



Business Analytics with Power BI

Microsoft Services



Module 3: Predictive Analytics with Power BI and R

Lesson 5: Microsoft Azure Machine Learning Overview

Azure Machine Learning Overview

Cloud offering for Machine Learning, part of Cortana Intelligence Suite

You can easily create and operationalize your machine learning experiment

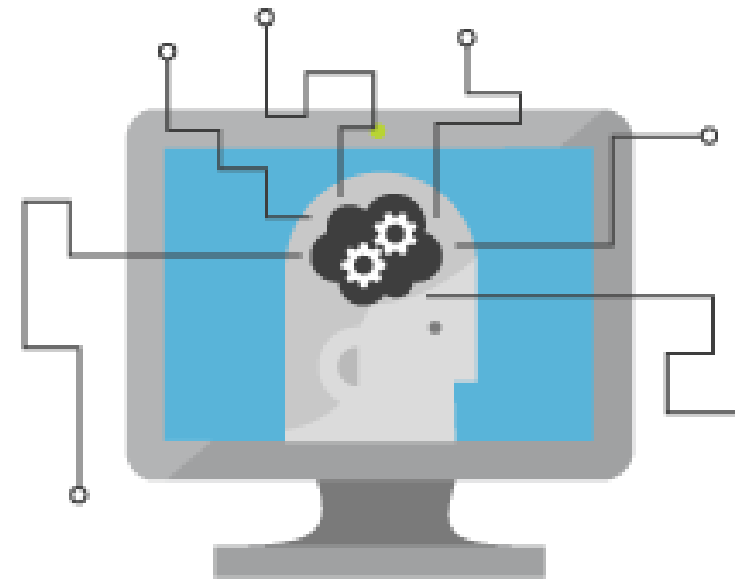
No setup or client required

No code required (all can be done using drag 'n drop)


You can integrate/extend with R and Python if you want



Native Jupyter Notebooks integration

You can easily try it (no credit card required) – <http://studio.azureml.net>







ML Studio


 Microsoft Azure Machine Learning Studio

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Introducing:
Competitions





Learn More 







Compete Today!





Azure ML Competitions



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Pricing & FAQ

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

Creating a model with AzureML

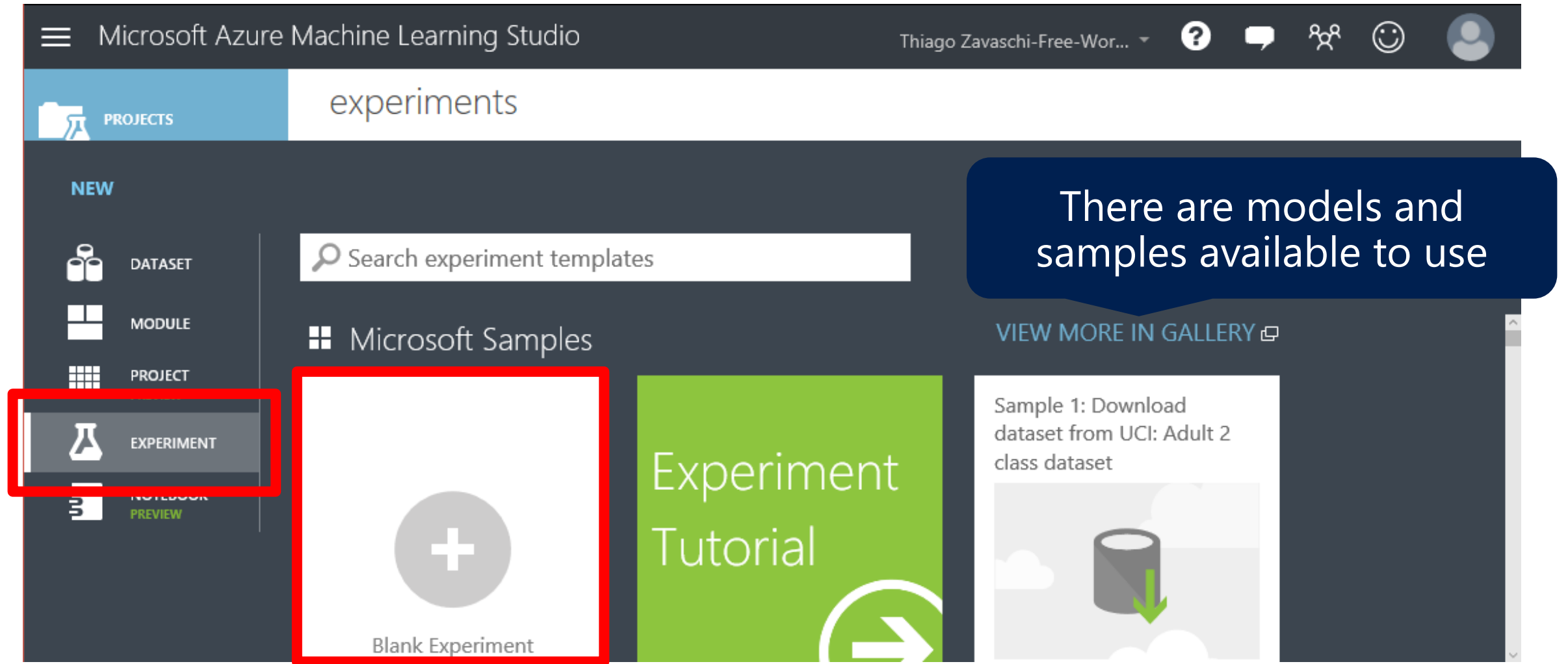
The screenshot displays the Microsoft Azure Machine Learning Studio interface. The top navigation bar includes the title 'Microsoft Azure Machine Learning Studio', a user profile 'Thiago Zavaschi-Free-Wor...', and icons for help, chat, collaboration, and feedback. The left sidebar contains navigation options: PROJECTS, EXPERIMENTS (highlighted), WEB SERVICES, NOTEBOOKS, DATASETS, TRAINED MODELS, and SETTINGS. The main area is titled 'experiments' and shows a table of 'MY EXPERIMENTS'.

	NAME	AUTHOR	STATUS
<input type="checkbox"/>	Experiment created on 9/...	thiagoz	Draft
<input type="checkbox"/>	Experiment created on 7/...	thiagoz	Draft
<input checked="" type="checkbox"/>	Experiment created on 3/...	thiagoz	Finished

Below the table, a workflow diagram is visible, showing a sequence of steps: 'Adult Census Income Binary C...' followed by 'Select Columns in Dataset' (marked with a green checkmark).

At the bottom of the interface, a dark bar contains a '+ NEW' button (highlighted with a red rectangle), a 'DELETE' button, and an 'ADD TO PROJECT' button.

Creating a model with AzureML



Creating a model with AzureML

The screenshot displays the Azure Machine Learning Studio interface. On the left, a sidebar contains a 'Modules' list with categories like Saved Datasets, Data Format Conversions, Data Input and Output, Data Transformation, Feature Selection, Machine Learning, OpenCV Library Modules, Statistical Functions, and Text Analytics. A search bar for 'Search experiment items' is at the top of this list. The main workspace is titled 'Experiment' and shows a 'Mini Map' and a dashed box indicating where to drag and drop modules. On the right, a 'Properties' panel shows 'Experiment Properties' with a status of 'InDraft' and a 'Summary' section for entering a description. The bottom toolbar includes icons for '+ NEW', 'RUN HISTORY', 'SAVE', 'SAVE AS', 'DISCARD CHANGES', 'RUN', 'SET UP WEB SERVICE', and 'PUBLISH TO GALLERY'. Five dark blue callout boxes with white text provide instructions: 'Modules' points to the sidebar; 'Drag and drop modules here to create your experiment' points to the main workspace; 'Zoom control' points to a zoom slider in the bottom left; 'Run your experiment (train or scoring)' points to the 'RUN' button; and 'Properties from selected module or experiment' points to the 'Properties' panel.

Modules

Search experiment items

Drag and drop modules here to create your experiment

Zoom control

Run your experiment (train or scoring)

Properties from selected module or experiment

Properties Project

Experiment Properties

STATUS CODE InDraft

Summary

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

description

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

Creating a model with AzureML

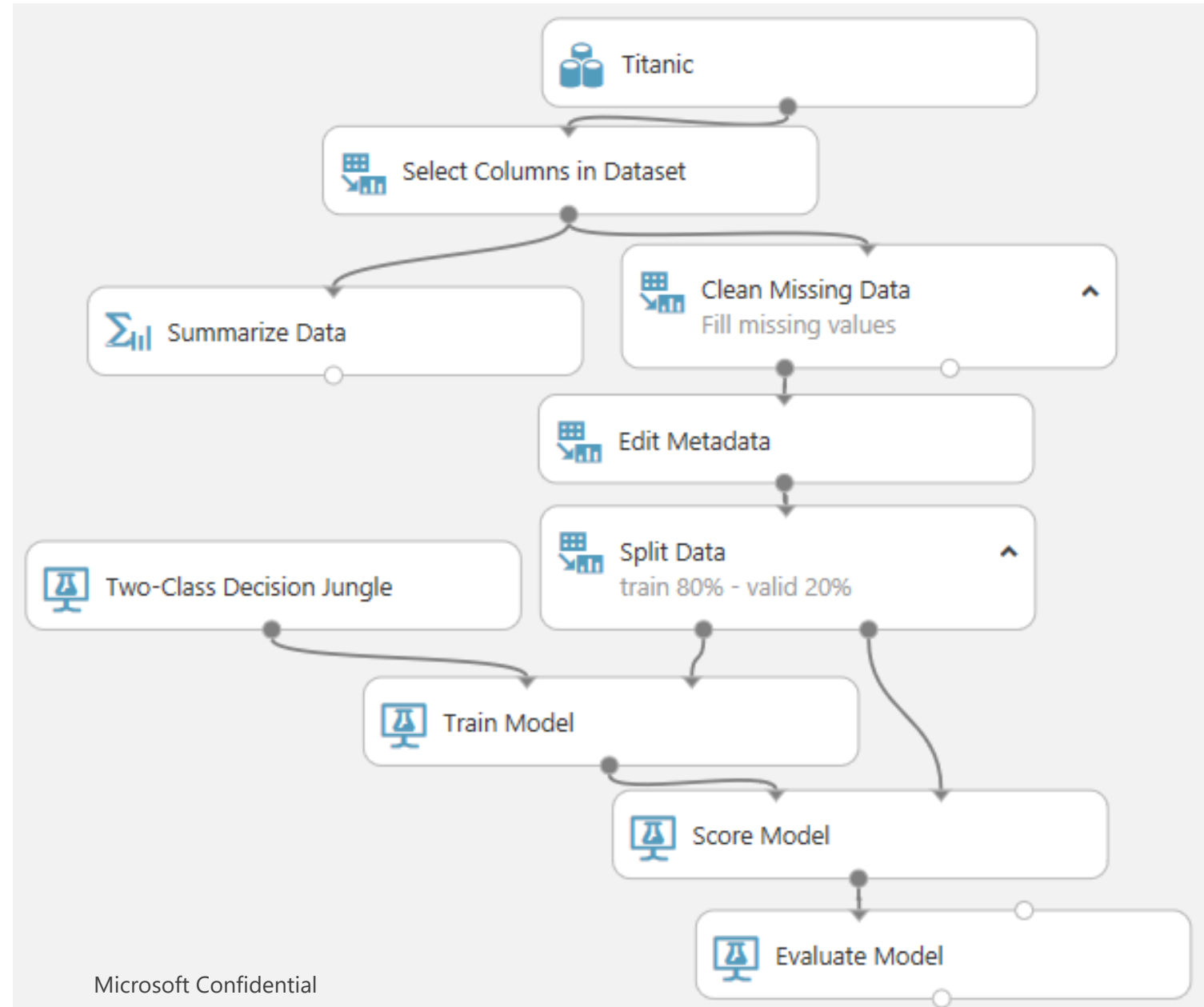
Sample model - Titanic

In this example, we will illustrate a classification problem solved by using AzureML

It is a problem to determine if a passenger would survive in Titanic

There are two possible outcomes:

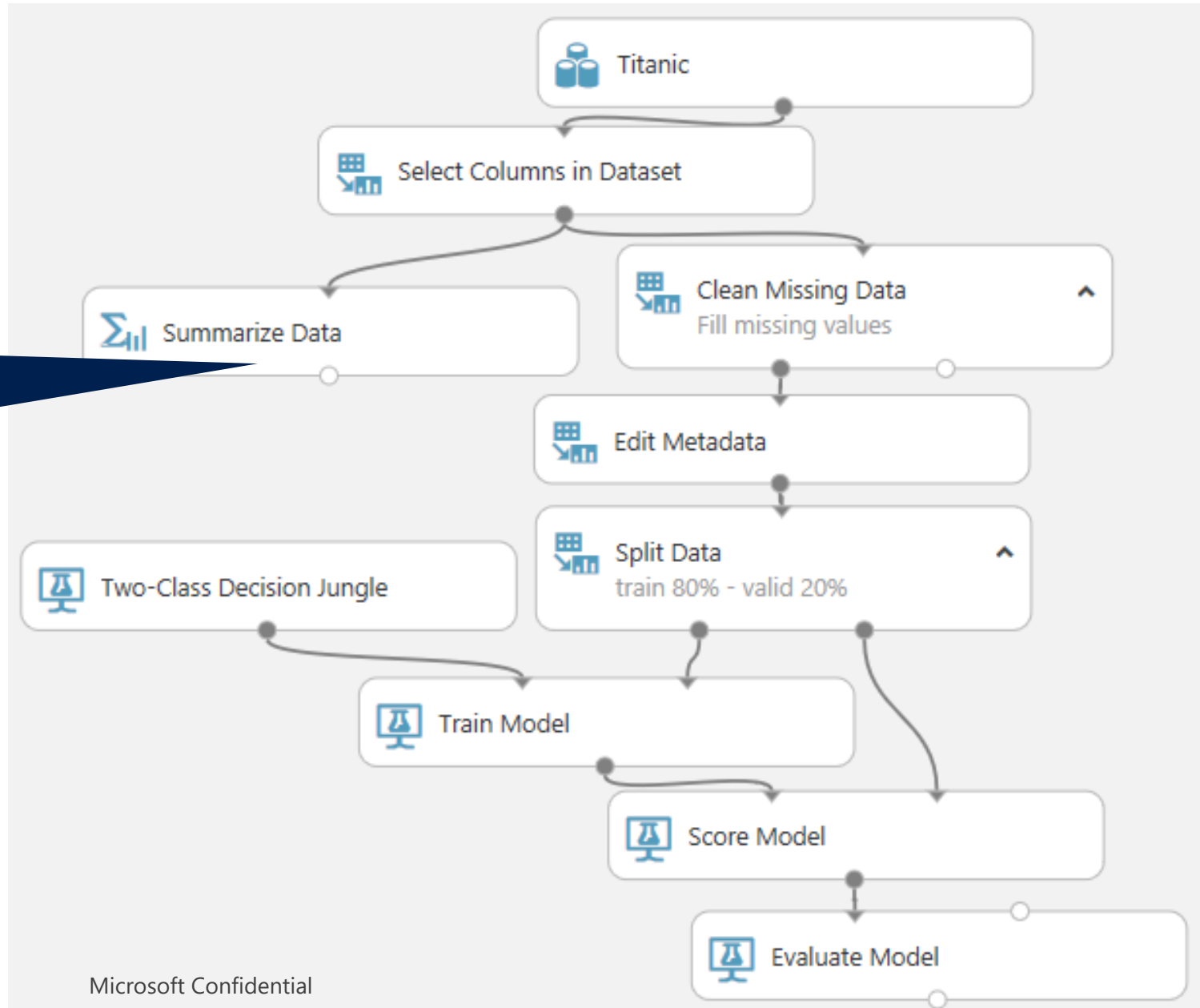
- Survived
- Not survived



Creating a model with AzureML

Sample model - Titanic

Modules
The “building blocks”
for all experiments in
AzureML

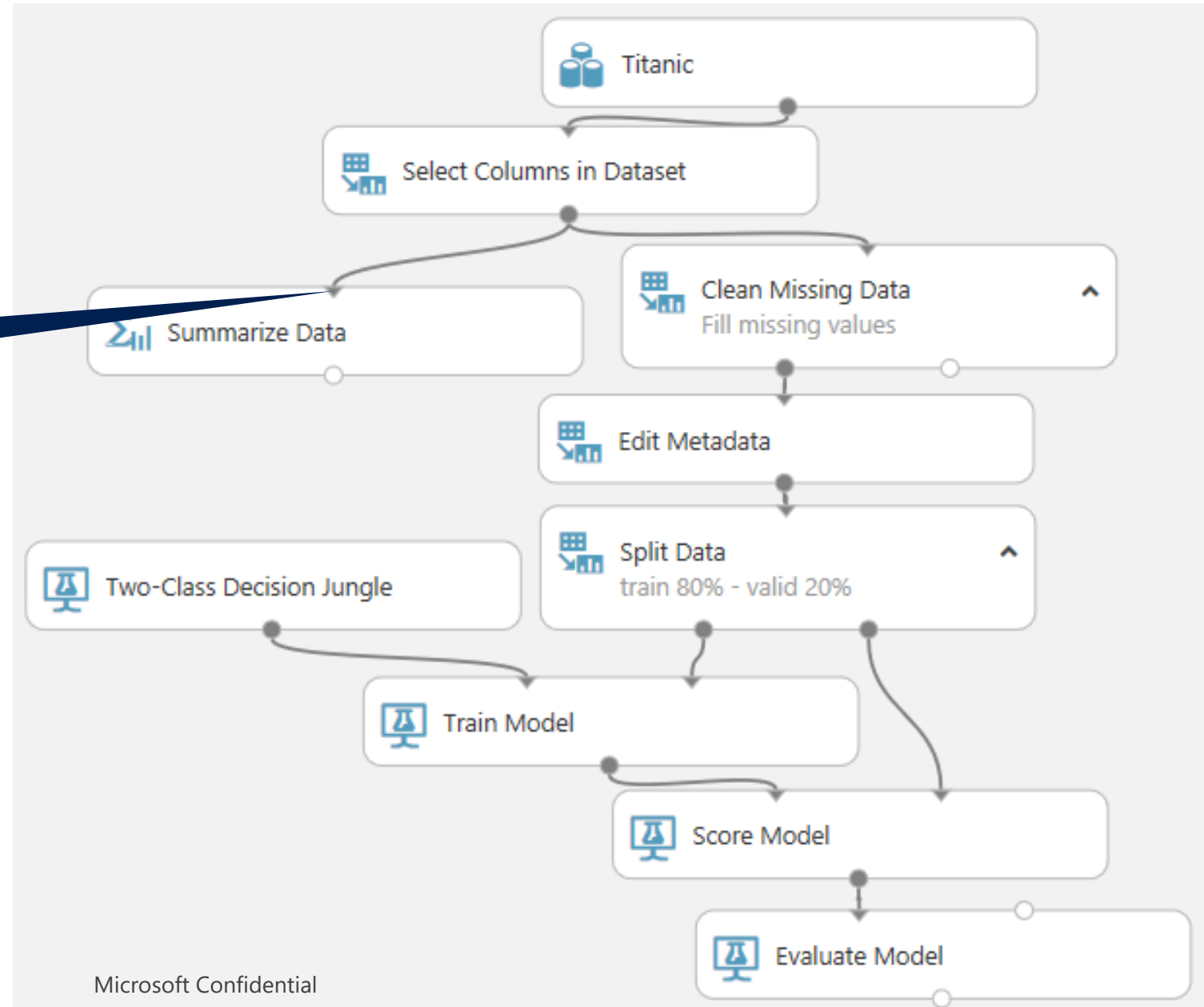


Creating a model with AzureML

Sample model - Titanic

Module input

*Some module inputs and outputs are optional

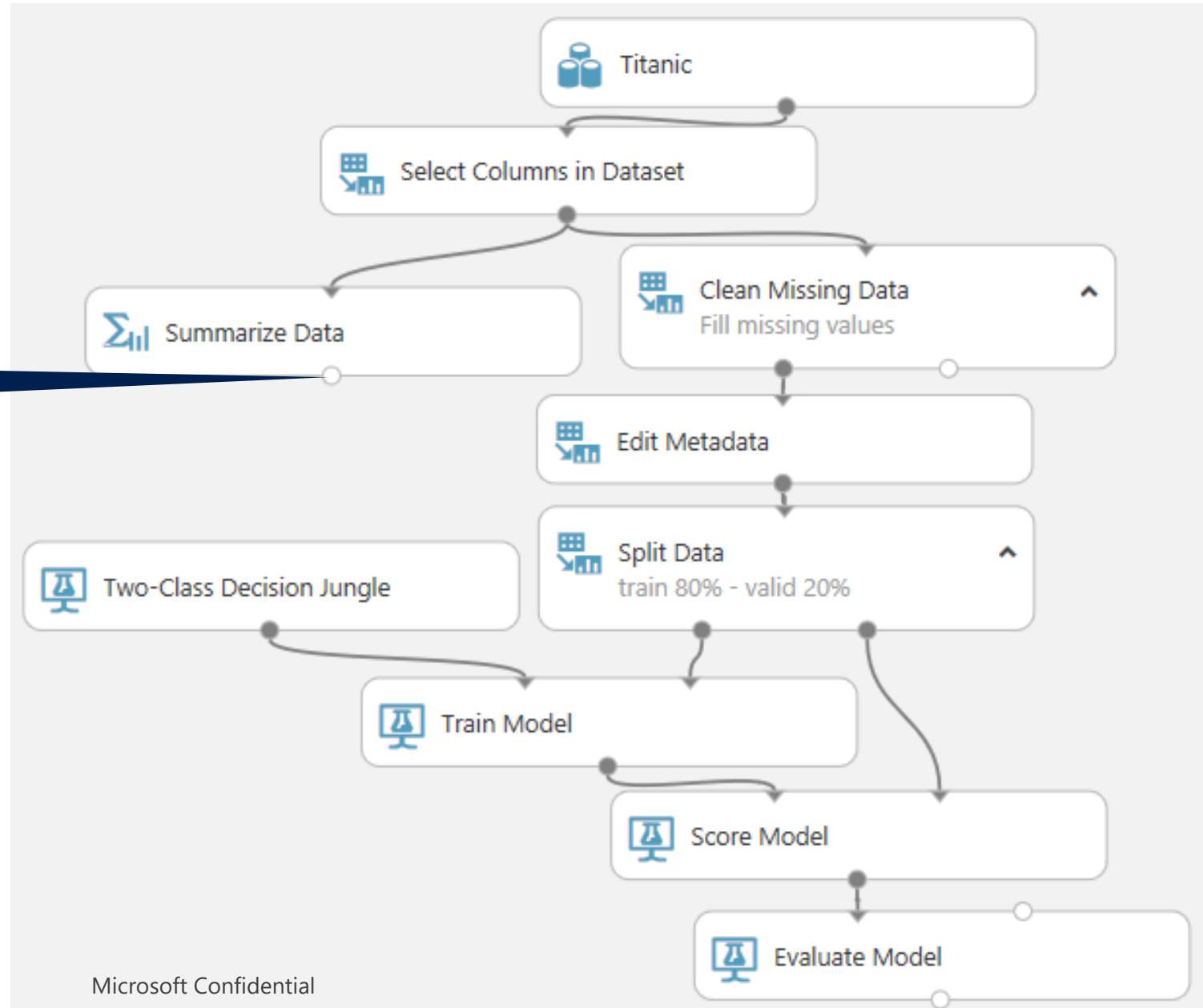


Creating a model with AzureML

Sample model - Titanic

Module output

*Some module inputs and outputs are optional



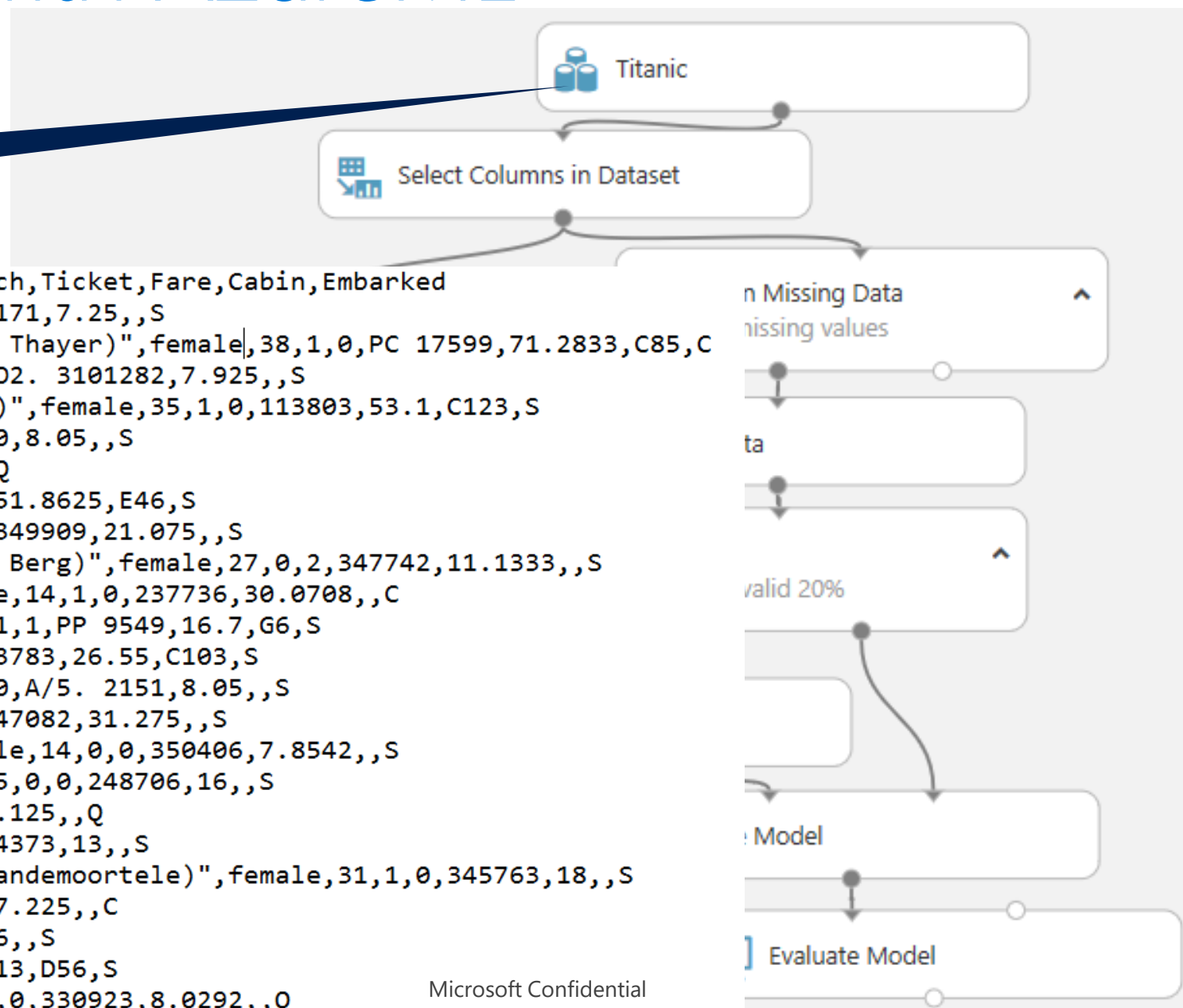
Creating a model with AzureML

Sample model - Titanic

Dataset with Titanic data

PassengerId, Survived, Pclass, Name, Sex, Age, SibSp, Parch, Ticket, Fare, Cabin, Embarked

1	0	3	"Braund, Mr. Owen Harris"	male	22	1	0	A/5 21171	7.25		S
2	1	1	"Cumings, Mrs. John Bradley (Florence Briggs Thayer)"	female	38	1	0	PC 17599	71.2833	C85	C
3	1	3	"Heikkinen, Miss. Laina"	female	26	0	0	STON/O2. 3101282	7.925		S
4	1	1	"Futrelle, Mrs. Jacques Heath (Lily May Peel)"	female	35	1	0	113803	53.1	C123	S
5	0	3	"Allen, Mr. William Henry"	male	35	0	0	373450	8.05		S
6	0	3	"Moran, Mr. James"	male		0	0	330877	8.4583		Q
7	0	1	"McCarthy, Mr. Timothy J"	male	54	0	0	17463	51.8625	E46	S
8	0	3	"Palsson, Master. Gosta Leonard"	male	2	3	1	349909	21.075		S
9	1	3	"Johnson, Mrs. Oscar W (Elisabeth Vilhelmina Berg)"	female	27	0	2	347742	11.1333		S
10	1	2	"Nasser, Mrs. Nicholas (Adele Achem)"	female	14	1	0	237736	30.0708		C
11	1	3	"Sandstrom, Miss. Marguerite Rut"	female	4	1	1	PP 9549	16.7	G6	S
12	1	1	"Bonnell, Miss. Elizabeth"	female	58	0	0	113783	26.55	C103	S
13	0	3	"Saunderscock, Mr. William Henry"	male	20	0	0	A/5. 2151	8.05		S
14	0	3	"Andersson, Mr. Anders Johan"	male	39	1	5	347082	31.275		S
15	0	3	"Vestrom, Miss. Hulda Amanda Adolfina"	female	14	0	0	350406	7.8542		S
16	1	2	"Hewlett, Mrs. (Mary D Kingcome) "	female	55	0	0	248706	16		S
17	0	3	"Rice, Master. Eugene"	male	2	4	1	382652	29.125		Q
18	1	2	"Williams, Mr. Charles Eugene"	male		0	0	244373	13		S
19	0	3	"Vander Planke, Mrs. Julius (Emelia Maria Vandemoortele)"	female	31	1	0	345763	18		S
20	1	3	"Masselmani, Mrs. Fatima"	female		0	0	2649	7.225		C
21	0	2	"Fynney, Mr. Joseph J"	male	35	0	0	239865	26		S
22	1	2	"Beesley, Mr. Lawrence"	male	34	0	0	248698	13	D56	S
23	1	3	"McGowan, Miss. Anna "Annie" "	female	15	0	0	330923	8.0292		Q



Creating a model with AzureML

Sample model - Titanic

Properties Project

Select Columns in Dataset

Select columns

Selected columns:

Column names:

Survived,Pclass,Sex,Age,SibSp,Parch

Launch column selector

START TIME 9/12/2016 4:24:24 PM

END TIME 9/12/2016 4:24:27 PM

ELAPSED TIME 0:00:02.578

STATUS CODE Finished

STATUS DETAILS None

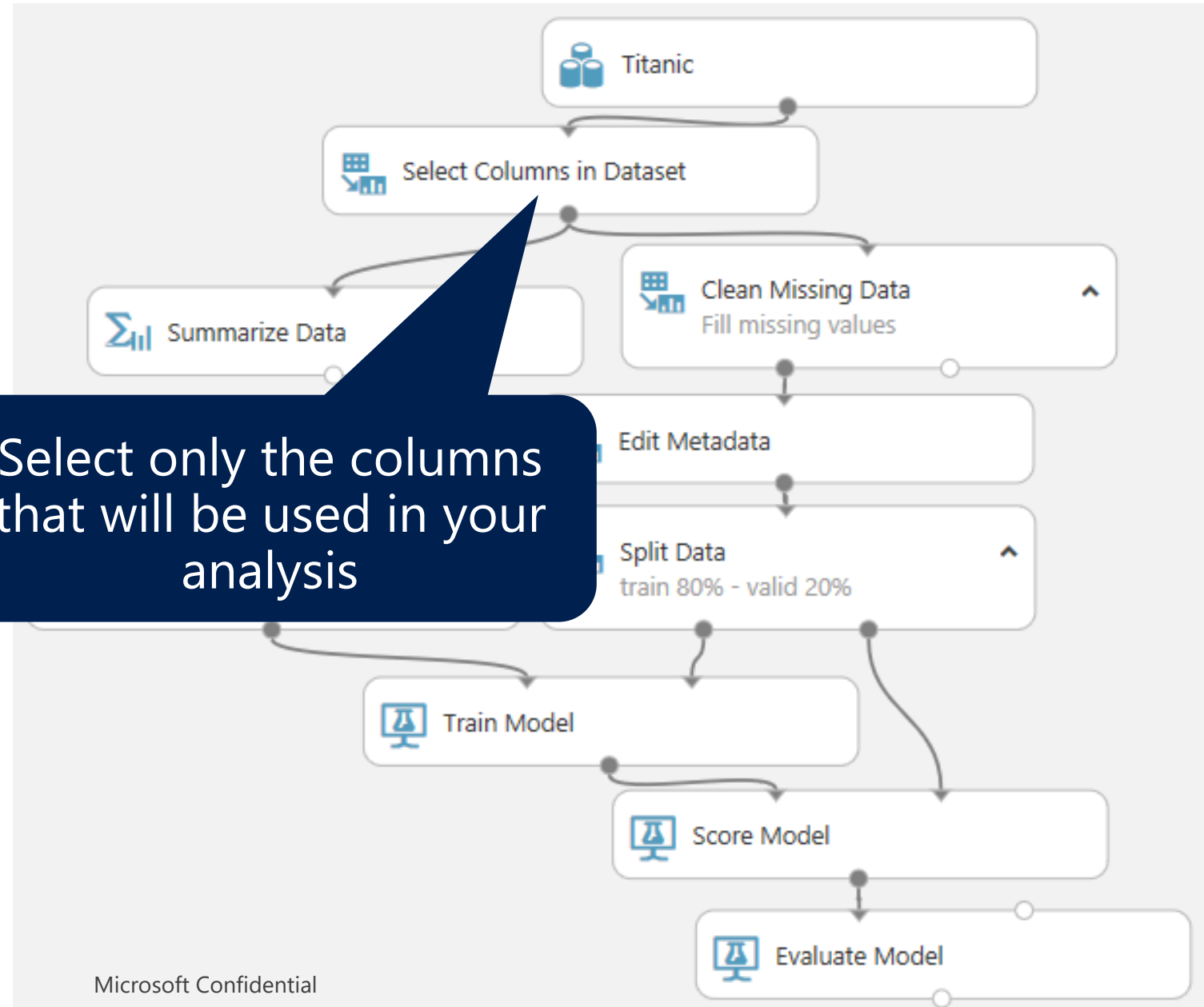
Survived: 0 = No; 1 = Yes

Pclass: Passenger Class (1=1st; 2 = 2nd; 3 = 3rd)

Sibsp: Number of Siblings/Spouses/Partners
Aboard

Parch: Number of Parents/Children Aboard

Select only the columns
that will be used in your
analysis



Creating a model with AzureML

Sample model - Titanic

Fill the missing data

Properties Project

Clean Missing Data

Columns to be cleaned

Selected columns:
All columns

Launch column selector

Minimum missing value ratio

0

Maximum missing value ratio

1

Cleaning mode

Replace using MICE

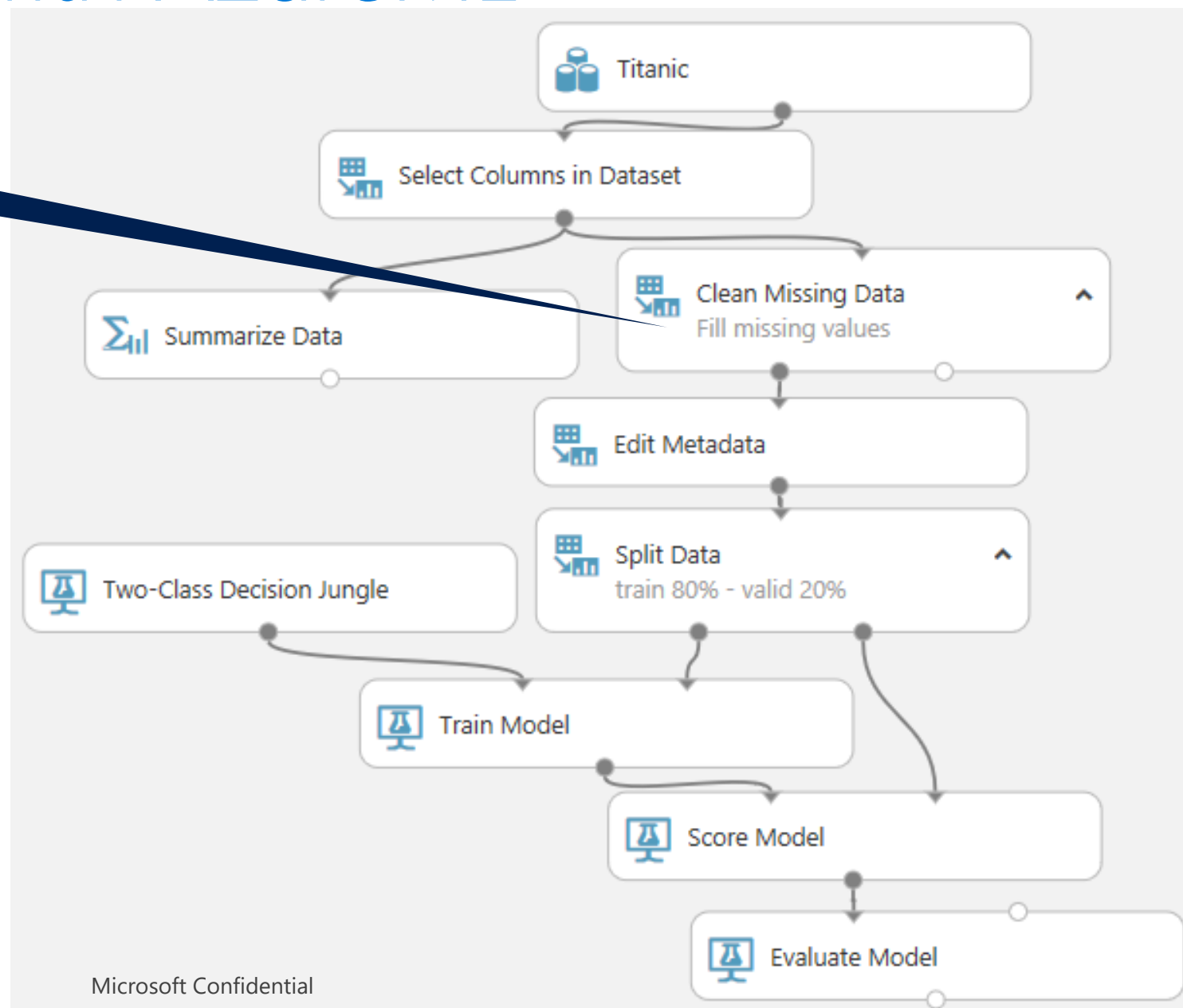
Cols with all missing values

Remove

☐ Generate missing value indicator colu...

Number of iterations

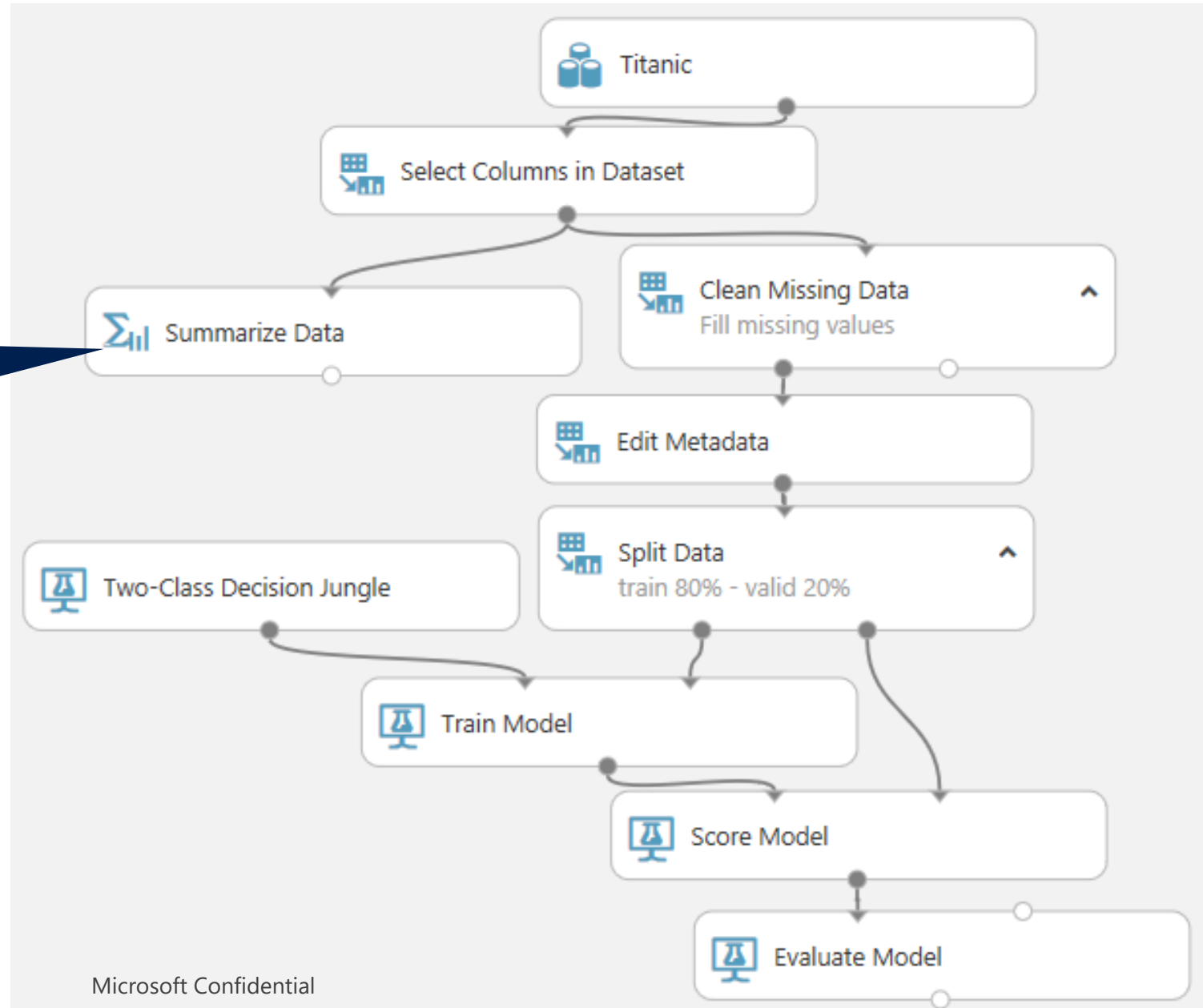
5



Creating a model with AzureML

Sample model - Titanic

Optional: It shows statistical information about our dataset









Creating a model with AzureML

Sample model – Titanic

Titanic - FastStartPowerBI > Summarize Data > Results dataset

rows 6
columns 23

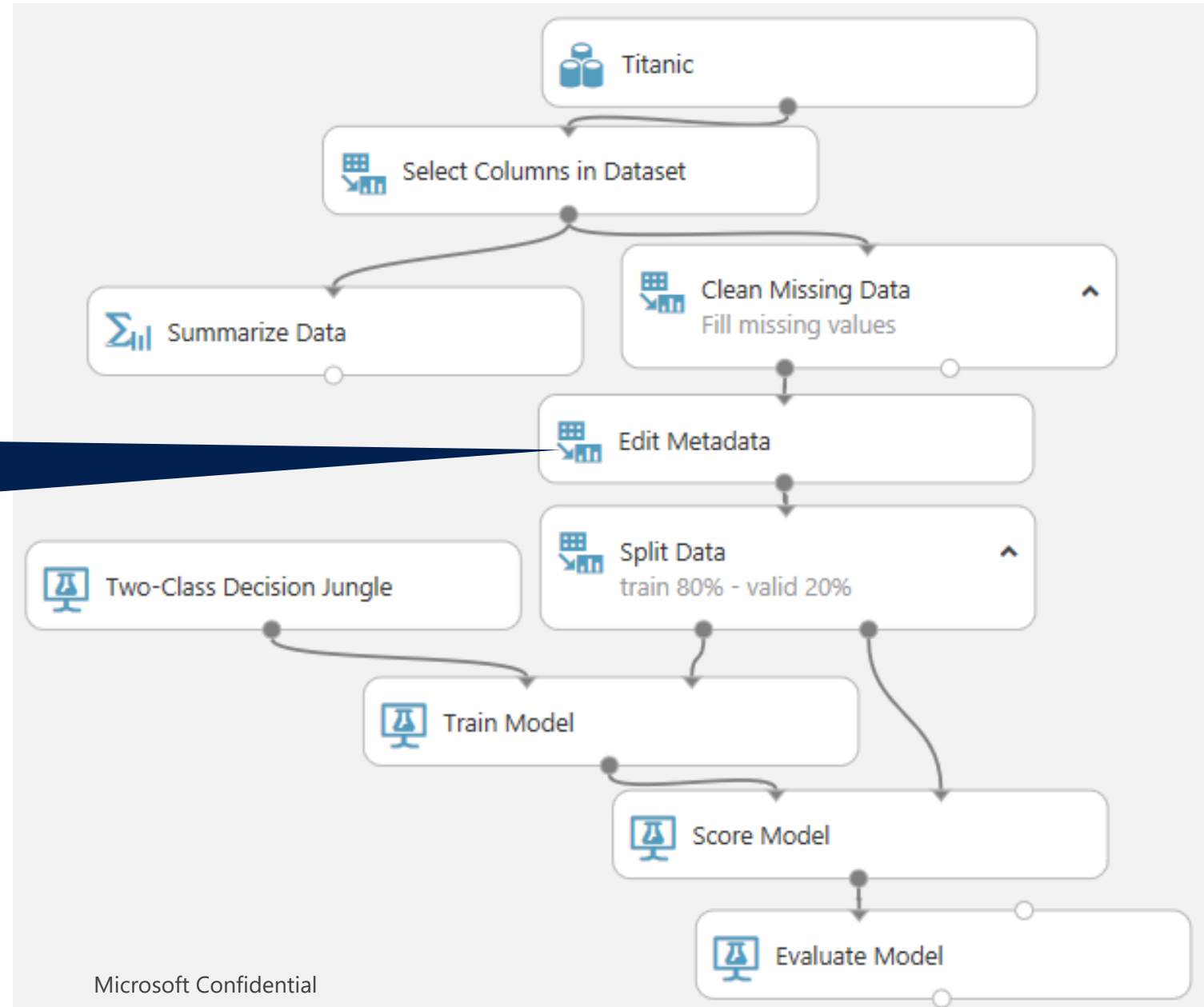
Output of Summarize Data module

view as	Feature	Count	Unique Value Count	Missing Value Count	Min	Max	Me
	Survived	891	2	0	0	1	0.3
	Pclass	891	3	0	1	3	2.3
	Sex	891	2	0			
	Age	714	88	177	0.42	80	29.
	SibSp	891	7	0	0	8	0.5
	Parch	891	7	0	0	6	0.3

Creating a model with AzureML

Sample model - Titanic

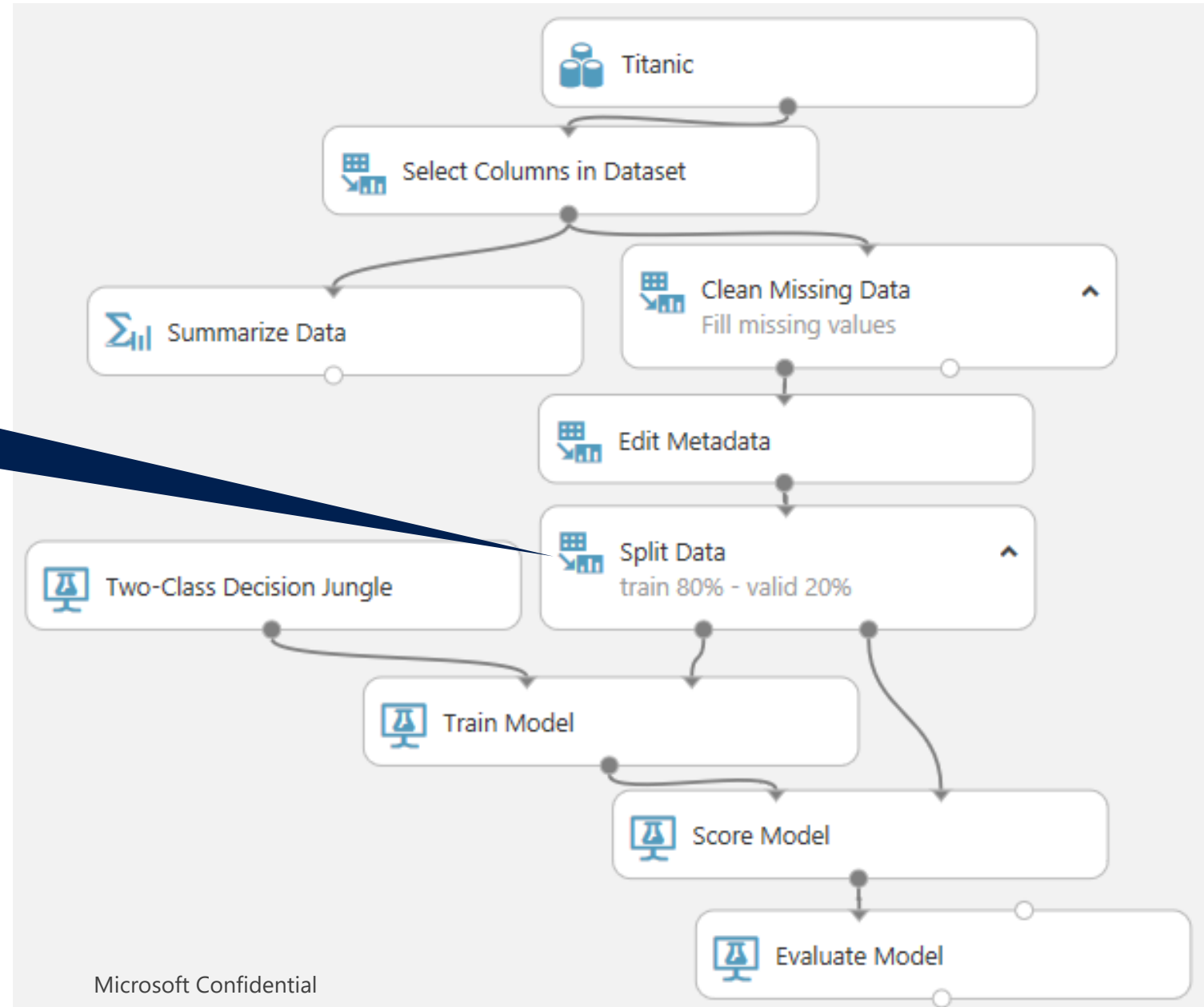
Changes "Sex" and
"Pclass" features to
categorical type



Creating a model with AzureML

Sample model - Titanic

Split data into training
and validation datasets

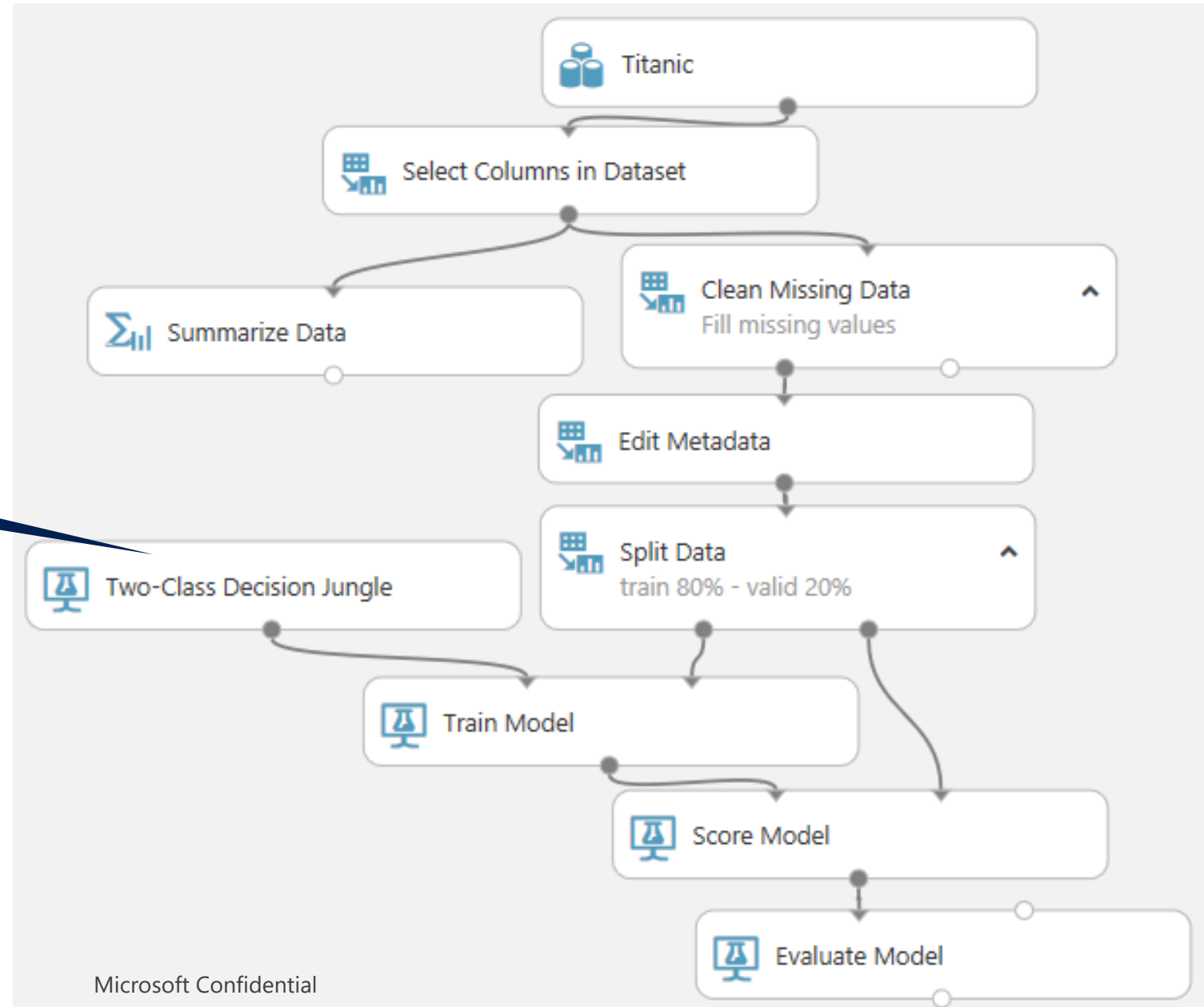


Creating a model with AzureML

Sample model - Titanic

Algorithm used in this experiment

This experiment wants to classify if someone survived or did not survive in the disaster, you need to use a classifier algorithm
It could be a Neural Network, Support Vector Machine, or others

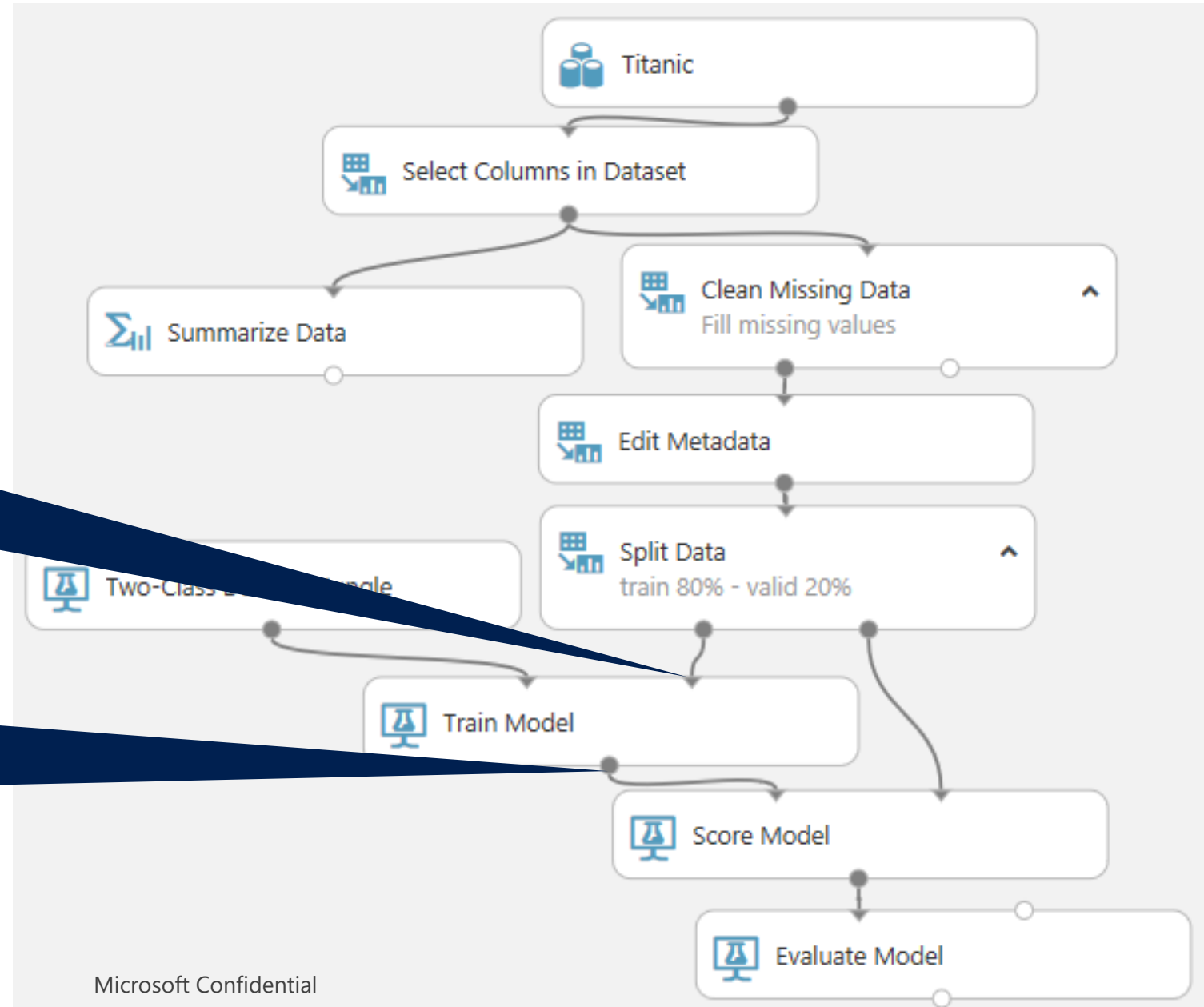


Creating a model with AzureML

Sample model - Titanic

The model is trained using the first output from split (80% of data – train data)

The output is a trained model, which can be saved and used in other experiments too

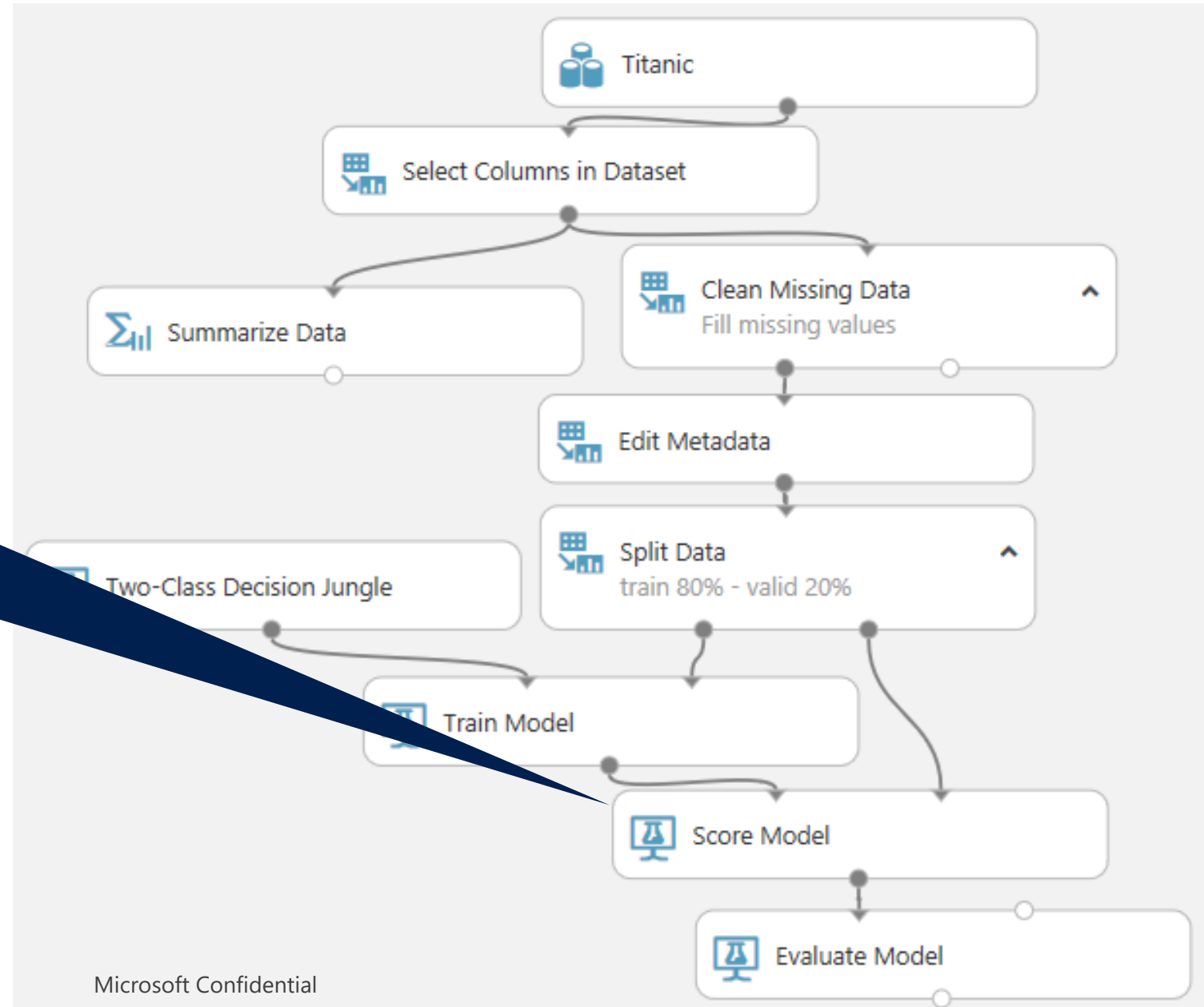


Creating a model with AzureML

Sample model - Titanic

Used to score the validation data (20% of all data) using the model created by "Train Model" module

80% (amount used for train) and 20% (amount used for validation) are only reference values, these values can change. The data scientist will determine the best values (from tests, experience, and others).

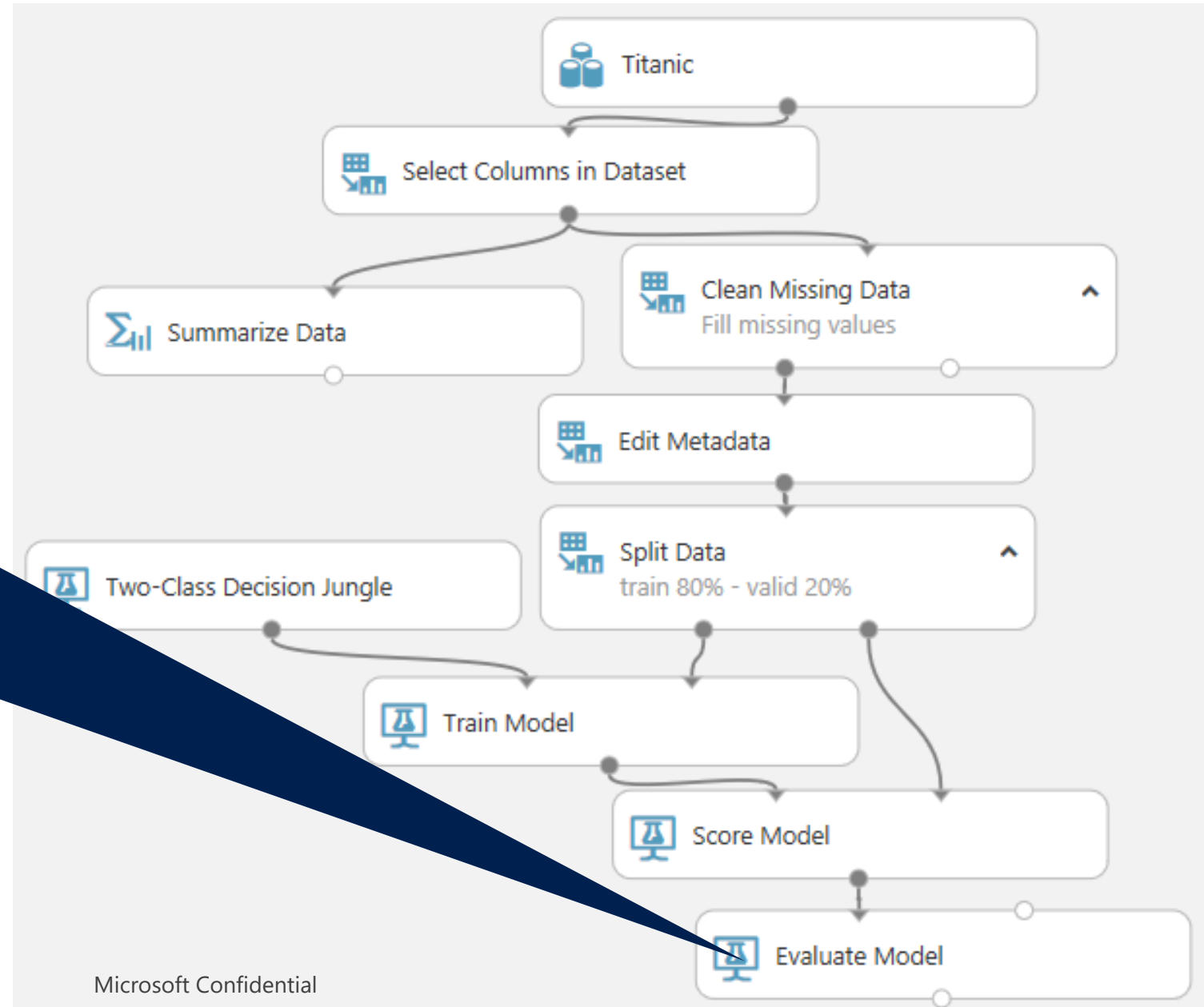


Creating a model with AzureML

Sample model - Titanic

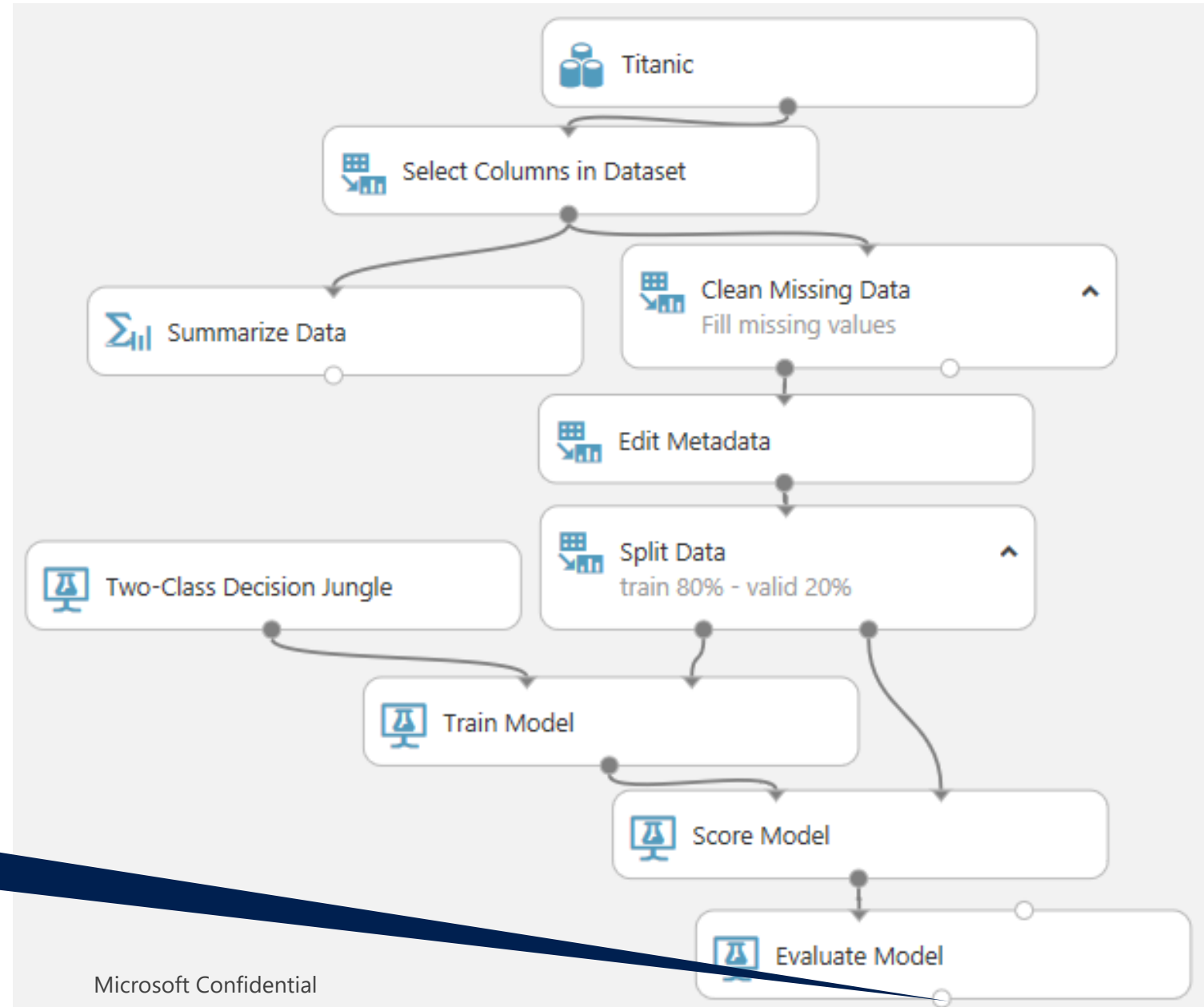
It uses the result from
"Score Model" module
to calculate several
metrics about model
performance and
accuracy

In this way, we can say
if this model will be
useful



Creating a model with AzureML

Sample model - Titanic



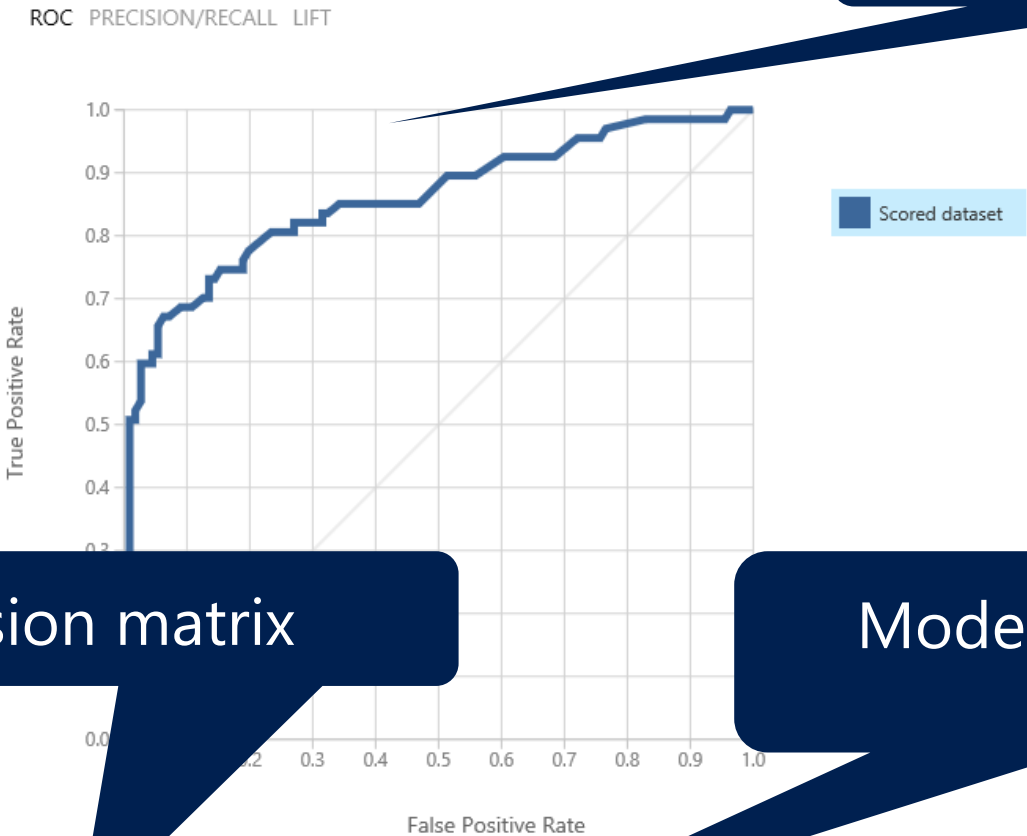
Results from Evaluate

Creating a model with AzureML

Sample model - Titanic

Titanic - FastStartPowerBI - v1 > Evaluate Model > Evaluation results

ROC Curve *



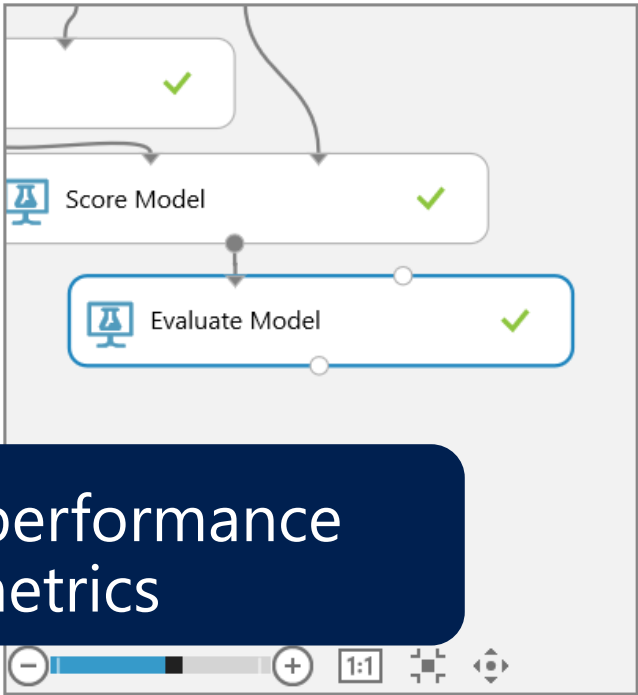
Confusion matrix

True Positive	False Negative
41	26
False Positive	True Negative
5	106

Accuracy	Precision
0.826	0.891
Recall	F1 Score
0.612	0.726

Threshold 0.5 AUC 0.858

Model performance metrics



* Receiver operating characteristic

Demonstration: AzureML Overview

Creating an Azure Machine Learning Model

Microsoft Confidential



Lab: Using Azure Machine Learning and Power BI

Exercise 01 – Using Azure Machine Learning and Power BI

