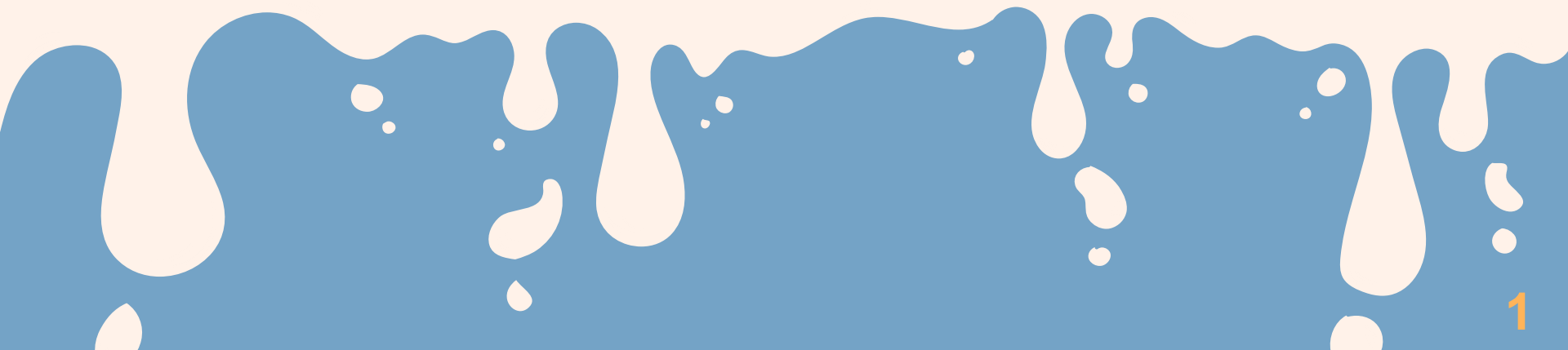


# MILK QUALITY PREDICTION



# DATASET

| Row No. | pH    | Temprature | Taste | Odor | Fat | Turbidity | Colour | Grade  |
|---------|-------|------------|-------|------|-----|-----------|--------|--------|
| 1       | 6.600 | 35         | 1     | 0    | 1   | 0         | 254    | high   |
| 2       | 6.600 | 36         | 0     | 1    | 0   | 1         | 253    | high   |
| 3       | 8.500 | 70         | 1     | 1    | 1   | 1         | 246    | low    |
| 4       | 9.500 | 34         | 1     | 1    | 0   | 1         | 255    | low    |
| 5       | 6.600 | 37         | 0     | 0    | 0   | 0         | 255    | medium |

Rows : 1059    Columns : 8

# DATASET

| Name          | Type    | Missing | Statistics          |                   |  | Filter (8) |
|---------------|---------|---------|---------------------|-------------------|--|------------|
| ✓ pH          | Real    | 0       | Min<br>3            | Max<br>9.500      | Average<br>6.630                               |            |
| ✓ Temperature | Integer | 0       | Min<br>34           | Max<br>90         | Average<br>44.227                              |            |
| ✓ Taste       | Integer | 0       | Min<br>0            | Max<br>1          | Average<br>0.547                               |            |
| ✓ Odor        | Integer | 0       | Min<br>0            | Max<br>1          | Average<br>0.432                               |            |
| ✓ Fat         | Integer | 0       | Min<br>0            | Max<br>1          | Average<br>0.671                               |            |
| ✓ Turbidity   | Integer | 0       | Min<br>0            | Max<br>1          | Average<br>0.491                               |            |
| ✓ Colour      | Integer | 0       | Min<br>240          | Max<br>255        | Average<br>251.840                             |            |
| ✓ Grade       | Nominal | 0       | Least<br>high (256) | Most<br>low (429) | Values<br>low (429), medium (374), ...[1 more] |            |

None Missing Value

# ABOUT DATASET

## 7 Features

- pH คือ ค่า pH ของนม มีตั้งแต่ 3 ถึง 9.5
- Temperature คือ อุณหภูมิของนม มีตั้งแต่ 34'C ถึง 90'C
- Taste คือ รสชาติของนม 0 (ไม่ดี) 1(ดี)
- Odor คือ กลิ่นของนม 0 (ไม่ดี) 1(ดี)
- Fat คือ ปริมาณไขมันที่อยู่ในนม 0(ต่ำ) 1(สูง)
- Turbidity คือ ความขุ่นของนม 0(ต่ำ) 1(สูง)
- Color คือ ค่าสีของนม มีตั้งแต่ 240 ถึง 255

# TARGET : GRADE OF MILK



Low

นมที่มีคุณภาพต่ำ



Medium

นมที่มีคุณภาพ  
ปานกลาง

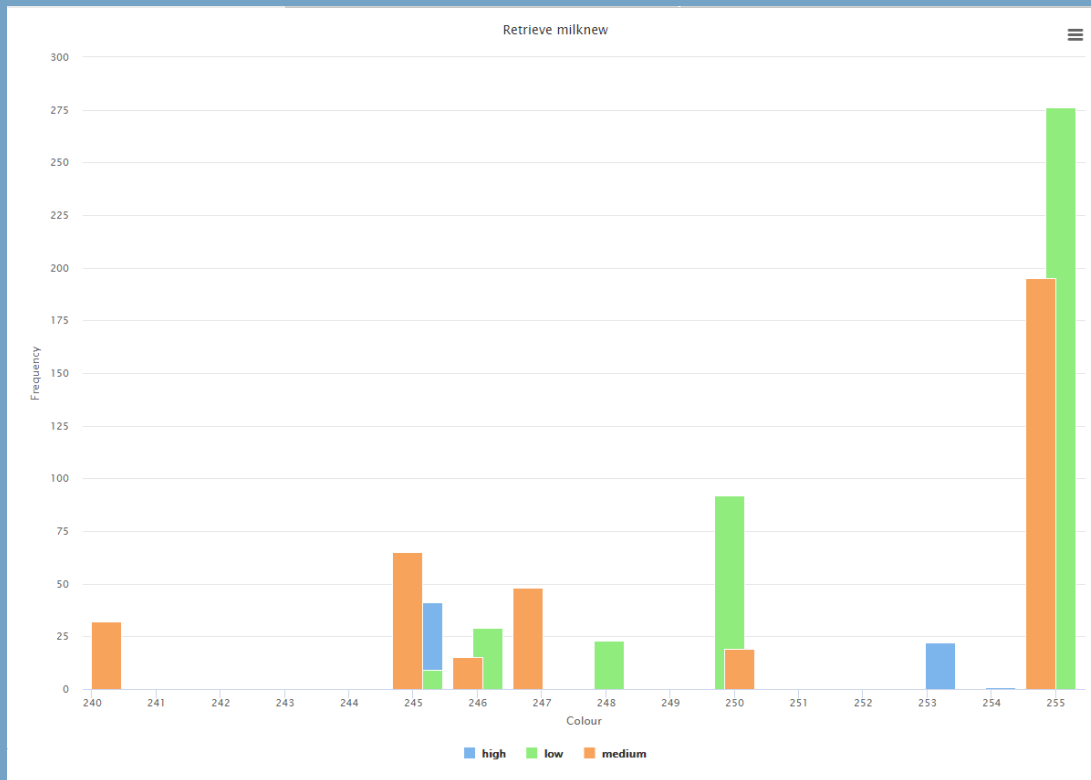


High

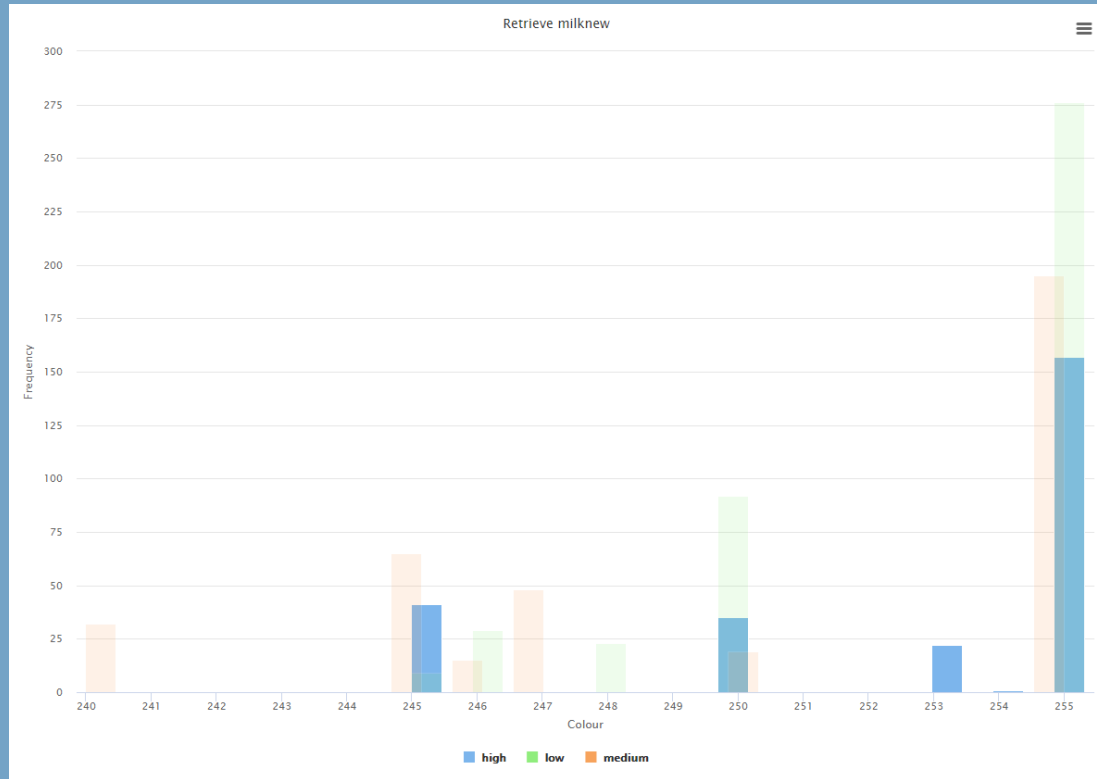
นมที่มีคุณภาพสูง

# Data Explore !

# Colour

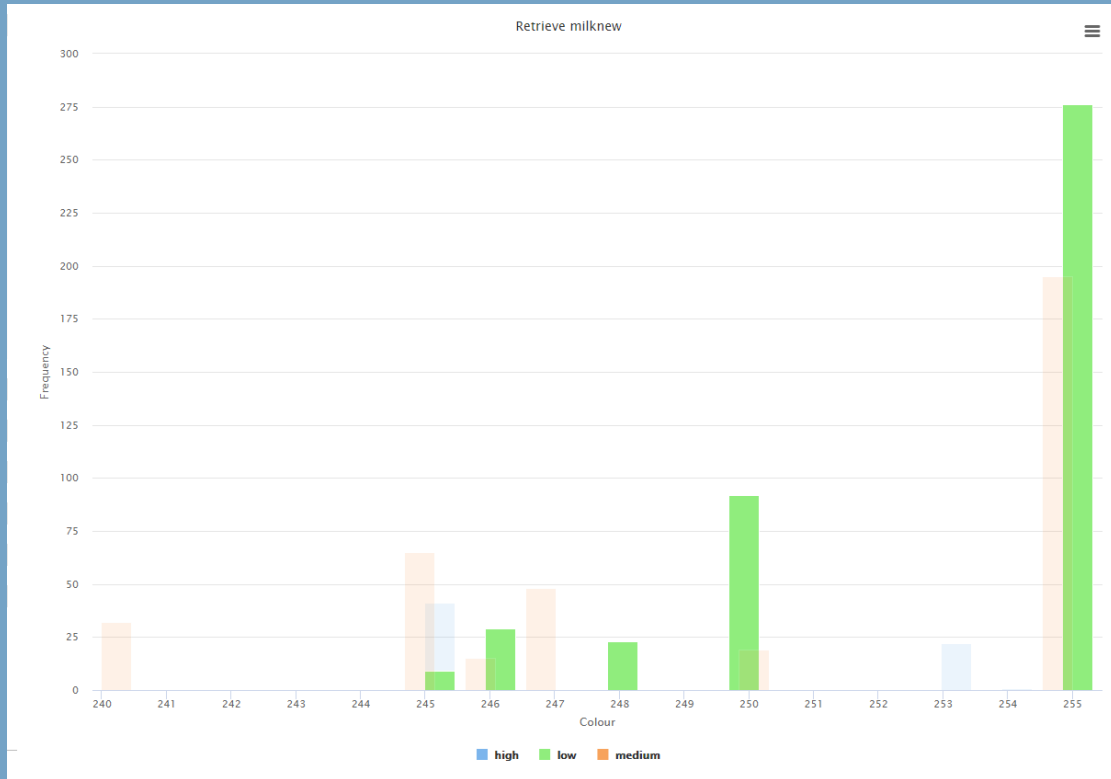


# Colour (HIGH)

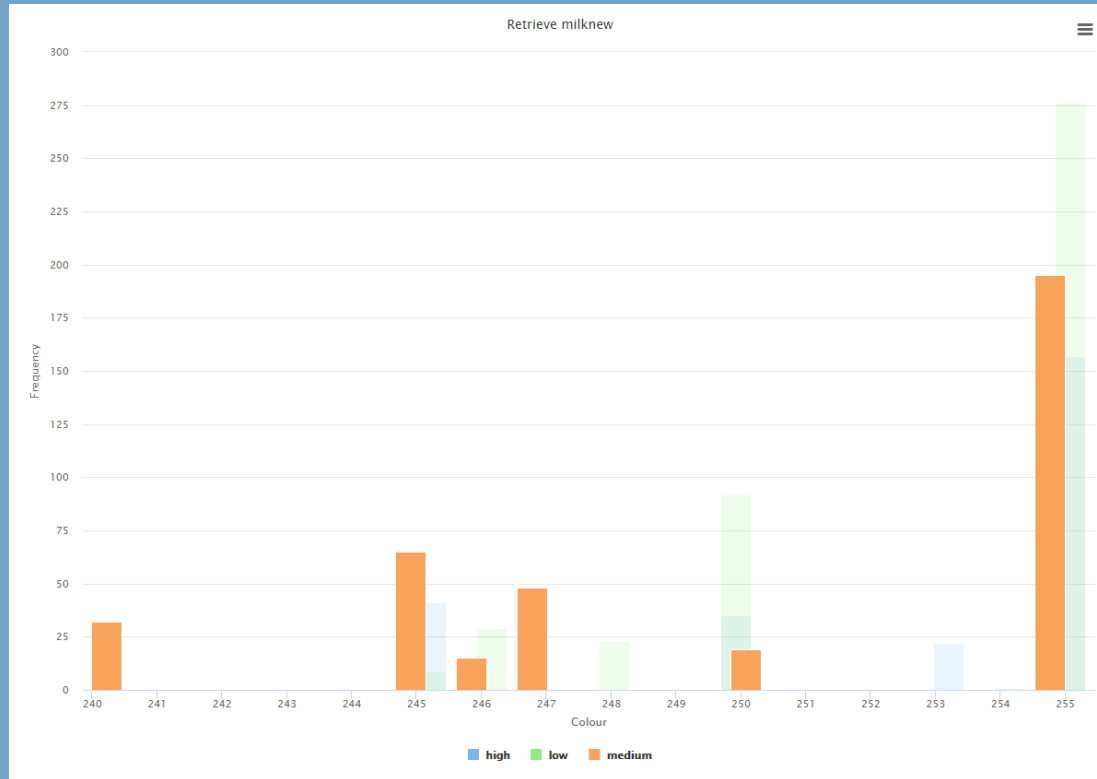




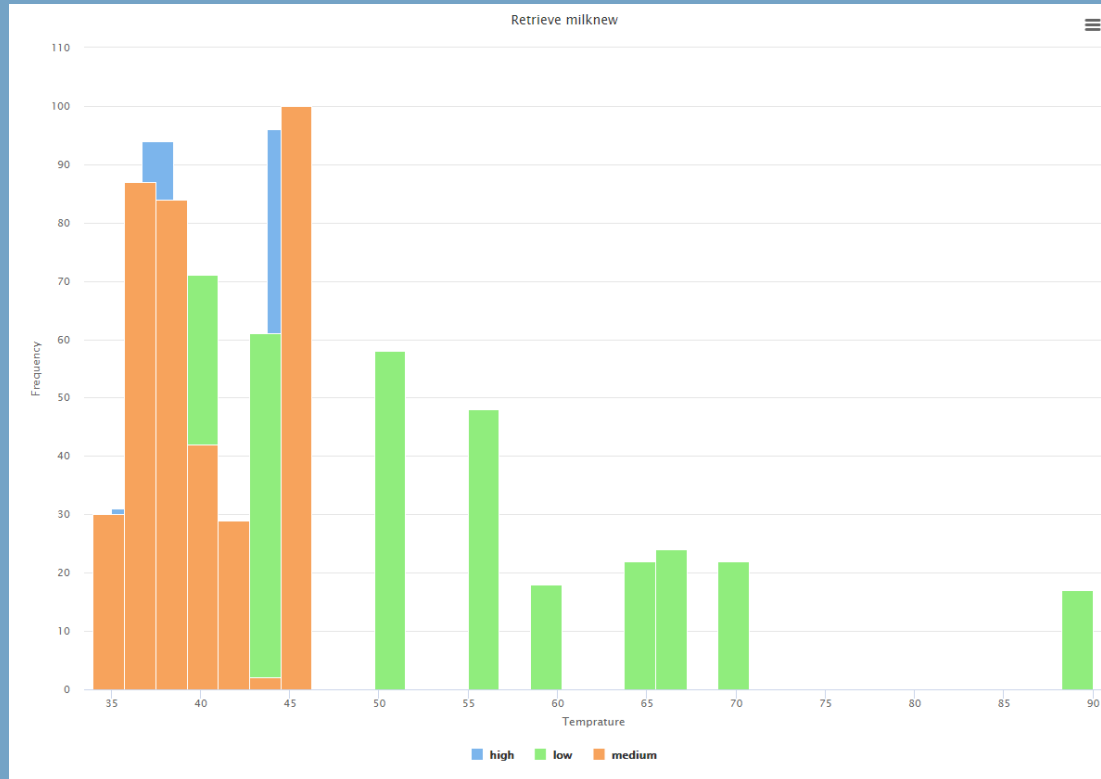
# Colour (LOW)



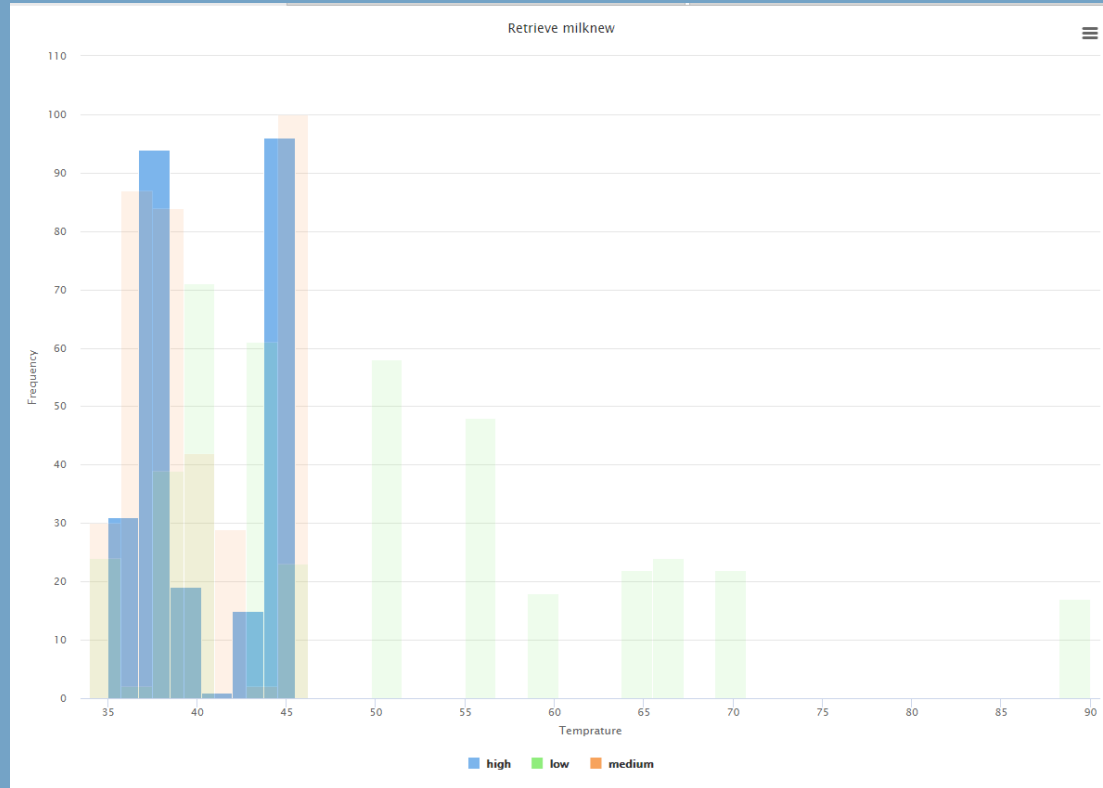
# Colour (MEDIUM)



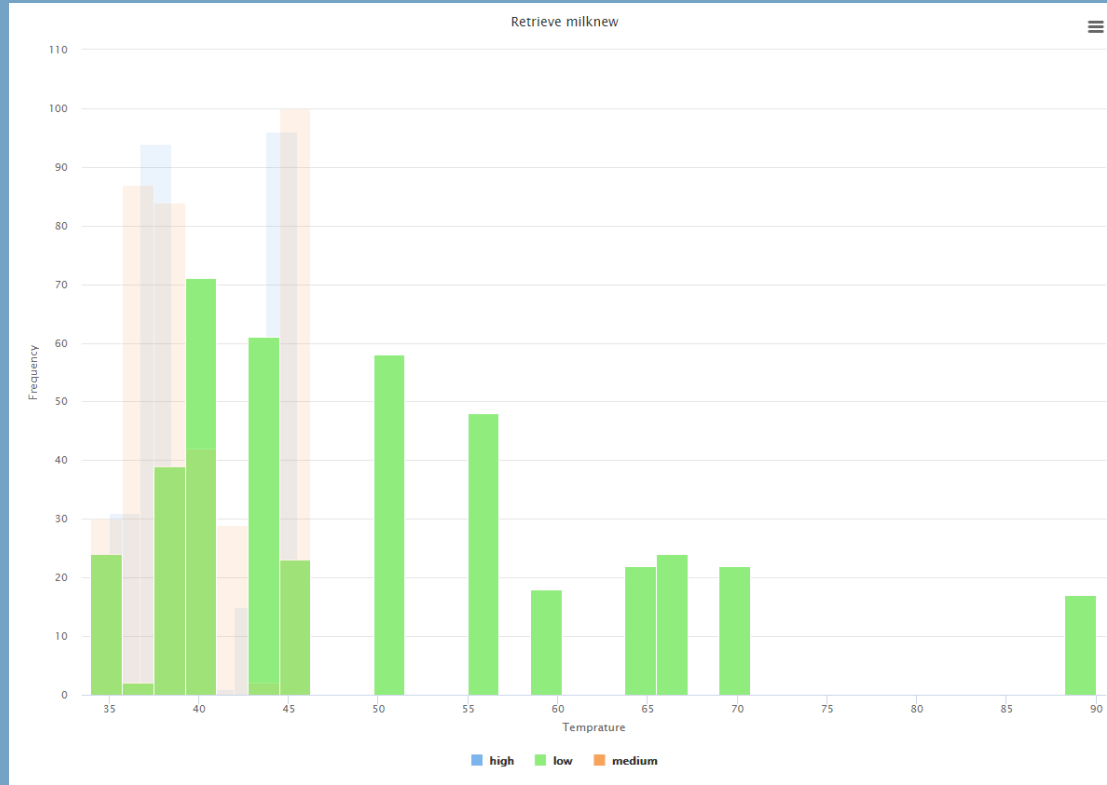
# Temperature



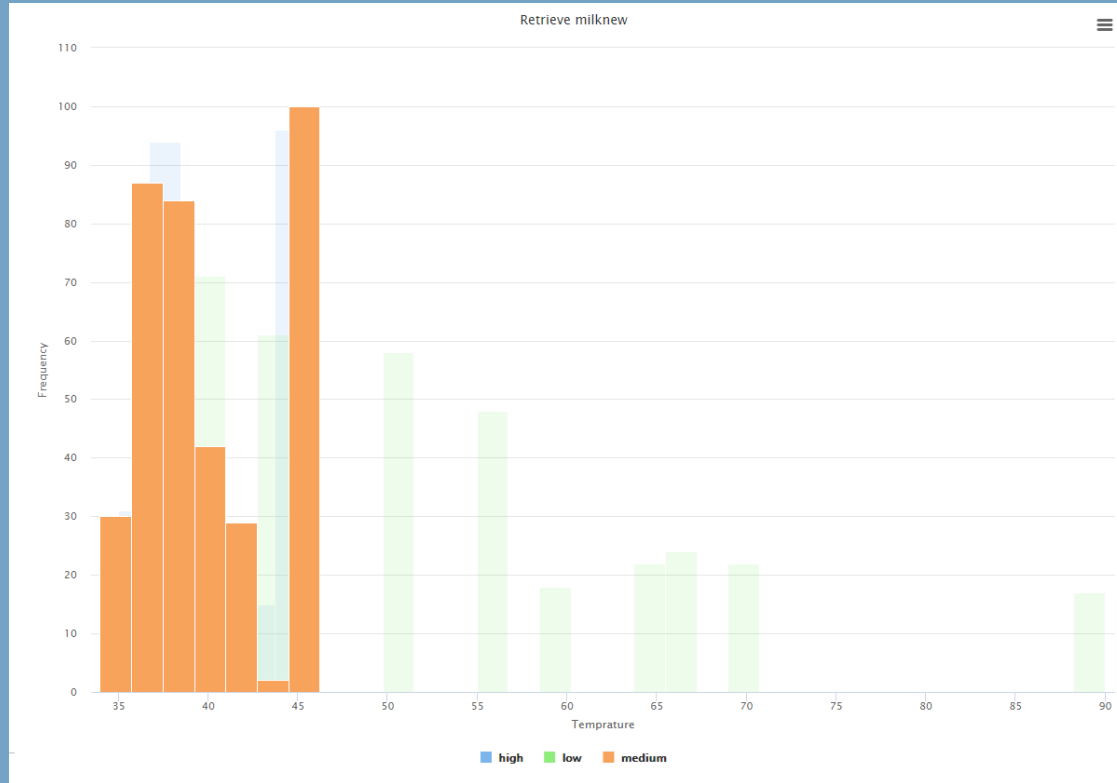
# Temperature (HIGH)



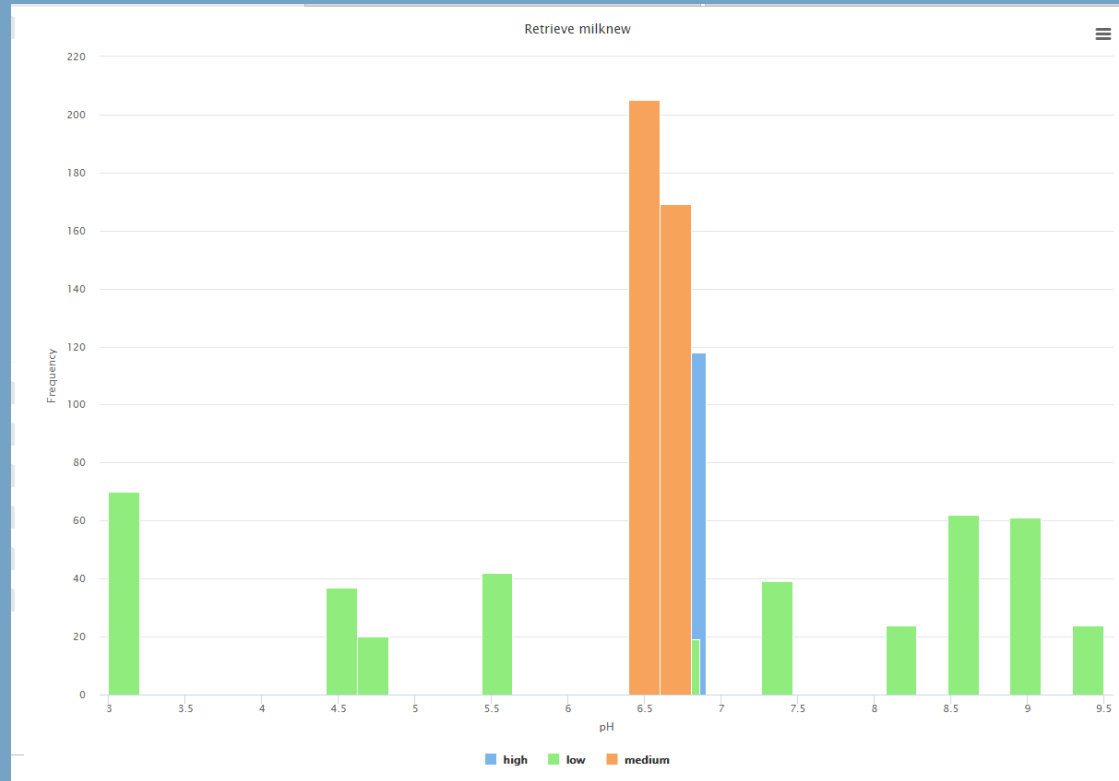
# Temperature (LOW)



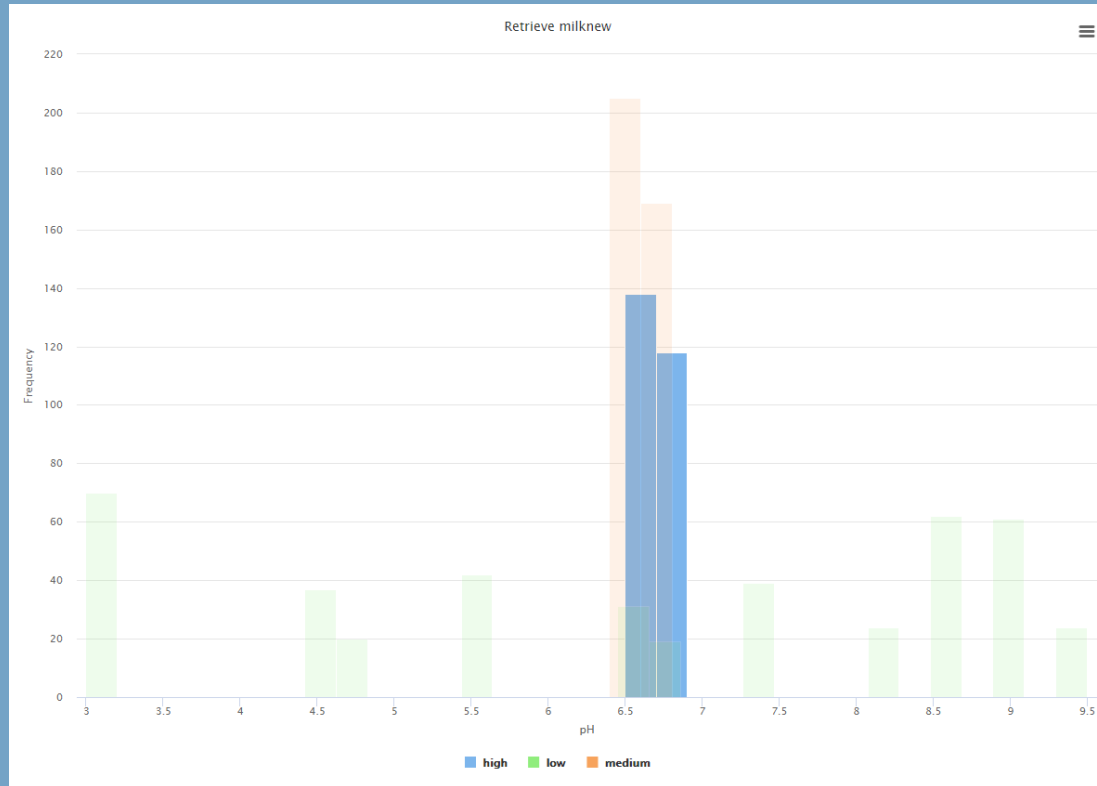
# Temperature (MEDIUM)



# pH

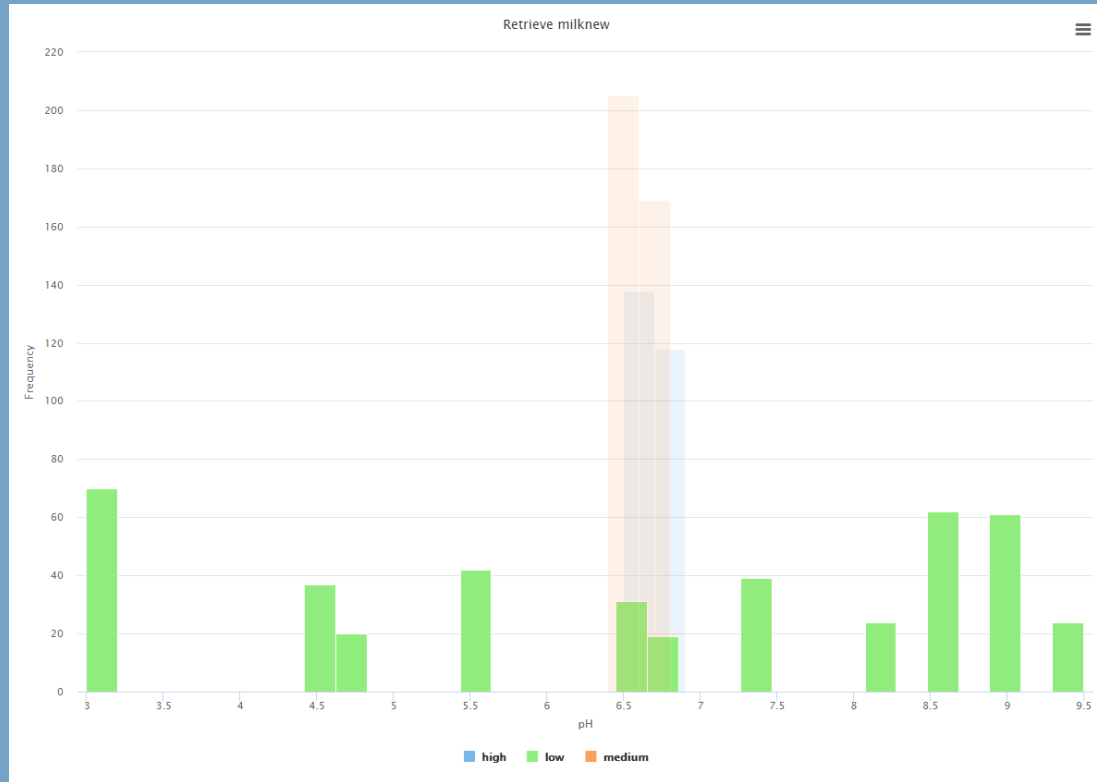


# pH (HIGH)

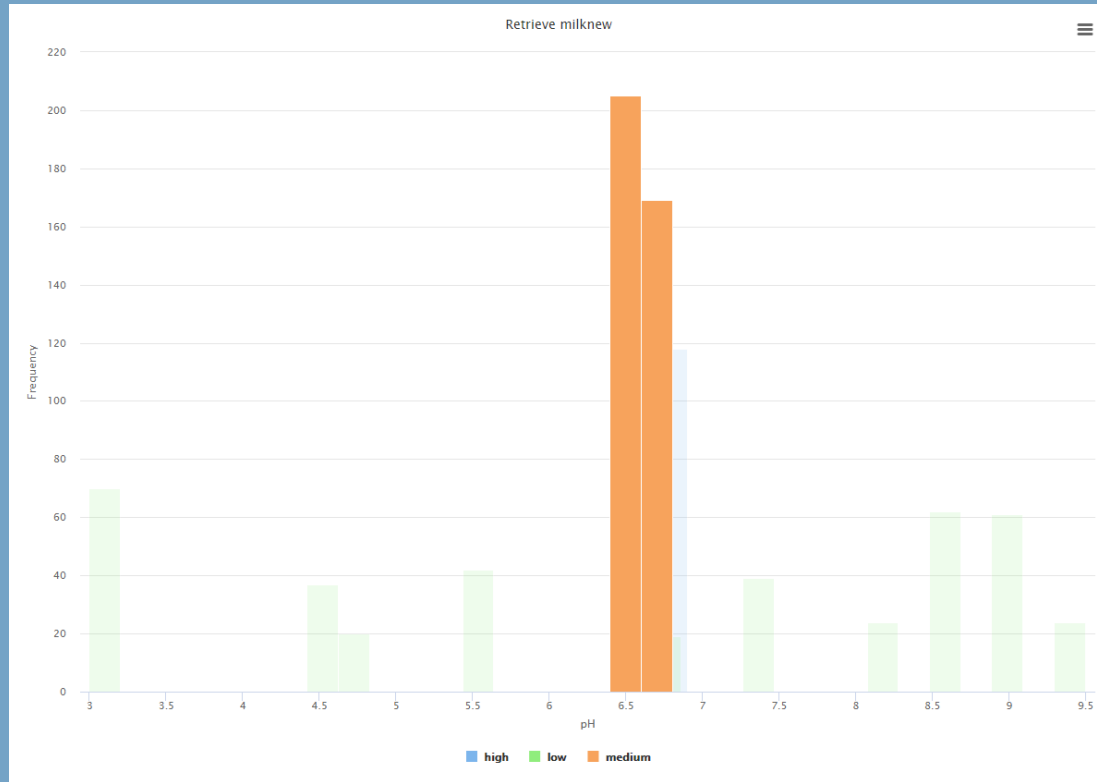




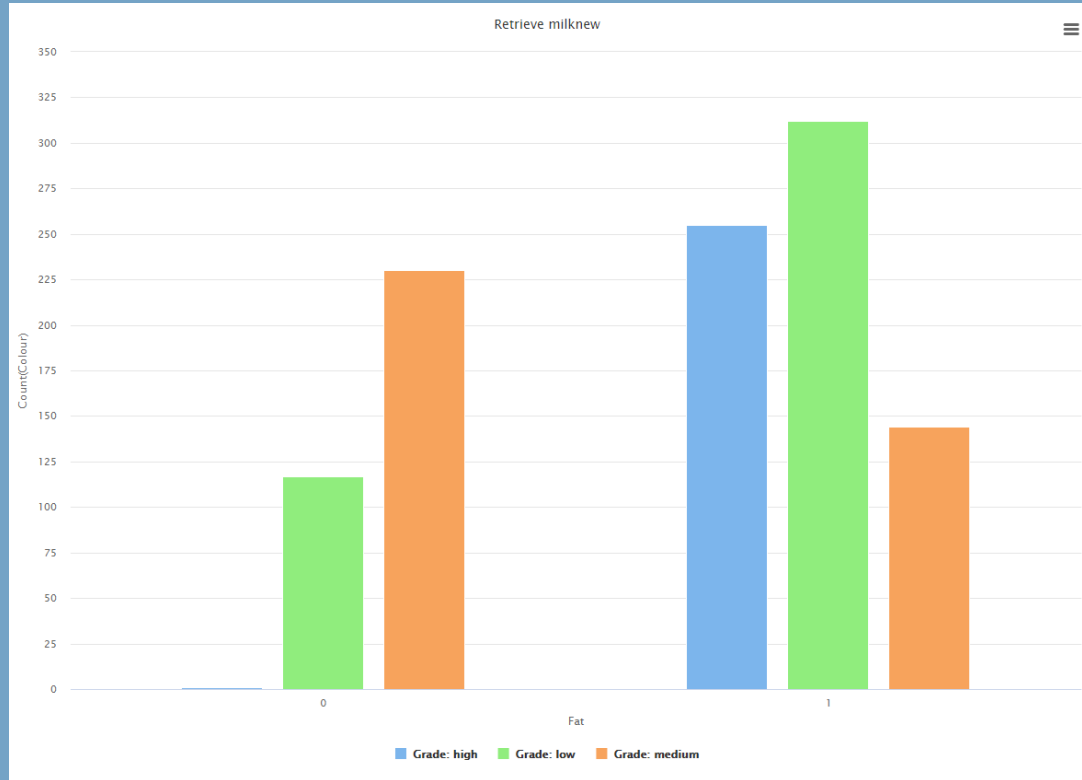
# pH (LOW)



# pH (MEDIUM)

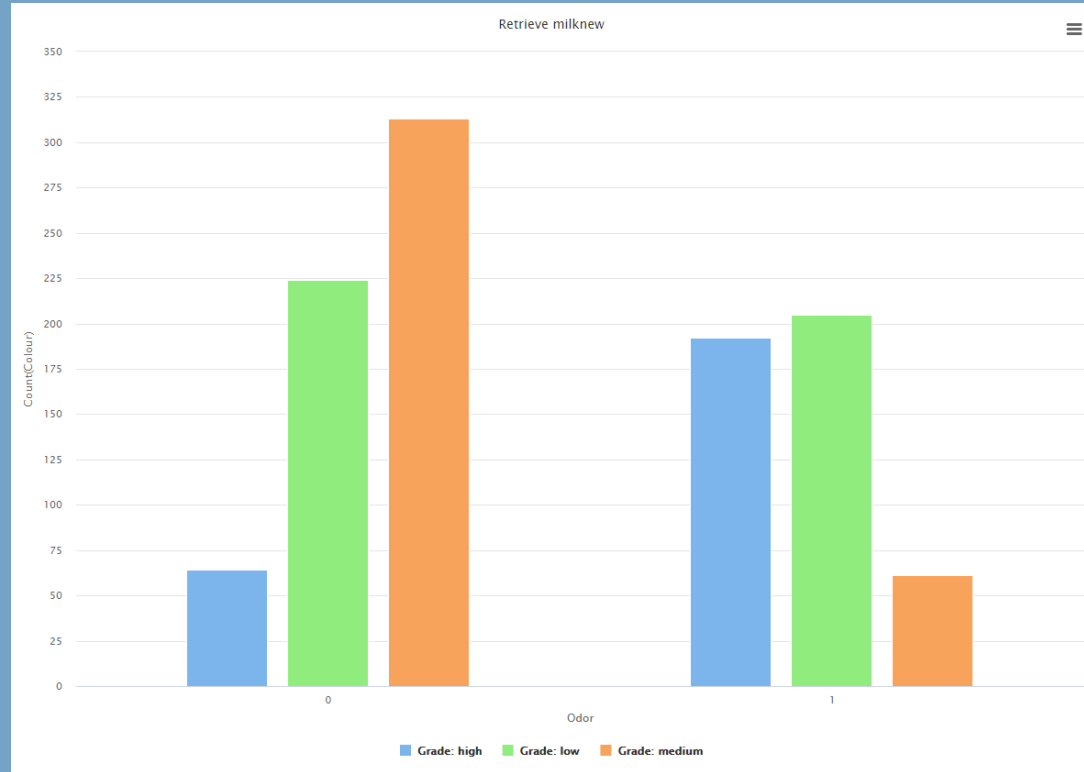


# Fat



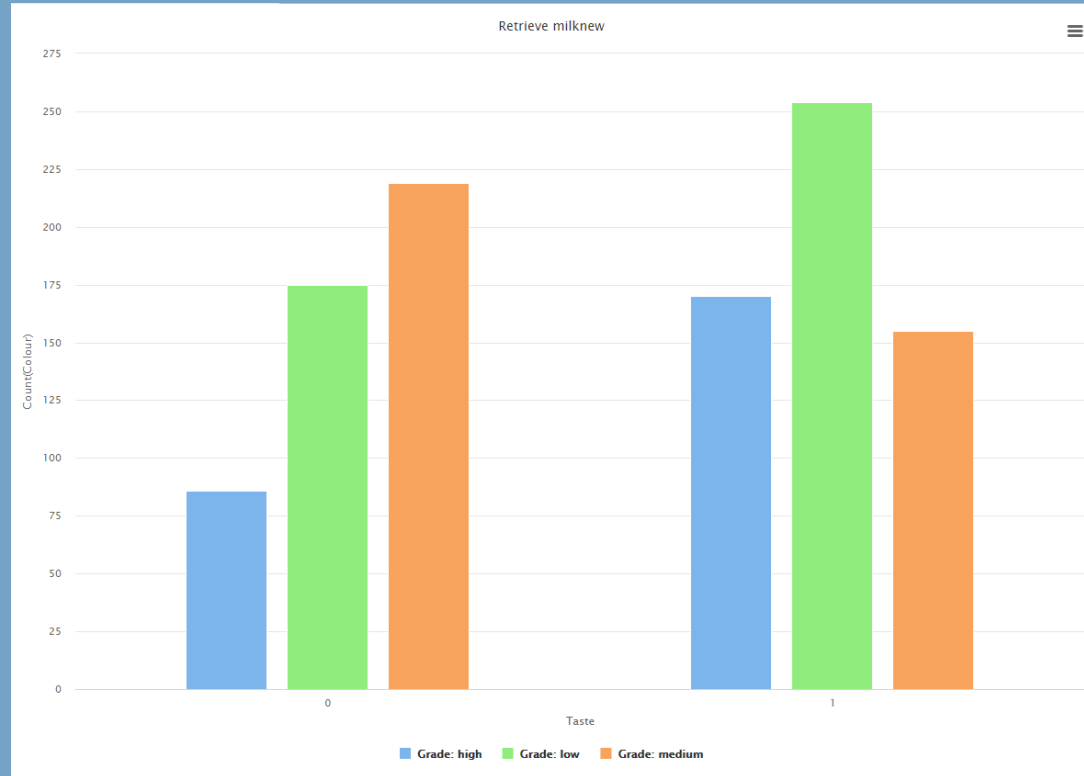
0 : Low  
1 : High

# Odor



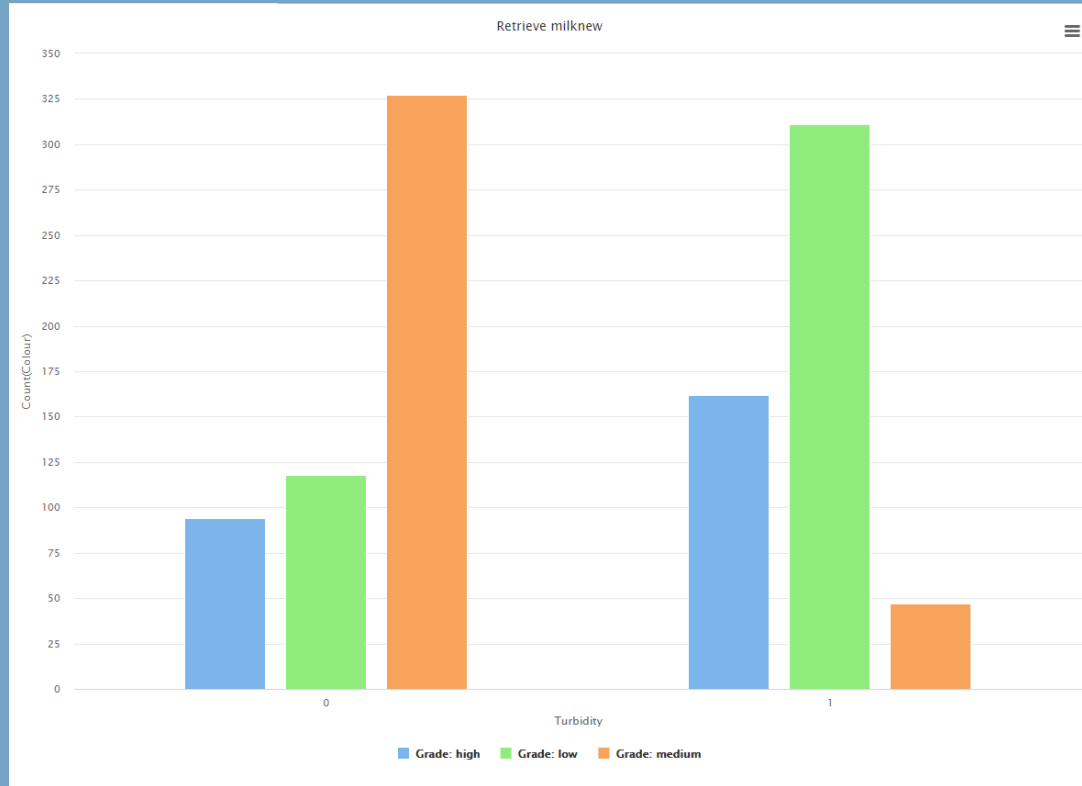
0 : Bad  
1 : Good

# Taste



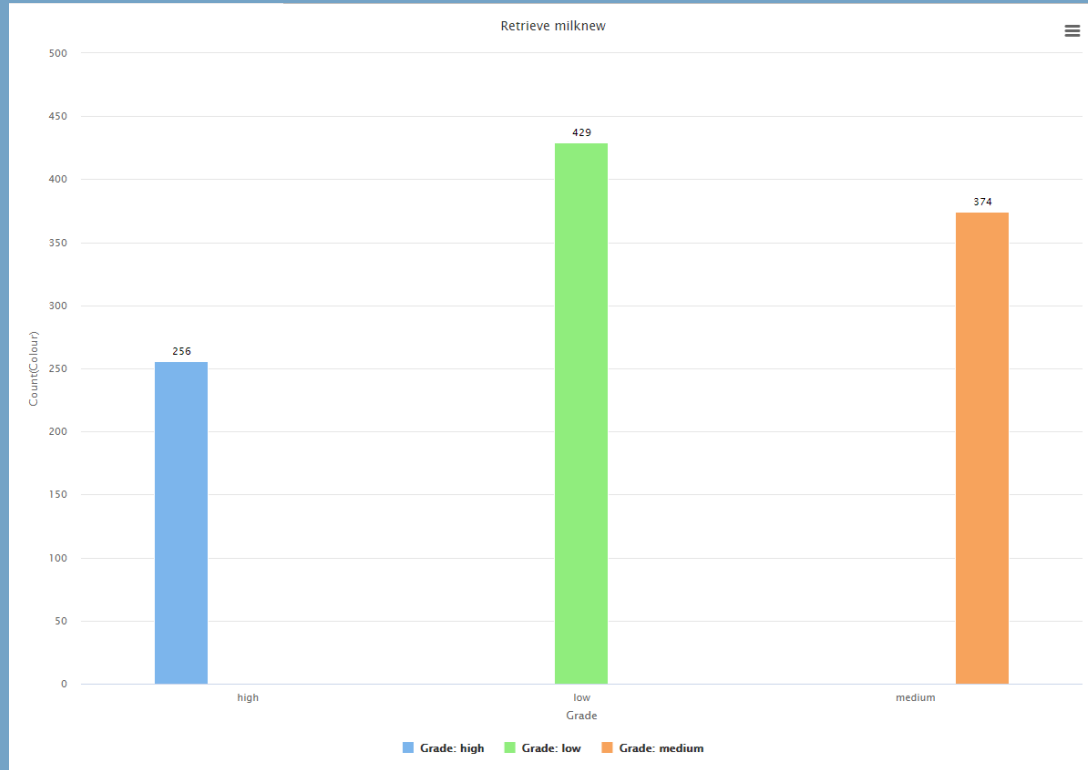
0 : Bad  
1 : Good

# Turbidity



0 : Low  
1 : High

# Grade

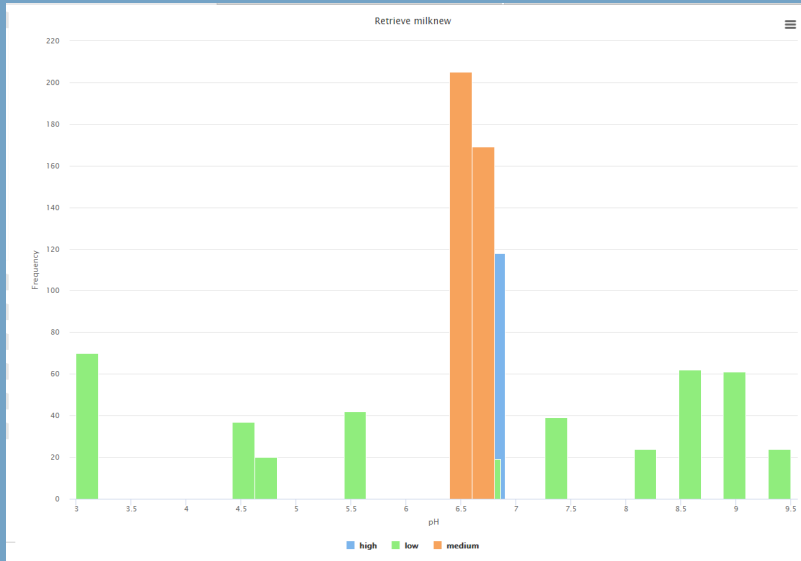


# Data Preprocess !

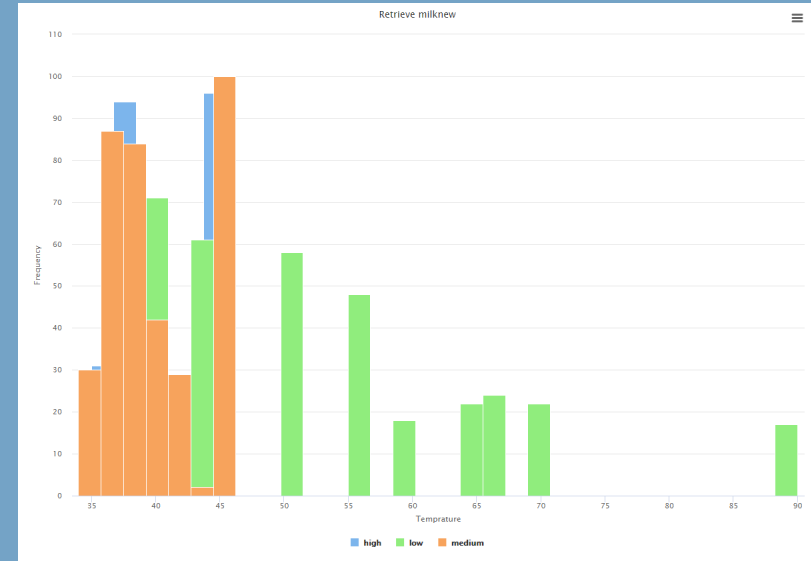


# Feature Selection

## pH



## Temperature



# CORRELATION

| Attribut... | Grade  | pH     | Tempra... | Taste  | Odor   | Fat    | Turbidity | Colour |
|-------------|--------|--------|-----------|--------|--------|--------|-----------|--------|
| Grade       | 1      | -0.013 | -0.094    | -0.198 | -0.455 | -0.501 | -0.428    | -0.213 |
| pH          | -0.013 | 1      | 0.245     | -0.064 | -0.081 | -0.093 | 0.048     | -0.165 |
| Temprat...  | -0.094 | 0.245  | 1         | -0.110 | -0.049 | 0.024  | 0.185     | -0.009 |
| Taste       | -0.198 | -0.064 | -0.110    | 1      | 0.018  | 0.324  | 0.056     | -0.083 |
| Odor        | -0.455 | -0.081 | -0.049    | 0.018  | 1      | 0.315  | 0.458     | -0.039 |
| Fat         | -0.501 | -0.093 | 0.024     | 0.324  | 0.315  | 1      | 0.329     | 0.114  |
| Turbidity   | -0.428 | 0.048  | 0.185     | 0.056  | 0.458  | 0.329  | 1         | 0.136  |
| Colour      | -0.213 | -0.165 | -0.009    | -0.083 | -0.039 | 0.114  | 0.136     | 1      |

# CORRELATION

| Attribut... | Grade  | pH     | Tempra... | Taste  | Odor   | Fat    | Turbidity | Colour |
|-------------|--------|--------|-----------|--------|--------|--------|-----------|--------|
| Grade       | 1      | -0.013 | -0.094    | -0.198 | -0.455 | -0.501 | -0.428    | -0.213 |
| pH          | -0.013 | 1      | 0.245     | -0.064 | -0.081 | -0.093 | 0.048     | -0.165 |
| Temprat...  | -0.094 | 0.245  | 1         | -0.110 | -0.049 | 0.024  | 0.185     | -0.009 |
| Taste       | -0.198 | -0.064 | -0.110    | 1      | 0.018  | 0.324  | 0.056     | -0.083 |
| Odor        | -0.455 | -0.081 | -0.049    | 0.018  | 1      | 0.315  | 0.458     | -0.039 |
| Fat         | -0.501 | -0.093 | 0.024     | 0.324  | 0.315  | 1      | 0.329     | 0.114  |
| Turbidity   | -0.428 | 0.048  | 0.185     | 0.056  | 0.458  | 0.329  | 1         | 0.136  |
| Colour      | -0.213 | -0.165 | -0.009    | -0.083 | -0.039 | 0.114  | 0.136     | 1      |

# Feature scaling

Normalize

## Parameters

### Normalize

☐ create view

attribute filter type

all

☐ invert selection

☐ include special attributes

method

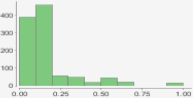
range transformation

min

0.0

max

1.0

|             |      |   |   |          |                  |                  |                    |
|-------------|------|---|---|----------|------------------|------------------|--------------------|
| Temperature | Real | 0 |  | Min<br>0 | Max<br>1         | Average<br>0.183 | Deviation<br>0.180 |
| Taste       | Real | 0 | Min<br>0  | Max<br>1 | Average<br>0.547 |                  |                    |
| Odor        | Real | 0 | Min<br>0  | Max<br>1 | Average<br>0.432 |                  |                    |
| Fat         | Real | 0 | Min<br>0  | Max<br>1 | Average<br>0.671 |                  |                    |
| Turbidity   | Real | 0 | Min<br>0  | Max<br>1 | Average<br>0.491 |                  |                    |
| Colour      | Real | 0 | Min<br>0  | Max<br>1 | Average<br>0.789 |                  |                    |

After normalize



Let's  
Train  
Model!

# OUR MODEL

A large, irregular orange splat shape with several smaller dots around it, serving as a background for the KNN text.

**KNN**

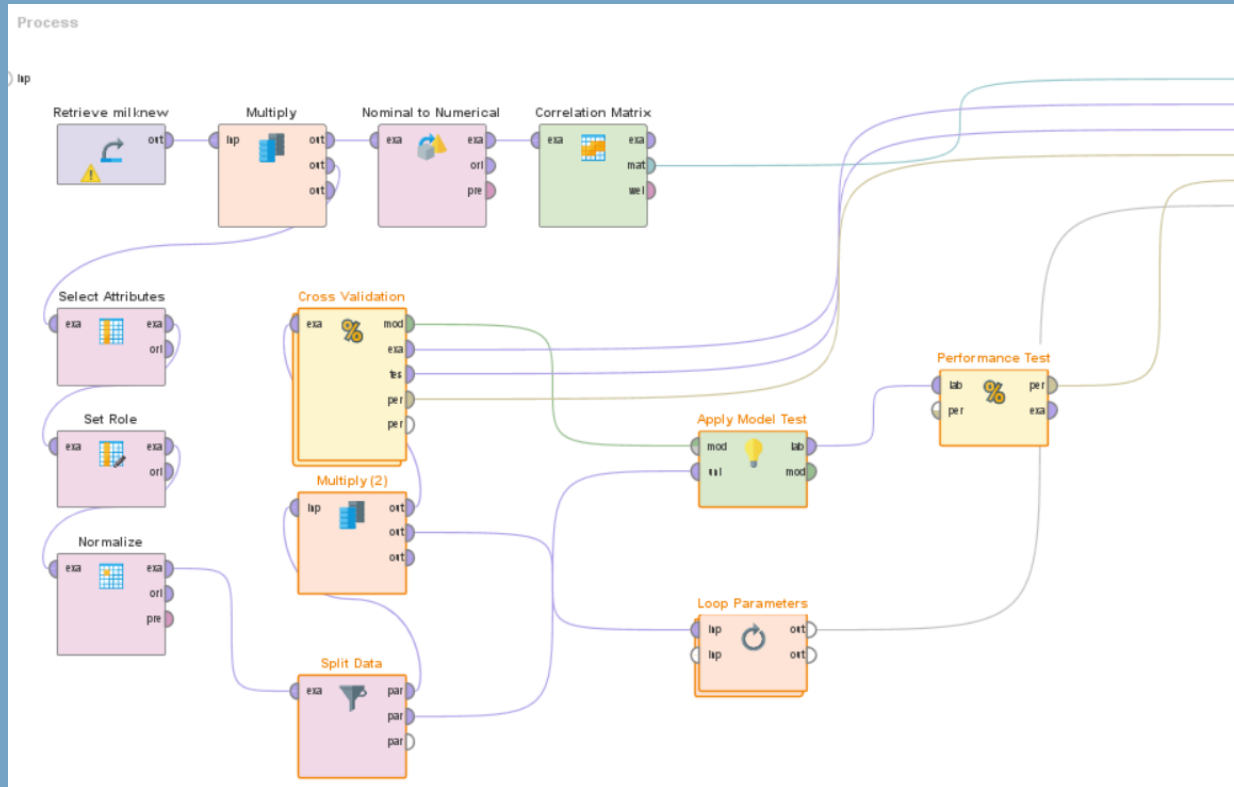
**K-Nearest Neighbors**

A large, irregular orange splat shape with several smaller dots around it, serving as a background for the Random Forest text.

**Random  
Forest**

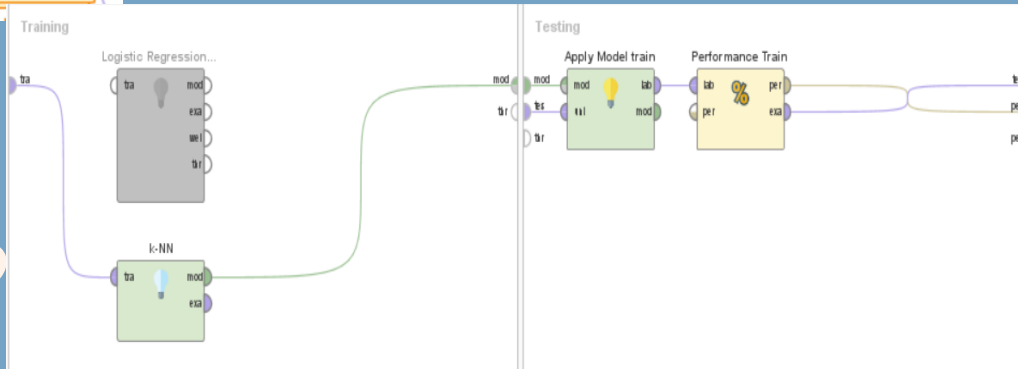
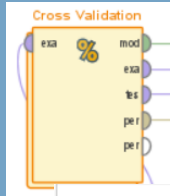
**Random forest**

# K-Nearest Neighbors (KNN)



# K-Nearest Neighbors (KNN)

- Cross Validation

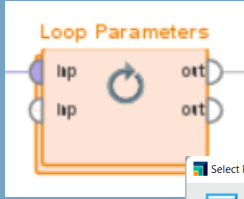


- ค่า Parameter ที่ต้องใส่ใน Model KNN (ค่า K)

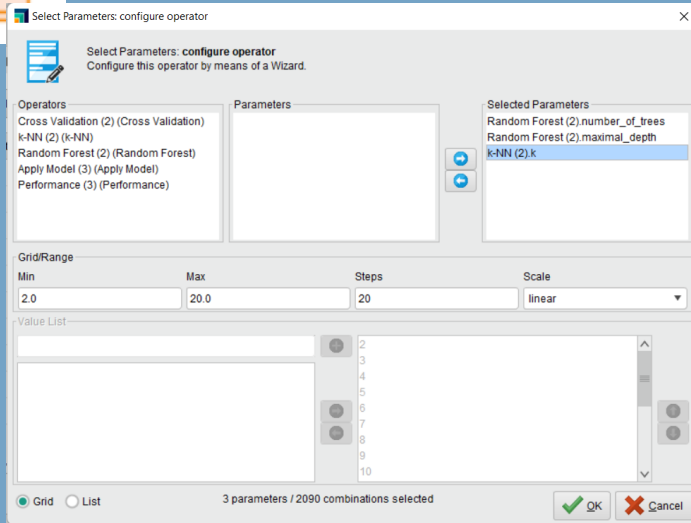
A screenshot of the 'Parameters' dialog box for the 'k-NN' model. The dialog has a title bar with a close button. Inside, there is a lightbulb icon and the text 'k-NN'. Below this, there are three parameters: 'k' with an empty input field, 'weighted vote' with a checked checkbox, 'measure types' with a dropdown menu set to 'MixedMeasures', and 'mixed measure' with a dropdown menu set to 'MixedEuclideanDistance'. Each parameter has an information icon (i) to its right.



# K-Nearest Neighbors (KNN)



- Loop Parameters Setting



- Loop Parameters Result

| Loop Parameters (2090 rows, 5 columns) |          |          |            |          |
|--|----------|----------|------------|----------|
| iteration                              | Rando... | Rando... | k-NN (2).k | acc... ↓ |
| 175                                    | 250      | 60       | 3          | 0.908    |
| 119                                    | 450      | 0        | 3          | 0.907    |
| 209                                    | 450      | 90       | 3          | 0.906    |
| 385                                    | 250      | 50       | 5          | 0.906    |
| 141                                    | 50       | 30       | 3          | 0.906    |
| 394                                    | 200      | 60       | 5          | 0.906    |
| 130                                    | 500      | 10       | 3          | 0.906    |
| 136                                    | 300      | 20       | 3          | 0.906    |
| 201                                    | 50       | 90       | 3          | 0.906    |
| 206                                    | 300      | 90       | 3          | 0.906    |
| 160                                    | 500      | 40       | 3          | 0.906    |
| 406                                    | 300      | 70       | 5          | 0.906    |

# K-Nearest Neighbors (KNN)

train

accuracy: 90.56% +/- 2.86% (micro average: 90.55%)

|              | true high | true low | true medium | class precision |
|--------------|-----------|----------|-------------|-----------------|
| pred. high   | 165       | 20       | 16          | 82.09%          |
| pred. low    | 27        | 322      | 3           | 91.48%          |
| pred. medium | 13        | 1        | 280         | 95.24%          |
| class recall | 80.49%    | 93.88%   | 93.65%      |                 |

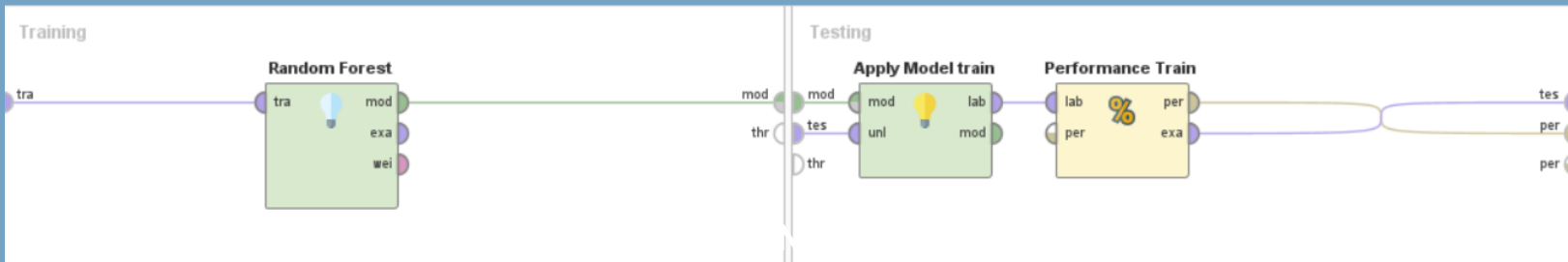
test

accuracy: 91.51%

|              | true high | true low | true medium | class precision |
|--------------|-----------|----------|-------------|-----------------|
| pred. high   | 42        | 2        | 6           | 84.00%          |
| pred. low    | 4         | 84       | 1           | 94.38%          |
| pred. medium | 5         | 0        | 68          | 93.15%          |
| class recall | 82.35%    | 97.67%   | 90.67%      |                 |

# Random Forest

- Cross Validation



- Set parameter
- จากการทำ loop parameters จะได้ค่าดังนี้

The screenshot shows the 'Parameters' dialog box for the 'Random Forest' model. It contains three settings:

| Parameter       | Value      |
|-----------------|------------|
| number of trees | 200        |
| criterion       | gain_ratio |
| maximal depth   | 30         |

# Random Forest

train

accuracy: 90.90% +/- 2.33% (micro average: 90.91%)

|              | true high | true low | true medium | class precision |
|--------------|-----------|----------|-------------|-----------------|
| pred. high   | 165       | 18       | 16          | 82.91%          |
| pred. low    | 27        | 324      | 2           | 91.78%          |
| pred. medium | 13        | 1        | 281         | 95.25%          |
| class recall | 80.49%    | 94.46%   | 93.98%      |                 |

test

accuracy: 91.98%

|              | true high | true low | true medium | class precision |
|--------------|-----------|----------|-------------|-----------------|
| pred. high   | 42        | 2        | 6           | 84.00%          |
| pred. low    | 4         | 84       | 0           | 95.45%          |
| pred. medium | 5         | 0        | 69          | 93.24%          |
| class recall | 82.35%    | 97.67%   | 92.00%      |                 |

# Conclusion

# Member

|              |             |             |
|--------------|-------------|-------------|
| นายนิติภูมิ  | สุขชัย      | 63340500032 |
| นายพันธุ์รัช | ลิขิตบัณฑูร | 63340500040 |
| นายภูฟ้า     | บุญเชื้อตรง | 63340500048 |

The background features a stylized, abstract design. On the left side, there are flowing, organic shapes in shades of blue and orange, resembling waves or splashing liquid. These shapes are composed of various rounded, teardrop-like forms. The rest of the background is a solid, medium blue color.

# Thank you