



**Ganpat
University**

॥ विद्यया समाजोत्कर्षः ॥

**Institute of
Computer
Technology**

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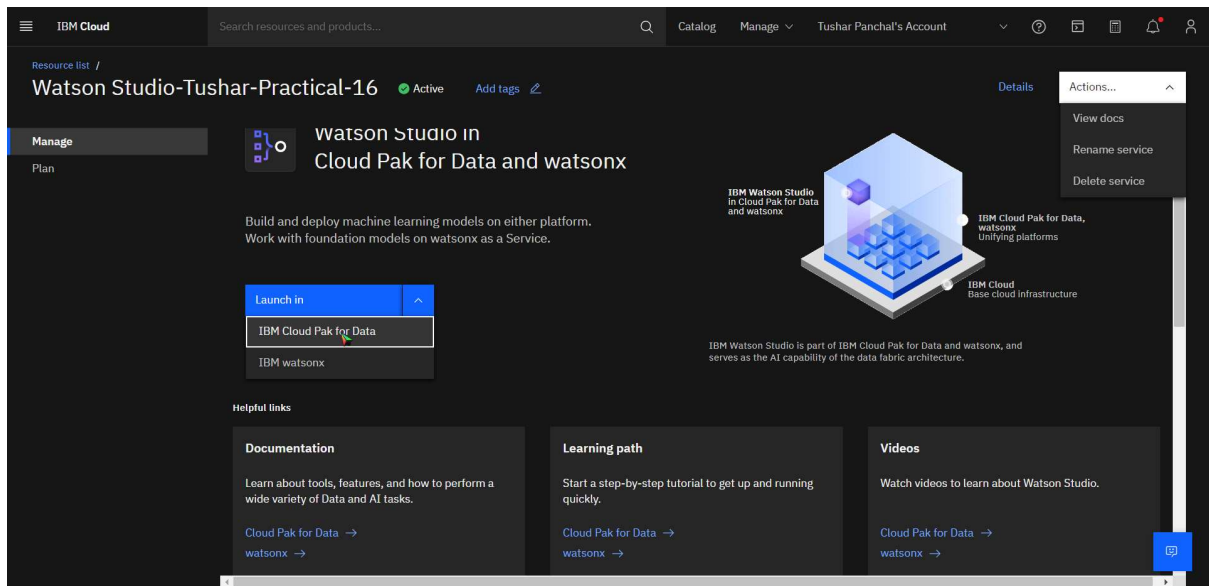
Batch:61

-----PRACTICAL 17-----

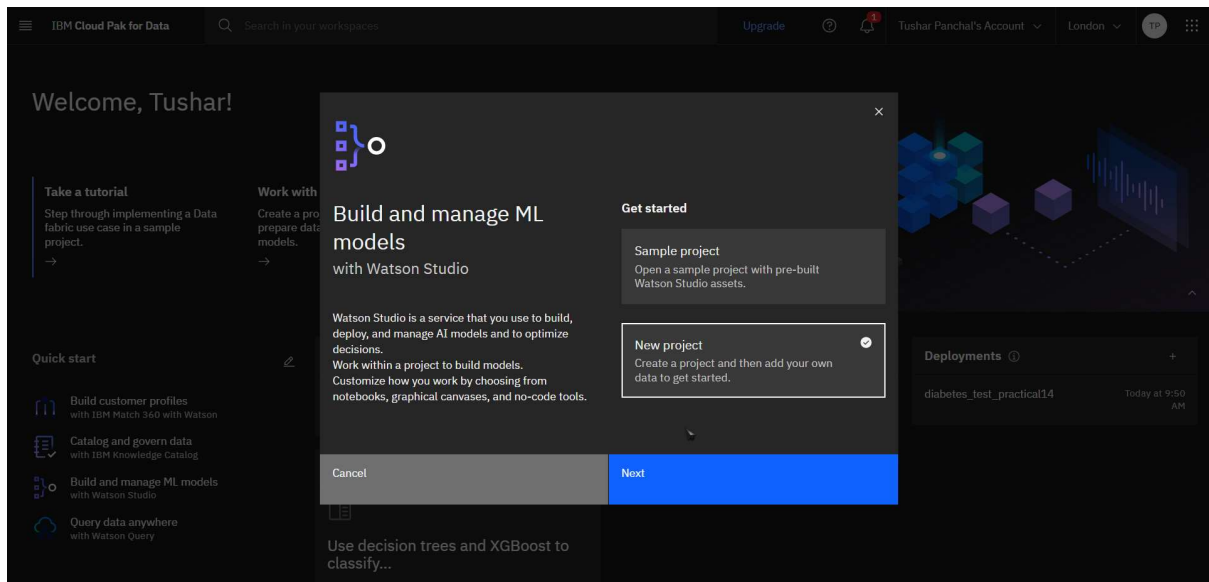
» **A : Using IBM Watson Studio, develop a Machine Learning model utilizing Artificial Intelligence to predict the survival of passengers aboard the Titanic based on given input parameters. The model will be trained on the Titanic survival dataset, which contains information about passengers such as their age, gender, ticket class, cabin, fare, and whether they survived or not. Once the model is trained, it will be deployed to provide predictions on the likelihood of survival for individuals with similar characteristics.**

1. Create new project on Watson Studio.

Launch in IBM Cloud pak for Data



Hit new project



Name it and hit create

IBM Cloud Pak for Data

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Create a project

Start with a new, blank project or select from where to import an existing project.

- + New
 - Local file
 - Resource hub

Define details

Name

tushar_practical_17

Description (optional)

What's the purpose of this project?

Storage

Cloud Object Storage-tushar

Project includes integration with [Cloud Object Storage](#) for storing project assets.

Advanced settings

Cancel Create

2. Upload data in assets and prepare data for that

IBM Cloud Pak for Data

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Projects / tushar_practical_17

Overview Assets Jobs Manage

Find assets Import assets New asset +

1 assets

All assets

Name	Last modified
titanic.csv CSV	Now Modified by you

Promote to space

Prepare data

Download

Delete

Data in this project

Drop data files here or browse for files to upload

3. Convert survived column from string to integer

The screenshot shows the IBM Cloud Pak for Data Data Refinery interface. The left sidebar contains the 'All Operations / Convert column type' section. The main panel shows the 'Data' tab with a table of data. The 'Survived' column is selected, and the 'Type' dropdown is set to 'Integer'. The 'Apply' button is highlighted.

CONVERSION 1

The 'Integer' data type most closely matches the column's data. Convert the column to a different data type.

Column: **Survived** Type: **Integer**

Thousands grouping symbol: **Select a grouping symbol**

☐ Create a new column for results

Select column

Apply

About this asset

Name
titanic.csv_flow
Data Refinery flow

Description
What is the purpose of this Data Refinery flow?

Asset details
Steps: 1

Associated assets
Source: titanic.csv
Target: titanic_csv_shaped

Last modified: Not yet saved
Created on: Not yet saved

Viewing: 891 rows, 12 columns Full data set: 891 rows, 12 columns

4. Now, again convert it to boolean for ease

The screenshot shows the IBM Cloud Pak for Data Data Refinery interface. The left sidebar contains the 'All Operations / Convert column type' section. The main panel shows the 'Data' tab with a table of data. The 'Survived' column is selected, and the 'Type' dropdown is set to 'Boolean'. The 'Apply' button is highlighted.

CONVERSION 1

The 'Integer' data type most closely matches the column's data. Convert the column to a different data type.

Column: **Survived** Type: **Boolean**

Thousands grouping symbol: **Select a grouping symbol**

☐ Create a new column for results

Select column

Apply

About this asset

Name
titanic.csv_flow
Data Refinery flow

Description
What is the purpose of this Data Refinery flow?

Asset details
Steps: 2

Associated assets
Source: titanic.csv
Target: titanic_csv_shaped

Last modified: Not yet saved
Created on: Not yet saved

Viewing: 891 rows, 12 columns Full data set: 891 rows, 12 columns

5. Convert other string columns like passengerid, pclass, age to integer from string for ease

The screenshot shows the IBM Cloud Pak for Data Data Refinery interface. The left sidebar lists 6 steps, with step 6, 'Convert column type', highlighted. The central pane displays a data table with columns: Name (String), Sex (String), and Age (Integer). The table contains 14 rows of data. The right-hand panel shows details for the 'titanic.csv_flow' asset, including its description, associated assets, and creation/modification status.

Name	Sex	Age
Braund, Mr. Owen Harris	male	22
Cummings, Mrs. John Bradley (Florence Briggs Thayer)	female	38
Heikkinen, Miss. Laina	female	26
Futrelle, Mrs. Jacques Heath (Lily May Peel)	female	35
Allen, Mr. William Henry	male	35
Moran, Mr. James	male	--
McCarthy, Mr. Timothy J	male	54
Palsson, Master. Gosta Leonard	male	2
Johnson, Mrs. Oscar W (Elisabeth Vilhelmina Berg)	female	27
Nasser, Mrs. Nicholas (Adele Achem)	female	14
Sandstrom, Miss. Marguerite Rut	female	4
Bonnell, Miss. Elizabeth	female	58
Saunderscock, Mr. William Henry	male	20
Anderson, Mr. Anders Johan	male	30

6. Save the flow

The screenshot shows the IBM Cloud Pak for Data Assets page. The left sidebar shows '2 assets' and 'Asset types' (Data, Flows). The central pane displays a table of assets, including 'titanic.csv_flow' and 'titanic.csv'. The right-hand panel shows a 'Data in this project' section with a drop zone for uploading files.

Name	Last modified
titanic.csv_flow Data Refinery flow	Now Modified by you
titanic.csv csv	3 minutes ago Modified by you

7. Create asset and add AutoAI

The screenshot shows the 'Create an AutoAI experiment' dialog in the IBM Cloud Pak for Data interface. The dialog is divided into three main sections: 'Define details', 'Define configuration', and 'Cancel/Create' buttons at the bottom right.

- Define details:**
 - Name:** Survival
 - Description (optional):** What's the purpose of this AutoAI experiment?
 - Tags (optional):** Add tags to make assets easier to find.
- Define configuration:**
 - Watson Machine Learning Service Instance:** Watson Machine Learning-Tushar-Practical-16
 - Environment definition:** Large: 8 CPU and 32 GB RAM
 - Capacity units:** This environment definition consumes 20 capacity units per hour for training. For details, see [Watson Machine Learning plans](#).

Buttons: Cancel, Create

8. Select csv data asset for it

The screenshot shows the 'Select data from project' dialog in the IBM Cloud Pak for Data interface. The dialog is divided into three main sections: 'Categories', 'Data assets', and 'Selected assets'.

- Categories:**
 - Connection
 - Data asset
 - Feature group
- Data assets:**
 - titanic.csv
- Selected assets:**
 - titanic.csv
 - Type: Data asset
 - Size: 60 KB
 - Owner: Tushar Panchal (tusharpanchal21@gnu.ac.in)
 - Mime type: text/csv
 - Created at: 2024/04/28 10:05:59

Buttons: Cancel, Select asset

9. Predict survived column and run the experiment

The screenshot shows the 'Configure AutoAI experiment' page for a project named 'Survival'. The interface is divided into several sections:

- Add data source:** A section on the left with a dashed box for adding files. Below it, a file named 'titanic.csv' (Size: 59.76 KB, Columns: 12) is listed.
- Configure details:**
 - Create a time series analysis?** A toggle switch set to 'No'.
 - What do you want to predict?** A dropdown menu with 'Survived' selected.
 - Prediction column:** 'Survived'.
 - Prediction type:** 'Binary Classification'.
 - Positive class:** '1'.
 - Optimized for:** 'Accuracy & run time'.
- Run experiment:** A large blue button at the bottom right.

At the top right, it says 'Autosaved: 10:11:59 AM'.

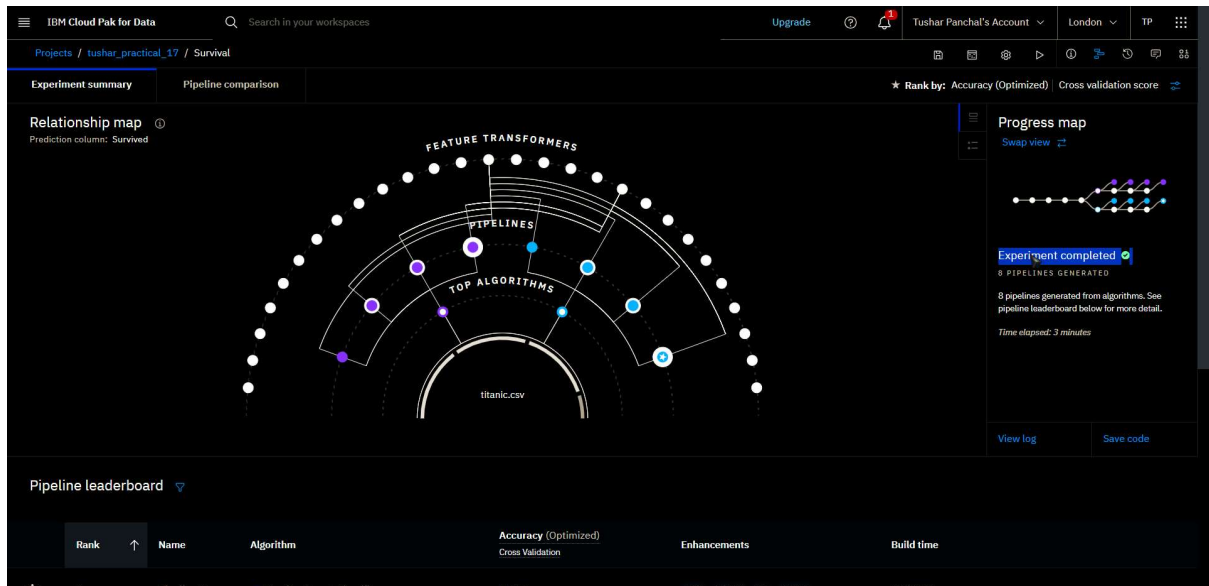
10. Wait for experiment to be successful

The screenshot shows the 'Experiment summary' page for the 'Survival' project. The interface includes:

- Relationship map:** A scatter plot showing data points for 'titanic.csv'.
- Progress map:** A section on the right showing the experiment's progress. It indicates 'Pending' status for 'TITANIC.CSV' and 'Starting the AutoAI experiment'. The time elapsed is '1 seconds'.
- Pipeline leaderboard:** A table at the bottom showing the results of the experiment. The table has columns: Rank, Name, Algorithm, Accuracy (Optimized), Enhancements, and Build time.

The 'Rank by' dropdown is set to 'Accuracy (Optimized)'.

11. Save the pipeline with highest accuracy and create model



Save as

Select asset type

Model
Create a Watson Machine Learning model asset that you can test with new data, deploy to generate predictions, and trace lineage activity.

Notebook
Create a notebook if you want to view the code that created this model pipeline or interact with the model programmatically.

Define details

Name
Survival - P4 Snap Boosting Machine Classifier - Model

Description (optional)
Model description

Tags
Add tags to make assets easier to find.
Add a tag

[Cancel](#) [Create](#)

12. Promote to new deployment space

Promote to space

Use a deployment space to organize supporting resources such as input data and environments; deploy models or functions to generate predictions or solutions; and view or edit deployment details.

Create a deployment space

Use a space to collect assets in one place to create, run, and manage deployments

Define details

Name:
 Validating...

Description (Optional):

Deployment stage
 Select or enter a name that describes the purpose of the space

Deployment space tags (optional)
 Add a tag

Select services

Select storage service:
 Cloud Object Storage-tushar

Select machine learning service (optional):
 Select a machine learning service

Cancel Create

Promote to space

Use a deployment space to organize supporting resources such as input data and environments; deploy models or functions to generate predictions or solutions; and view or edit deployment details.

Target space

Tags (optional)
 Add a tag

Why don't I see all of my spaces?
 ☐ Go to the model in the space after promoting it

Selected assets (1)

Name	Format
Survival - P4 Snap Boosting Machine Classifier - Model	Model

Select version

Description (Optional):

Cancel Promote

13. Now, create deployment for the model

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Deployments /

Create a deployment

Overview

Associated asset
Survival - P4 Snap Boosting Machine Classifier - Model

Deployment type

1 Online ☒ Batch

Run the model on data in real-time, as data is received by a web service.

Run the model against data as a batch process.

Name
Titanic_Survival

Serving name

Deployment serving name

Description
Deployment description

Cancel Create

14. Test the deployment

IBM Cloud Pak for Data

Deployments / Titanic / Survival - P4 Snap Boosting Mac... /

Titanic_Survival

Deployed Online

API reference Test

Enter input data

Text JSON

Enter data manually or use a CSV file to populate the spreadsheet. Max file size is 50 MB.

Download CSV template Browse local files Search in space Clear all x

	PassengerId (double)	Pclass (double)	Name (other)	Sex (other)	Age (double)	SibSp
1	7	7	McCarthy, Mr.	male	54	0
2						
3						
4						
5						
6						
7						
8						

1 row, 11 columns

Predict

File Home Insert Page Layout Formulas Data Review View Help Acrobat

Clipboard Font Alignment Number Conditional Formatting Styles

Format as Table Cell Styles

Cells Editing Add-ins Create and Share Adobe PDF Adobe Acrobat

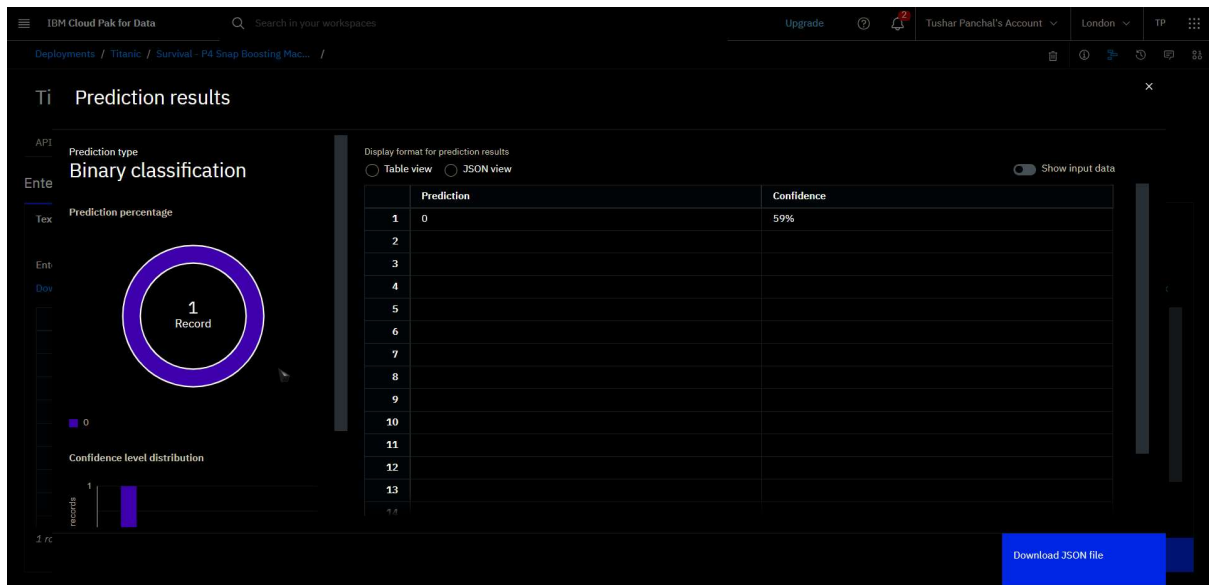
POSSIBLE DATA LOSS Some features might be lost if you save this workbook in the comma-separated (csv) format. To preserve these features, save it in an Excel file format. Don't show again Save As...

GET GENUINE OFFICE Your license isn't genuine, and you may be a victim of software counterfeiting. Avoid interruption and keep your files safe with genuine Office today. Get genuine Office Learn more

	A	B	C	D	E	F	G	H	I	J	K	L
1	PassengerId	Survived	Pclass	Name	Sex	Age	SibSp	Parch	Ticket	Fare	Cabin	Embarked
2	1	0	3	Braund, M	male	22	1	0	A/5 21171	7.25	S	
3	2	1	1	Cummings, N	female	38	1	0	PC 17599	71.2833	C85	C
4	3	1	3	Heikkinen, female		26	0	0	STON/O2.	7.925		S
5	4	1	1	Futrelle, M	female	35	1	0	113803	53.1	C123	S
6	5	0	3	Allen, Mr.	male	35	0	0	373450	8.05		S
7	6	0	3	Moran, Mr	male		0	0	330877	8.4583		Q
8	7	0	1	McCarthy, male		54	0	0	17463	51.8625	E46	S
9	8	0	3	Palsson, M	male	2	3	1	349909	21.075		S
10	9	1	3	Johnson, N	female	27	0	2	347742	11.1333		S
11	10	1	2	Nasser, M	female	14	1	0	237736	30.0708		C
12	11	1	3	Sandstrom	female	4	1	1	PP 9549	16.7	G6	S
13	12	1	1	Bonnell, M	female	58	0	0	113783	26.55	C103	S
14	13	0	3	Saunders	male	20	0	0	A/5. 2151	8.05		S
15	14	0	3	Andersson	male	39	1	5	347082	31.275		S
16	15	0	3	Vestrom, N	female	14	0	0	350406	7.8542		S
17	16	1	2	Hewlett, N	female	55	0	0	248706	16		S
18	17	0	3	Rice, Mast	male	2	4	1	382652	29.125		Q
19	18	1	2	Williams, N	male		0	0	244373	13		S
20	19	0	3	Vander Pla	female	31	1	0	345763	18		S
21	20	1	3	Masselman	female		0	0	2649	7.225		C
22	21	0	2	Fynney, M	male	35	0	0	239865	26		S
23	22	1	2	Beesley, M	male	34	0	0	248698	13	D56	S
24	23	1	3	McGowan	female	15	0	0	330923	8.0292		Q
25	24	1	1	Sloper, Mr	male	28	0	0	113788	35.5	A6	S

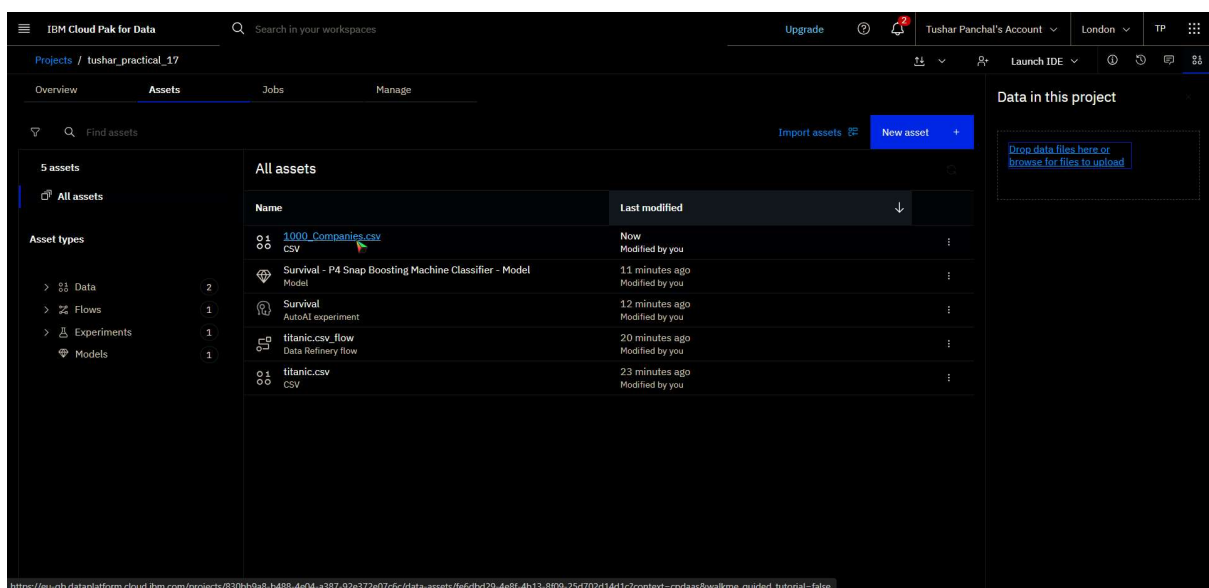
Select destination and press E... Average: 47270.6369 Count: 10 Sum: 330894.4583

15. Here, as seen the successful prediction is done for a demo record



» **B :** Using IBM Watson Studio, build a Machine Learning model with the help of Artificial Intelligence for an organization which Contains start-ups company database. You are supposed to find out the profit of start-up company based on given Input and showcase the Output. You are supposed to deploy space for all the trained A.I models and bring out the final result.

1. Add data to assets in new or existing project



2. Prepare data and create column for total spent by adding two columns marketing spent and r&d spent

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Projects / tushar_practical_17 / 1000_Companies.csv / Data Refinery

All Operations / Calculate

Change column selection

SELECTED COLUMN: R&D Spend

Apply a calculation with another column or a value. Overwrite the existing column or create a new column for the results.

Operator

Addition

Specify value or a column

Value Column

Marketing Spend

Showing columns with supported data types.

Create a new column for results

New column name

TotalSpent

New column position

Right-most column in the data set

Next to original column

Cancel Apply

Use a code template to add a step

Data Profile Visualizations

R&D Spend

Decimal

165349.2

162597.7

153441.51

144372.41

142107.34

131876.9

134615.46

130298.13

120542.52

123334.88

101913.08

100671.96

93863.75

91992.39

119943.24

114523.61

78013.11

Configure Viewing: 1000 rows, 5 columns

Full data set: 1000 rows, 5 columns

About this asset

Name

1000_Companies.csv_flow

Data Refinery flow

Description

What is the purpose of this Data Refinery flow?

Asset details

Steps: 1

Associated assets

Source: 1000_Companies.csv

Target: 1000_Companies_csv_shaped

Last modified

Not yet saved

Created on

Not yet saved

IBM Cloud Pak for Data

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Projects / tushar_practical_17 / 1000_Companies.csv / Data Refinery

Steps (2)

Data source

1000_Companies.csv

1. Convert column type

Automatically converted one or more columns to inferred data types. Strings that are converted to decimal use a dot (.) for the decimal symbol.

Auto-generated

2. Calculate

Add R&D Spend and Marketing Spend into TotalSpent

Just added

New step

Use a code template to add a step

Data Profile Visualizations

	R&D Spend	Administrat...	Marketing S...	State	Profit	TotalSpent
	Decimal	Decimal	Decimal	String	Decimal	Decimal
1	165349.2	136897.8	471784.1	New York	192261.83	637133.3
2	162597.7	151377.59	443898.53	California	191792.06	606496.23
3	153441.51	101145.55	407934.54	Florida	191050.39	561376.05
4	144372.41	118671.85	383199.62	New York	182901.99	527572.03
5	142107.34	91391.77	366168.42	Florida	166187.94	508275.76
6	131876.9	99814.71	362861.36	New York	156991.12	494738.26
7	134615.46	147198.87	127716.82	California	156122.51	262332.28
8	130298.13	145530.06	323876.68	Florida	155752.6	454174.81
9	120542.52	148718.95	311613.29	New York	152211.77	432155.81
10	123334.88	108679.17	304981.62	California	149759.96	428316.5
11	101913.08	110594.11	229160.95	Florida	146121.95	331074.03
12	100671.96	91790.61	249744.55	California	144259.4	350416.51
13	93863.75	127320.38	249839.44	Florida	141585.52	343703.19
14	91992.39	135495.07	252664.93	California	134307.35	344657.32
15	119943.24	156547.42	256512.92	Florida	132602.65	376456.16000000...
16	114523.61	122616.84	261776.23	New York	129917.04	376299.84
	78013.11	121597.55	264346.06	California	126992.93	342259.17

Configure Viewing: 1000 rows, 6 columns

Full data set: 1000 rows, 6 columns

About this asset

Name

1000_Companies.csv_flow

Data Refinery flow

Description

What is the purpose of this Data Refinery flow?

Asset details

Steps: 2

Associated assets

Source: 1000_Companies.csv

Target: 1000_Companies_csv_shaped

Last modified

Not yet saved

Created on

Not yet saved

3. Create a deployment space and promote it there as previously done

The screenshot shows the 'Promote to space' dialog in IBM Cloud Pak for Data. The 'Create a deployment space' tab is active. The dialog is divided into two main sections: 'Define details' and 'Select services'.

Define details:

- Name:** companies
- Description (Optional):** Deployment space description
- Deployment stage:** Select or enter a name that describes the purpose of the space
- Deployment space tags (optional):**

Select services:

- Select storage service:** Cloud Object Storage-tushar
- Select machine learning service (optional):** Watson Machine Learning-Tushar-Practical-16

At the bottom, there are 'Cancel' and 'Create' buttons.

The screenshot shows the 'Promote to space' dialog in IBM Cloud Pak for Data, with the 'Promote' tab active. The dialog is divided into two main sections: 'Target space' and 'Tags (optional)'.

Target space:

- Target space:** companies
- Why don't I see all of my spaces?:** Go to the data refinery flow in the space after promoting it
- Selected assets (1):**

Name	Format
1000_Companies.csv_flow	Data Refinery flow

Select version:

- Current**

Description (Optional):

At the bottom, there are 'Cancel' and 'Promote' buttons.

4. Create AutoAI experiment for this also

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Projects / tushar_practical_17

New asset

Create an AutoAI experiment

+ New

Sample

As

Define details

Name

startup-companies

Description (optional)

What's the purpose of this AutoAI experiment?

Tags (optional)

Add tags to make assets easier to find.

Start typing to add tags

Define configuration

Watson Machine Learning Service Instance

Watson Machine Learning-Tushar-Practical-16

Environment definition

Large: 8 CPU and 32 GB RAM

This environment definition consumes 20 capacity units per hour for training. For details, see [Watson Machine Learning plans](#).

Cancel

Create

5. In experiment settings, choose 3 algorithms for better accuracy and run the experiment

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Projects / tushar_practical_17 / startup-companies

Configure AutoAI experiment

startup-companies

Autosaved: 10:36:45 AM

Add data source

Add files such as tabular data (CSV).

Browse

Select data from project

1000 Companies.csv

Size: 50.98 KB

Columns: 5

Configure details

Create a time series analysis?

Enable this option to predict future activity over a specified date/time range. Data must be structured and sequential. [Learn more](#)

Yes

No

What do you want to predict?

Prediction column

Profit

Prediction column: Profit

Prediction type

Regression

Optimized for

RMSE & run time

CUH remaining: 17.46 CUH

Experiment settings

Run experiment

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Experiment settings

Prediction column: Profit (DEC)

Data source: 1000_Companies.csv

General

☐ Random Forest Regressor

☐ Ridge

☐ Snap Boosting Machine Regressor

☐ Snap Decision Tree Regressor

☐ Snap Random Forest Regressor

☐ XGB Regressor

Algorithms to use: 3 / 4

AutoAI will test the specified algorithms and use the top performers to create model pipelines. Choose how many top algorithms to apply. Each algorithm generates 4-5 pipelines and more algorithms increase the runtime.

1 2 3 4

Cancel

Save settings

6. Save the highest accurate pipeline for creating model

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Experiment summary

Pipeline comparison

Rank by: Root mean squared error (RMSE) (Cross validation score)

Relationship map

Prediction column: Profit

Feature Transformers

Pipelines

Top Algorithms

Univariate feature selection

5 | Pipeline 4

RMSE: 2235.530

1000_Compan...

90% Training data

3 Folds

10% Holdout data

Progress map

Swap view

Experiment completed

12 PIPELINES GENERATED

12 pipelines generated from algorithms. See pipeline leaderboard below for more detail.

Time elapsed: 3 minutes

View log

Save code

Pipeline leaderboard

Rank	Name	Algorithm	RMSE (Optimized)	Enhancements	Build time
1	Pipeline 4	Auto Regressor	2235.530		00:00:04
2	Pipeline 5	Auto Regressor	2235.530		00:00:04
3	Pipeline 6	Auto Regressor	2235.530		00:00:04
4	Pipeline 7	Auto Regressor	2235.530		00:00:04
5	Pipeline 8	Auto Regressor	2235.530		00:00:04
6	Pipeline 9	Auto Regressor	2235.530		00:00:04
7	Pipeline 10	Auto Regressor	2235.530		00:00:04
8	Pipeline 11	Auto Regressor	2235.530		00:00:04
9	Pipeline 12	Auto Regressor	2235.530		00:00:04

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Projects / tushar practical 17 / startup-companies

Save as

Select asset type

Model

Create a Watson Machine Learning model asset that you can test with new data, deploy to generate predictions, and trace lineage activity.

Notebook

Create a notebook if you want to view the code that created this model pipeline or interact with the model programmatically.

Define details

Name

startup-companies - P4 XGB Regressor - Model

Description (optional)

Model description

Tags

Add tags to make assets easier to find.

Add a tag

Cancel Create

7. Test the model

eu-gb.dataplatform.cloud.ibm.com/ml-r...

IBM Cloud Pak for Data Upgrade TP

Deployments / startup-companies / startup-companies - P4 XGB Reg... /

Startup_Companies Deployed Online

API reference Test

Enter input data

Text JSON

Enter data manually or use a CSV file to populate the spreadsheet. Max file size is 50 MB.

Download CSV template Browse local files Search in space Clear all x

	R&D Spend (double)	Administration (double)	Marketing Spend (double)	State (other)
1	93863.75	127320.38	249839.44	Florida
2				
3				
4				
5				
6				
7				
8				

1 row, 4 columns Predict

1000_Companies - Excel

	A	B	C	D	E	F	G	H	I
1	R&D Spend	Administration	Marketing Spend	State	Profit				
2	165345.2	136897.8	471784.1	New York	192261.8				
3	162597.7	151377.59	443898.53	California	191792.1				
4	153441.51	101145.55	407934.54	Florida	191050.4				
5	144372.41	118671.85	383199.62	New York	182902				
6	142107.34	91391.77	366168.42	Florida	166187.9				
7	131876.9	99814.71	362861.36	New York	156991.1				
8	134615.46	147198.87	127716.82	California	156122.5				
9	130298.13	145530.06	323876.68	Florida	155752.6				
10	120542.52	148718.95	311613.29	New York	152211.8				
11	123334.88	108679.17	304981.62	California	149760				
12	101913.08	110594.11	229160.95	Florida	146122				
13	100671.96	91790.61	249744.55	California	144259.4				
14	93863.75	127320.38	249839.44	Florida	141353.5				
15	91992.39	135495.07	252664.93	California	134307.4				
16	119943.24	156547.42	256512.92	Florida	132602.7				
17	114523.61	122616.84	261776.23	New York	129917				
18	78013.11	121597.55	264346.06	California	126992.9				
19	94657.16	145077.58	282574.31	New York	125370.4				
20	91749.16	114175.79	294919.57	Florida	124266.9				
21	86419.7	153514.11	0	New York	122776.9				
22	76253.86	113867.3	298664.47	California	118474				
23	78389.47	153773.43	299737.29	New York	111313				
24	73994.56	122782.75	303319.26	Florida	110352.3				
25	67532.53	105751.03	304768.73	Florida	108734				
26	77044.01	99281.34	140574.81	New York	108552				
27	64664.71	139553.16	137962.62	California	107404.3				
28	75328.87	144135.98	134050.07	Florida	105733.5				
29	72107.6	127864.55	353183.81	New York	105008.3				
30	66051.52	182845.56	118148.2	Florida	103282.4				

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8. As seen, the predicted profit (131692.171875) is accurately matching with actual record (141585.52)

