AzureMachineLearning
ハンズオン入門

株式会社ISAO MSPプロジェクト

秋山 康平

はじめる前に

- 以下の準備はできていますか？
    - PC
    - ネット環境
    - ブラウザ
    - Microsoftアカウント

目次

- 自己紹介
- Microsoft Azure 概要
- Azure Machine Learning 概要
- ハンズオン

自己紹介

- 2017年1月からISAO入社
- ブログ
  http://kheiakiyama.hateblo.jp/
- Azure 歴それなり
- 機械学習歴<10人日
- ゼロから始めるDeepLearning4章で挫折

機械学習の学習(僕の場合)

- 「機械学習」でググる
- 数学の知識が必要と知る
- 微分積分を学び直し始める
- python を学び始める

圧倒的 yak shaving 感

プログラマの学習

- HelloWorld
- マルバツゲーム、シューティングゲーム
- 徐々に大きめのアプリへ
- 第2言語を学ぶ

HelloWorld としての

AzureMachineLearning

MicrosoftAzure概要

今日の内容向けの最低限

Microsoft Azure 概要

- ポータル

  https://portal.azure.com

- 認証は Microsoftアカウント

- 請求単位は Azureサブスクリプション

Azure Machine Learning 概要

Azure Machine Learning 概要

- 公式

  https://azure.microsoft.com/ja-jp/services/machine-learning/

- 概要

  https://docs.microsoft.com/ja-jp/azure/machine-learning/machine-learning-studio-overview-diagram

Machine Learning in ML Studio

Anomaly Detection
- One-class Support Vector Machine
- Principal Component Analysis-based Anomaly Detection
- Time Series Anomaly Detection*

Classification

Two-class Classification
- Averaged Perceptron
- Bayes Point Machine
- Boosted Decision Tree
- Decision Forest
- Decision Jungle
- Logistic Regression
- Neural Network
- Support Vector Machine

Multi-class Classification
- Decision Forest
- Decision Jungle
- Logistic Regression
- Neural Network
- One-vs-all

Clustering
- K-means Clustering

Recommendation
- Matchbox Recommender

Regression
- Bayesian Linear Regression
- Boosted Decision Tree
- Decision Forest
- Fast Forest Quantile Regression
- Linear Regression
- Neural Network Regression
- Ordinal Regression
- Poisson Regression

Statistical Functions
- Descriptive Statistics
- Hypothesis Testing T-Test
- Linear Correlation
- Probability Function Evaluation

Text Analytics
- Feature Hashing
- Named Entity Recognition
- Vowpal Wabbit

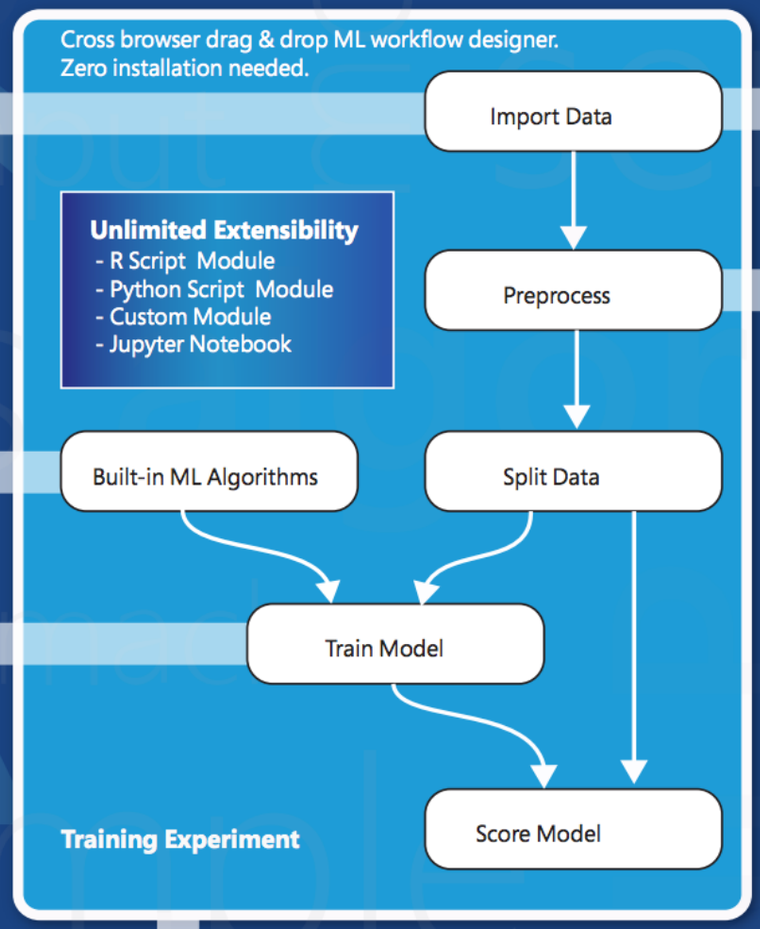
Computer Vision
- OpenCV Library

Data/Model Visualization
- Scatterplots
- Bar Charts
- Box plots
- Histogram
- R and Python Plotting Libraries
- REPL with Jupyter Notebook
- ROC, Precision/Recall, Lift
- Confusion Matrix
- Decision Tree*

Training
- Cross Validation
- Retraining
- Parameter Sweep

https://studio.azureml.net

Guest Access Workspace: Free trial access without logging in.
Free Workspace: Free persisted access, no Azure subscription needed.
Standard Workspace: Full access with SLA under an Azure subscription.



Data Source
- Azure Blob Storage
- Azure SQL DB
- Azure SQL DW*
- Azure Table
- Desktop Direct Upload
- Hadoop Hive Query
- Manual Data Entry
- OData Feed
- On-prem SQL Server*
- Web URL (HTTP)

Data Format
- ARFF
- CSV
- SVMLight
- TSV
- Excel
- ZIP

Data Preparation
- Clean Missing Data
- Clip Outliers
- Edit Metadata
- Feature Selection
- Filter
- Learning with Counts
- Normalize Data
- Partition and Sample
- Principal Component Analysis
- Quantize Data
- SQLite Transformation
- Synthetic Minority Oversampling Technique

Enterprise Grade Cloud Service
- SLA: 99.95% Guaranteed Up-time
- Azure AD Authentication
- Compute at Large Scale
- Multi-geo Availability
- Regulatory Compliance*

One-click Operationalization

Predictive Experiment

Make Prediction with Elastic APIs
- Request-Response Service (RRS)
- Batch Execution Service (BES)
- Retraining API

Community
- Gallery (http://gallery.azureml.net)
- Samples & Templates
- Workspace Sharing and Collaboration
- Live Chat & MSDN Forum Support

* Feature Coming Soon

Azure Machine Learning Studio Capabilities Overview

Created by the Azure Machine Learning Team Email: AzurePoster@microsoft.com
Download this poster: http://aka.ms/MLStudioOverview

Microsoft

http://download.microsoft.com/download/C/4/6/C4606116-522F-428A-BE04-B6D3213E9E52/ml_studio_overview_v1.1.pdf

Azure Machine Learning 概要

- 課金体系は2つ
    - Microsoftアカウントで使える無料プラン
    - Azureサブスクリプションで使う有料プラン
- Pricing
  https://azure.microsoft.com/ja-jp/pricing/details/machine-learning/

ここからハンズオン

ハンズオン

- 今回のゴール
    - 日本の祝日かどうかを判定するAIの作成
        - たとえば 2017/1/1 は祝日、
          2017/1/2 は祝日ではない
- 50年分のデータを元に分析器を作成
- WebAPIとして呼び出す

Microsoft Azure Machine Learning Studio

康平 秋山-Free-Workspace

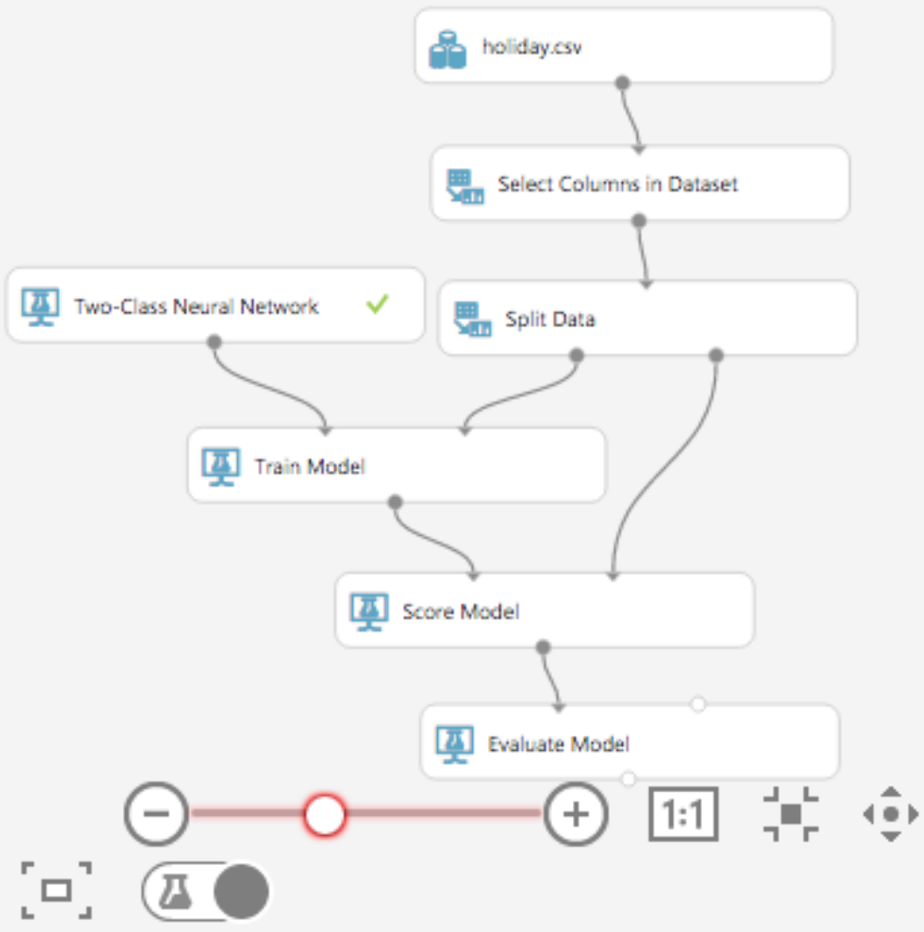
Search experiment items

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

Experiment created ...

In draft

Draft saved at 0:18:06



Properties Project

Experiment Properties

START TIME	3/13/2017 ...
END TIME	3/13/2017 ...
STATUS CODE	InDraft
STATUS DETAILS	None

Summary

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

Quick Help

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

ハンズオン

- Microsoft Azure Machine Learning Studio
  https://studio.azureml.net/
  を開く

- 右上の Sign In からログイン

Microsoft Azure Machine Learning Studio

康平 秋山-Free-Workspace

PROJECTS

EXPERIMENTS

WEB SERVICES

NOTEBOOKS

DATASETS

TRAINED MODELS

SETTINGS

experiments

MY EXPERIMENTS SAMPLES

	NAME	AUTHOR	STATUS	LAST E...	PROJ...

No experiments found

0 items selected

NEW

DELETE

ADD TO PROJECT

ハンズオン

- https://goo.gl/Mdzn3p
  をダウンロード
- DATASETS を開き、NEW から csv ファイルを
  アップロード

Microsoft Azure Machine Learning Studio

康平 秋山-Free-Workspace

PROJECTS

EXPERIMENTS

WEB SERVICES

NOTEBOOKS

DATASETS

TRAINED MODELS

SETTINGS

datasets

MY DATASETS SAMPLES

	NAME	SUBMITTED BY	DESCRIPTION	DATA TYPE	CREATED	SIZE	PROJECT
☐	holiday.csv	kheiakiyama		GenericCSV	3/12/2017 10:58:...	310.99 KB	*None*

NEW

DOWNLOAD DELETE OPEN IN GENERATE DATA ADD TO PROJECT

https://studio.azureml.net/Home/ViewWorkspaceCached/793b9e1234e34818bbbfec672878d8b0#Workspace/Datasets

ハンズオン

- EXPERIMENTS を開き、NEW から Blank Experiment をクリック
  適当な名前をつける

- Saved Datasets -> My Datasets から holiday.csv を配置

📒 配置した item の移動や拡大・縮小や視点の移動に慣れておきましょう

Microsoft Azure Machine Learning Studio

康平 秋山-Free-Workspace

Search experiment items

- Saved Datasets
  - My Datasets
    - holiday.csv
  - Samples
- Data Format Conversions
- Data Input and Output
- Data Transformation
- Feature Selection
- Machine Learning
- OpenCV Library Modules
- Python Language Modules
- R Language Modules

Experiment created on 2017/3/12

In draft

holiday.csv

Mini Map

holiday.csv

1:1

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

ハンズオン

- 左上の 検索ボックスから Select Columns in Dataset を検索し配置

- Holiday.csv の下から Select Columns に接続

- Select Columns を選択し、Properties -> Launch column selector で title 以外を選択

📒試しに Holiday.csv の下をクリック、Visualize を開いてみてください

Select Columns の下を見た場合と比べてみてください

Microsoft Azure Machine Learning Studio

康平 秋山-Free-Workspace

select

Saved Datasets

Samples

Restaurant customer data

Restaurant feature data

Data Transformation

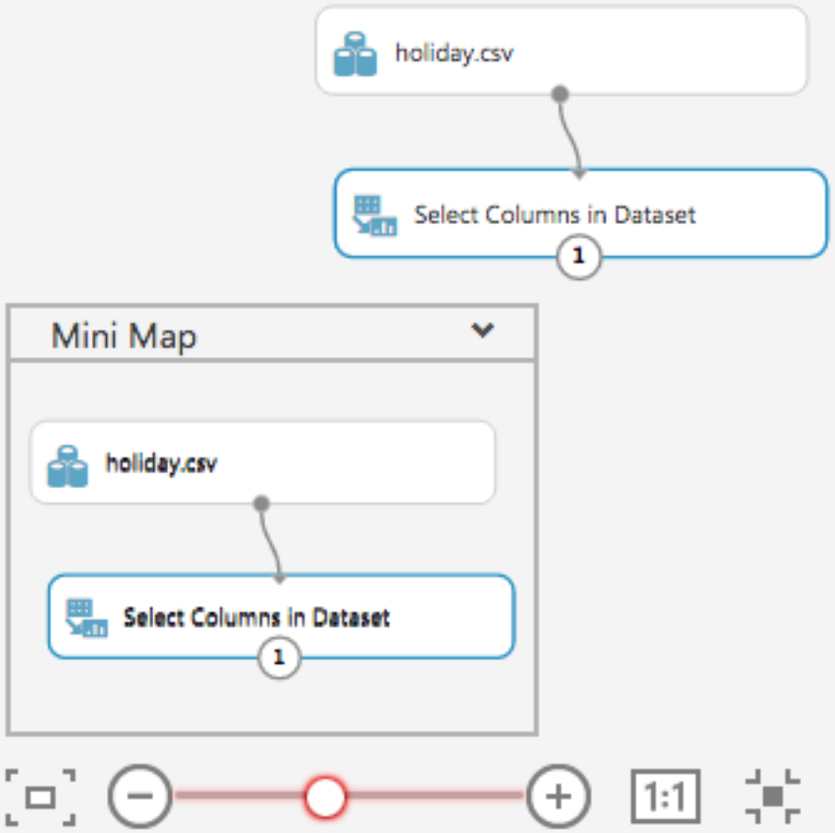
Manipulation

Select Columns in Datas...

Select Columns Transfor...

Experiment created ...

In draft



Properties Project

Select Columns in Dataset

Select columns

Selected columns:
Column names:
year,month,day,holiday

Launch column selector

Quick Help

NEW

RUN HISTORY

SAVE

SAVE AS

DISCARD CHANGES

RUN

SET UP WEB SERVICE

PUBLISH TO GALLERY

ハンズオン

- 左上の 検索ボックスから Split Data を検索し配置
- Select Columns の下から Split Data に接続
- Split Data を選択し、Properties -> Fraction of rows ... で 0.7 を入力

📒 今回はデータの70%を学習に、30%を検証に使う

Microsoft Azure Machine Learning Studio

康平 秋山-Free-Workspace

split

Saved Datasets

Samples

Restaurant ratings

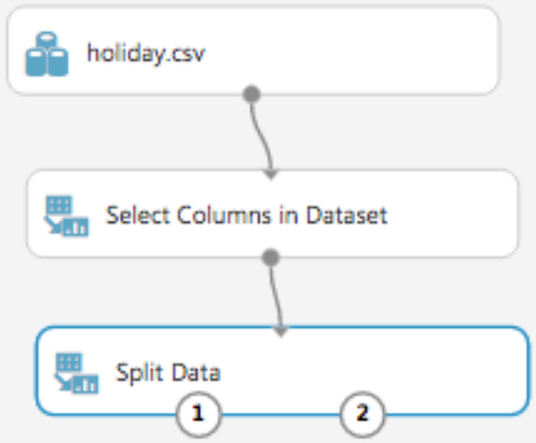
Data Transformation

Sample and Split

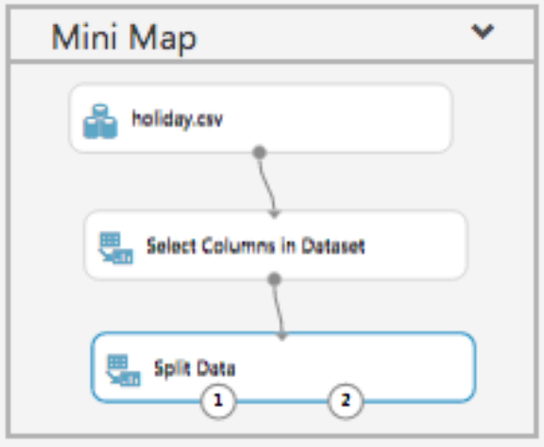
Split Data

Experiment created ...

In draft



Mini Map



1:1

Properties Project

Split Data

Splitting mode

Split Rows

Fraction of rows in the firs...

0.7

Randomized split

Random seed

0

Stratified split

False

Quick Help

Split the rows of a dataset into two distinct sets

(more help...)

NEW

RUN HISTORY

SAVE

SAVE AS

DISCARD CHANGES

RUN

SET UP WEB SERVICE

PUBLISH TO GALLERY

ハンズオン

- 左上の 検索ボックスから Train Modelを検索し配置

- Split Data の左下から Train Model の右上に接続

- Train Model を選択し、Properties -> Launch column selector で holiday を選択

📒今回は教師あり学習

Microsoft Azure Machine Learning Studio

康平 秋山-Free-Workspace

train

- Sweep Clustering
- Train Anomaly Detectio...
- Train Clustering Model
- Train Matchbox Recom...
- Train Model
- Tune Model Hyperpara...

OpenCV Library Modules

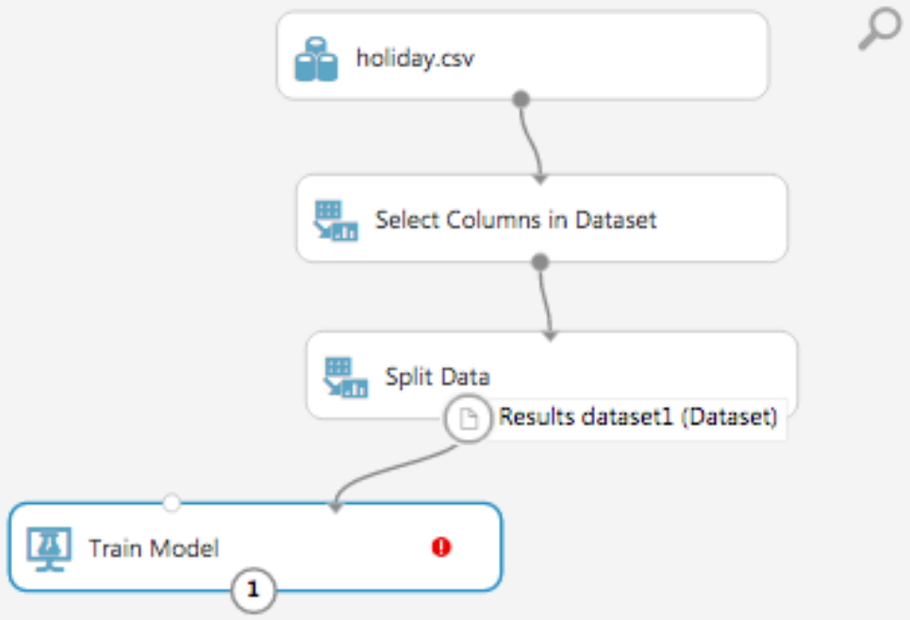
- Pre-trained Cascade Image...

Text Analytics

- Train Vowpal Wabbit Versi...
- Train Vowpal Wabbit Versi...
- Train Vowpal Wabbit Versi...

Experiment created ...

In draft



Properties Project

Train Model

Label column

Selected columns:
Column names: holiday

Launch column selector

Quick Help

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

ハンズオン

- 左上の 検索ボックスから Score Model を検索し配置
- Train Model の下から Score Model 左上に接続
- Split Data の右下から Score Model 右上に接続

📒 スコアを計測する

Microsoft Azure Machine Learning Studio

康平 秋山-Free-Workspace

score mode

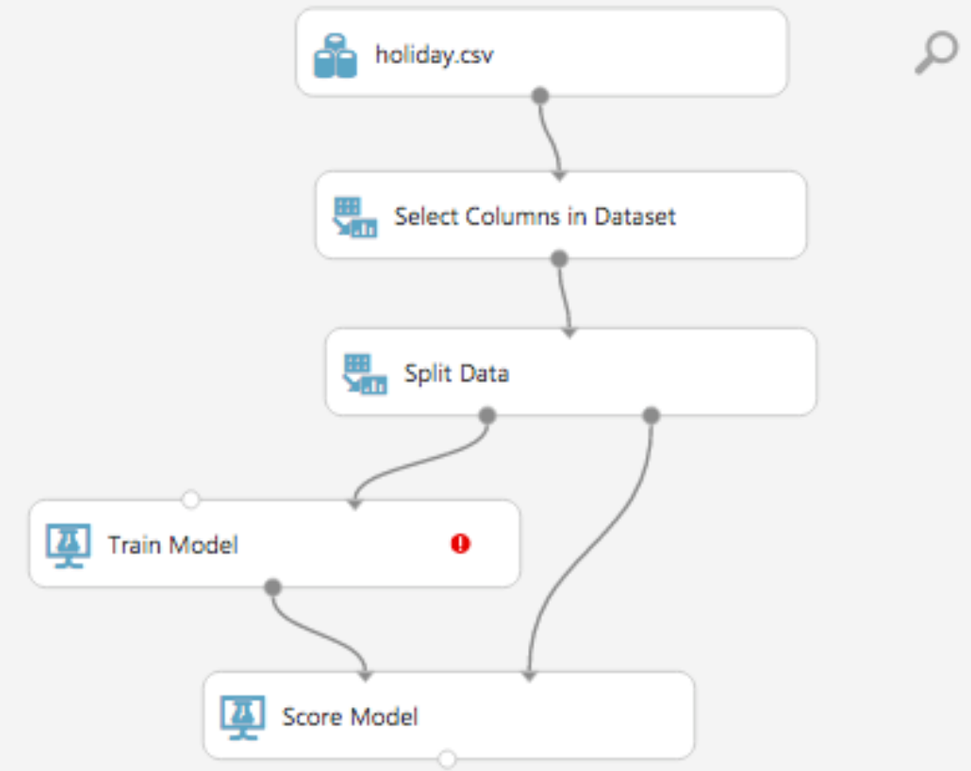
Machine Learning

Score

Score Model

Experiment created ...

In draft



Properties Project

Experiment Properties

STATUS CODE InDraft

Summary

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

Description

Enter the detailed description for your

Quick Help

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

ハンズオン

- 左上の 検索ボックスから Evaluate Model を検索し配置
- Score Model の下から Evaluate Model 左上に接続

📒 結果を評価する

Microsoft Azure Machine Learning Studio

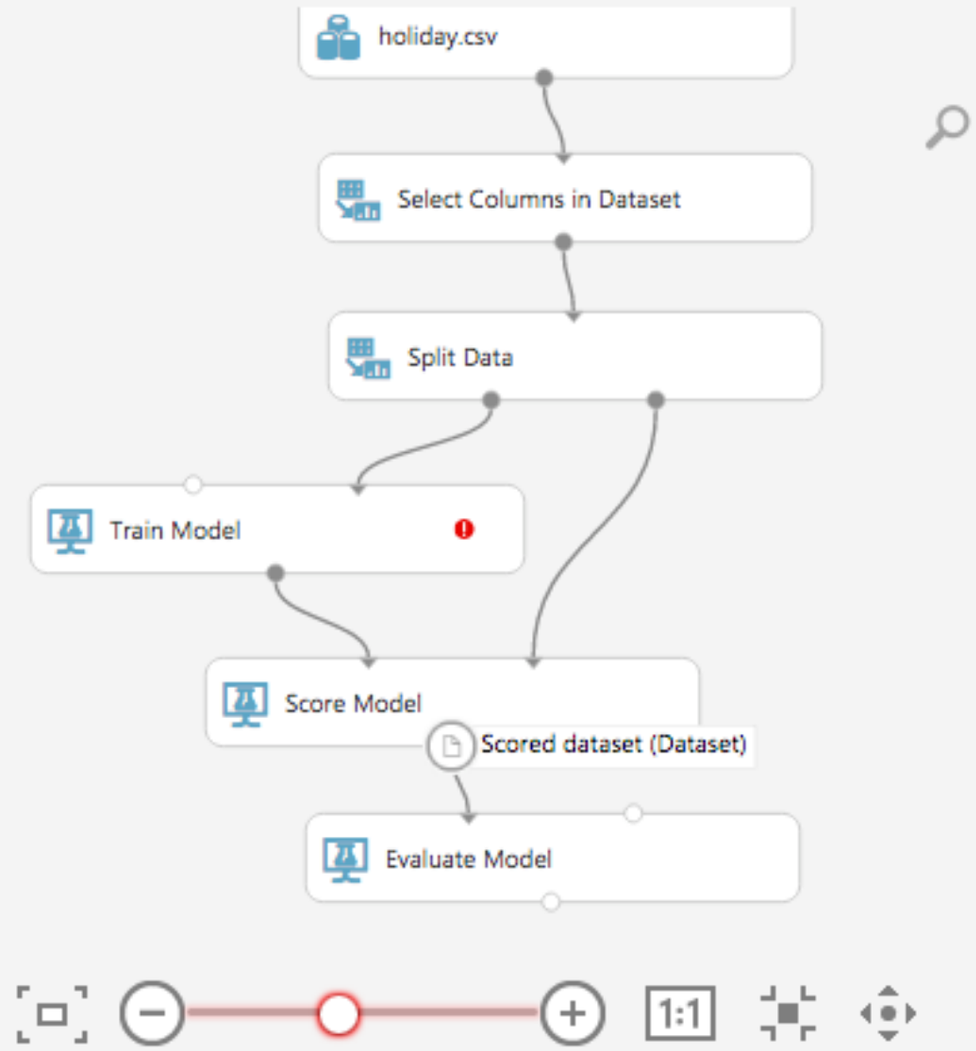
康平 秋山-Free-Workspace

eval

- Machine Learning
  - Evaluate
    - Cross Validate Model
    - Evaluate Model
    - Evaluate Recommender
  - Statistical Functions
    - Evaluate Probability Function

Experiment created ...

In draft



Properties Project

Experiment Properties

STATUS CODE InDraft

Summary

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

Description

Enter the detailed description for your

Quick Help

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

ハンズオン

- いよいよアルゴリズムの選択

  チートシートを確認する

  今回は2項分類なので、Two-Class ... がよさげです

- (なんらかのアルゴリズム)を検索し、配置

- 配置したものから Train Model 左上に接続

📒 分類、値予測、異常の検出、など何を行いたいかによって使うアルゴリズムは異なります

Microsoft Azure Machine Learning Studio

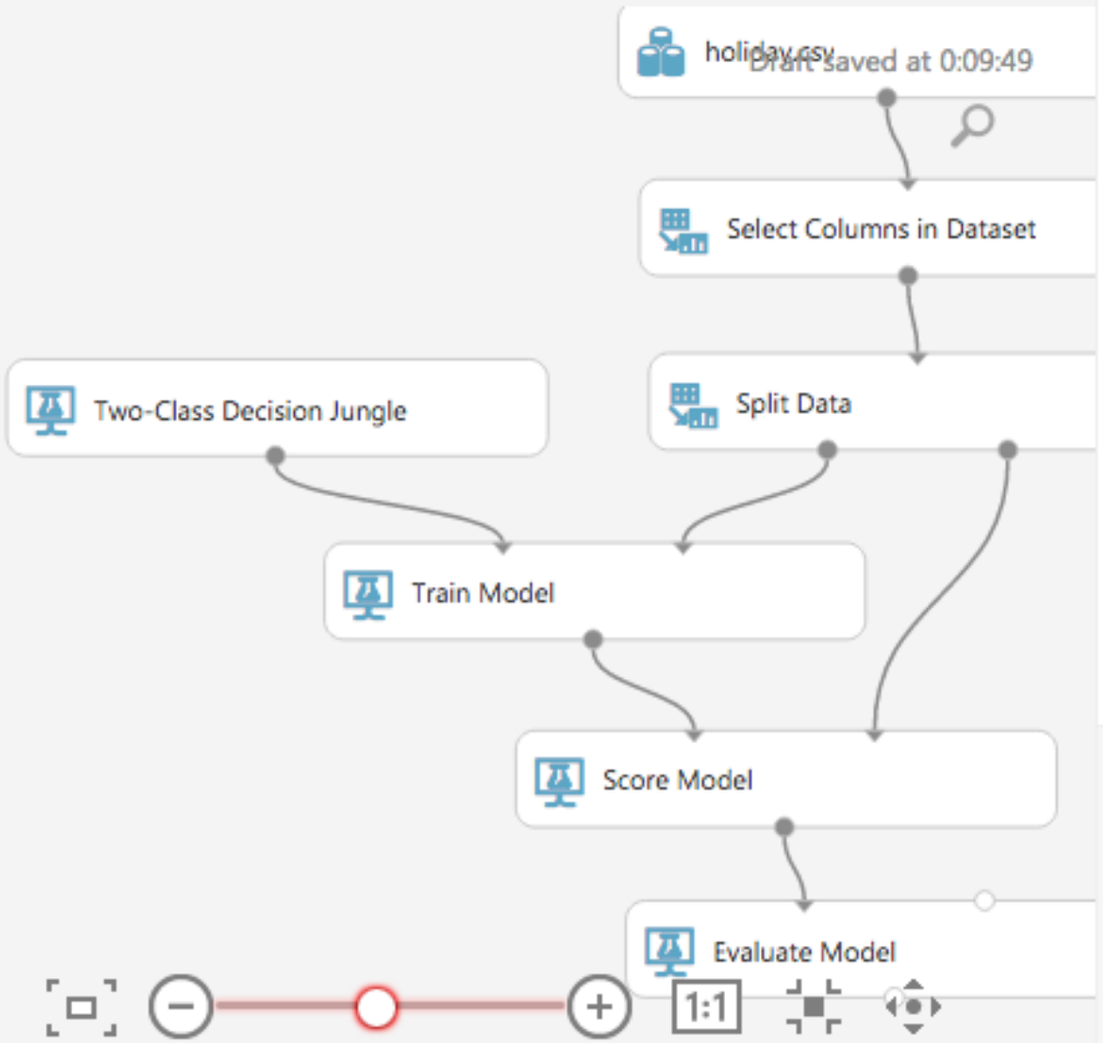
康平 秋山-Free-Workspace

two-class

- Machine Learning
  - Initialize Model
    - Classification
      - Two-Class Averaged ...
      - Two-Class Bayes Poi...
      - Two-Class Boosted ...
      - Two-Class Decision F...
      - Two-Class Decision J...
      - Two-Class Locally-D...
      - Two-Class Logistic R...
      - Two-Class Neural Ne...
      - Two-Class Support V...

Experiment created ...

In draft



Properties Project

Experiment Properties

START TIME	3/13/2017 ...
END TIME	3/13/2017 ...
STATUS CODE	InDraft
STATUS DETAILS	None

Summary

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

Quick Help

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

ハンズオン

- 学習をスタートします
- 画面下の Run をクリックします
- Evaluate Model の下をクリックし、Visualize で結果を確認します
- Train Model の下をクリックし、Visualize でどういうモデルが作成されたかを確認できます

📒結果を見て、あとは試行錯誤の繰り返しです

Microsoft Azure Machine Learning Studio

康平 秋山-Free-Workspace

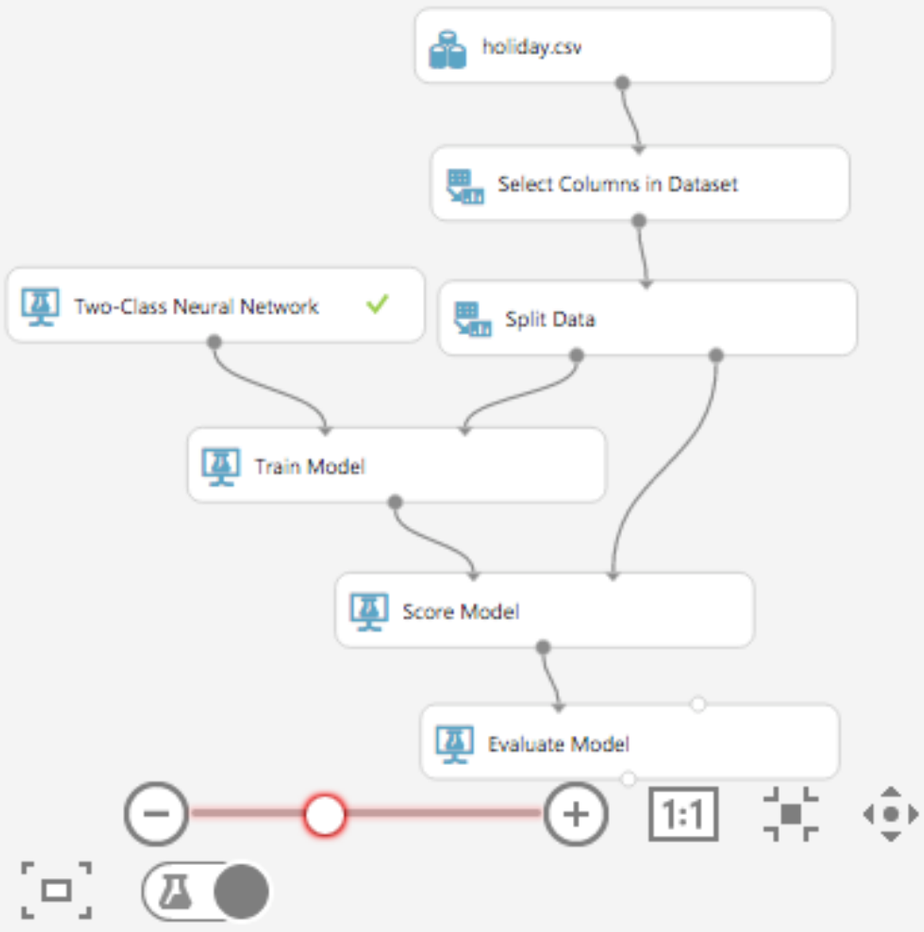
Search experiment items

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

Experiment created ...

In draft

Draft saved at 0:18:06



Properties Project

Experiment Properties

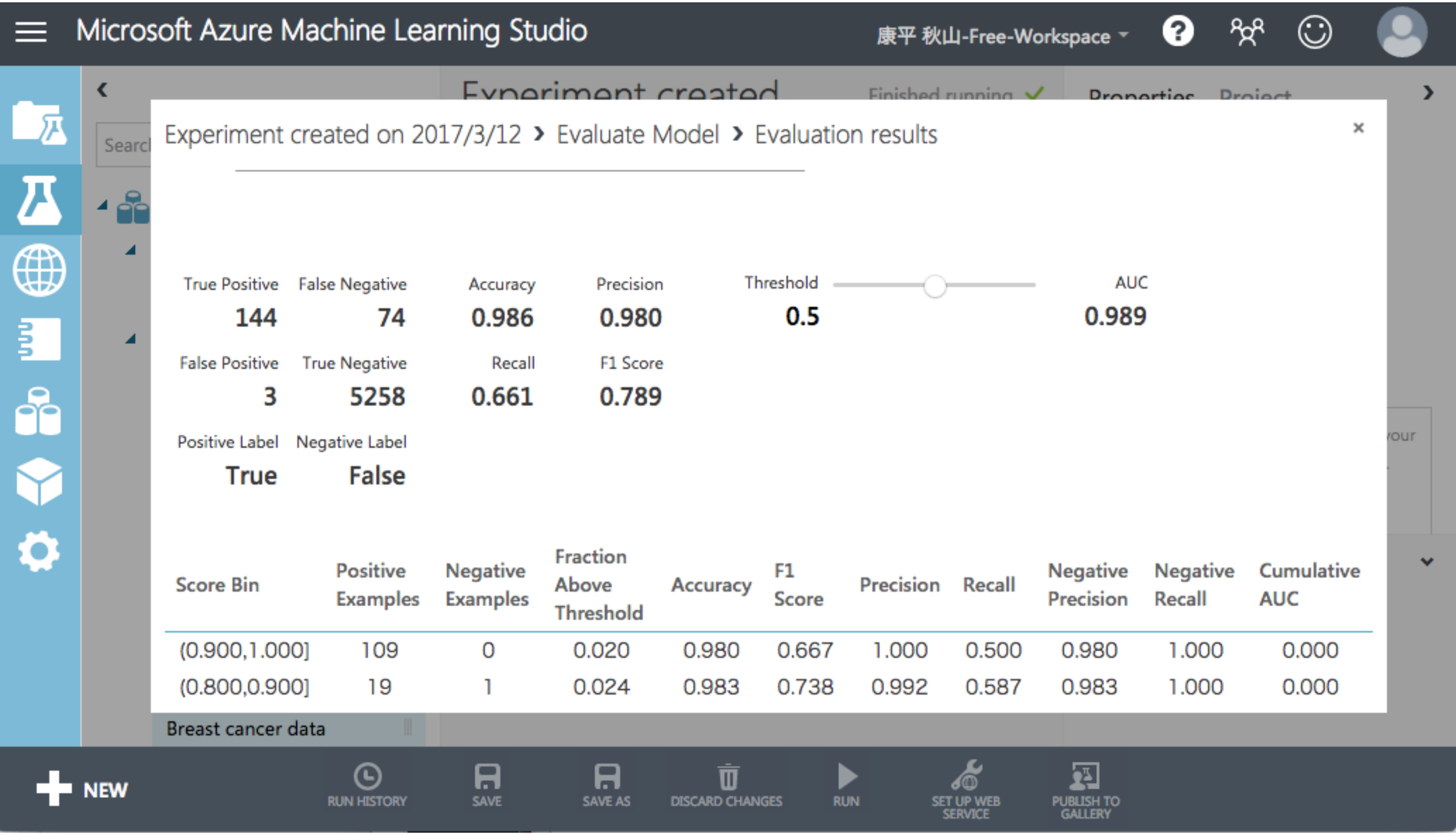
START TIME	3/13/2017 ...
END TIME	3/13/2017 ...
STATUS CODE	InDraft
STATUS DETAILS	None

Summary

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

Quick Help

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


Microsoft Azure Machine Learning Studio
康平 秋山-Free-Workspace
Experiment created
Finished running
Properties
Project
Experiment created on 2017/3/12 › Evaluate Model › Evaluation results
True Positive
144
False Negative
74
Accuracy
0.986
Precision
0.980
Threshold
0.5
AUC
0.989
False Positive
3
True Negative
5258
Recall
0.661
F1 Score
0.789
Positive Label
True
Negative Label
False
Score Bin
Positive Examples
Negative Examples
Fraction Above Threshold
Accuracy
F1 Score
Precision
Recall
Negative Precision
Negative Recall
Cumulative AUC
(0.900,1.000]
109
0
0.020
0.980
0.667
1.000
0.500
0.980
1.000
0.000
(0.800,0.900]
19
1
0.024
0.983
0.738
0.992
0.587
0.983
1.000
0.000
Breast cancer data
NEW
RUN HISTORY
SAVE
SAVE AS
DISCARD CHANGES
RUN
SET UP WEB SERVICE
PUBLISH TO GALLERY

ハンズオン

- SetUp WebService からWebAPI へデプロイします
- Predictive Web Service でWebAPIリクエストの入出力を設定します

Microsoft Azure Machine Learning Studio

康平 秋山-Free-Workspace

Search experiment items

Saved Datasets

My Datasets

holiday.csv

Samples

Adult Census Income Bi...

Airport Codes Dataset

Automobile price data (...

Bike Rental UCI dataset

Bill Gates RGB Image

Blood donation data

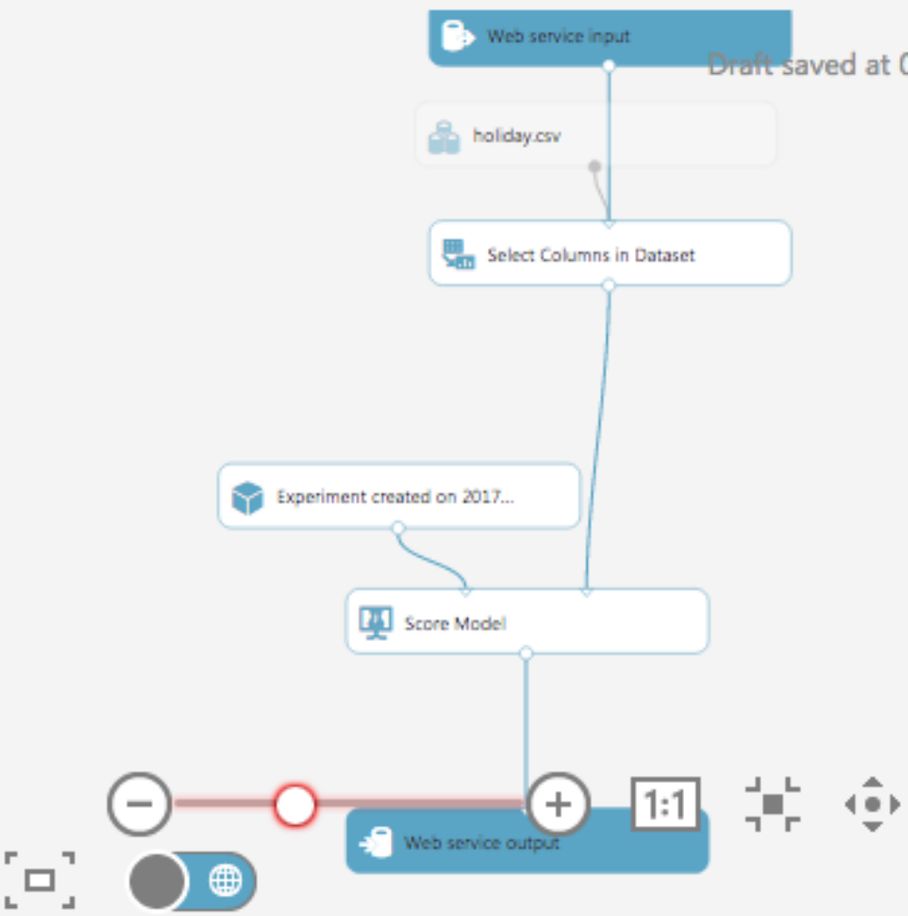
Book Reviews from Am...

Breast cancer data

Training experiment | Predictive experiment

Experiment created ... In draft

Draft saved at 0:31:55



Properties Project

Experiment Properties

START TIME	3/13/2017 ...
END TIME	3/13/2017 ...
STATUS CODE	InDraft
STATUS DETAILS	None

Summary

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

Quick Help

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

ハンズオン

- 1度 Run してから Web Deploy します
- すぐにデプロイ完了します
- WebServiceの管理画面はプレビュー機能の新UIのほうが便利です

📒 Swagger API もサポートしています

experiment created on 2017/3/12 [predictive exp.]

DASHBOARD CONFIGURATION

General New Web Services Experience preview

Published experiment

View snapshot View latest

Description

No description provided for this web service.

API key

Default Endpoint

API HELP PAGE	TEST	APPS	LAST UPDATED
REQUEST/RESPONSE	Test Test preview	Excel 2013 or later | Excel 2010 or ear	3/13/2017 12:27:36 AM
BATCH EXECUTION	Test preview	Excel 2013 or later workbook	3/13/2017 12:27:36 AM

Microsoft Azure Machine Learning Web Services

Quickstart | Dashboard | Batch Request Log | Configure | Consume | Test | Swagger API

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

Parameters

Execution request

body

```
{
  "Inputs": {
    "input1": [
      {
        "year": 1,
        "month": 1,
        "day": 1,
        "holiday": false,
        "title": ""
      }
    ]
  },
  "GlobalParameters": {}
}
```

The API version to use REQUIRED

query

string

時間があれば補足

AMLの中で行われたこと

year	month	day	holiday
2016	1	1	TRUE
2017	1	1	TRUE
2018	1	1	TRUE
…	1	1	TRUE?

AMLの中で行われたこと

year	month	day	holiday
2016	1	11	TRUE
2017	1	9	TRUE
2017	1	11	FALSE
2018	1	8	TRUE
2019	1	9	???

AMLの中で行われたこと

- Excute Python(R) Script で自作コードも可

  https://goo.gl/Z2D0fr

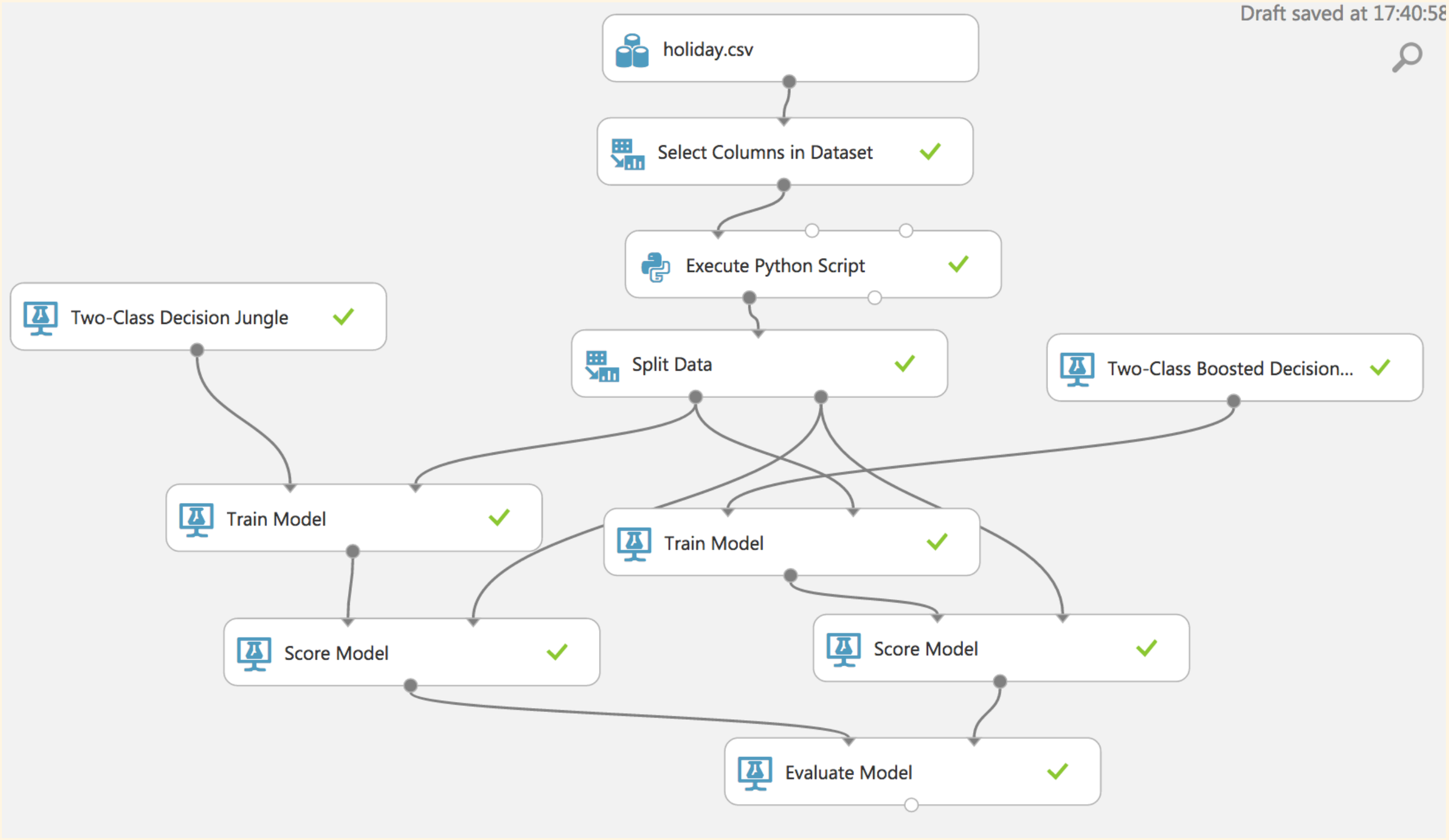
```python
import pandas as pd
import datetime

def azureml_main(dataframe1 = None, dataframe2 = None):
    ret = []
    for index, row in dataframe1.iterrows():
        date = datetime.date(int(row['year']),int(row['month']),int(row['day']))
        ret.append({
            'year':row['year'],
            'month':row['month'],
            'day':row['day'],
            'holiday':row['holiday'],
            'week':(row['day'] / 7) + 1,
            'dayofweek':date.weekday()})
    return pd.DataFrame(ret),
```

AMLの中で行われたこと

year	month	day	dayof week	week	holiday
2016	1	11	1	2	TRUE
2017	1	9	1	2	TRUE
2017	1	11	3	2	FALSE
2018	1	8	1	2	TRUE
2019	1	9	3	2	FALSE?

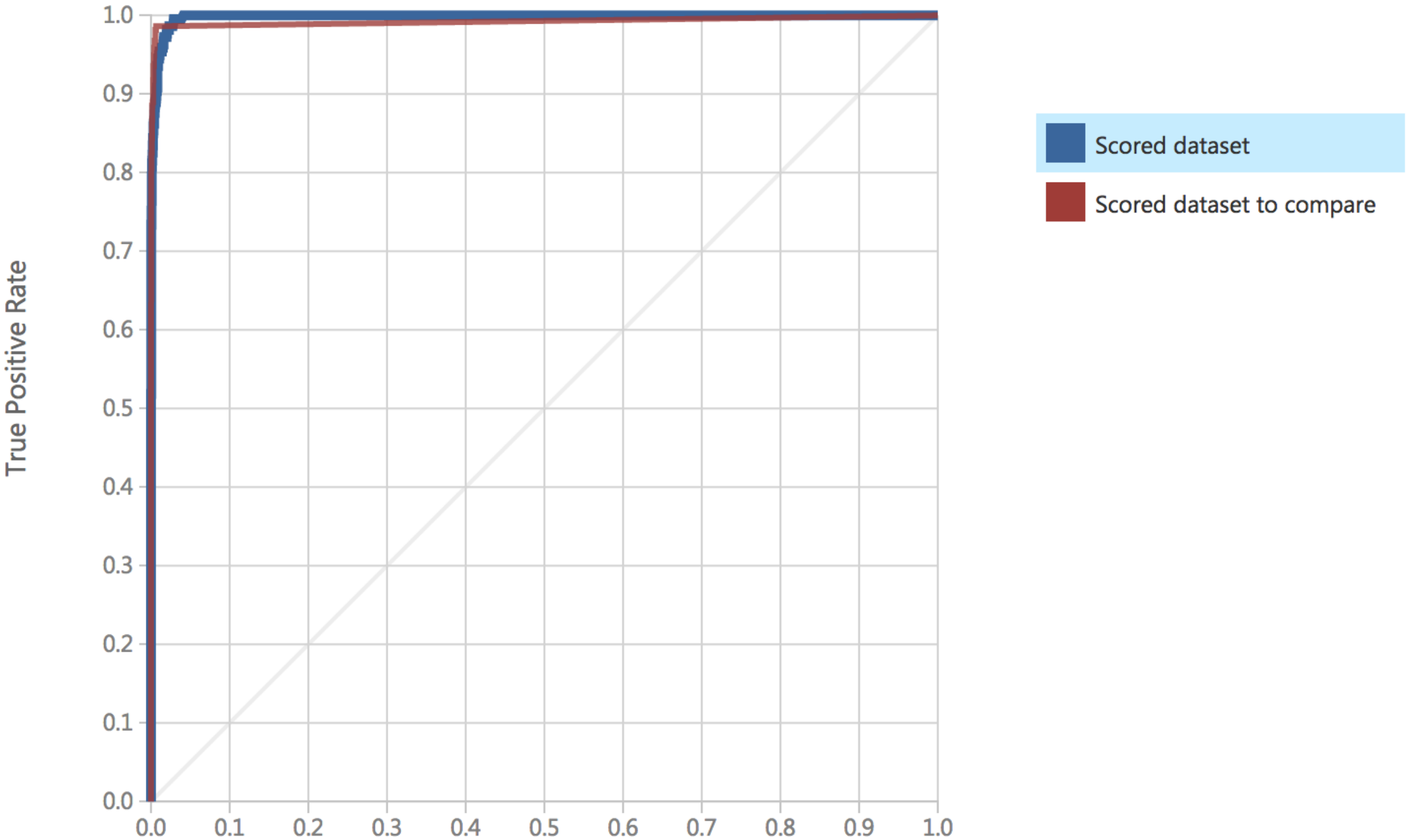
他にもできること

アルゴリズムの結果比較

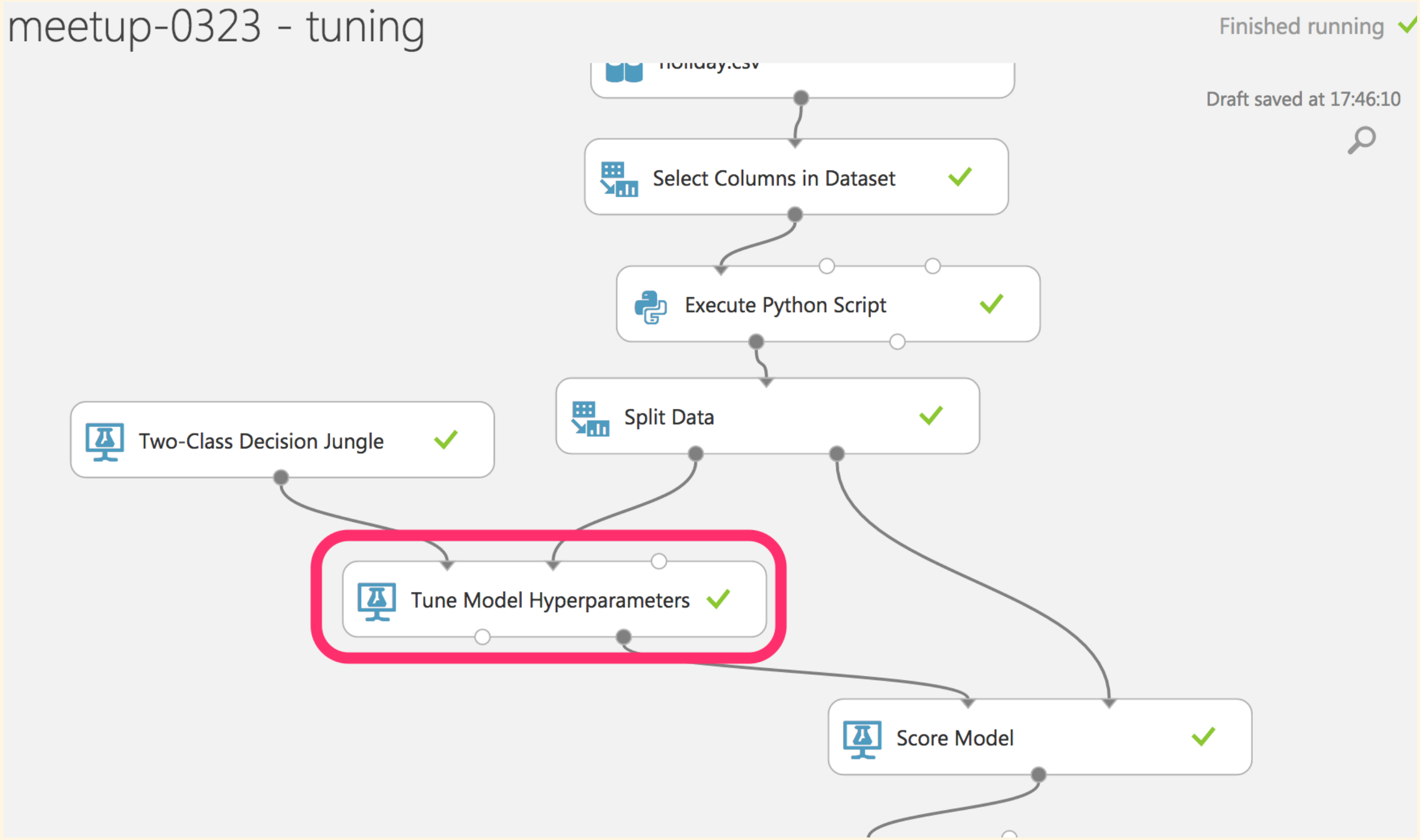


meetup-0323 - multiple › Evaluate Model › Evaluation results

ROC PRECISION/RECALL LIFT



パラメータの自動チューニング



ここまでハンズオン

おつかれさまでした

まとめ

- Azure Machine Learning は非エンジニアでも使える

- 機械学習でも少しずつ動くようになるフィードバックループで学習スピードを高めよう

- 適切なデータを集めることが大事

Machine Learning in ML Studio

Anomaly Detection
- One-class Support Vector Machine
- Principal Component Analysis-based Anomaly Detection
- Time Series Anomaly Detection*

Classification

Two-class Classification
- Averaged Perceptron
- Bayes Point Machine
- Boosted Decision Tree
- Decision Forest
- Decision Jungle
- Logistic Regression
- Neural Network
- Support Vector Machine

Multi-class Classification
- Decision Forest
- Decision Jungle
- Logistic Regression
- Neural Network
- One-vs-all

Clustering
- K-means Clustering

Recommendation
- Matchbox Recommender

Regression
- Bayesian Linear Regression
- Boosted Decision Tree
- Decision Forest
- Fast Forest Quantile Regression
- Linear Regression
- Neural Network Regression
- Ordinal Regression
- Poisson Regression

Statistical Functions
- Descriptive Statistics
- Hypothesis Testing T-Test
- Linear Correlation
- Probability Function Evaluation

Text Analytics
- Feature Hashing
- Named Entity Recognition
- Vowpal Wabbit

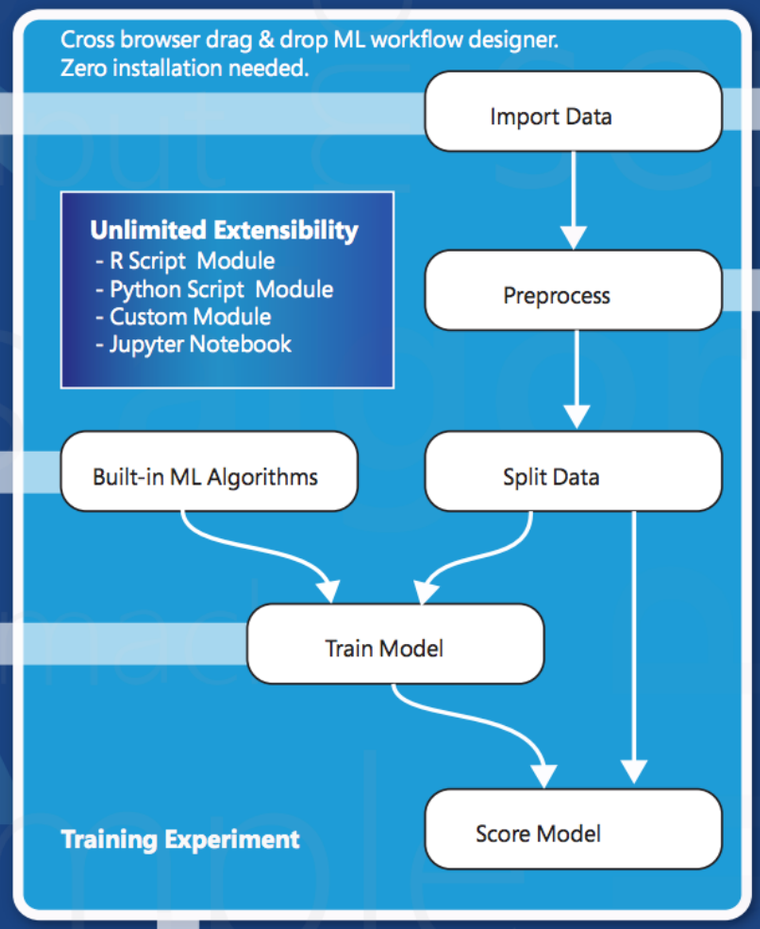
Computer Vision
- OpenCV Library

Data/Model Visualization
- Scatterplots
- Bar Charts
- Box plots
- Histogram
- R and Python Plotting Libraries
- REPL with Jupyter Notebook
- ROC, Precision/Recall, Lift
- Confusion Matrix
- Decision Tree*

Training
- Cross Validation
- Retraining
- Parameter Sweep

https://studio.azureml.net

Guest Access Workspace: Free trial access without logging in.
Free Workspace: Free persisted access, no Azure subscription needed.
Standard Workspace: Full access with SLA under an Azure subscription.



Data Source
- Azure Blob Storage
- Azure SQL DB
- Azure SQL DW*
- Azure Table
- Desktop Direct Upload
- Hadoop Hive Query
- Manual Data Entry
- OData Feed
- On-prem SQL Server*
- Web URL (HTTP)

Data Format
- ARFF
- CSV
- SVMLight
- TSV
- Excel
- ZIP

Data Preparation
- Clean Missing Data
- Clip Outliers
- Edit Metadata
- Feature Selection
- Filter
- Learning with Counts
- Normalize Data
- Partition and Sample
- Principal Component Analysis
- Quantize Data
- SQLite Transformation
- Synthetic Minority Oversampling Technique

Enterprise Grade Cloud Service
- SLA: 99.95% Guaranteed Up-time
- Azure AD Authentication
- Compute at Large Scale
- Multi-geo Availability
- Regulatory Compliance*

One-click Operationalization

Predictive Experiment

Make Prediction with Elastic APIs
- Request-Response Service (RRS)
- Batch Execution Service (BES)
- Retraining API

Community
- Gallery (http://gallery.azureml.net)
- Samples & Templates
- Workspace Sharing and Collaboration
- Live Chat & MSDN Forum Support

* Feature Coming Soon

Azure Machine Learning Studio Capabilities Overview

Created by the Azure Machine Learning Team Email: AzurePoster@microsoft.com
Download this poster: http://aka.ms/MLStudioOverview

Microsoft

http://download.microsoft.com/download/C/4/6/C4606116-522F-428A-BE04-B6D3213E9E52/ml_studio_overview_v1.1.pdf

Azure関連サービス

- AzureStorage
  Blob, Table(KVS)

- AzureDataFactory
  サービス間のデータ移行支援

- AzureFunctions
  サーバーレスで RestAPI を実装

- CognitiveServices
  画像認識、音声認識などのWebAPI群

参考資料

参考

- 公式:よくある質問

  https://docs.microsoft.com/ja-jp/azure/machine-learning/machine-learning-faq

- 非公式:よくある質問

  https://blogs.msdn.microsoft.com/kosasaki/2016/04/13/azure-machine-learning-%E3%82%92%E5%88%A9%E7%94%A8%E3%81%99%E3%82%8B%E3%81%8A%E5%AE%A2%E6%A7%98%E3%81%8B%E3%82%89%E3%81%AE%E3%82%88%E3%81%8F%E3%81%82%E3%82%8B%E8%B3%AA%E5%95%8F/

参考

- 公式:Microsoft Azure Machine Learning のアルゴリズムの選択方法

  https://docs.microsoft.com/ja-jp/azure/machine-learning/machine-learning-algorithm-choice

- 非公式:日本語版アルゴリズムチートシート

  https://ty-memo.azurewebsites.net/azure/microsoft-azure-machine-learning-%E6%97%A5%E6%9C%AC%E8%AA%9E%E7%89%88%E3%82%A2%E3%83%AB%E3%82%B4%E3%83%AA%E3%82%BA%E3%83%A0%E3%83%81%E3%83%BC%E3%83%88%E3%82%B7%E3%83%BC%E3%83%88%E3%82%92%E5%85%AC/

参考

- 公式:学習アルゴリズム

  https://msdn.microsoft.com/library/en-us/Dn905812.aspx

- Azure Machine Learning 分析アルゴリズムの選択

  http://qiita.com/hiiyan0402/items/3e1584b25bfb6f453f52

- 機械学習アルゴリズム解説スライドまとめ

  https://freelance.levtech.jp/guide/detail/41/

- 代表的な機械学習手法一覧

  http://qiita.com/tomomoto/items/b3fd1ec7f9b68ab6dfe2