
# image creation
from azureml.core.image import ContainerImage
myimage_config = ContainerImage.image_configuration(execution_script = driver_file,
                                                    runtime = runtime,
                                                    conda_file = my_conda_file)

# Webservice creation
myservice = Webservice.deploy_from_model(
    workspace=ws,
    name=service_name,
    deployment_config = myaci_config,
    models = [mymodel],
    image_config = myimage_config
)
```

