



TUTORIAL ON RAPID MINER

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About the Tutorial:

RapidMiner is a Data Analytics and Data Science tool which provides the user all the interactions with the data from preprocessing stage to model evaluation stage without any use of programming language.

This RapidMiner is intended to support all the functionalities across the AI ecosystem.

Prerequisites:

The major prerequisites required before using this tool, One should be aware of basic calculus, algebra, Excel and basic workflow of machine learning models.

1. Introduction On RapidMiner Studio:

The main motto of the RapidMiner tool is to collaborate and provide an interface to perform all the data science work. From providing multiple datasets, Machine Learning Algorithm, Visualizations and Model Deployment.

Below are the major establishments of this RapidMiner —

- This platform provides its user with different types of datasets where one can directly use them to build the models. However, rapidminer also supports loading data from different sources like Cloud, Relational Databases, NoSQL, Excel and CSV files.
- The process of working with datasets is completely in drag and drop format. All the preprocessing, model building and visualization can be done without any code.
- We need not build any supervised or unsupervised machine learning algorithm from scratch. RapidMiner tool also provides us all the required algorithms to perform Regression, Classification and Clustering.
- We can train the data to provide optimal solutions. This also supports hyperparameter tuning to build an efficient algorithm.
- RapidMiner also supports deploying our model into different platforms with the help of certain interfaces.
- Once the model is deployed, with the help of interfaces we can collect and store the real time data.

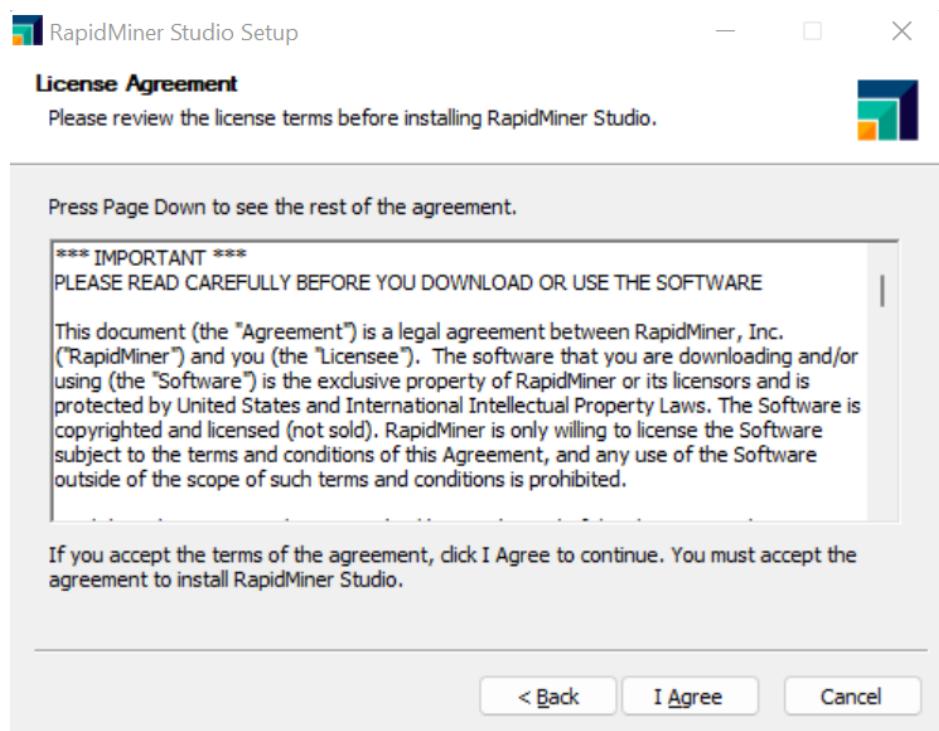
2. SETTING UP RAPIDMINER Studio:

A. DOWNLOADING:

- a. Downloading RapidMiner Studio into our local machine, we need go to the URL <https://my.rapidminer.com/nexus/account/index.html#downloads>
- b. The above URL will redirect you to the download webpage, where you can select your option of operating system. The version available is RapidMiner Studio 9.10
- c. Once you click on the operating system to download, an .exe file will be in your downloads.
- d. Go to downloads in your local machine and install the RapidMiner Studio.

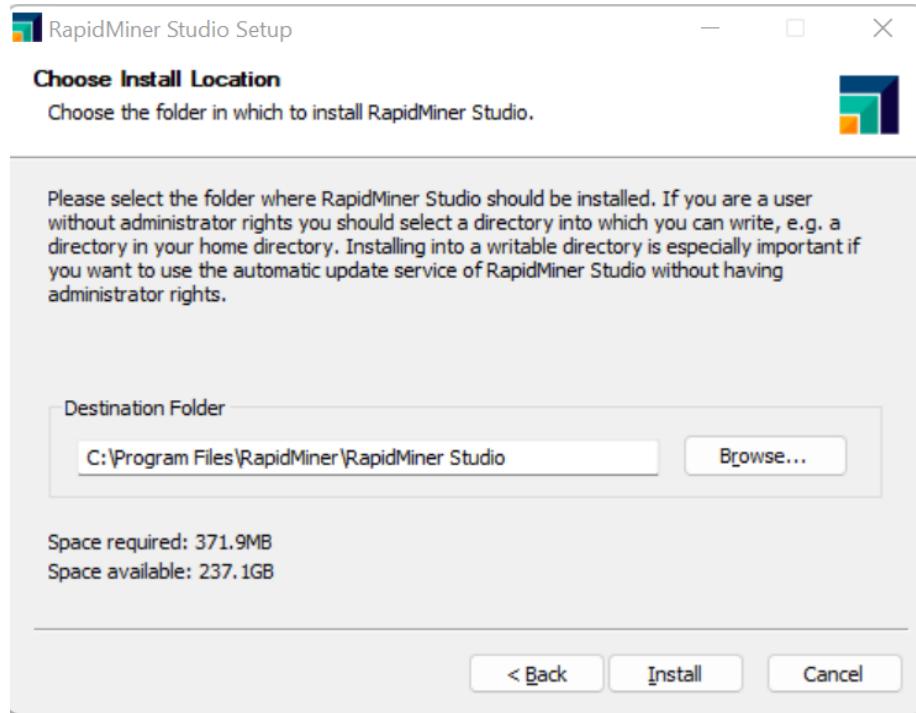
B. INSTALLING:

- a. Once you install the RapidMiner Studio in your local machine, it will ask you to agree to the License. Click on **I Agree**.

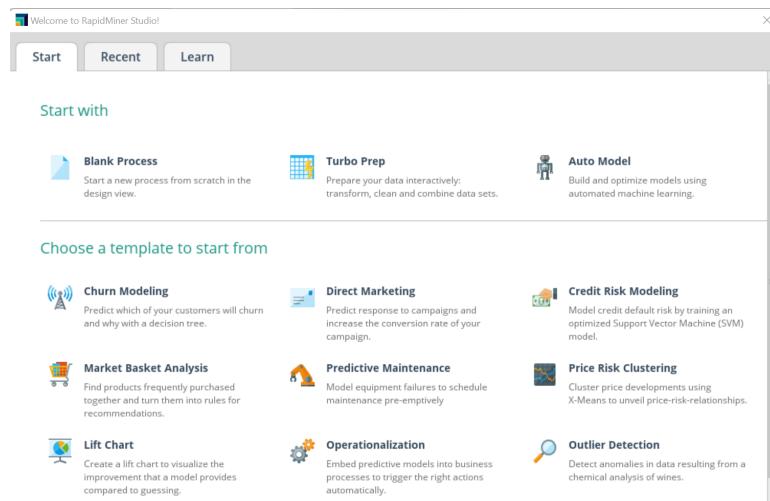


- b. Once you click **I Agree**, it will ask you to choose the desired location to install. Instead of a predefined source provided you can change the

location by clicking on **Browse** and selecting the best location as per your reference.

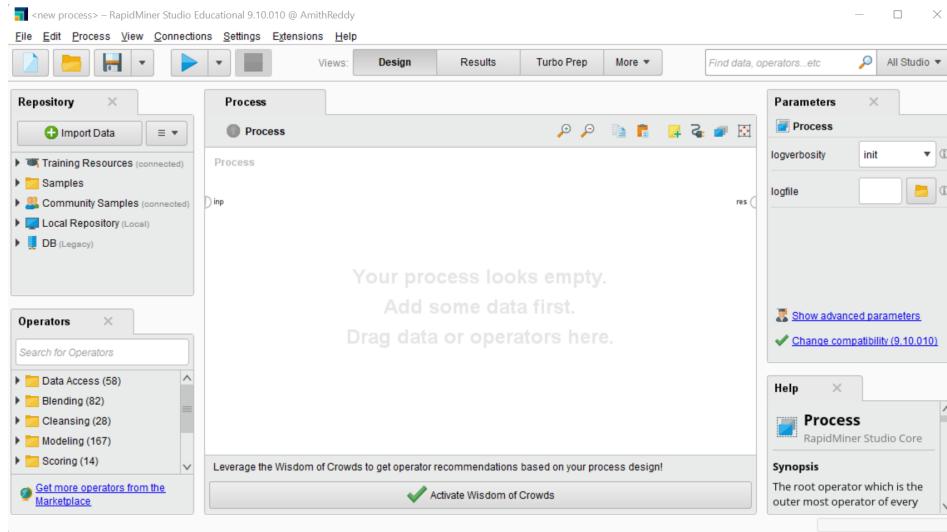


- c. Then click on **Install**, all the files will be installed on your machine and click on **Finish** button.
- d. After installing, when you open the RapidMiner Studio you can view the below window.



3. RAPIDMINER Studio Overview:

- Below is the basic overview of how a RapidMiner Studio looks like:



- We can see there are a lot of tabs present, each one has its own definition and functions.
- Repository: This is the primary tab that is used to load the required data and also import the data from local devices.
- Operators: This tab provides us all the operation related tasks like data preprocessing, cleaning, model building, validations.
- Process: In this tab, all the major operations are performed. Here we need to drag the required data or operators from other tabs and join them to build a desired model.
- Parameters: This provides us a chance to add, remove and edit the parameters present in the dataset. This tab can mainly be used for hyperparameter tuning.

Now we know the primary tabs and their functions. But there is another horizontal bar at the top of all the tabs that are discussed.

This horizontal section contains features like selection of files, editing, saving the process, running the built model in process.



In middle of the above section, we can find views-

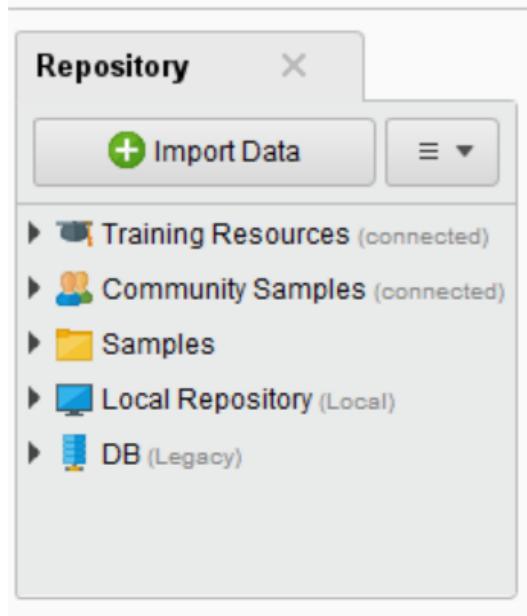
- Design - Responsible for model design
- Results - Provide model results
- Turbo Prep - Mainly used for data preprocessing and cleaning
- Auto Model - Automatically model the data with the desired parameters available.
- Deployment - Used to deploy our model that is built. In this, deployment we have two options:
 - New
 - Connect

We can click on New, to start the deployment of the new model. In this we can deploy in both local machines or remote machines. In case the model is already deployed and we connect to the server and use it.

4. FUNCTIONS:

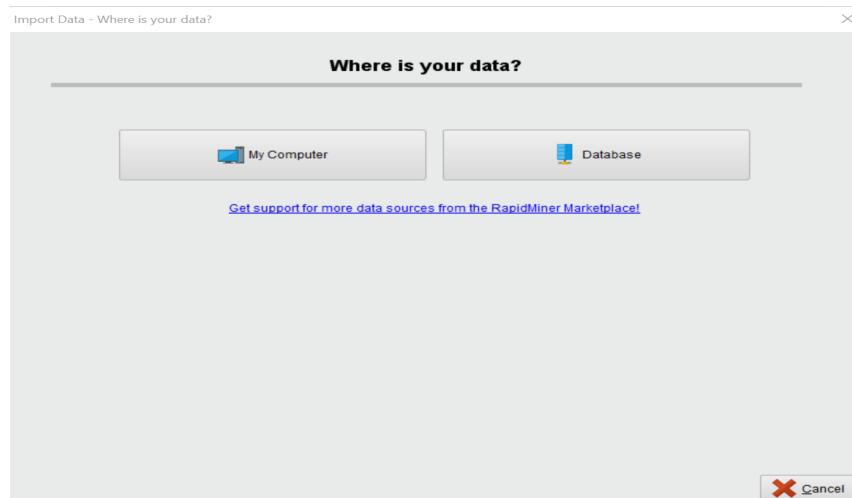
A. Importing Data:

This import function is present in the Repository tab at the top left corner.



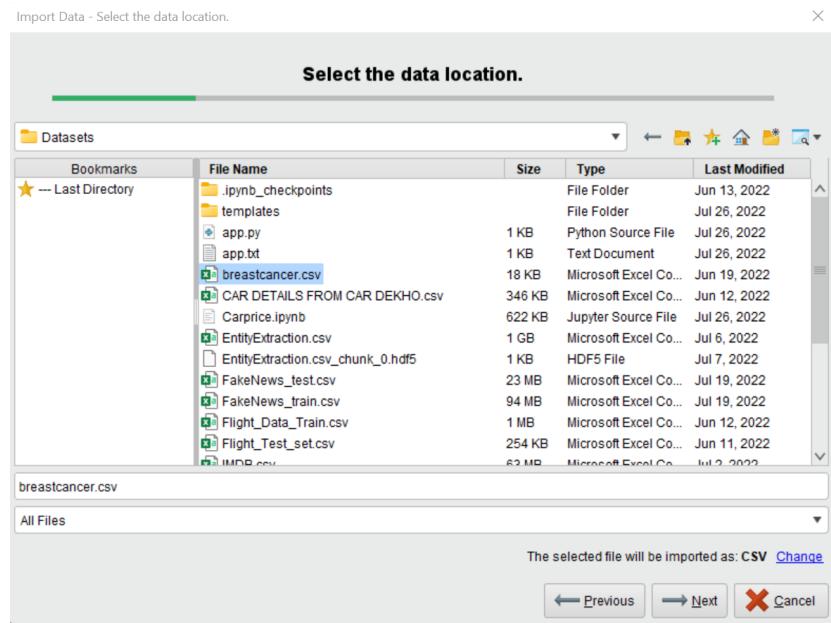
As you can see from the above screenshot, we have few options that can be used to import the data into RapidMiner Studio.

Import Data: If we click on **Import Data** it will redirect us to a new tab from where we can select the required dataset that can be imported to build.



- This provides us options to take the data from local machines and different databases as well.

- Once you select the **My Computer** option you will have options to select any file of your choice, be it to any extension from your computer.



- From the above screenshot we can see that we selected the required dataset for our model. Then click on **Next**.
- Now it will give us a new tab where it provides us options to specify our data format. This helps us to update any default values that the

RapidMiner has already considered from the data available.

The screenshot shows the 'Specify your data format' dialog in RapidMiner. The dialog has several configuration options:

- Header Row: Checked, set to 1.
- Start Row: Set to 1.
- Column Separator: Set to Comma ','.
- File Encoding: Set to windows-12... (dropdown).
- Escape Character: Set to \.
- Decimal Character: Set to .
- Use Quotes: Checked, set to ".
- Trim Lines: Unchecked.
- Skip Comments: Checked, set to #.

Below the configuration area is a preview of the data table. The table has 10 rows and 10 columns. The columns are labeled: 1, Class, age, menopausal, tumor-si..., inv-nodes, node-ca..., deg-malig, breast, breast-q..., and irradiat. The data rows are as follows:

1	Class	age	menopausal	tumor-si...	inv-nodes	node-ca...	deg-malig	breast	breast-q...	irradiat
2	no-recurr...	30-39	premeno	30-34	0-2	no	3	left	left_low	no
3	no-recurr...	40-49	premeno	20-24	0-2	no	2	right	right_up	no
4	no-recurr...	40-49	premeno	20-24	0-2	no	2	left	left_low	no
5	no-recurr...	60-69	ge40	15-19	0-2	no	2	right	left_up	no
6	no-recurr...	40-49	premeno	0-4	0-2	no	2	right	right_low	no
7	no-recurr...	60-69	ge40	15-19	0-2	no	2	left	left_low	no
8	no-recurr...	50-59	premeno	25-29	0-2	no	2	left	left_low	no
9	no-recurr...	60-69	ge40	20-24	0-2	no	1	left	left_low	no
10	no-recurr...	40-49	premeno	50-54	0-2	no	2	left	left_low	no

At the bottom right of the dialog, there is a message: "no problems." with a green checkmark icon. Below the message are three buttons: "Previous", "Next", and "Cancel".

- Once we are good with our parameters and data format then click on **Next**.
- In the next tab, it gives us options to format our columns. Firstly it provides date format, and for each column present we can click on down arrow(), from which we can change the datatype, change role, rename the column and exclude the column.
- We also have an option called **Replace errors with missing values**. If we check the box it will replace all the missing values in

OUR

dataset.

Import Data - Format your columns.

Format your columns.

Date format Replace errors with missing values ⓘ

	Class polynomial	age polynomial	menopause polynomial	tumor-size polynomial	inv-nodes polynomial	node-caps polynomial
1	no-recurrence-ev...	30-39	premeno	30-34	0-2	no
2	no-recurrence-ev...	40-49	premeno	20-24	0-2	no
3	no-recurrence-ev...	40-49	premeno	20-24	0-2	no
4	no-recurrence-ev...	60-69	ge40	15-19	0-2	no
5	no-recurrence-ev...	40-49	premeno	0-4	0-2	no
6	no-recurrence-ev...	60-69	ge40	15-19	0-2	no
7	no-recurrence-ev...	50-59	premeno	25-29	0-2	no
8	no-recurrence-ev...	60-69	ge40	20-24	0-2	no
9	no-recurrence-ev...	40-49	premeno	50-54	0-2	no
10	no-recurrence-ev...	40-49	premeno	20-24	0-2	no
11	no-recurrence-ev...	40-49	premeno	0-4	0-2	no

◀ ▶ no problems.

- Once you click **Next**, it will ask you where to store the data. Once you select the location click on **Finish**.

Import Data - Where to store the data?

Where to store the data?

Local Repository (Local)

⚠ Please select a repository location before continuing.

Name

Location breastcancer

◀ Previous Finish

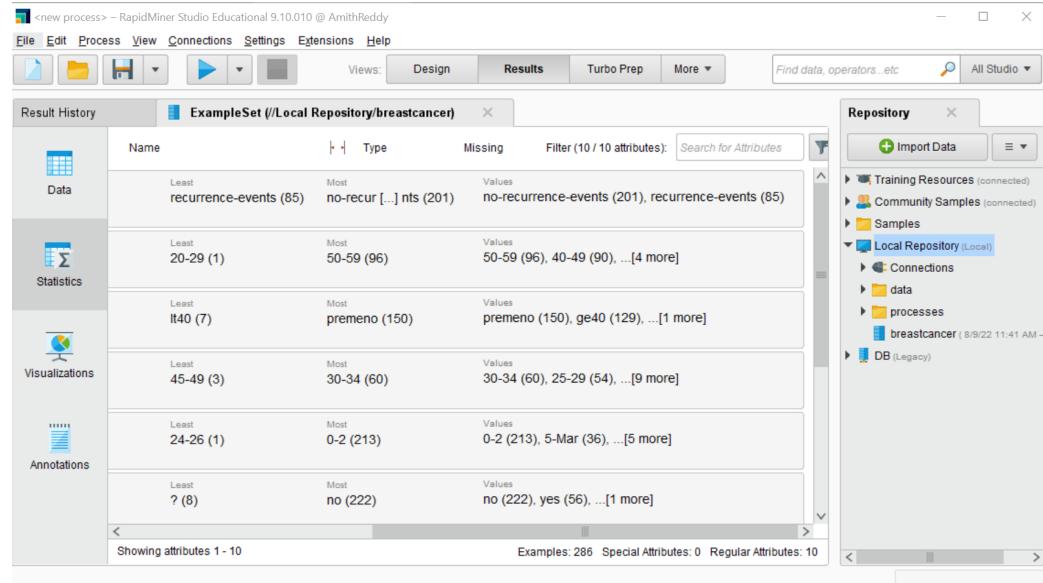
B. View Results:

- a. Once you finish the data loading, it will provide us a result view. This contains four functions —
 - i. Data
 - ii. Statistics
 - iii. Visualization
 - iv. Annotations

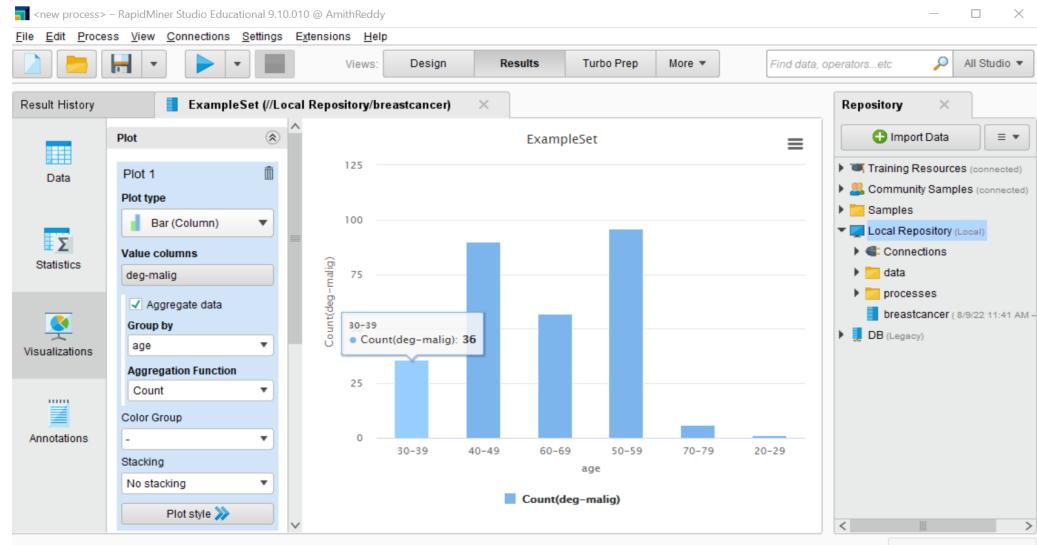
The screenshot shows the RapidMiner Studio interface with the 'Results' tab selected. The main area displays a table titled 'ExampleSet (breastcancer)' with 286 rows and 9 columns. The columns are: Row No., Class, age, menopause, tumor-size, inv-nodes, node-caps, and deg-mal. The data table shows various patient characteristics. To the left of the table is a vertical sidebar with four sections: Data, Statistics, Visualizations, and Annotations. Above the table, there are buttons for 'Turbo Prep' and 'Auto Model'. A filter dropdown is set to 'all'. The bottom of the table area shows the text 'ExampleSet (286 examples, 0 special attributes, 10 regular attributes)'. On the right side, there is a 'Repository' panel showing a tree structure with 'Training Resources', 'Community Samples', 'Samples', and a 'Local Repository (Local)' section containing 'Connections', 'data', 'processes', and 'breastcancer' (with a timestamp of 8/9/22 11:41 AM).

- b. This Data Result provides us all the dataset information and other options to open it in different views like **Turbo Prep**, **Auto Model**. There is a filter dropdown where we have options like **all**, **no_missing_attributes**, **missing_attributes**.

- c. Statistics Results contains all the statistics analysis like missing values, least occurrence, most occurrence, values.

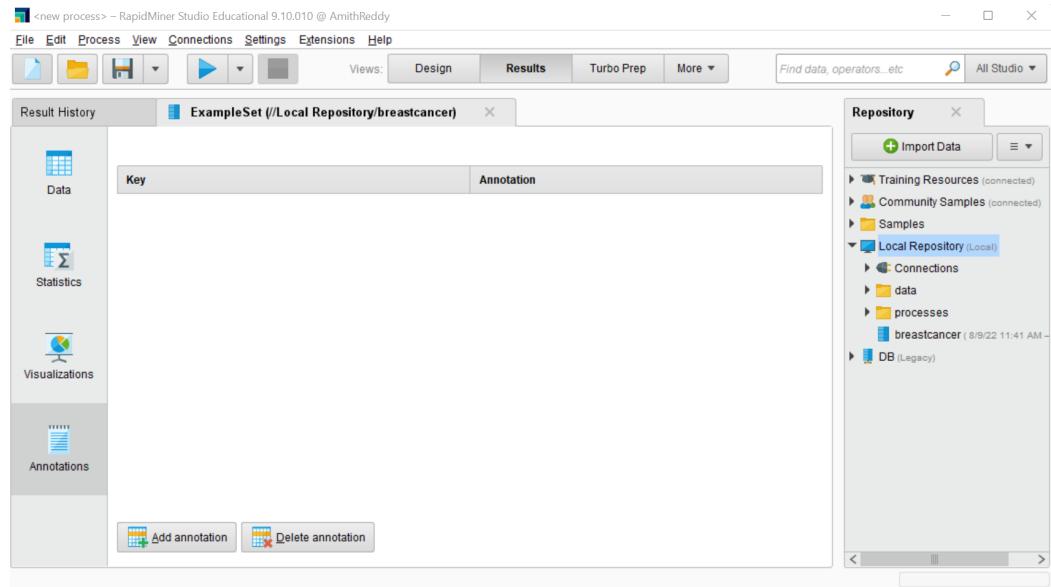


- d. Visualization view depicts all the possible charts that can be done by data. We have a lot of types to play with and many selections that can be selected in the Plot area on the left side.



- e. Annotation view gives us some space to provide our findings that can be stored for future purposes. We can add and delete any number of

annotations.

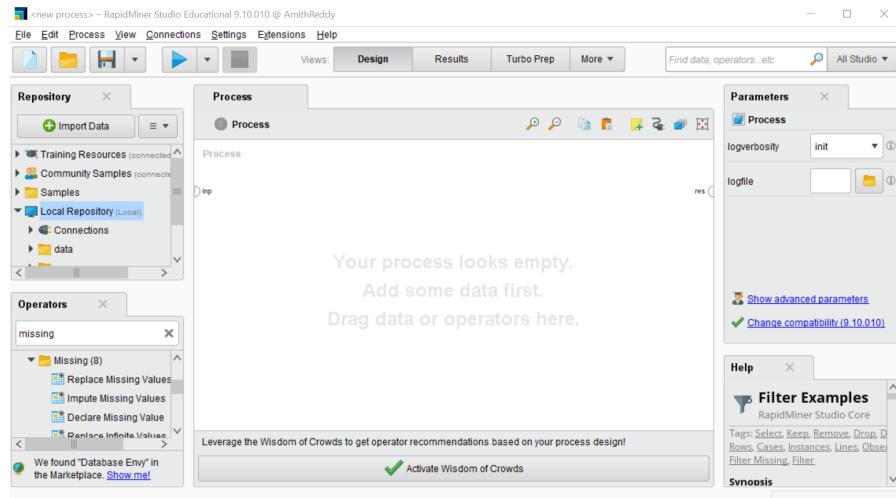


C. Operations:

There are different types of operators for all the major purposes.

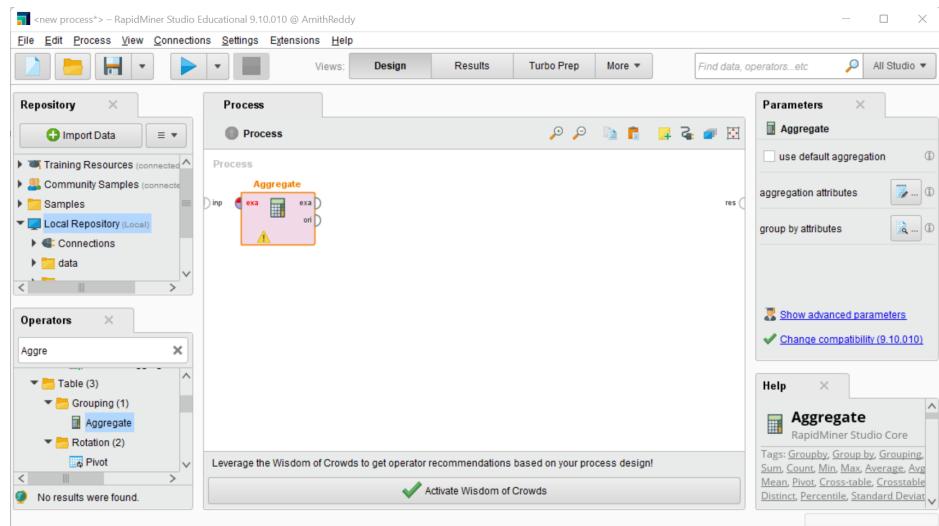
1. Replacing Missing Values: This is a major operator in RapidMiner.

Where we can replace the missing values as per our requirement.

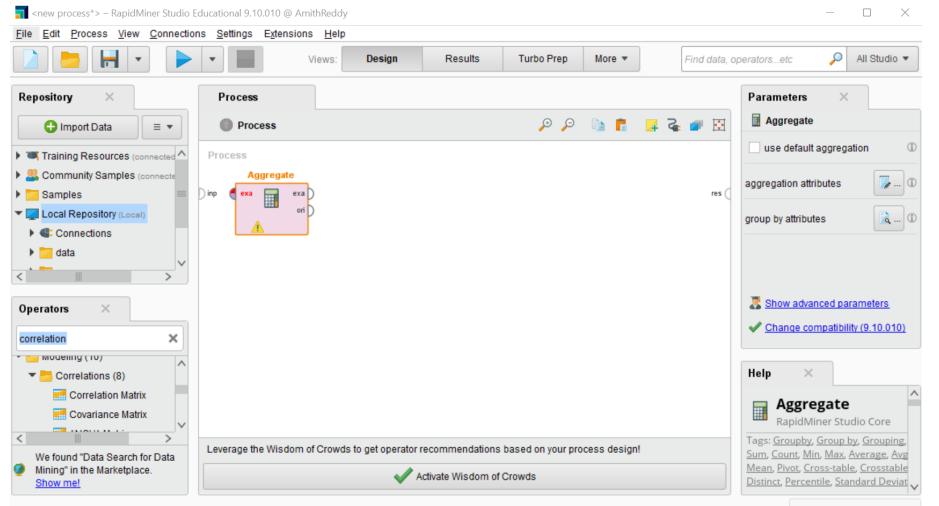


2. Aggregate: This function is used for mathematical calculations like sum, average, count. We can choose the required parameters for

calculations.

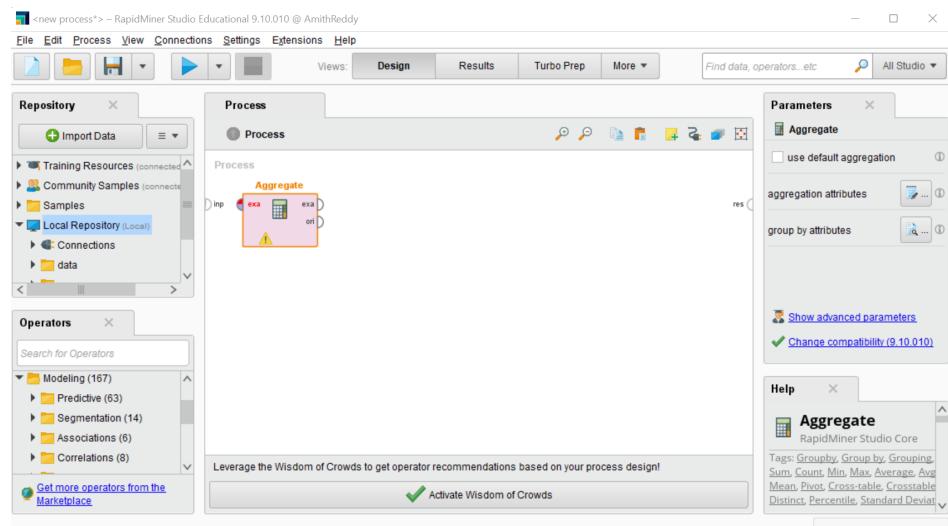


3. Correlation: This is another important function where we can find how strong our features in the dataset are correlated. We can find this in operators.



4. Modeling: With this function we can use any model that can solve our problem. RapidMiner has a wide range of modeling algorithms that can be used by operators. In this we have different types like predictive, Segmentation, Association etc., Which in turn have

many other modeling techniques that can be used in the process.



5. Extensions:

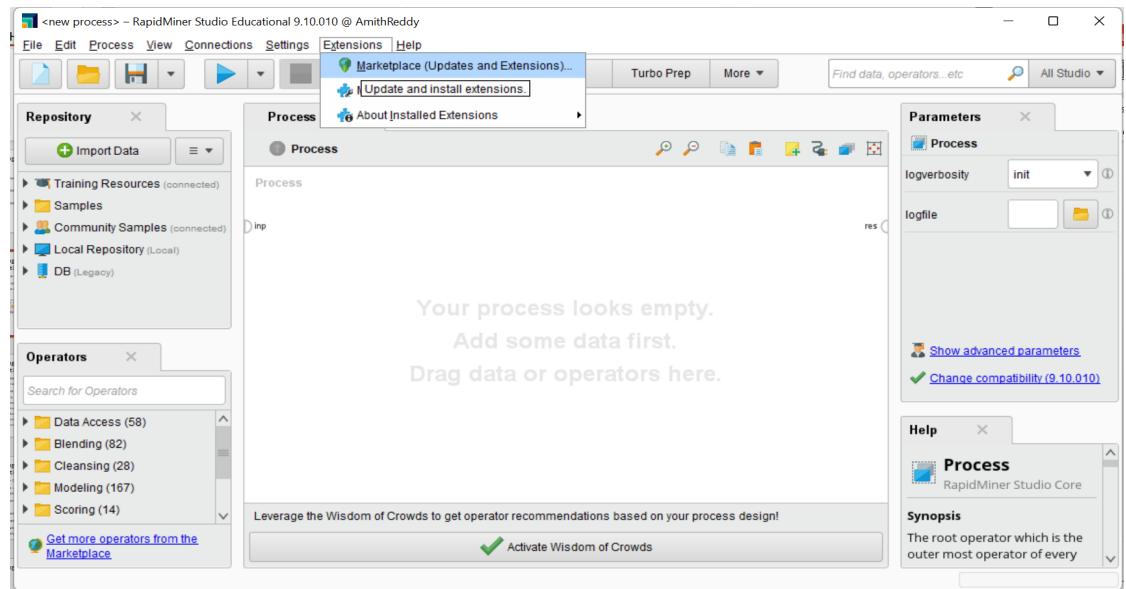
RapidMiner supports certain extensions to provide more high-level data analytic functions to derive an optimum and efficient result in the present data world.

This extension provides few major operators like R and Weka for data preprocessing, NoSQL connection for data, machine learning and other mining options for text and web.

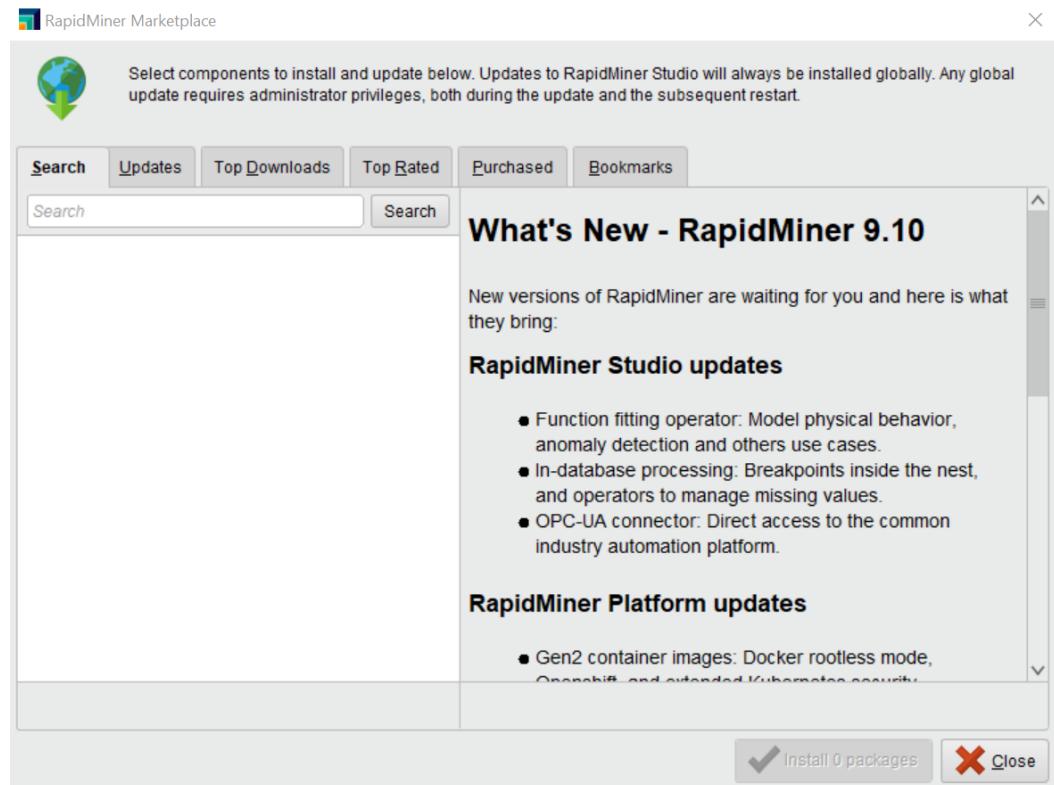
SETTING UP EXTENSIONS:

A. Installing within RapidMiner Studio:

- a. Once you open the RapidMiner Studio. At the top horizontal bar you can find the **Extension** option, click the **Marketplace** option.



- b. Once you click **Marketplace** you end up with a new tab as shown below.

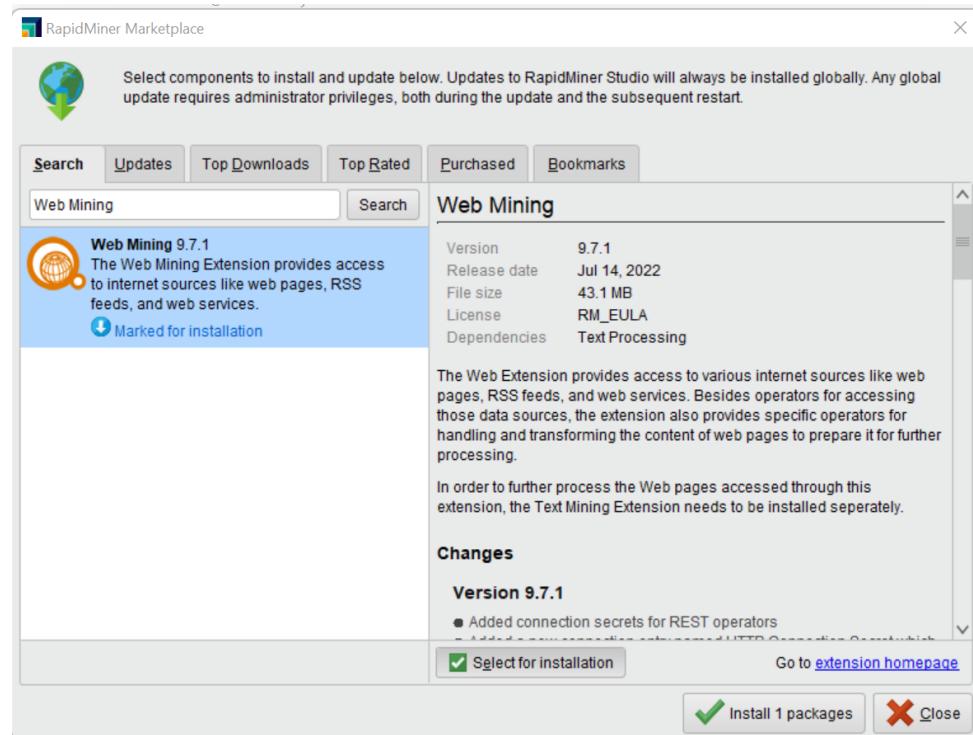


- c. Now depending upon our preference we can select the options provided.

As the option states -

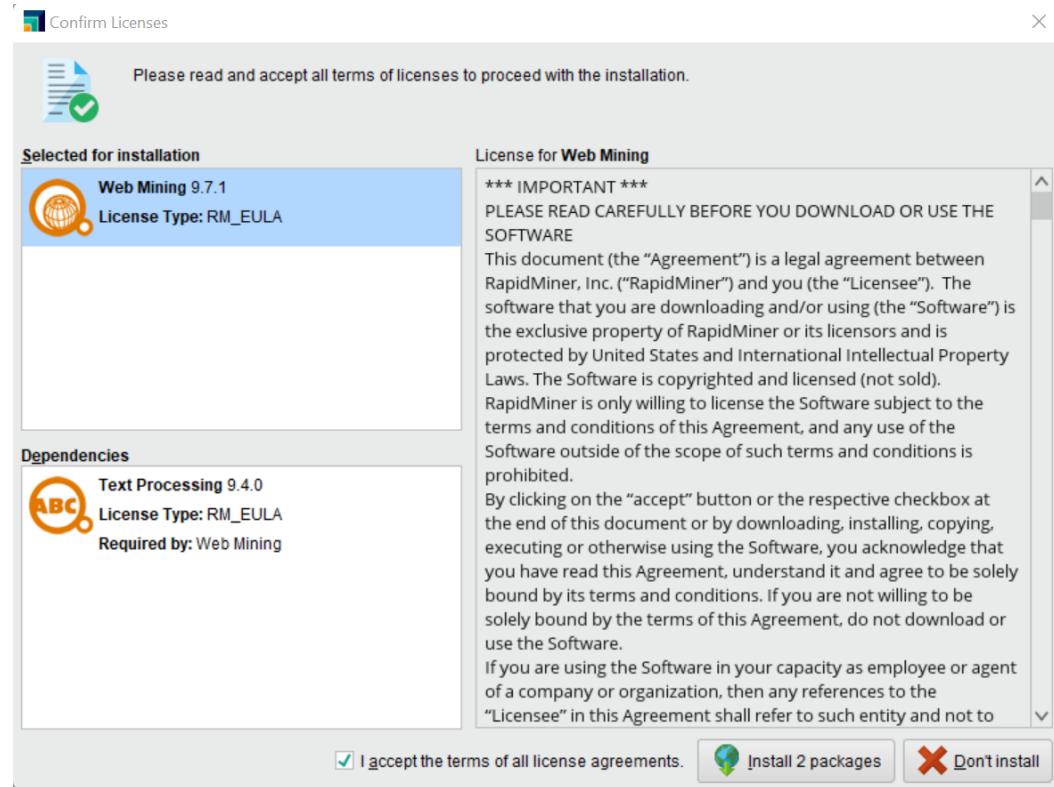
- Search, in this we can find the required extension.
 - Updates, when you click this it provides updates for all the available extensions.
 - Top Downloads, in RapidMiner this tab provides all the extensions that are downloaded by most users using RapidMiner.
 - Top Rated, this gives us the extensions that are highly rated.
 - Purchased, this gives us the extensions that are bought.
 - Bookmarks, keep a track of the extensions that are bookmarked by the user.
- d. Let us now search for an extension and install it. We will install a web mining extension. Then click on **Web Mining**, to the right you will be given all the documentation regarding the extension that is searched. Once you check the box for select for installation you will be ready to install the

extension.



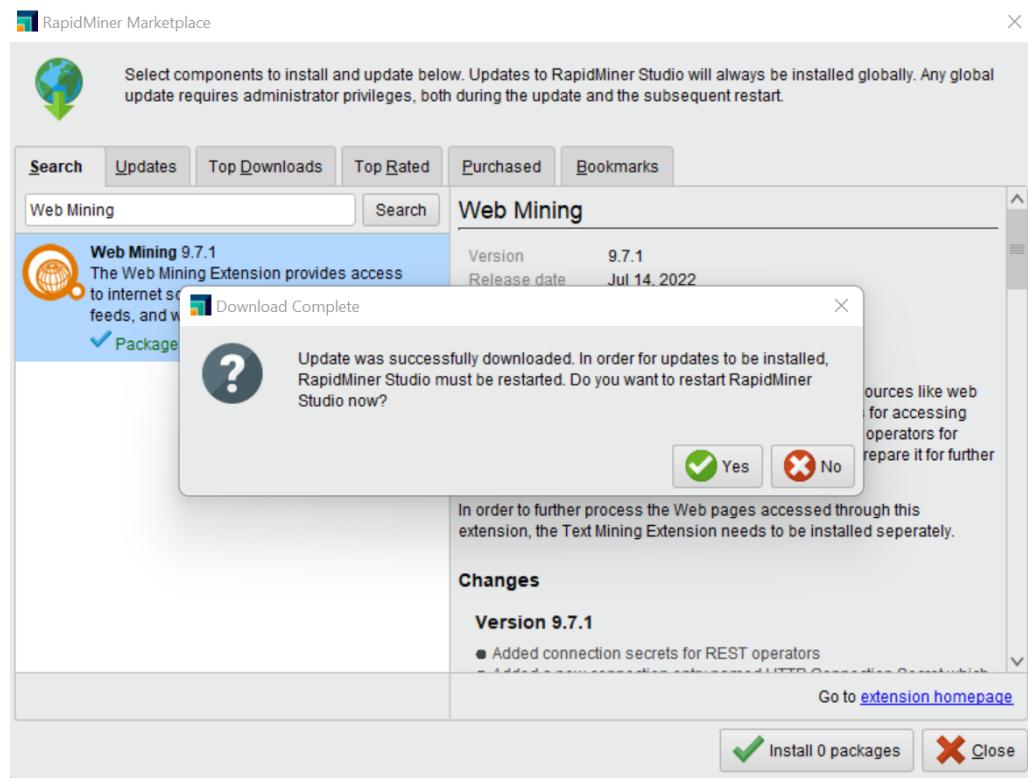
- e. Then click on **Install 1 packages**.

- f. Next, it will redirect to a license agreement tab which needs to be accepted by checking the box adjacent to it and install the extensions.

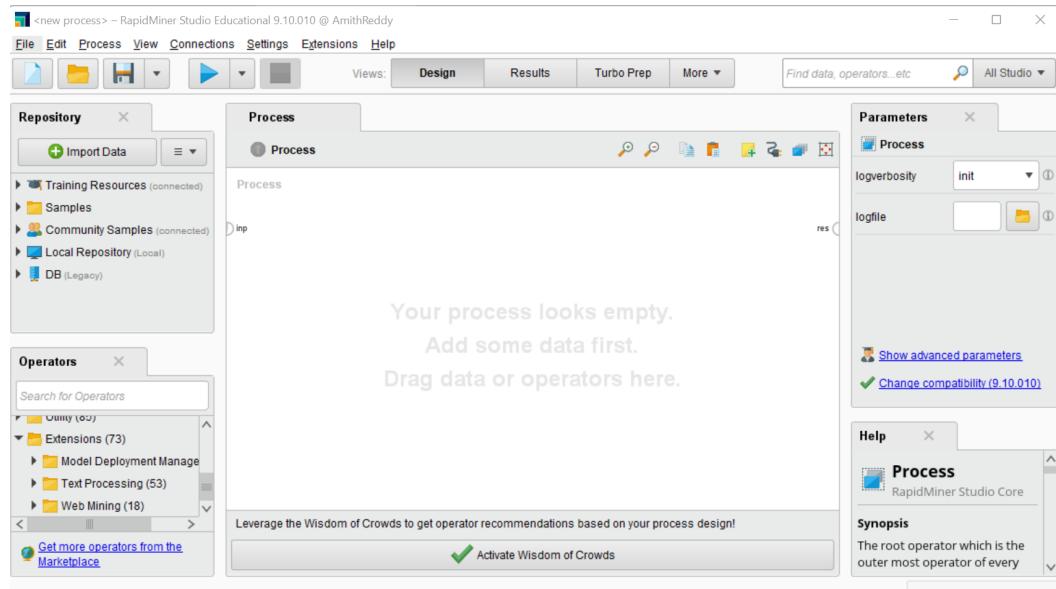


- g. Here, once we accept the license, we can see Install 2 packages. This is because Web Mining extension is dependent on Text Preprocessing so we can install both the packages at a time by clicking **Install 2 Packages**.

- h. Once the installation is completed you can show a dialogue box telling us to restart the RapidMiner Studio to install the updates. So click on **Yes**.



- i. The RapidMiner will restart with all the new updates and will be ready to use. These extensions can be found in the operators tab.



B. Installing using Manual File:

RapidMiner also supports the installation of extensions with the help of manual files. This is completely done with an external file unlike the previous process which is done within the application.

- a. Initially click on this URL <https://marketplace.rapidminer.com/>
- b. This opens a new web page where you can find different options where we can select any from the available.

The screenshot shows the RapidMiner Marketplace homepage. At the top, there is a navigation bar with the RapidMiner logo, the text 'RAPIDMINER Marketplace', a 'Login' button, a search bar containing 'Search for Extensions', and a magnifying glass icon. Below the navigation bar, there is a large, semi-transparent watermark featuring icons for a plus sign, a magnifying glass, a gear, and a question mark. The main content area has a heading 'Get even more out of RapidMiner with Extensions.' followed by a subtext: 'Extensions add new functionality to RapidMiner, like text mining, web crawling, or integration with Python and R.' Below this, there are two sections: 'Browse by Category' and 'Top Downloads This Week'. The 'Browse by Category' section lists categories such as Data Sources and Formats, Domain specific operators, Machine Learning, Operators, Training, User Interface, Libraries, and Development. The 'Top Downloads This Week' section lists extensions with their download counts: Text Processing (556), Anomaly Detection (300), Web Mining (295), Operator Toolbox (263), RapidMiner Radoop (147), Python Scripting (141), ND4J Back End (114), and Deep Learning (106).

Browse by Category		Top Downloads This Week	
Data Sources and Formats		Text Processing	(556)
Domain specific operators		Anomaly Detection	(300)
Machine Learning		Web Mining	(295)
Operators		Operator Toolbox	(263)
Training		RapidMiner Radoop	(147)
User Interface		Python Scripting	(141)
Libraries		ND4J Back End	(114)
Development		Deep Learning	(106)

- c. Here we can select any extension or we can search for the desired extension.
- d. Now I am clicking on **Anomaly Detection** and it redirects to the documentation page of this extension.



Anomaly Detection

The Anomaly Detection Extension comprises the most well known unsupervised anomaly detection algorithms, assigning individual anomaly scores to data rows of example sets

The Anomaly Detection Extension comprises the most well known unsupervised anomaly detection algorithms, assigning individual anomaly scores to data rows of example sets

==== 4.0.0 ===

Please be aware that this release is not backwards compatible, since attributes got new names!

Anomaly models are now serialized using JSON, not java serialization

Normal Anomaly models are now IOTablePredictionModels, just like any other learner (except clustering)

Since Anomaly models are now IOTablePredictionModels their response is prediction, not a score

Univariate models are still Preprocessing models, but their main score is called prediction. all other scores are called prediction(attributeName)

Univariate models are now stating the correct covered attributes in their description

==== 3.3.0 ===

Warning: This version is not backwards compatible, since column names changed from v 3.2.0 to 3.3.0 to have one schema.

* Trees in isolation forests can now define the number of features considered in every tree.

==== 3.1.0 ===

* Added a new operator Detect Outliers (Univariate), which was previously part of Operator Toolbox

* Added a new operator Detect Outliers (Time Series)

==== Version 3.0.1 ===

Added new operator Detect Outliers (Clustering) which wraps the three outlier detection algorithms

Detect Outliers (Clustering) provides a model to be applied on new data.

Added a new operator Detect Outliers (rPCA), which also provides a model.

Switched to an up-to date LibSVM version. Robust one-class is thus not available anymore. Results may differ slightly.

Switched the lib for RNN operator, results may differ.

==== Version 3.0.2 ===

Fixed minor bugs

[Install in Studio](#)

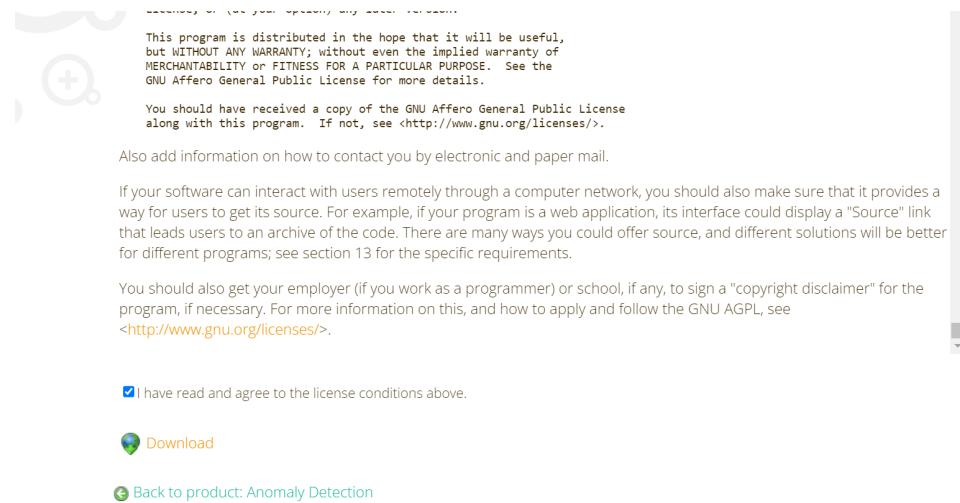
Studio 9.10.10+ (Windows or Mac)

[Download File](#)

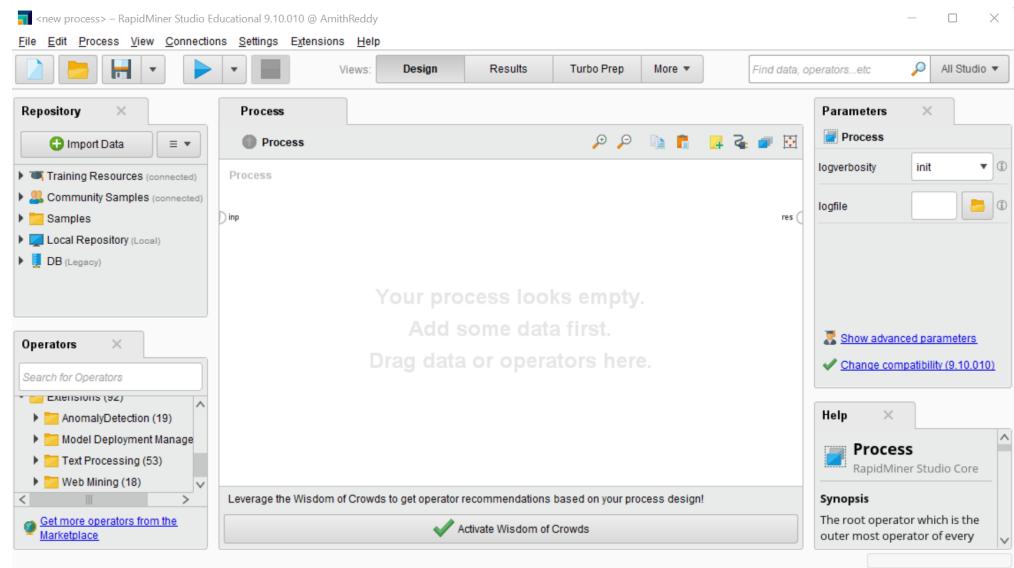
Read how to add Extensions to RapidMiner

-
- e. At the bottom of the page you can find the option to **Install in Studio** and **Download File**. Click on **Download File**.

- f. Once you click **Download File**, it will ask to agree for the license agreement, at the bottom just check the box and click **Download**.



- g. Once you download the file, copy the file and paste it in the RapidMiner Extension folder in your local machine.
- h. Then you can restart the RapidMiner Studio and check the extensions tab that should have the installed extension. In the below screenshot we can find the Anomaly Detection in Extensions tab.

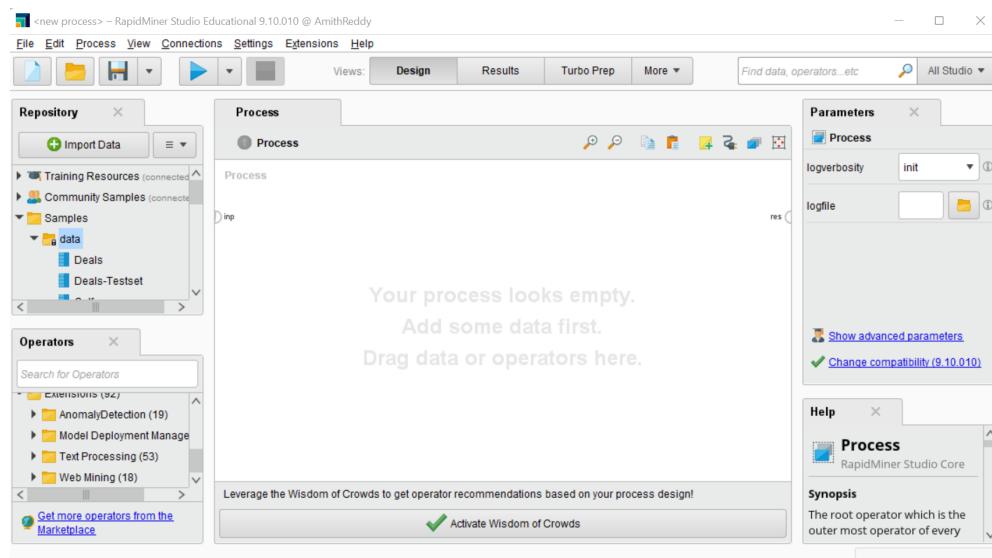


6. MODEL BUILDING:

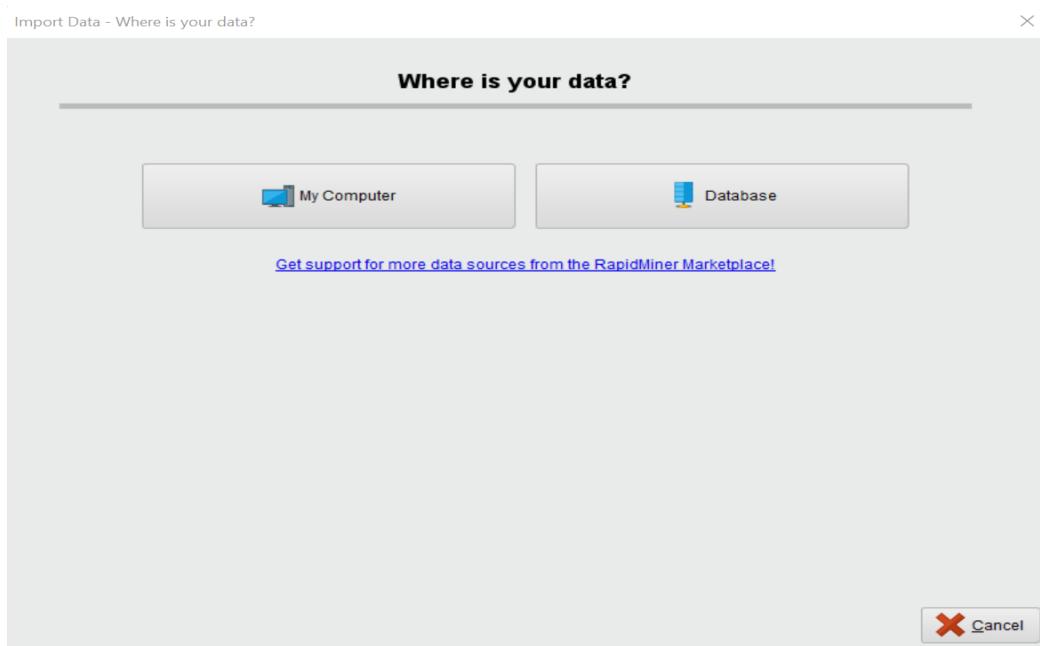
Once the complete setup of RapidMiner is completed we are ready to build the required models.

A. Data Preprocessing:

- a. This is the initial stage of any model building. Either you can import the data from different sources or you can use the available datasets that are preloaded in the repository tab.



- b. So, here we are importing a car dataset from a local machine to predict the car prices.



- c. Click on **My Computer**.
- d. Then select the dataset from the computer and click **Next**.

Import Data - Select the data location.

Select the data location.

Datasets

Bookmarks	File Name	Size	Type	Last Modified
---	.ipynb_checkpoints		File Folder	Jun 13, 2022
---	templates		File Folder	Jul 26, 2022
	app.py	1 KB	Python Source File	Jul 26, 2022
	app.txt	1 KB	Text Document	Jul 26, 2022
	breastcancer.csv	18 KB	Microsoft Excel Co...	Jun 19, 2022
	CAR DETAILS FROM CAR DEKHO.csv	346 KB	Microsoft Excel Co...	Jun 12, 2022
	Carpice.ipynb	622 KB	Jupyter Source File	Jul 26, 2022
	EntityExtraction.csv	1 GB	Microsoft Excel Co...	Jul 6, 2022
	EntityExtraction.csv_chunk_0.hdf5	1 KB	HDF5 File	Jul 7, 2022
	FakeNews_test.csv	23 MB	Microsoft Excel Co...	Jul 19, 2022
	FakeNews_train.csv	94 MB	Microsoft Excel Co...	Jul 19, 2022
	Flight_Data_Train.csv	1 MB	Microsoft Excel Co...	Jun 12, 2022
	Flight_Test_set.csv	254 KB	Microsoft Excel Co...	Jun 11, 2022
	IMDB.csv	62 MB	Microsoft Excel Co...	Jul 2, 2022

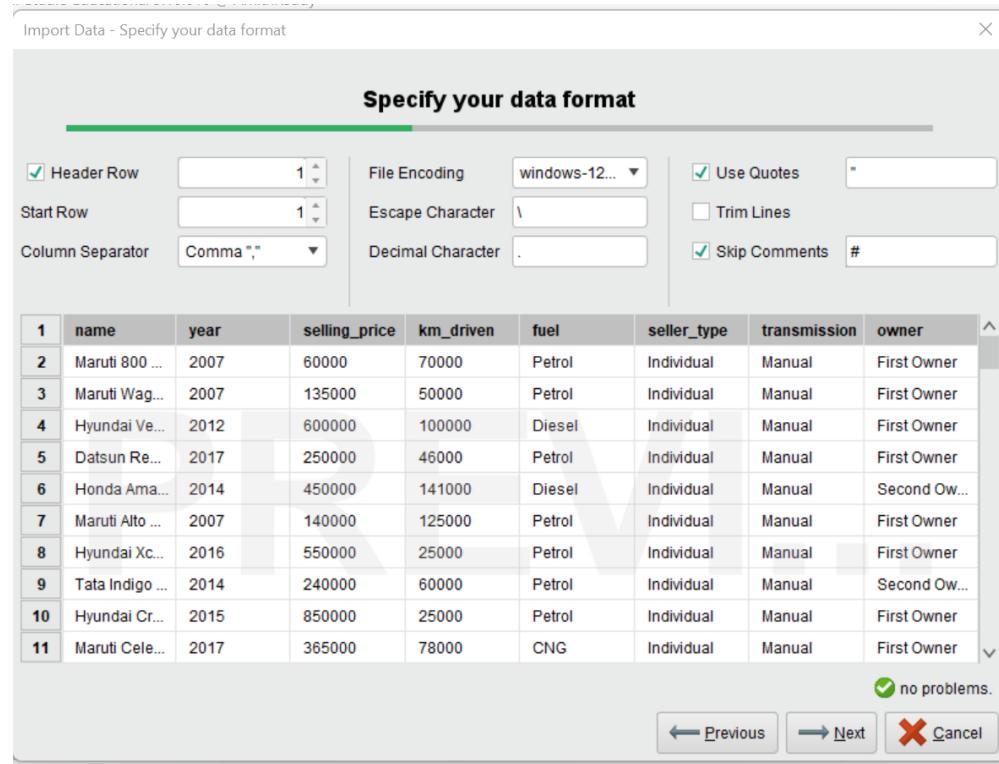
CAR DETAILS FROM CAR DEKHO.csv

All Files

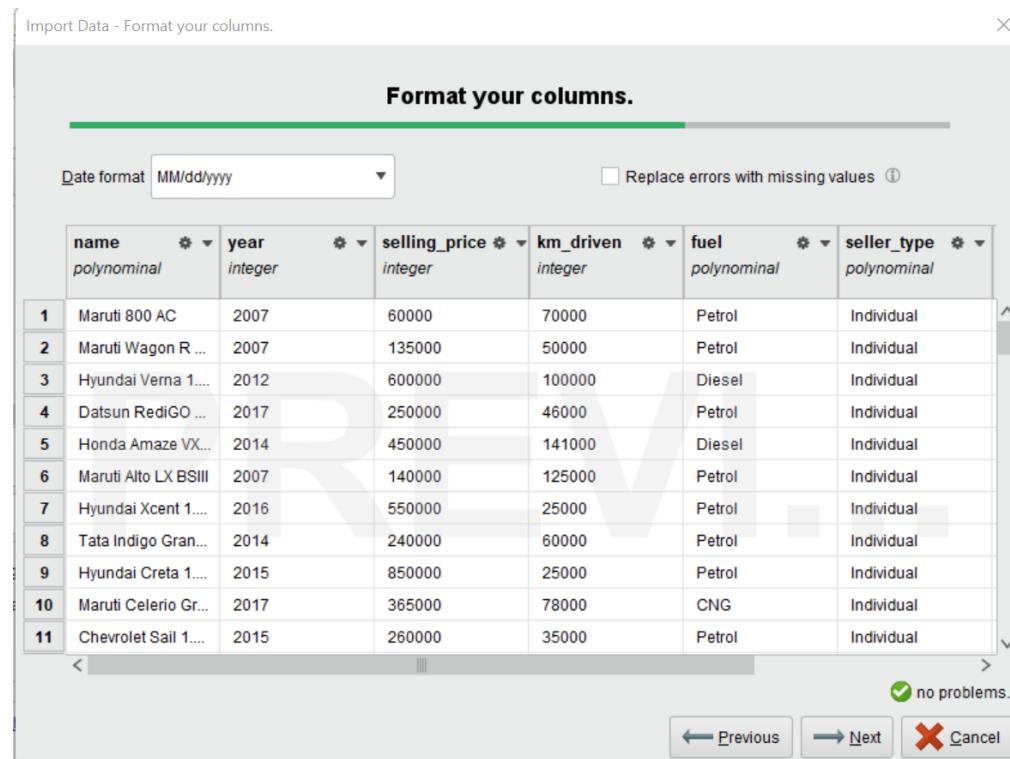
The selected file will be imported as: CSV [Change](#)

Previous Next Cancel

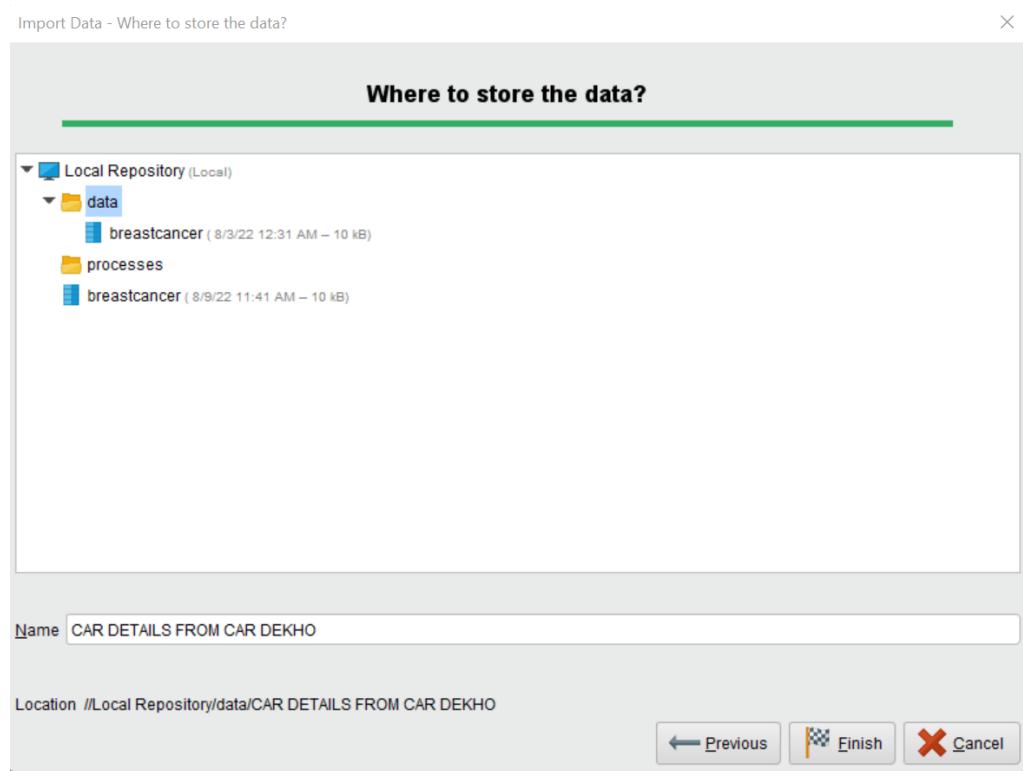
- e. Then in the next tab you can specify the required data format if any.



- f. Then you can format the columns depending on the requirement. Click on **Next**.

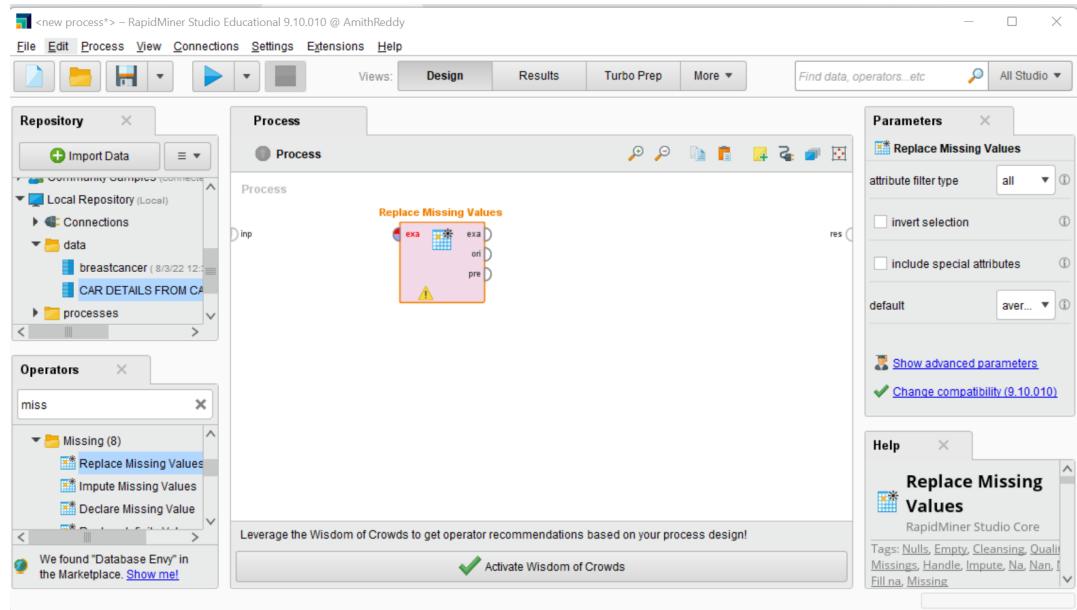


- g. Then the final step to import data is where we want to store the data in the Local Repository. Here we store it in data. You can see the path of the data at the bottom. Then click **Finish**.

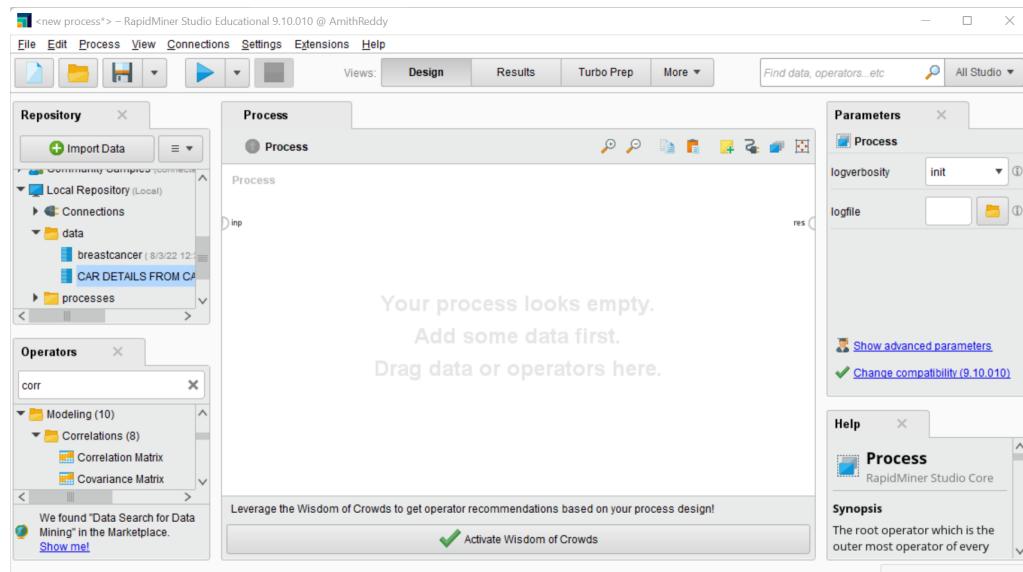


- h. Once the data is loaded you can view the required result in the results view.

- i. We can also check for missing values in operators and replace them.

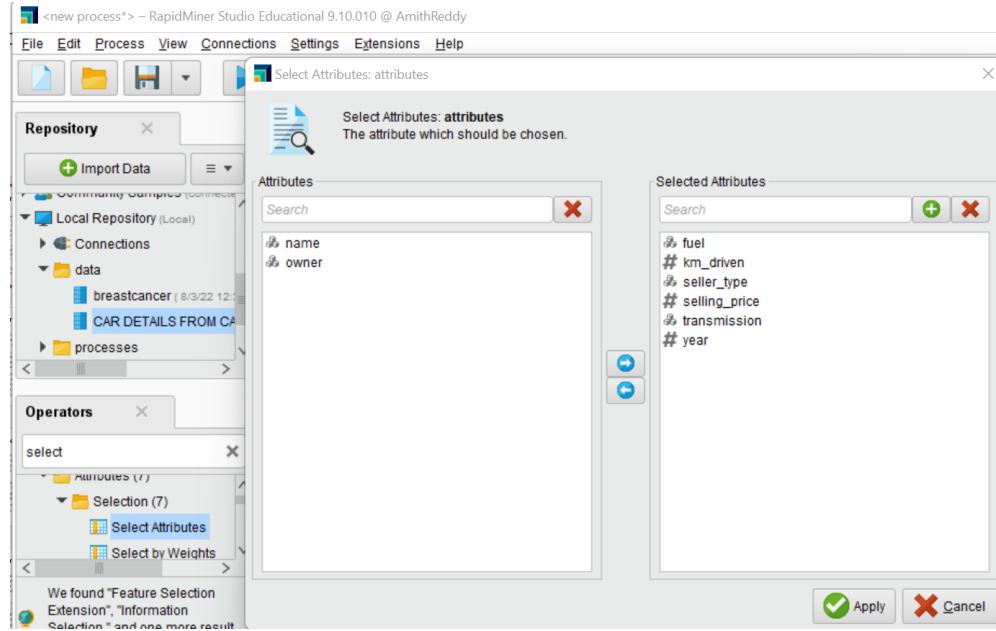


- j. Here, we can replace the missing values with any type of values be it sum, maximum, minimum, average. Default RapidMiner has Average. You can find these operations in the parameters tab on the right side of the studio.
- k. Now after replacing the missing values and removing them we can find the correlation of the parameters in the dataset. This correlation is found in the operation.

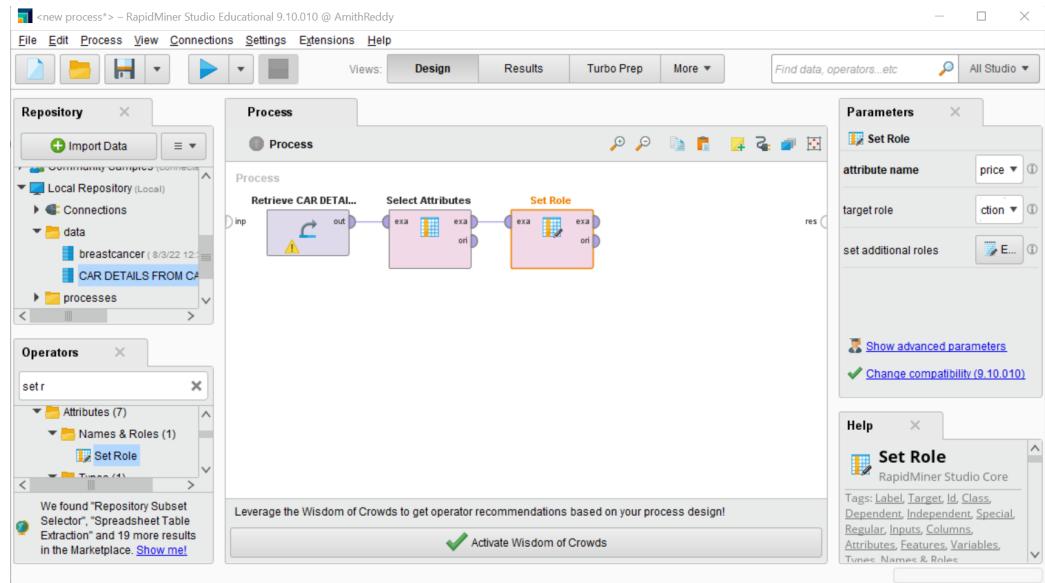


- l. Once all the data cleaning and preprocessing is completed, we can define the dependent and independent attributes in the dataset.

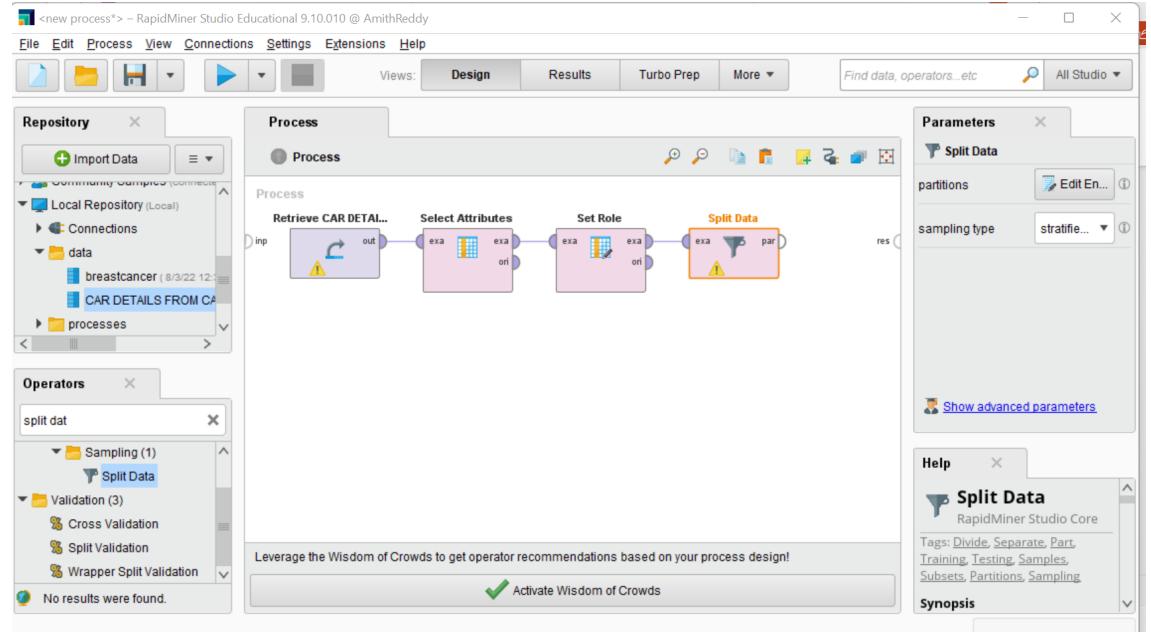
m. This operation is included in Selection, once you drag the Select attribute function in the process and click on the cell, to the right side in the parameters tab select subset in attribute filter type.



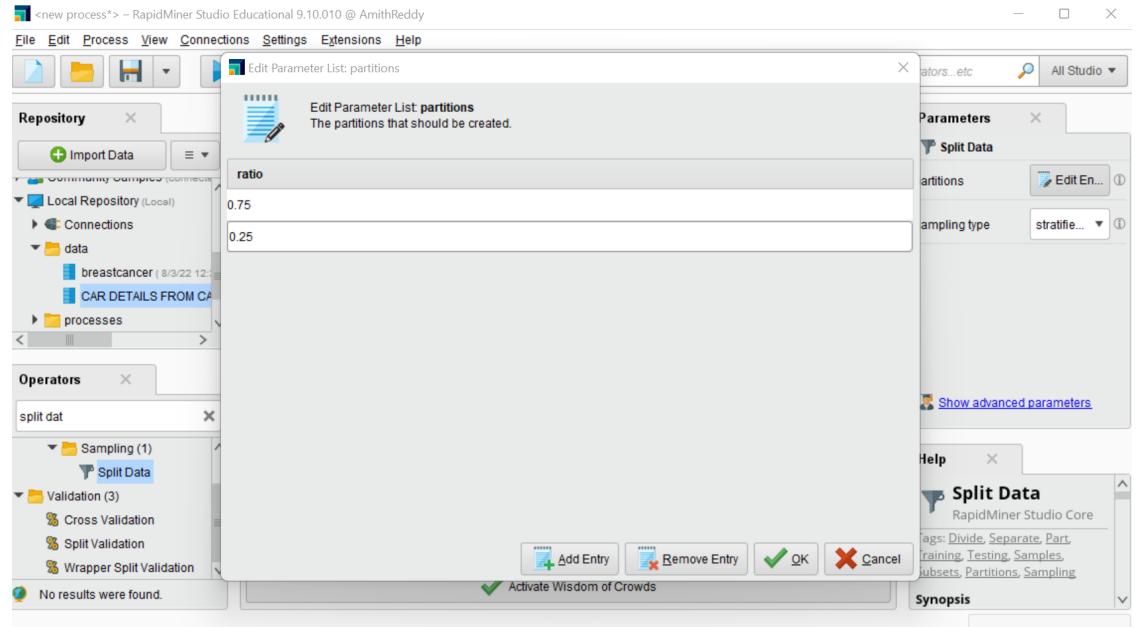
- n. Now, we selected the required attributes from the dataset to build the model.
- o. Next we should set up the role, like the target role with respect to the attribute name. This set role function is also present in the operators tab.



- p. In the above screenshot, once we drag Set Role and in the parameters tab at the right side we select the **prediction** for **target role** for **Selling Price** attribute.
- q. We can split the data for train and test, this split function is also present in operators. It will provide different sampling techniques to select from sampling types.



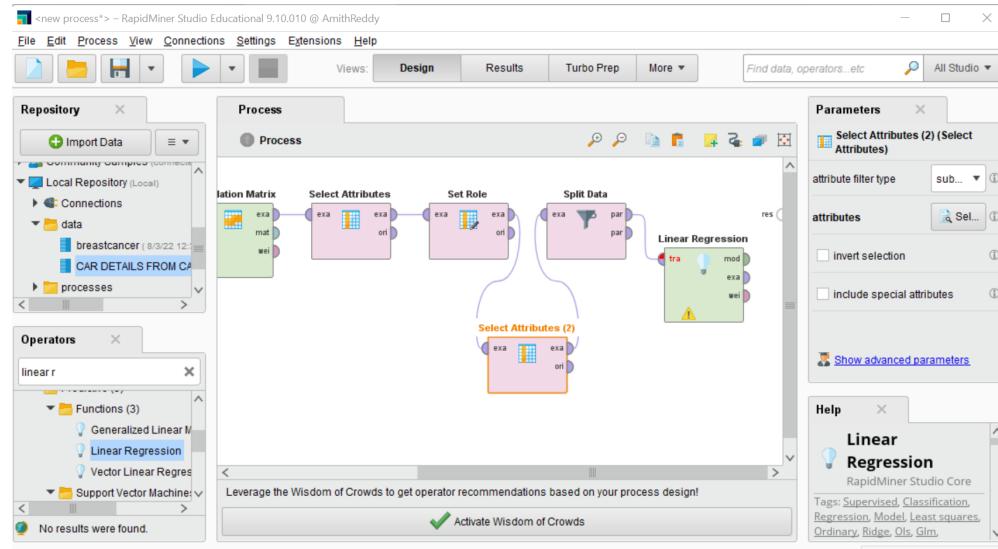
- r. Once we select the sampling type, click on **Partitions** it will ask for ratio, add the ratio - generally splitting data is done by 70/30, 75/25, 80/20.



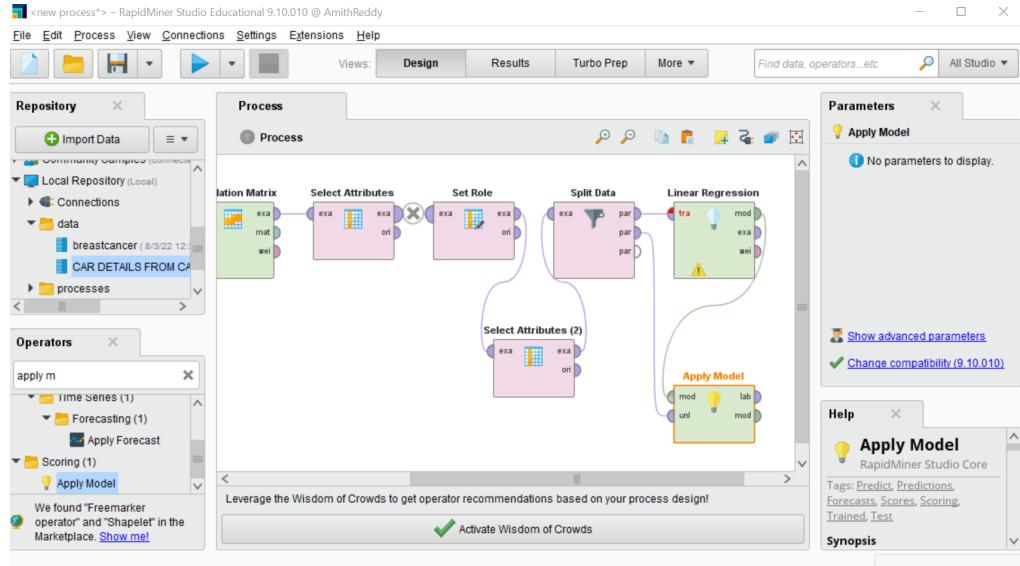
- s. Thus we completed all the data preprocessing and cleaning. Now we can build the machine learning model.

B. Linear Regression:

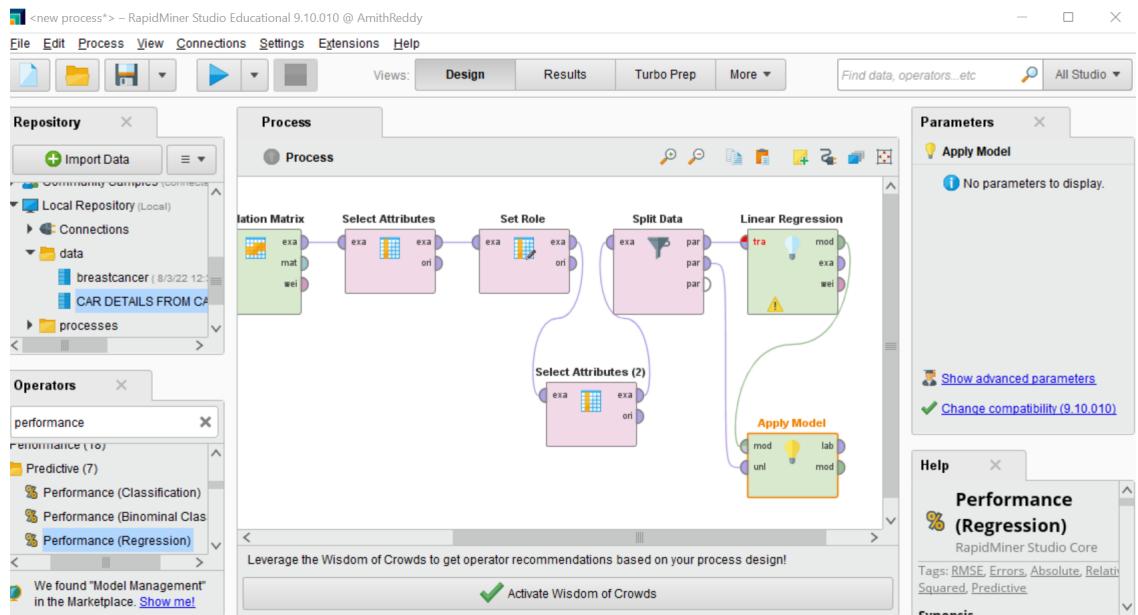
- a. This linear model is already pre build and available in operators.



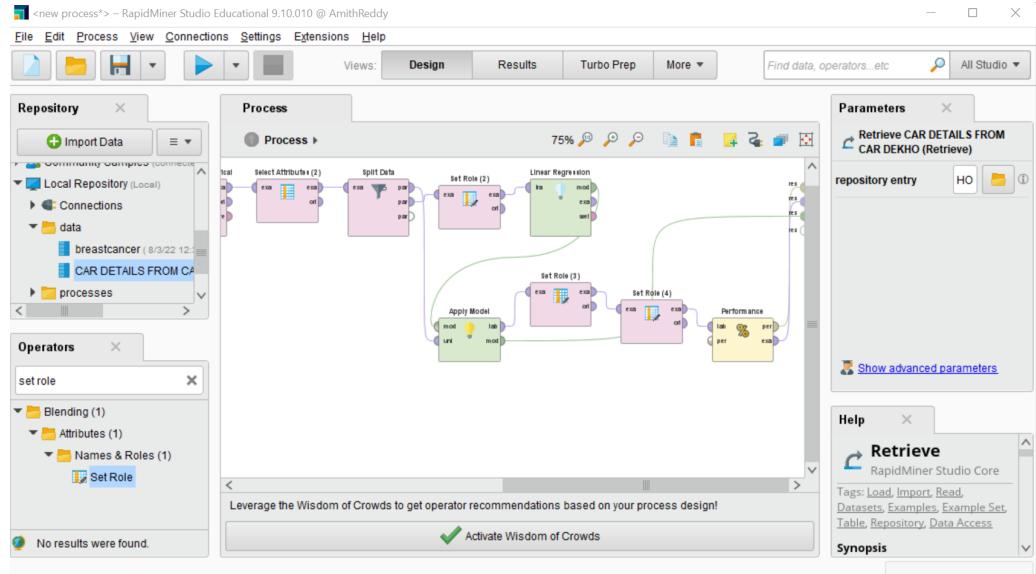
- b. Next we need to apply a model which is predefined and available in operators.



- c. This Apply Model helps us to evaluate the performance of our Machine learning algorithm. The test data from split is connected to Apply Model and output from Apply Model is connected to Linear Regression.
- d. To evaluate our model, check for performance in operators. Depending on the model we can select the performance. Here we will choose Performance for regression as this is a Regression model.



- e. Then at the end connect the performance to the result and click the **Execution** Button on the top.

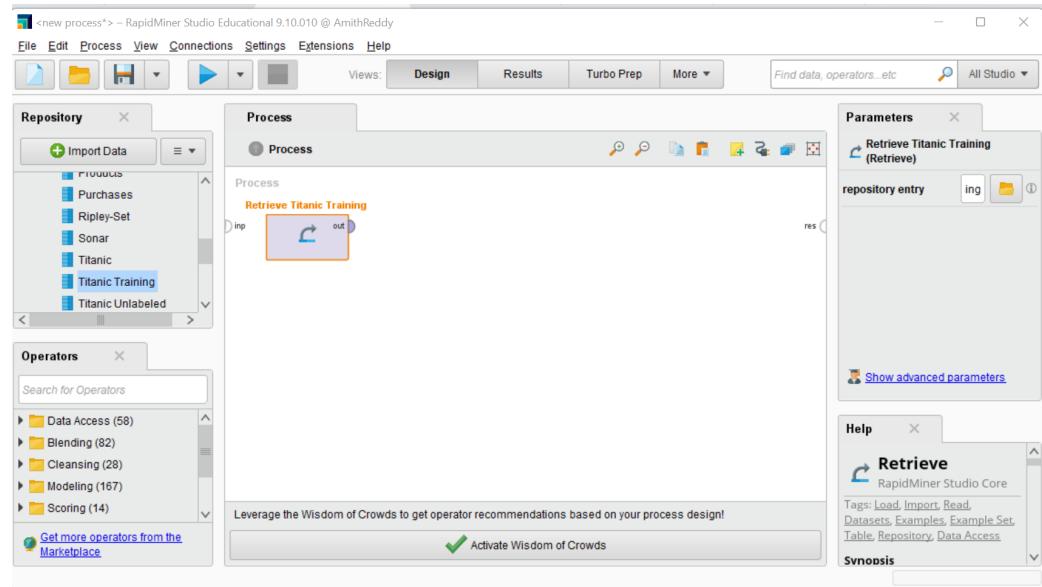


- f. Once the execution is completed the prediction result will appear.
g. Thus we can build a complete model in a step to step manner.

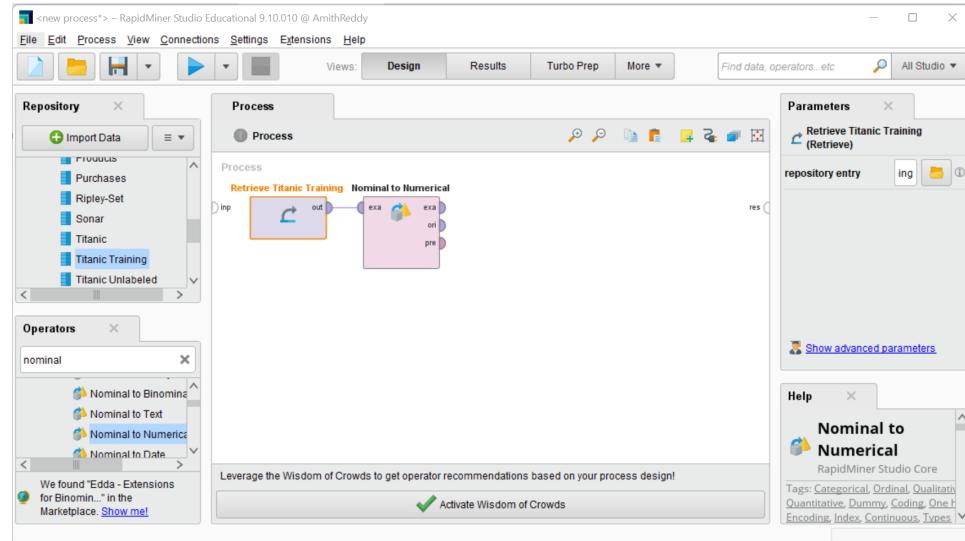
C. Logistic Regression:

- In this machine learning model, the output is a discrete value i.e., it is either Yes or No, 1 or 0, True or False etc.,
- For this model, let us take the pre trained data from RapidMiner called Titanic Training

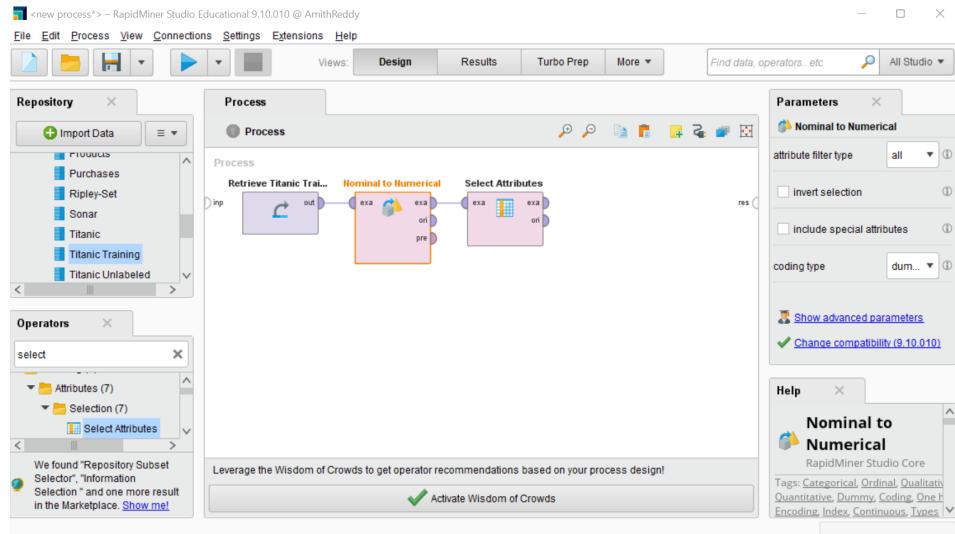
c. This data set is available in Repository>Samples>data>Titanic Training.



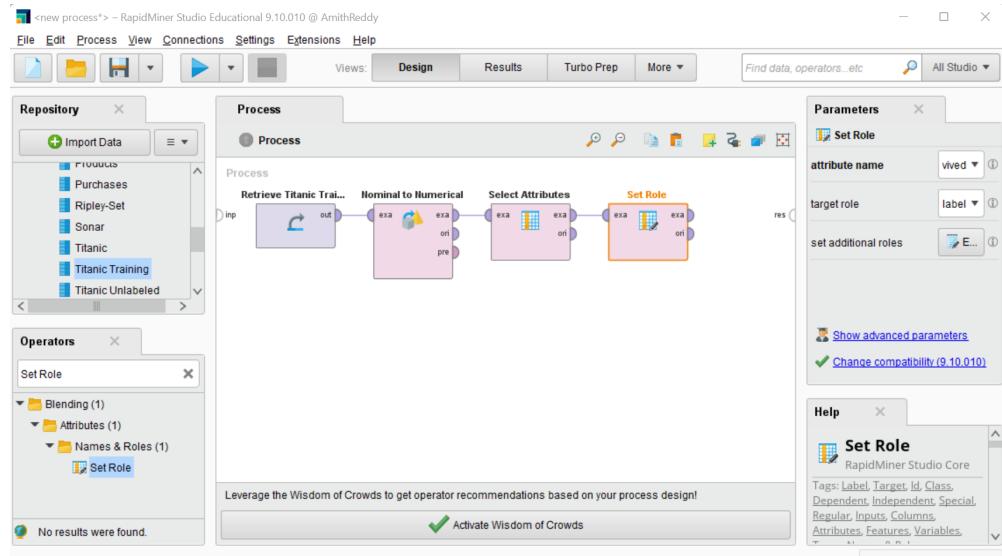
d. Now we need to select nominal to numeric from types in attributes from operators.



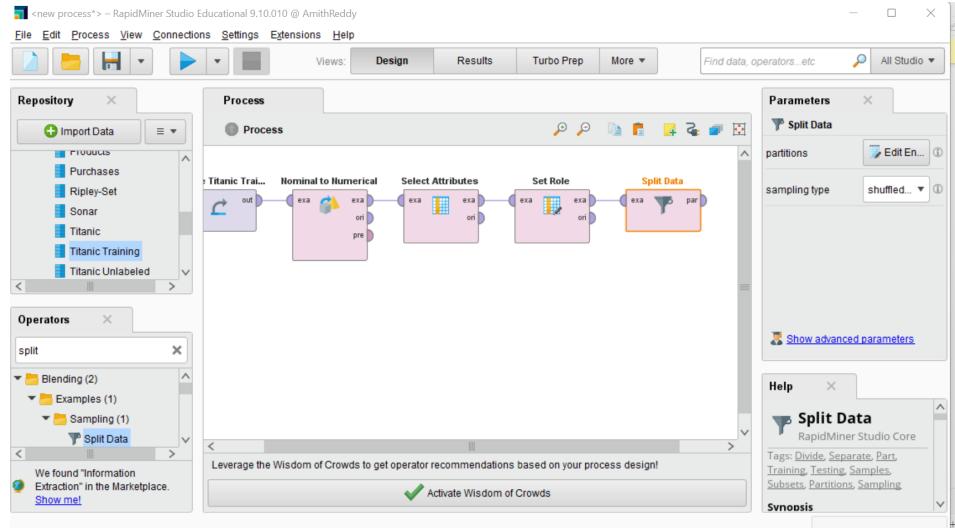
e. Next we can select the attributes required. Which is also present in the operators tab. Operators > Selection> Select Attributes.



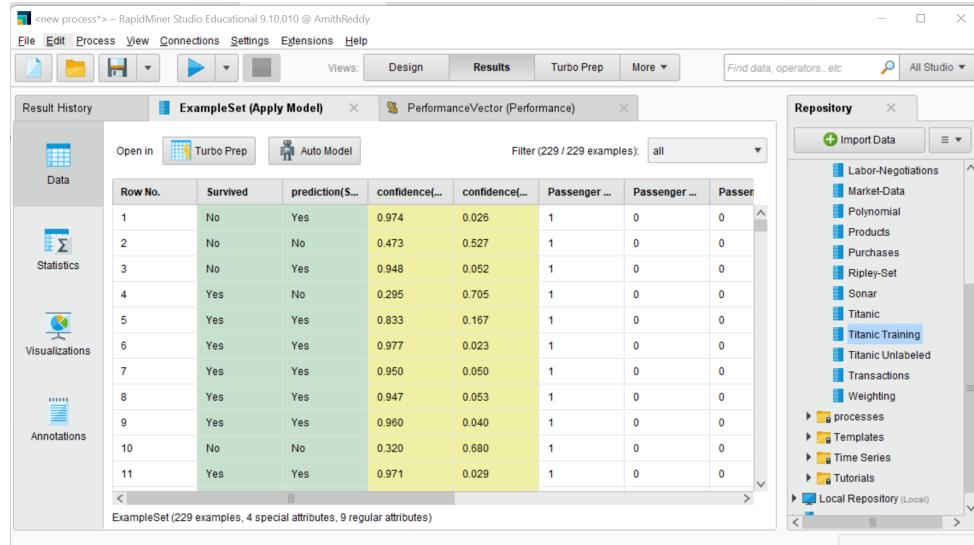
f. Now we should set the role of our attributes. We selected attribute name as survived and target role as label in parameters tab.



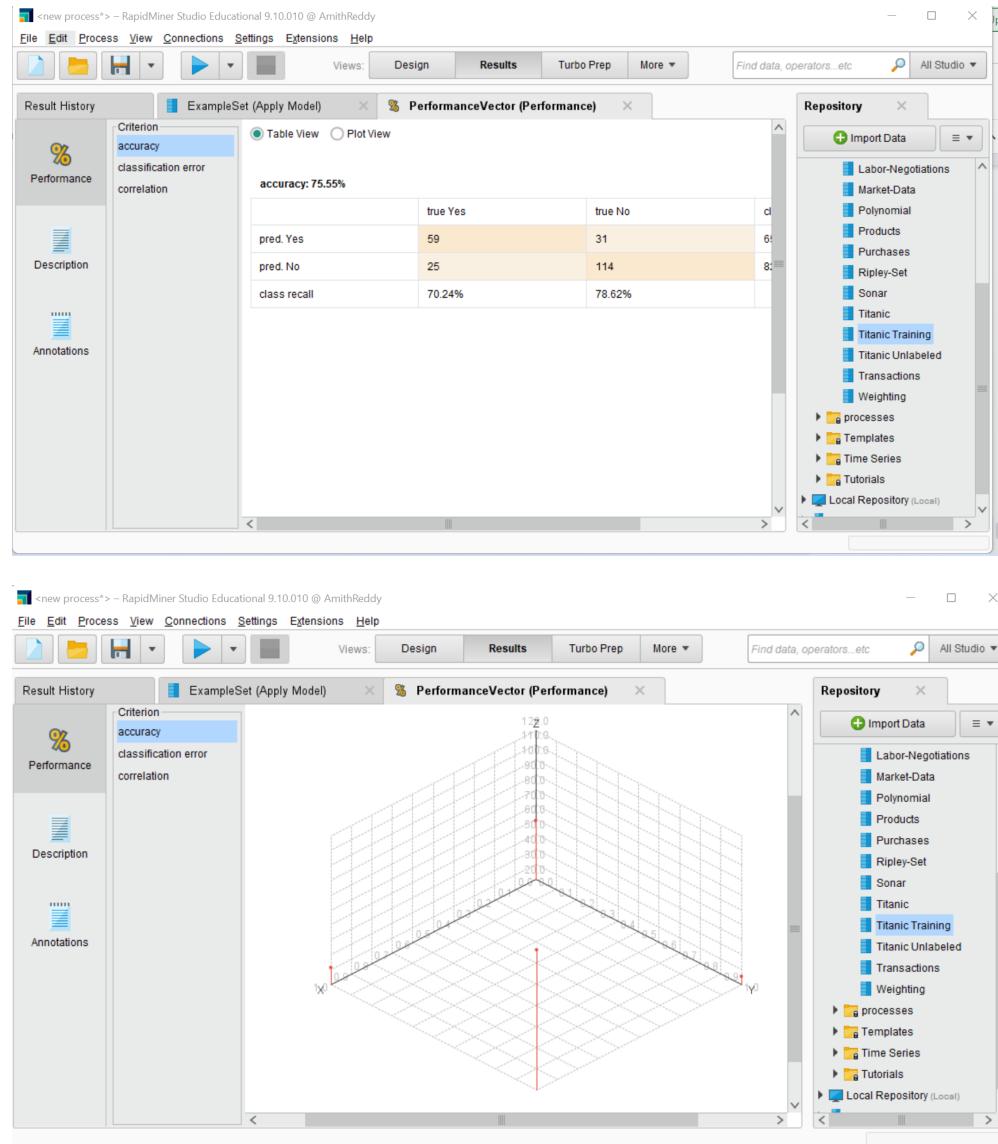
- g. Once data is preprocessed we can split the data as per our requirement. We can get the split function in operators as well.



- h. Now we can get the Logistic Regression model, Apply model and performance to build the complete model and derive the results.



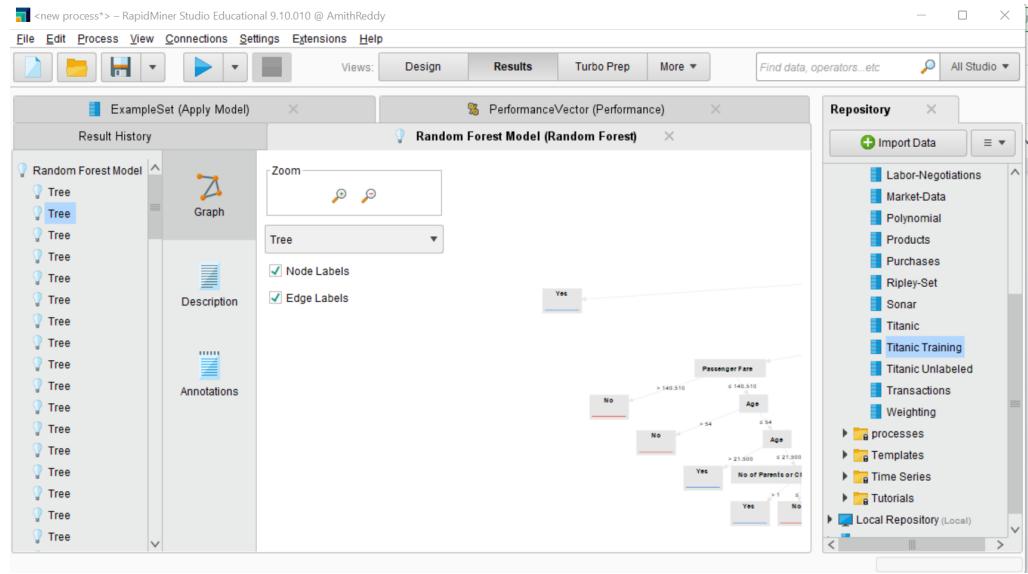
- i. Performance Metrics of our Logistic Model. Here we can get any of the metrics that are needed and can view the result in both table view and plot view.



D. Random Forest:

- Now let us build a Tree model and view the process of building the model.
- Even this model also has the same preprocessing steps like the previous models. Only difference is we consider the model selection to be different.

c. Then we will be getting the output as below and we can check for each tree as the data is bagged into different trees.



Therefore, we are now good with model building and data preprocessing in RapidMiner Studio.

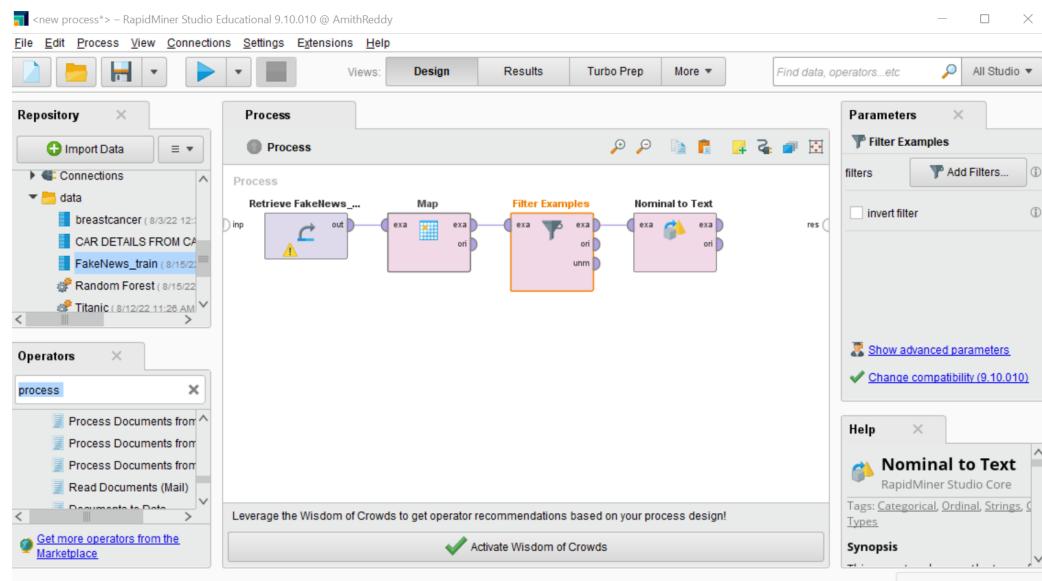
7. TEXT ANALYSIS, CLUSTERING AND ASSOCIATION RULES:

In RapidMiner, we can also perform Text Analysis, Clustering and Association Rules.

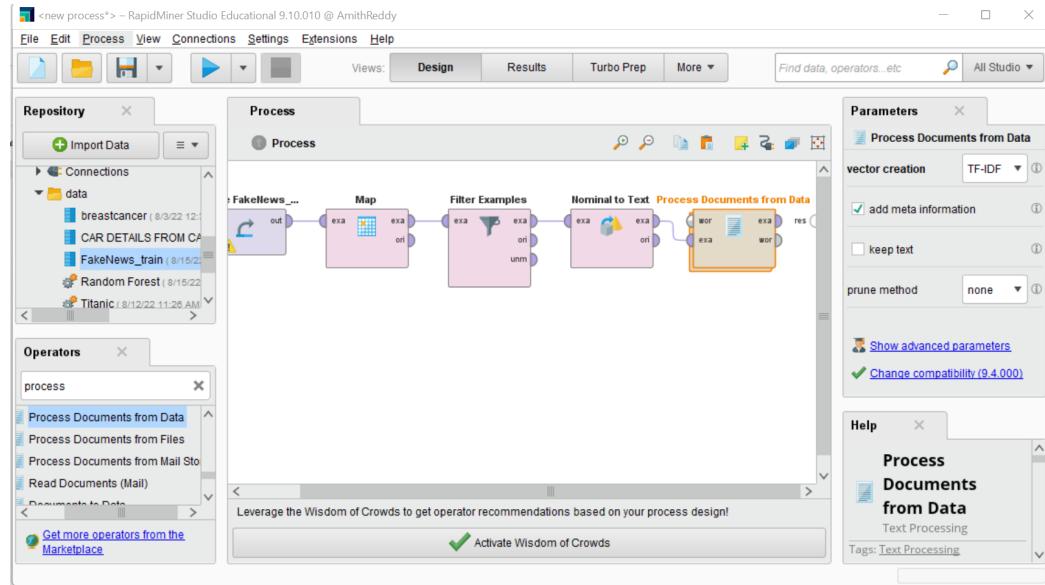
A. TEXT ANALYSIS:

This text analysis can also be performed in RapidMiner, the preprocessing steps are the same as the above model building.

- a. Initially, we will take the required data and load it in the process stage.
- b. Next, we can use preprocessing tasks like filtering the text and changing the nominal data to text.



- c. Then we can use a function called Process Documents from data, available in the operators tab.

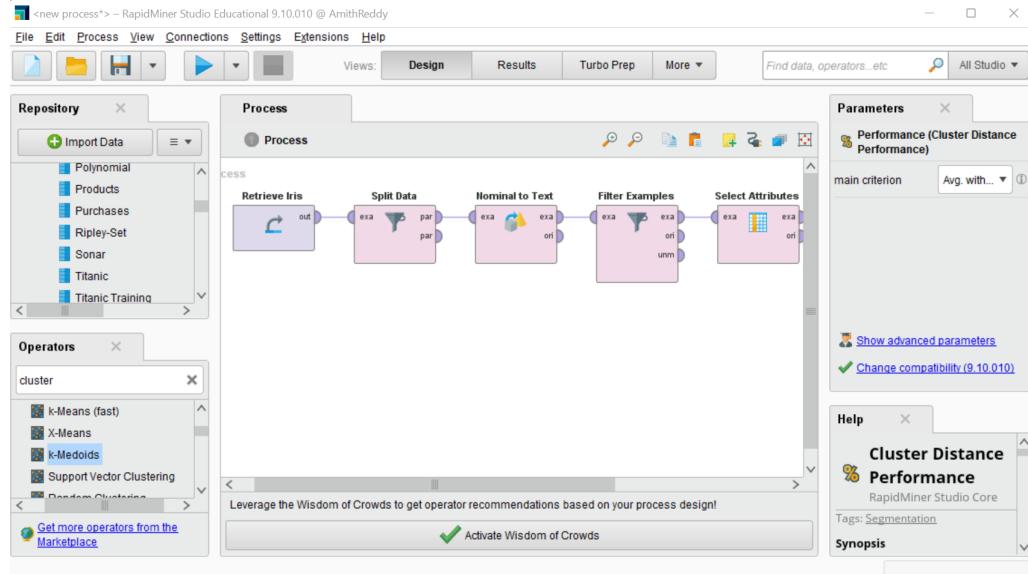


- d. Next, we can set the role and split the data according to our requirement.
e. Then we can select the desired model from the operators tab.
f. Finally the model provides us the result tab and all the performance metrics.

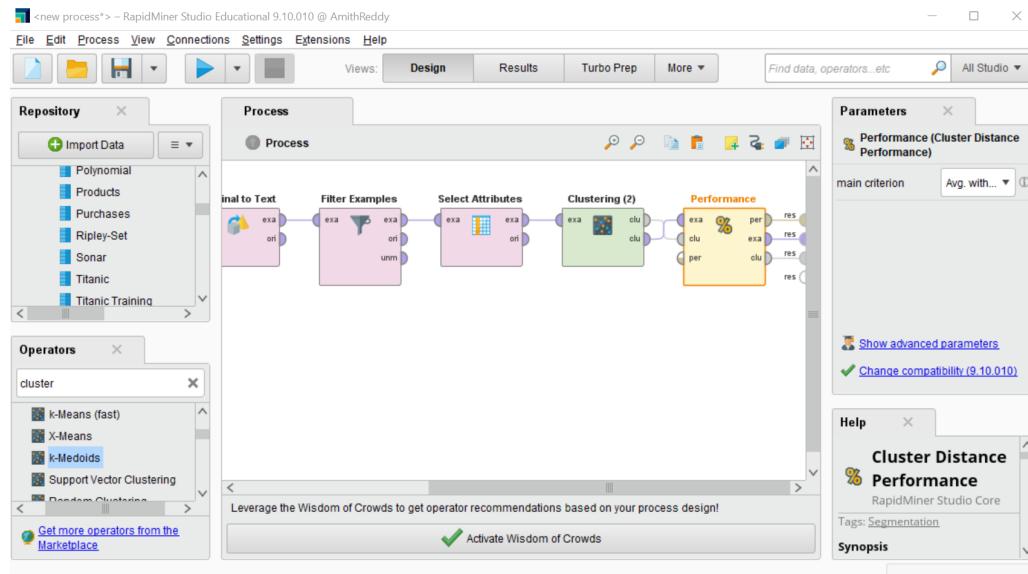
B. CLUSTERING:

Clustering is an unsupervised machine learning algorithm. The main aim of this algorithm is to make different clusters with available data points based on their distance between each other.

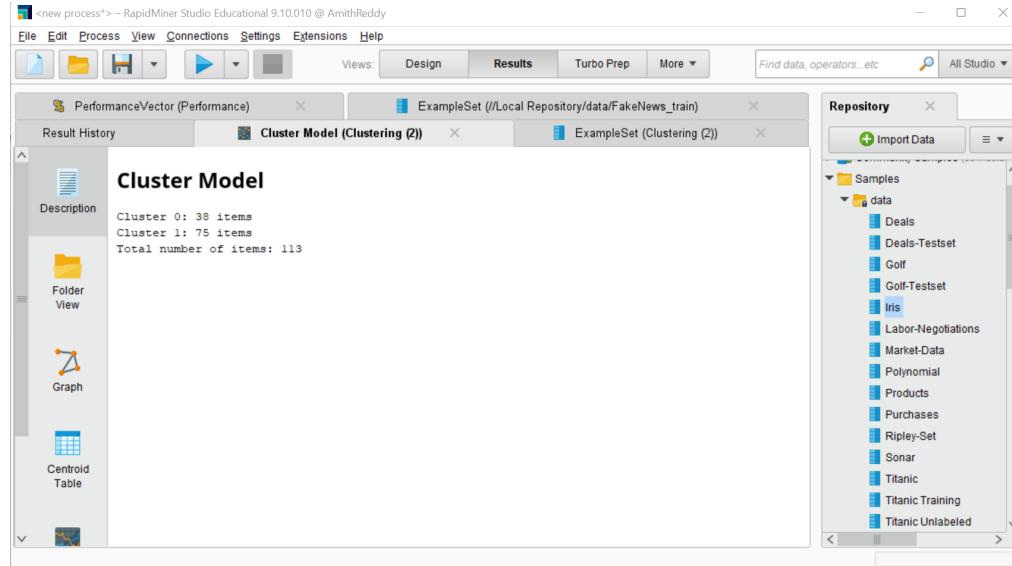
- a. Building this model also includes all the same preprocessing and data loading techniques.



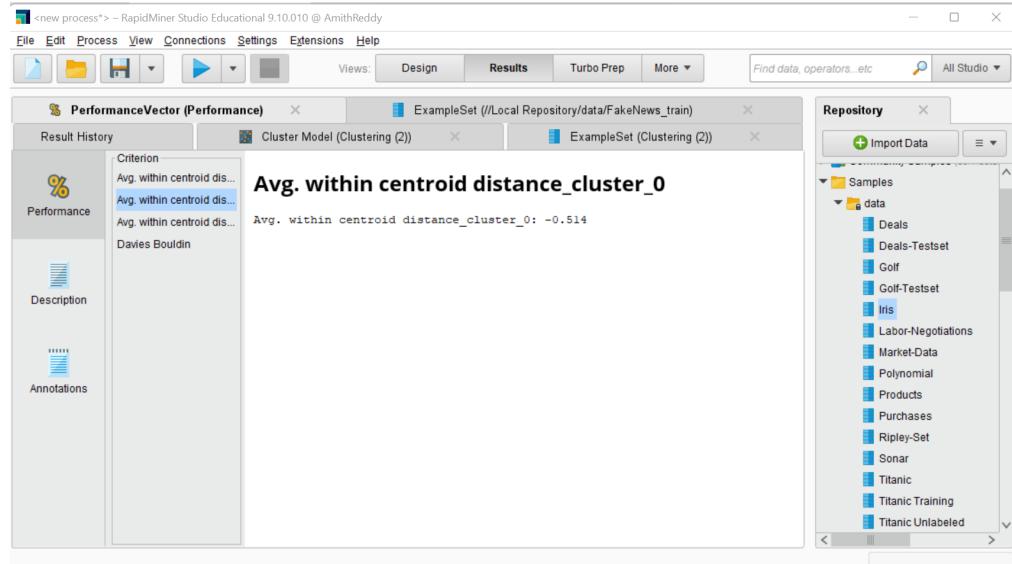
- b. Next we can get the clustering model from operators and the choice of the model should be based on the dataset. Here we considered k-medoids clustering.



- c. Then we execute the complete process and results for the model will be displayed.



- d. We can now state that for the dataset we can have 2 clusters. We can also check the performance of our model.



- e. We can present the required metrics by selecting the tabs at top.

C. ASSOCIATION RULES:

This is a rule based model. Where we can derive certain rules and relationships from the given data.

The arrived association rule contains antecedent and consequent part -

Antecedent is the first part in the data available and the consequent is the combination with the antecedent part.

Eg: If a student buys a book, he/she is 85% likely to buy a pen.

In this we can say that the student is antecedent and the pen is consequent.

These association rules contain two important features.

1. Support.
2. Confidence.

Here Support indicates how frequent the antecedent and consequent appears in the data.

Confidence provides us the total number of times these relationships appear true.

8. Conclusion:

Overall we can say that this RapidMiner Studio is one of the efficient tools for data analysis and model building. As this provides us all the functionalities, tools and techniques to complete end to end data science projects without using any code makes this tool one of the best in the industry.