

# Energy Efficiency Recommendations

By Aishani Singh



# What is RapidMiner?

**RapidMiner by Altair is a powerful data science platform used for tasks such as data preparation, text mining, predictive analytics, and machine learning. It enables users to build and deploy models with minimal coding through its visual workflow interface, making it accessible for both beginners and experts in data science.**



# Energy Efficiency Recommendations

- **Building an Energy Efficiency Recommender System using a dataset from Kaggle. The objective is to optimize energy consumption in residential buildings, specifically focusing on heating and cooling loads, using available data on energy usage patterns. We aim to develop a system that analyzes historical data to identify patterns and trends in heating and cooling consumption, allowing for the implementation of targeted energy-saving actions and recommendations.**
- **link from kaggle of dataset**
- **[https://www.kaggle.com/code/kehindabayode/energy-efficiency-model-for-residential-building/input?select=ENB2012\\_data.csv](https://www.kaggle.com/code/kehindabayode/energy-efficiency-model-for-residential-building/input?select=ENB2012_data.csv)**

# About The Analysis

## RapidMiner Features:

- **GUI:** RapidMiner's graphical user interface is user-friendly and helps streamline the data analysis process.
- **Drag and Drop:** The drag-and-drop feature makes it easier for data analysts to build workflows without extensive coding.
- **Various Algorithms:** RapidMiner provides a wide range of methods and algorithms for predictive modeling.

## Methods to Build the Model:

- **Automodel:** This feature automatically selects and applies the best model for your data based on various criteria.
- **Process Panel:** This feature allows you to manually build and customize your workflow .

## Methods and Algorithms:

- **RapidMiner** offers a diverse set of operators and algorithms, allowing for flexibility in model building.

# About Dataset

- Name of the dataset survey residential.csv
- It has 768 records with 10 Attributes

## Steps to cleaning the dataset:

- Select Attributes
- Normalize
- Detect Outliers
- Filter Examples

## Importing dataset:

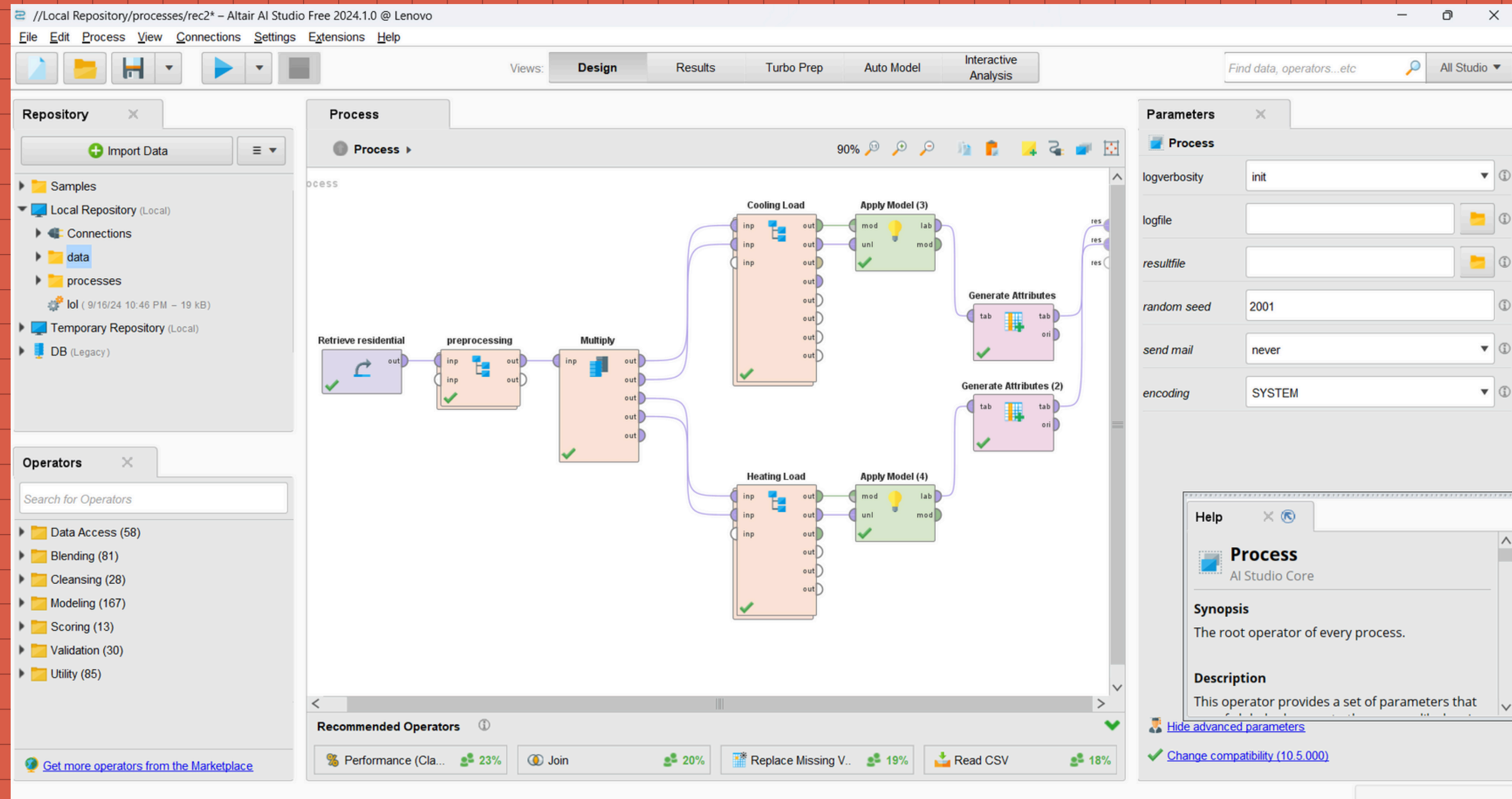
- Retrieve residential.csv

# Attributes

- **X1 - Relative Compactness**
- **X2 - Surface Area**
- **X3 - Wall Area**
- **X4 - Roof Area**
- **X5 - Overall Height**
- **X6 - Orientation**
- **X7- Glazing Area. Three types of glazing areas, which are expressed as percentages of the floor area: 10%, 25%, and 40%.**
- **X8 - Glazing Area Distribution. (1) uniform: with 25% glazing on each side, (2) north: 55% on the north side and 15% on each of the other sides, (3) east: 55% on the east side and 15% on each of the other sides, (4) south: 55% on the south side and 15% on each of the other sides, and (5) west: 55% on the west side and 15% on each of the other sides.**
- **y1 - Heating Load**
- **y2 - Cooling Load**

# Predictive model using process panel

## Overview of model





# preprocessing module

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Views: Design Results Turbo Prep Auto Model Interactive Analysis

Find data, operators...etc All Studio

**Repository**

Import Data

- Samples
- Local Repository (Local)
  - Connections
  - data
  - processes
    - lol ( 9/16/24 10:46 PM - 19 kB)
- Temporary Repository (Local)
- DB (Legacy)

**Process**

Process preprocessing

preprocessing

Select Attributes Normalize Detect Outlier (Dist... Filter Examples

Recommended Operators

- Performance (Cla... 23%
- Join 20%
- Replace Missing V.. 19%
- Read CSV 18%

**Parameters**

preprocessing (Subprocess)

No parameters to display.

**Help**

**Subprocess**  
AI Studio Core

Tags: Group, Sub-process, Routine, Function, Building, Block, Process, Utility

**Synopsis**

This operator introduces a process within a process. Whenever a Subprocess operator is reached during a process execution, first the



# In cooling load

//Local Repository/processes/rec2\* – Altair AI Studio Free 2024.1.0 @ Lenovo

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**Repository**

Import Data

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**Operators**

Search for Operators

- Data Access (58)
- Blending (81)
- Cleansing (28)
- Modeling (167)
- Scoring (13)
- Validation (30)
- Utility (85)

[Get more operators from the Marketplace](#)

**Process**

Process Cooling Load

**Cooling Load**

in in in in

Select Attributes (2)

exa exa ori

Split Data

exa par par

random forest

inp inp out out out out out out out

Select Attributes (3)

exa exa ori

Split Data (3)

exa par par

decesion tree

inp inp out out out out out

**Parameters**

Cooling Load (Subprocess)

No parameters to display.

**Help**

Subprocess

AI Studio Core

Tags: Group, Sub-process, Routine, Function, Building, Block, Process, Utility

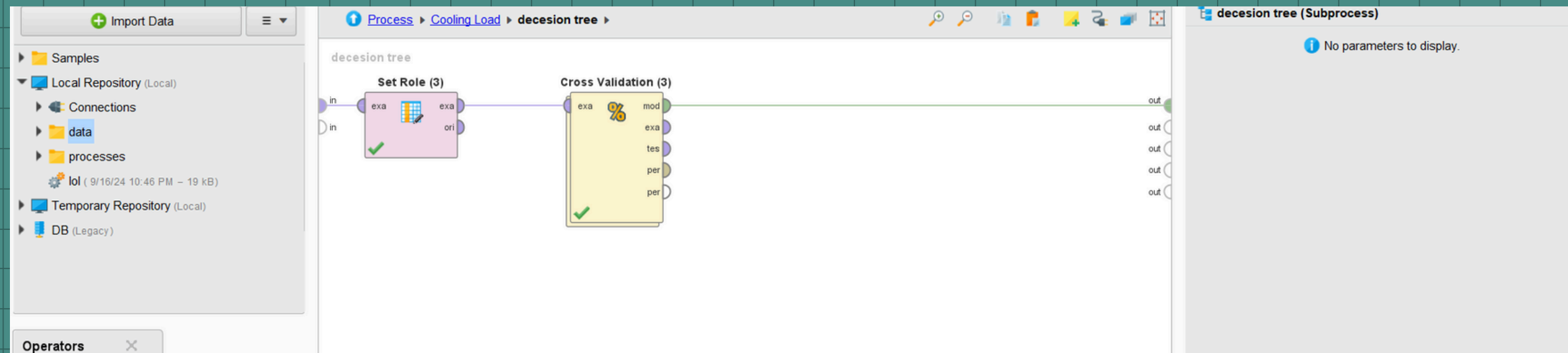
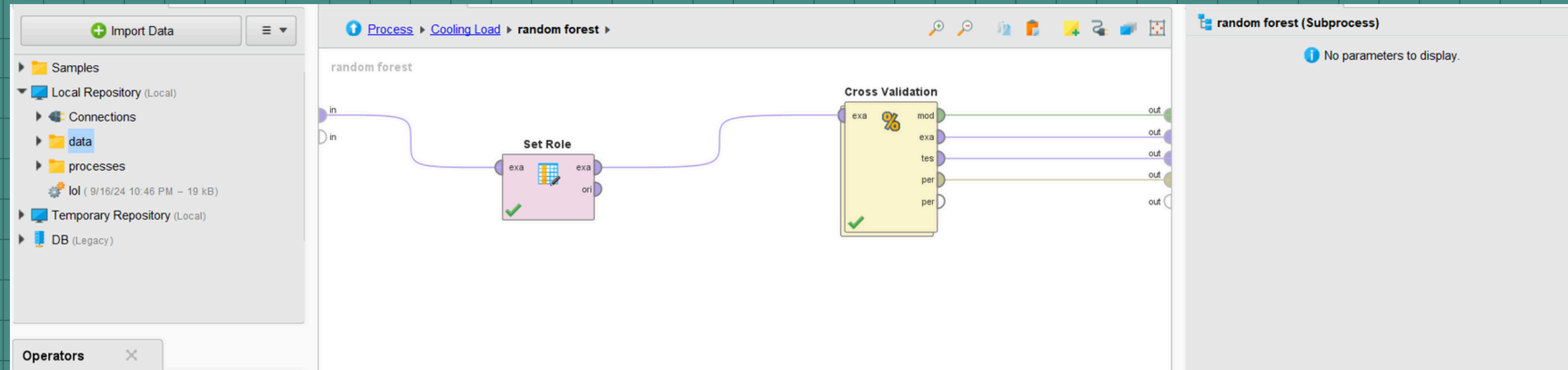
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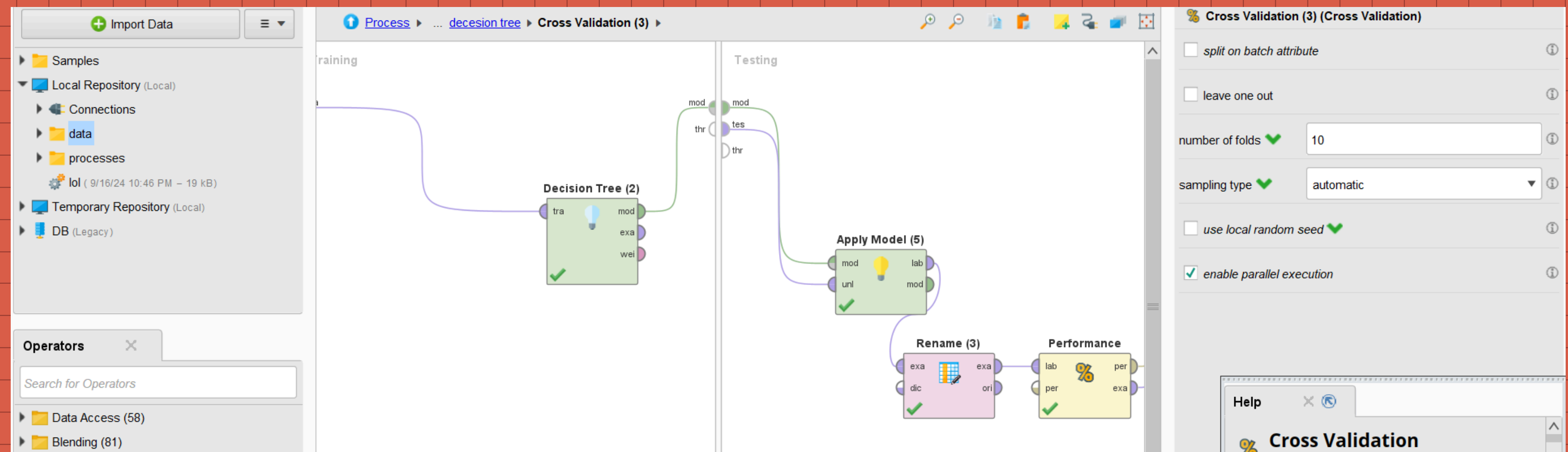
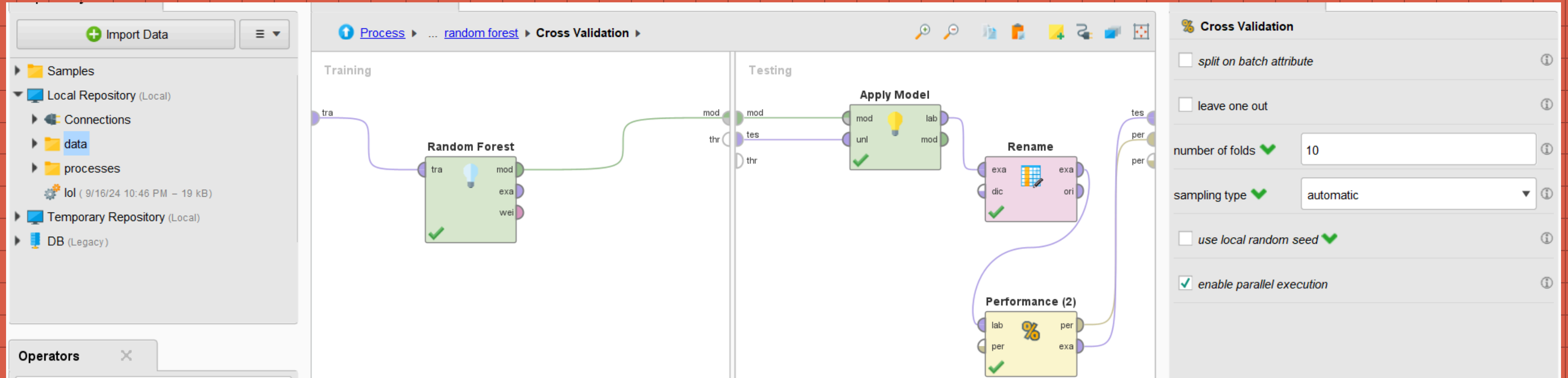
**Recommended Operators**

- Performance (Cla... 23%
- Join 20%
- Replace Missing V.. 19%
- Read CSV 18%

# In Random forest and Decision Tree



# Inside the cross validation of both the decision tree and random forest



# this same will be done in heating load just like cooling Load

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Find data, operators...etc All Studio

### Repository

Import Data

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### Operators

Search for Operators

- Data Access (58)
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- Utility (85)

[Get more operators from the Marketplace](#)

### Process

Process Heating Load

Heating Load

Recommended Operators

- Performance (Cla... 23%
- Join 20%
- Replace Missing V.. 19%
- Read CSV 18%

### Parameters

Heating Load (Subprocess)

No parameters to display.

### Help

#### Subprocess

AI Studio Core

Tags: [Group](#), [Sub-process](#), [Routine](#), [Function](#), [Building](#), [Block](#), [Process](#), [Utility](#)

#### Synopsis

This operator introduces a process within a process. Whenever a Subprocess operator is reached during a process execution, first the

# for Recommendation we are using generate attribute

The screenshot displays the Altair AI Studio interface. The main window is titled "Edit Expression: function expressions". The "Expression" field contains the following code:

```
1 if([prediction(Cooling Load)] > 0.5, "Add window shading", "No recommendation")
```

Below the expression field, a green message states: "Info: Expression is syntactically correct."

The interface includes a "Repository" panel on the left with a tree view showing "Samples", "Local Repository (Local)", "Connections", "data", "processes", "lol ( 9/16/24 10:46 PM - 19 KB)", "Temporary Repository (Local)", and "DB (Legacy)".

The "Operators" panel on the left shows a search bar and a list of operator categories: "Data Access (58)", "Blending (81)", "Cleansing (28)", "Modeling (167)", "Scoring (13)", "Validation (30)", and "Utility (85)".

The "Functions" panel on the right shows a search bar and a list of function categories: "Logical", "Comparison", "Text information", "Text transformation", "Mathematical functions", "Statistical functions", "Trigonometric functions", "Rounding functions", "Conversion functions", "Date calculation", and "Time calculation".

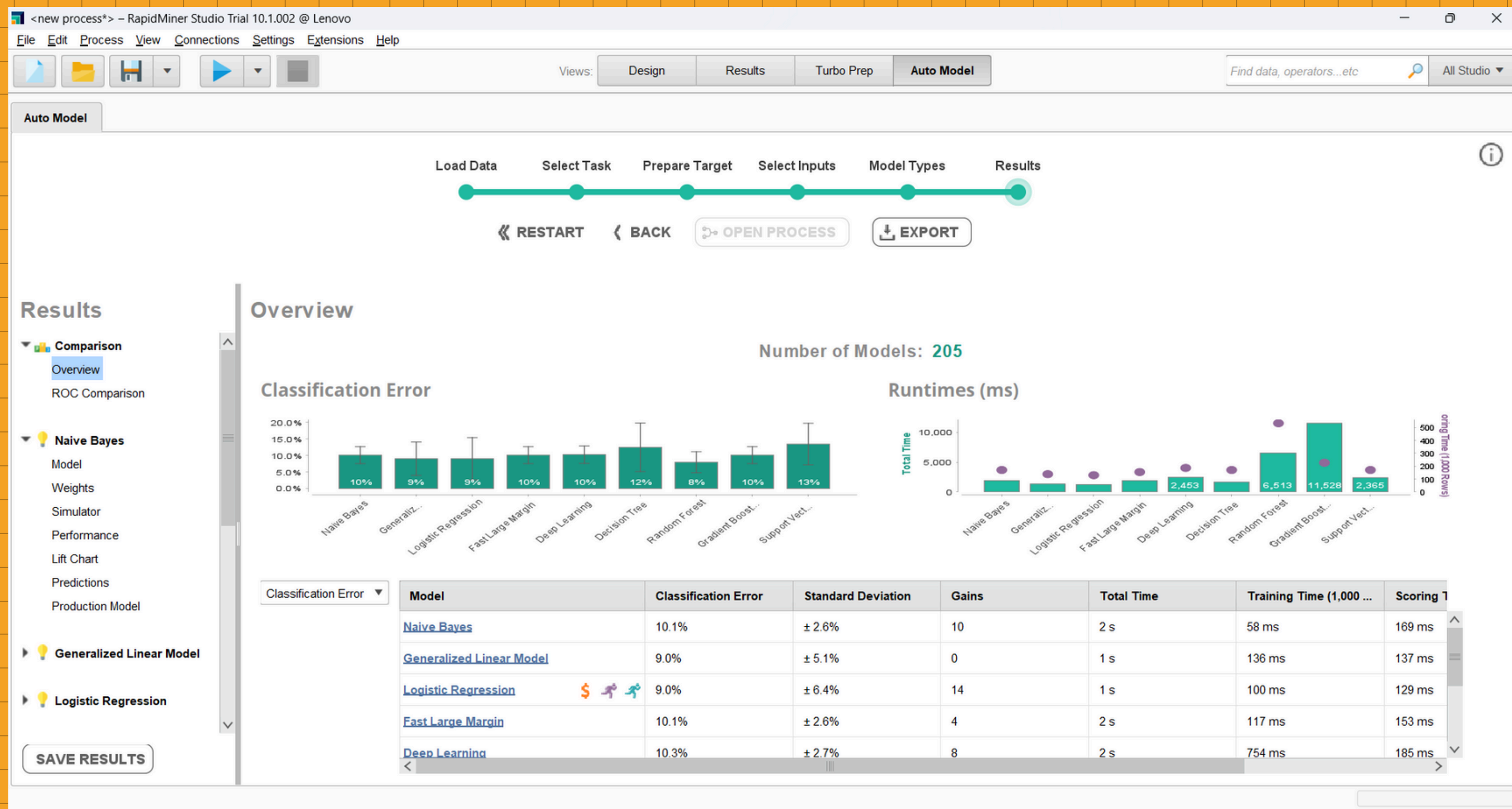
The "Inputs" panel on the right shows a search bar and a list of input categories: "Regular Attributes" (Glazing Area, Glazing Area Distribution, Overall Height, Relative Compactness, Roof Area, Surface Area, Wall Area), "Special Attributes", and "Basic Constants".

The "Generate Attributes" panel on the right shows a search bar and a list of attributes: "Glazing Area", "Glazing Area Distribution", "Overall Height", "Relative Compactness", "Roof Area", "Surface Area", "Wall Area", "Special Attributes", and "Basic Constants".

At the bottom of the "Edit Expression" dialog, there are "Apply" and "Cancel" buttons.



# Auto model approach can also be use it is a great tool



# Result as prediction with Recommendation

//Local Repository/processes/rec2\* – Altair AI Studio Free 2024.1.0 @ Lenovo

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Views: DesignResultsTurbo PrepAuto ModelInteractive Analysis

Find data, operators...etc

All Studio

Result HistoryExampleSet (Generate Attributes)ExampleSet (Generate Attributes (2))

Data

Statistics

Visualizations

Annotations

Open inTurbo PrepAuto ModelInteractive Analysis

Filter (64 / 64 examples): all

Row No.	Cooling Load	prediction(C...	outlier	Relative Co...	Surface Area	Wall Area	Roof Area	Overall Heig...	Glazing Area	Glazing Area...	recommender
1	1.785	1.642	false	0.337	-0.337	0.674	-0.506	0.674	0.674	-0.899	Add window s...
2	1.912	1.642	false	0.337	-0.337	0.674	-0.506	0.674	0.674	-0.899	Add window s...
3	1.444	1.375	false	0.084	-0.112	2.698	-0.843	0.674	0.674	-0.899	Add window s...
4	1.427	1.375	false	0.084	-0.112	2.698	-0.843	0.674	0.674	-0.899	Add window s...
5	1.338	1.375	false	0.084	-0.112	2.698	-0.843	0.674	0.674	-0.899	Add window s...
6	0.049	-0.027	false	-0.927	1.012	0.674	0.506	-0.674	0.674	-0.899	No recommen...
7	0.050	-0.027	false	-0.927	1.012	0.674	0.506	-0.674	0.674	-0.899	No recommen...
8	-0.375	-0.358	false	-1.096	1.237	1.349	0.506	-0.674	0.674	-0.899	No recommen...
9	-0.375	-0.358	false	-1.096	1.237	1.349	0.506	-0.674	0.674	-0.899	No recommen...
10	-0.379	-0.358	false	-1.096	1.237	1.349	0.506	-0.674	0.674	-0.899	No recommen...
11	-0.375	-0.358	false	-1.096	1.237	1.349	0.506	-0.674	0.674	-0.899	No recommen...
12	1.333	1.558	false	0.337	-0.337	0.674	-0.506	0.674	0.674	-0.450	Add window s...
13	1.338	1.367	false	0.084	-0.112	2.698	-0.843	0.674	0.674	-0.450	Add window s...
14	1.409	1.367	false	0.084	-0.112	2.698	-0.843	0.674	0.674	-0.450	Add window s...
15	1.414	1.367	false	0.084	-0.112	2.698	-0.843	0.674	0.674	-0.450	Add window s...
16	1.355	1.367	false	0.084	-0.112	2.698	-0.843	0.674	0.674	-0.450	Add window s...
17	-0.028	-0.031	false	-0.927	1.012	0.674	0.506	-0.674	0.674	-0.450	No recommen...
18	-0.001	-0.031	false	-0.927	1.012	0.674	0.506	-0.674	0.674	-0.450	No recommen...

ExampleSet (64 examples,3 special attributes,8 regular attributes)



**Thank you**