1: Consider the perceptron x+y -1 > 0
Consider the training data:

X	Y	Label
0	0	+1
1	1	-1

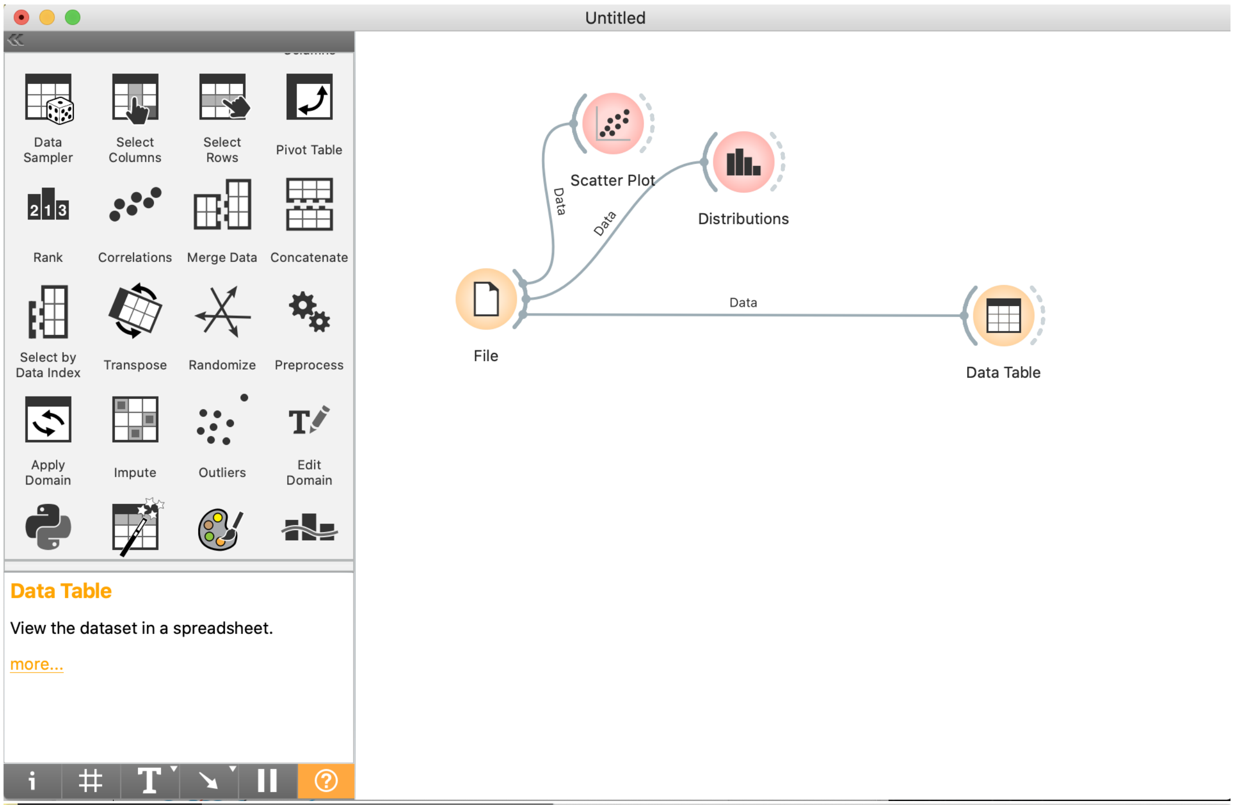
Give the first 4 updates of the perceptron on this data, taking the order in which the data is given , i.e., loop over the training data in the order given. Give the prediction, state whether it is error or no, and give the updated perceptron

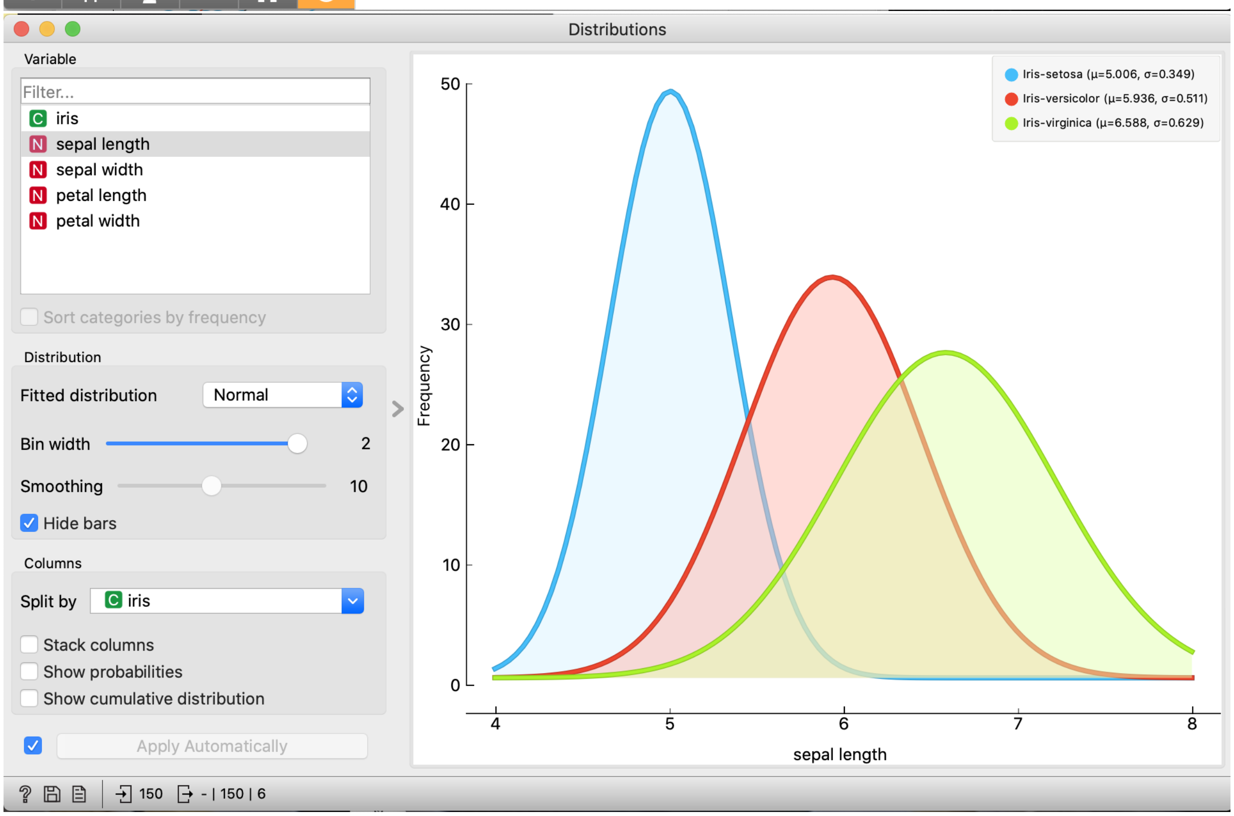
w_0 = 1, w_1 = 1, w_2 = -1 in the form $w_0x + w_1y + w_2 > 0$

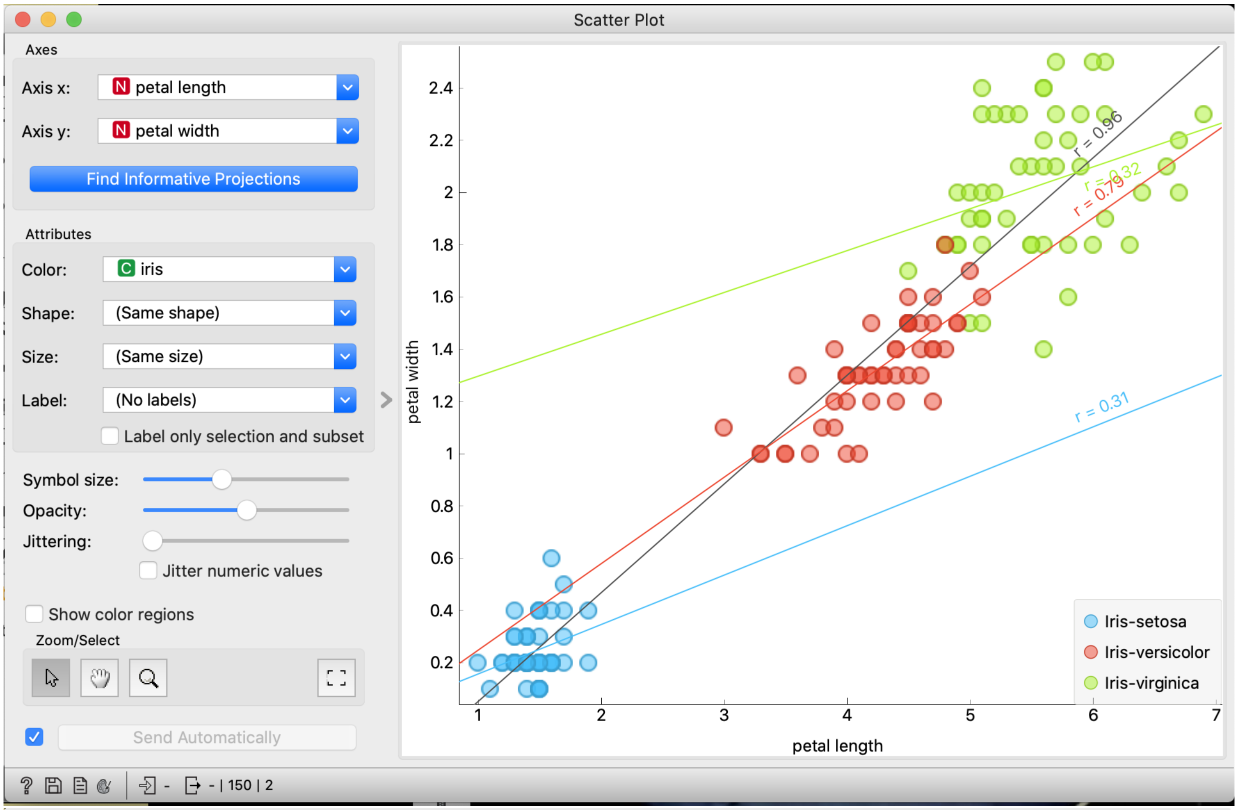
Data Point(0, 0) → label = -1 : Incorrectly Classified, update needed
$w_0 = 0 - 1 = -1$, $w_1 = 0 - 1 = -1$, line update: $-x - y - 1 > 0$
Data Point (1,1) → label = -1: Correctly classified, No line update
Datapoint (0,0) → label = -1: Update Needed
$w_0 = 0 - (-1) = 1$, $w_1 = 0 - (-1) = 1$: line update: $x + y - 1 > 0$
Data point (1, 1) → label = + 1: Update Needed
$w_0 = 1 + 1 = 2$, $w_1 = 1 + 1 = 2$: line update: $2x + 2y - 1 > 0$
Datapoint (0, 0) → label = -1: Update Needed
$w_0 = 0 - 2 = -2$, $w_1 = 0 - 2 = -2$: line update: $-2x - 2y - 1 > 0$

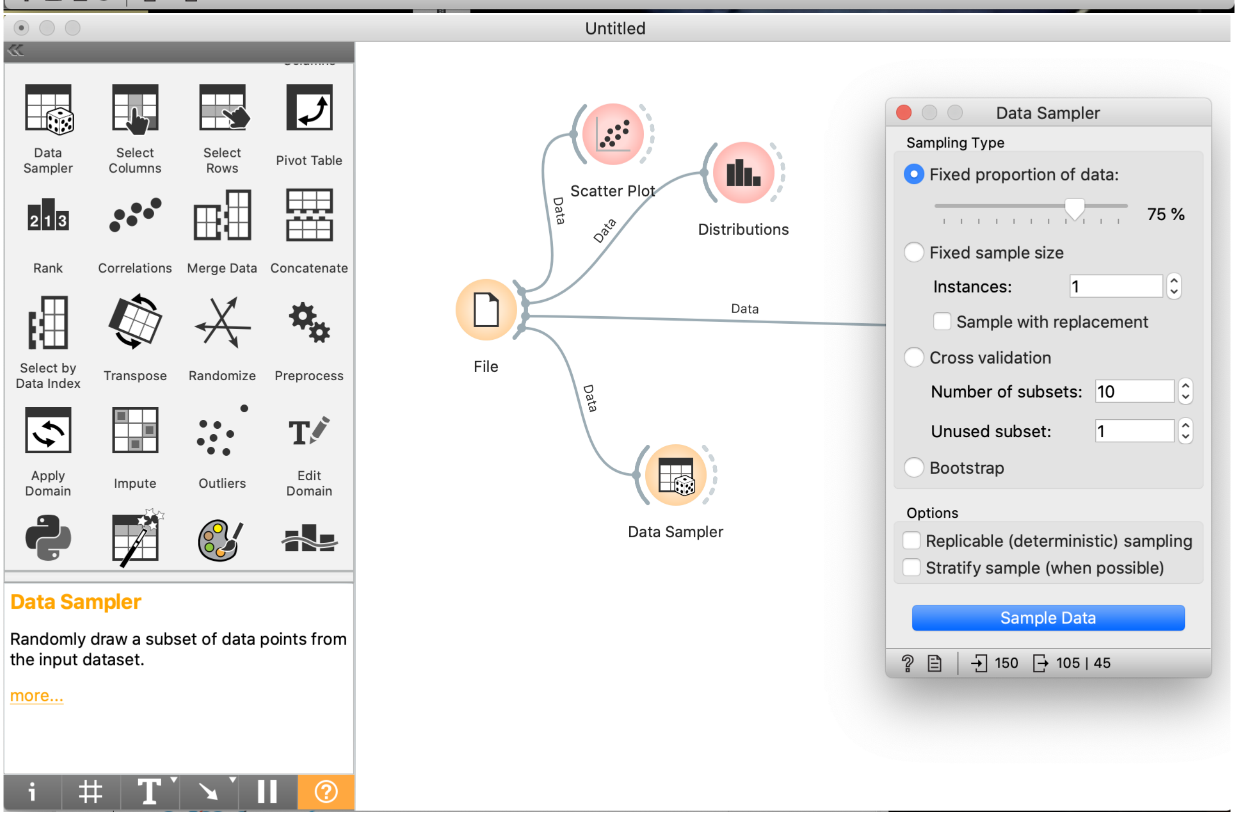
1(Extra Credit): Give the updated perceptrons till convergence

2: Download Orange
Use iris data set - divide into training and testing
to create models of decision tree, neural network, naive bayesian, KNN
give training and testing errors
give screen shot of the process flow.

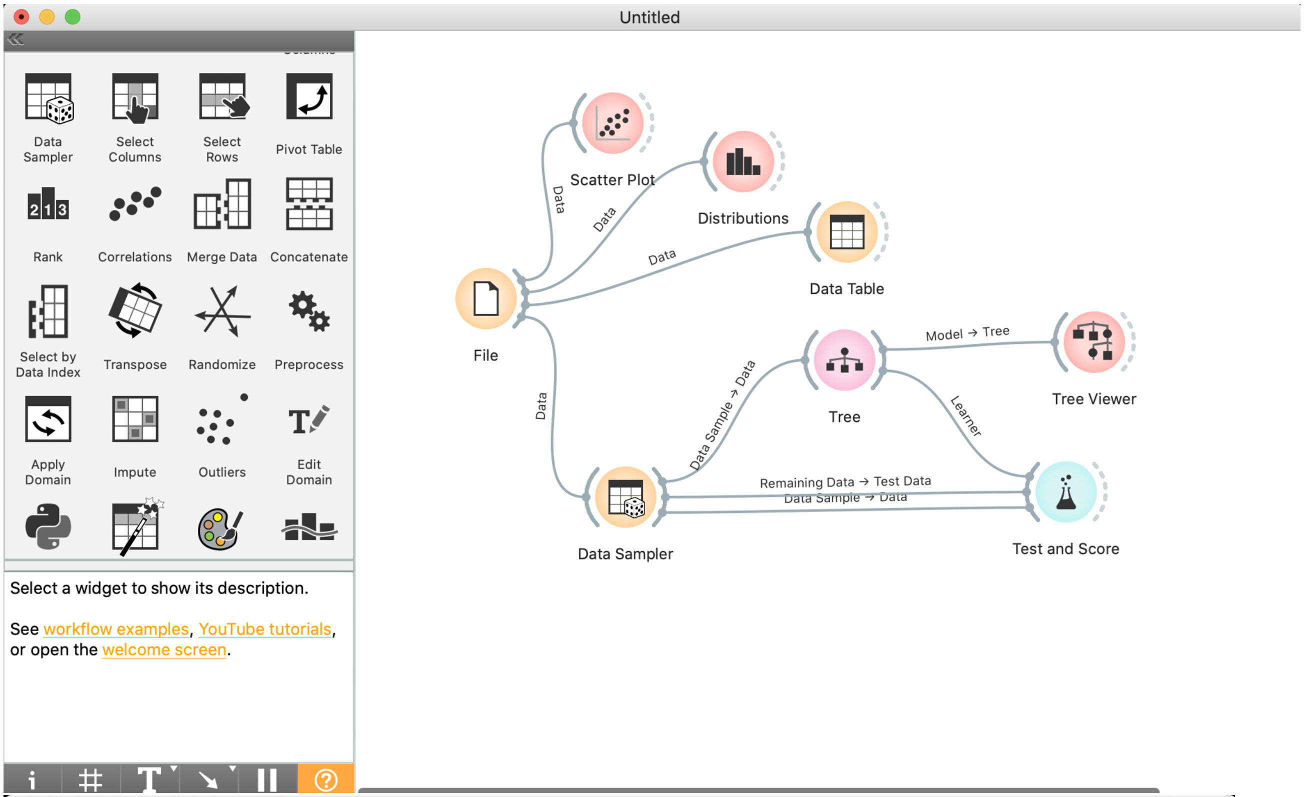

Untitled
Data Sampler
Select Columns
Select Rows
Pivot Table
Rank
Correlations
Merge Data
Concatenate
Select by Data Index
Transpose
Randomize
Preprocess
Apply Domain
Impute
Outliers
Edit Domain
Data Table
View the dataset in a spreadsheet.
more...
Scatter Plot
Distributions
File
Data Table
Data
Data
Data

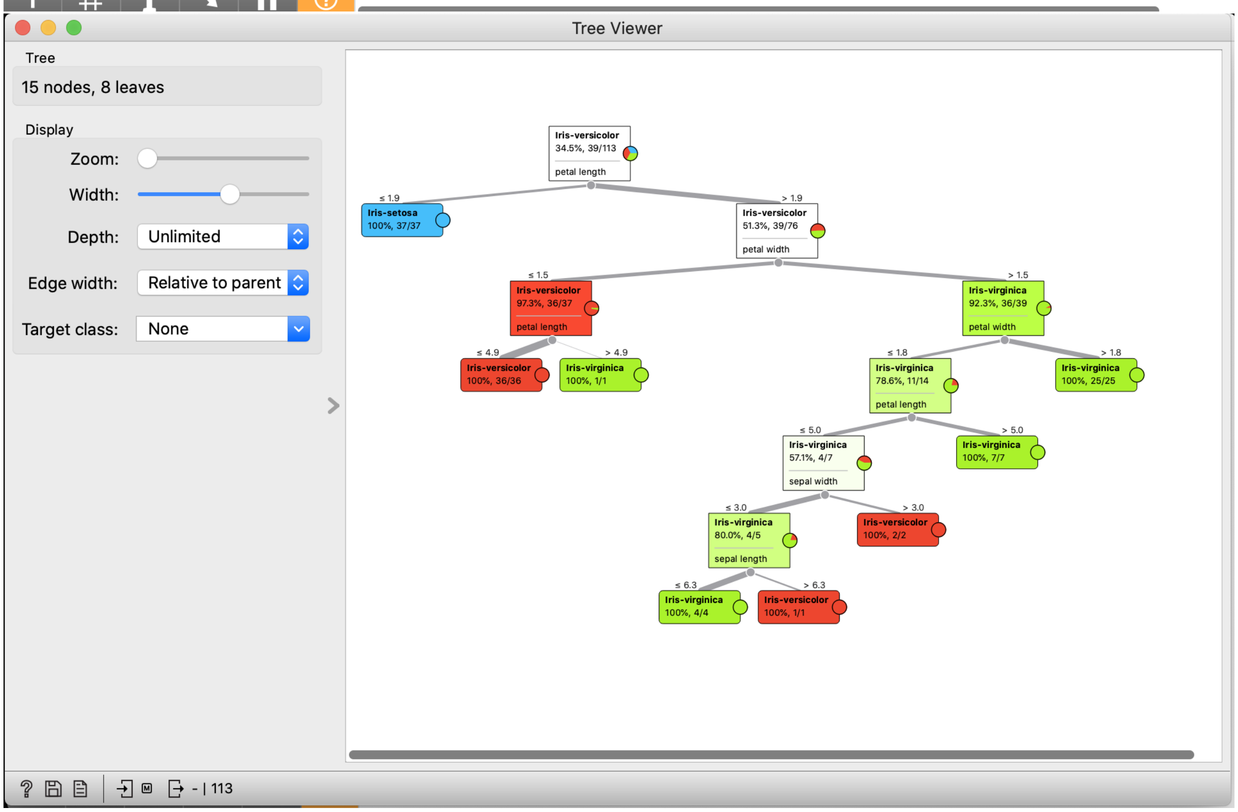

Distributions
Variable
Filter...
iris
sepal length
sepal width
petal length
petal width
Sort categories by frequency
Distribution
Fitted distribution
Normal
Bin width
2
Smoothing
10
Hide bars
Columns
Split by
iris
Stack columns
Show probabilities
Show cumulative distribution
Apply Automatically
150
- | 150 | 6
Iris-setosa (μ=5.006, σ=0.349)
Iris-versicolor (μ=5.936, σ=0.511)
Iris-virginica (μ=6.588, σ=0.629)
Frequency
sepal length
0
10
20
30
40
50
4
5
6
7
8



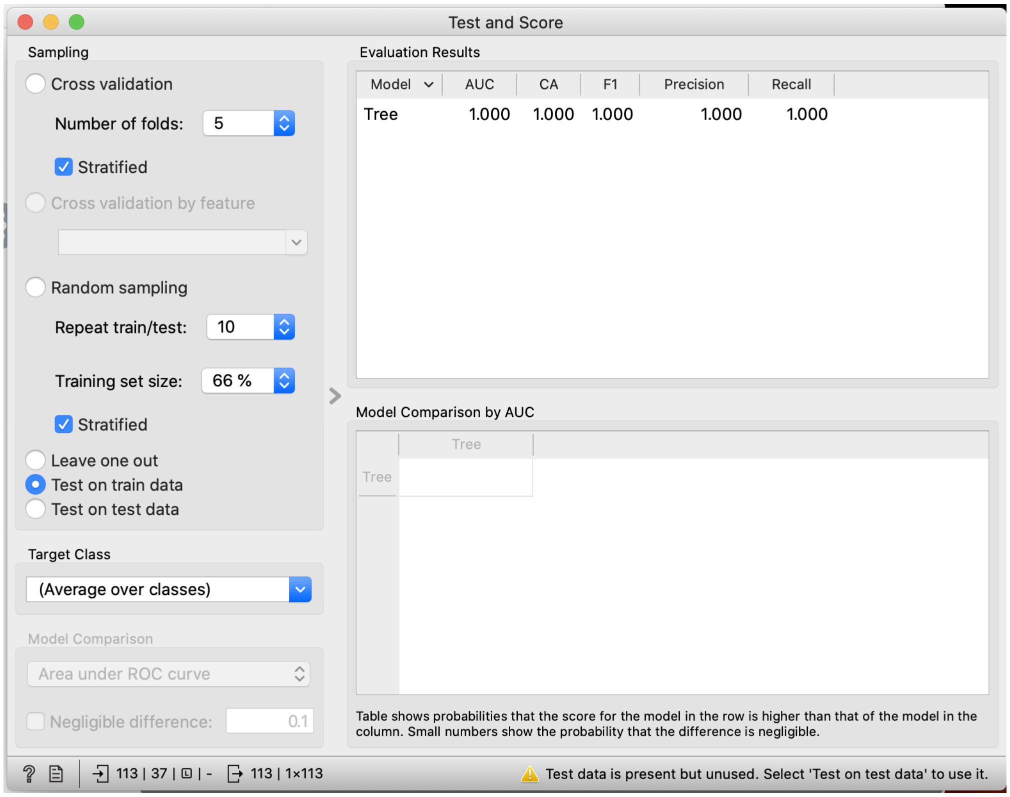


Decision Tree

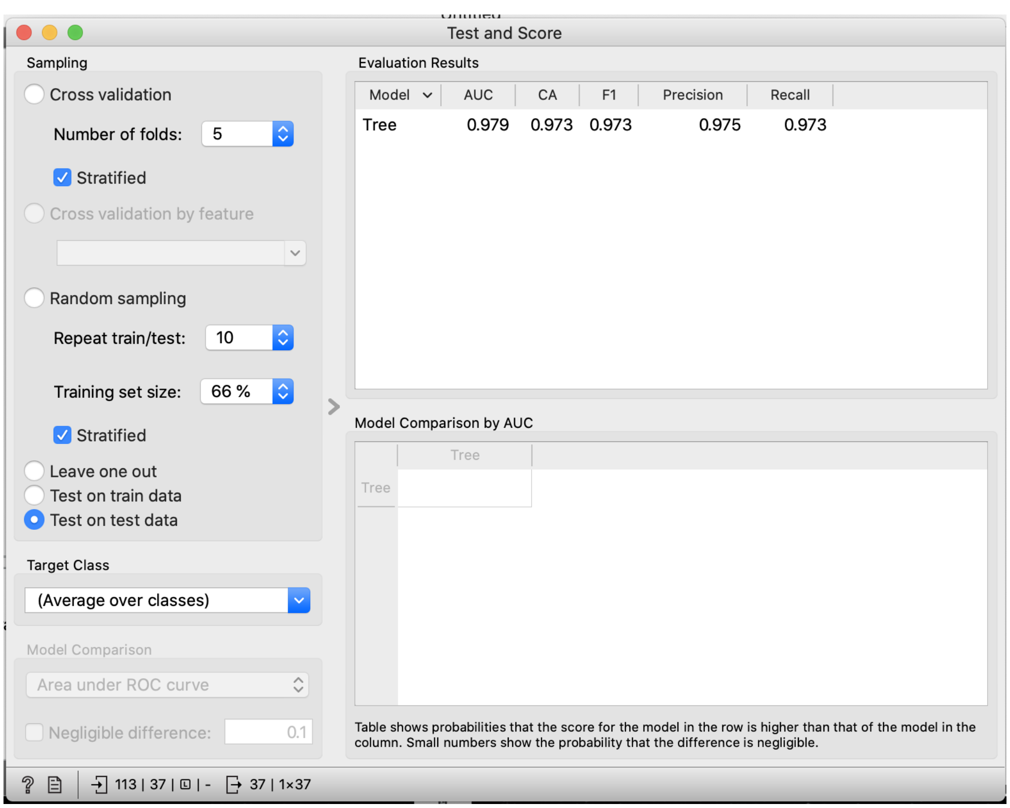




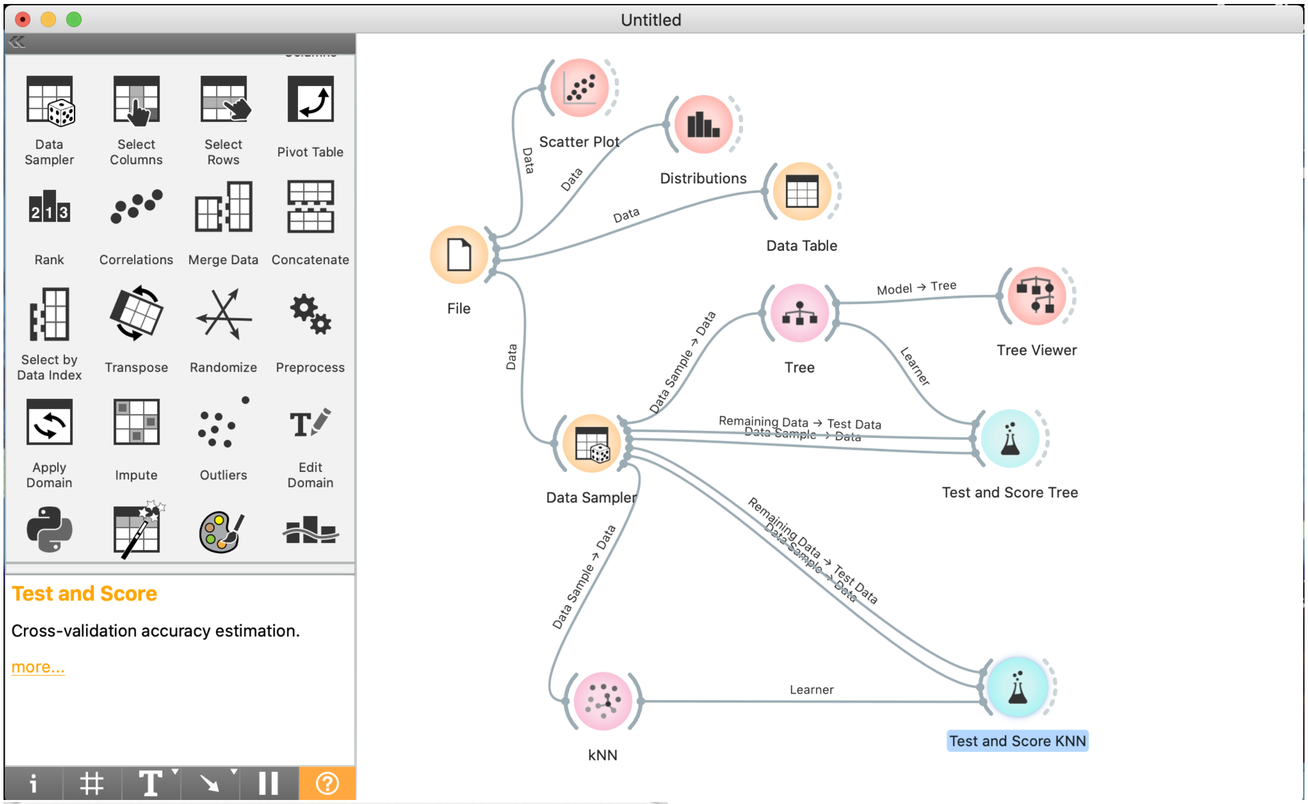
Training Scores:

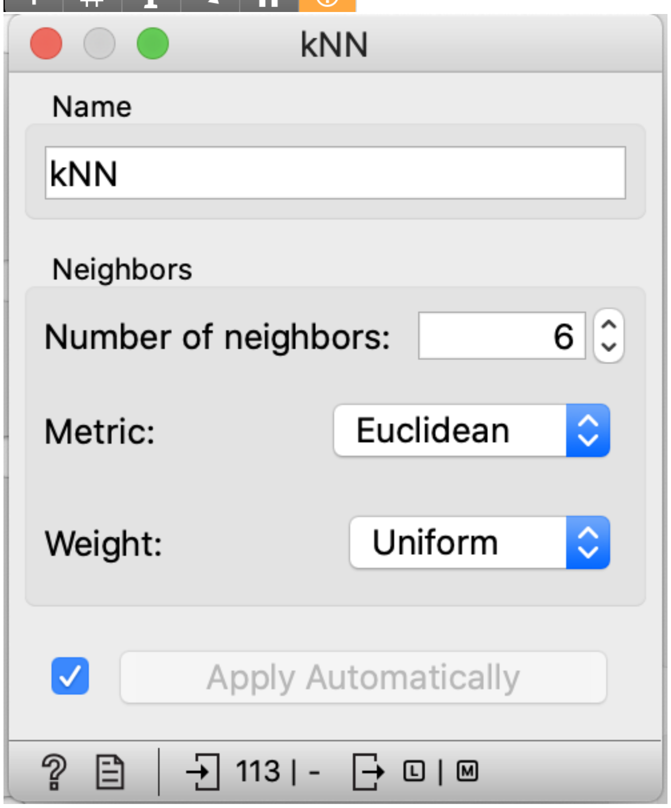


Testing Scores:

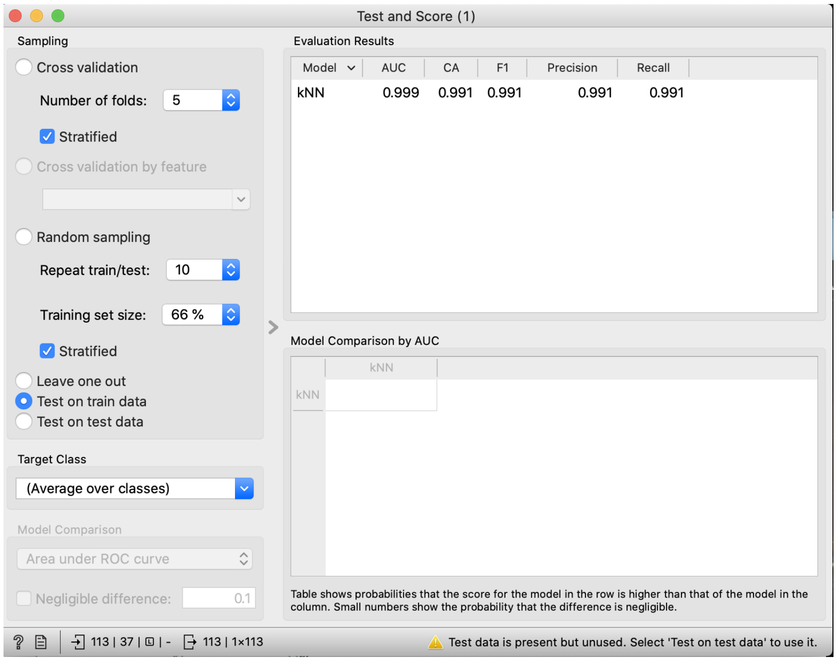


kNN

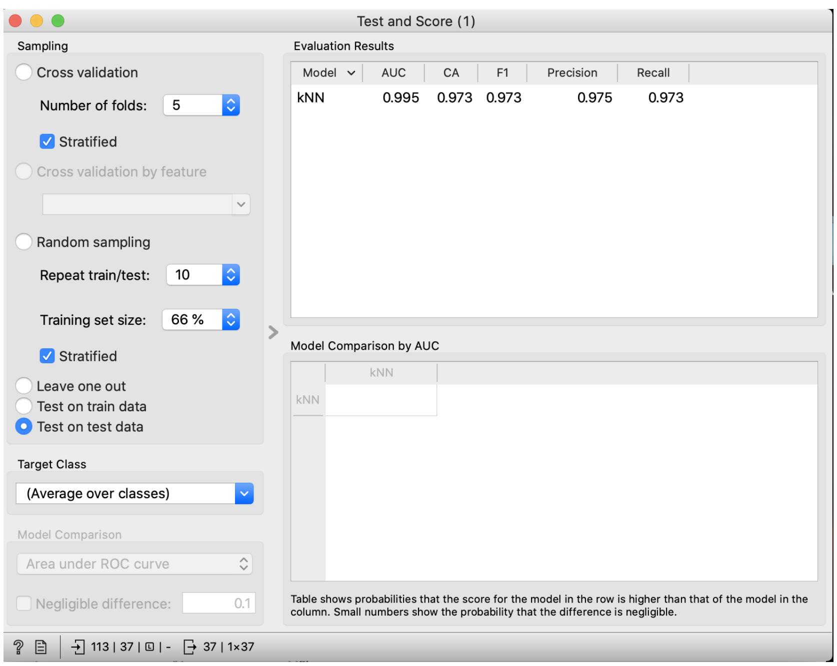




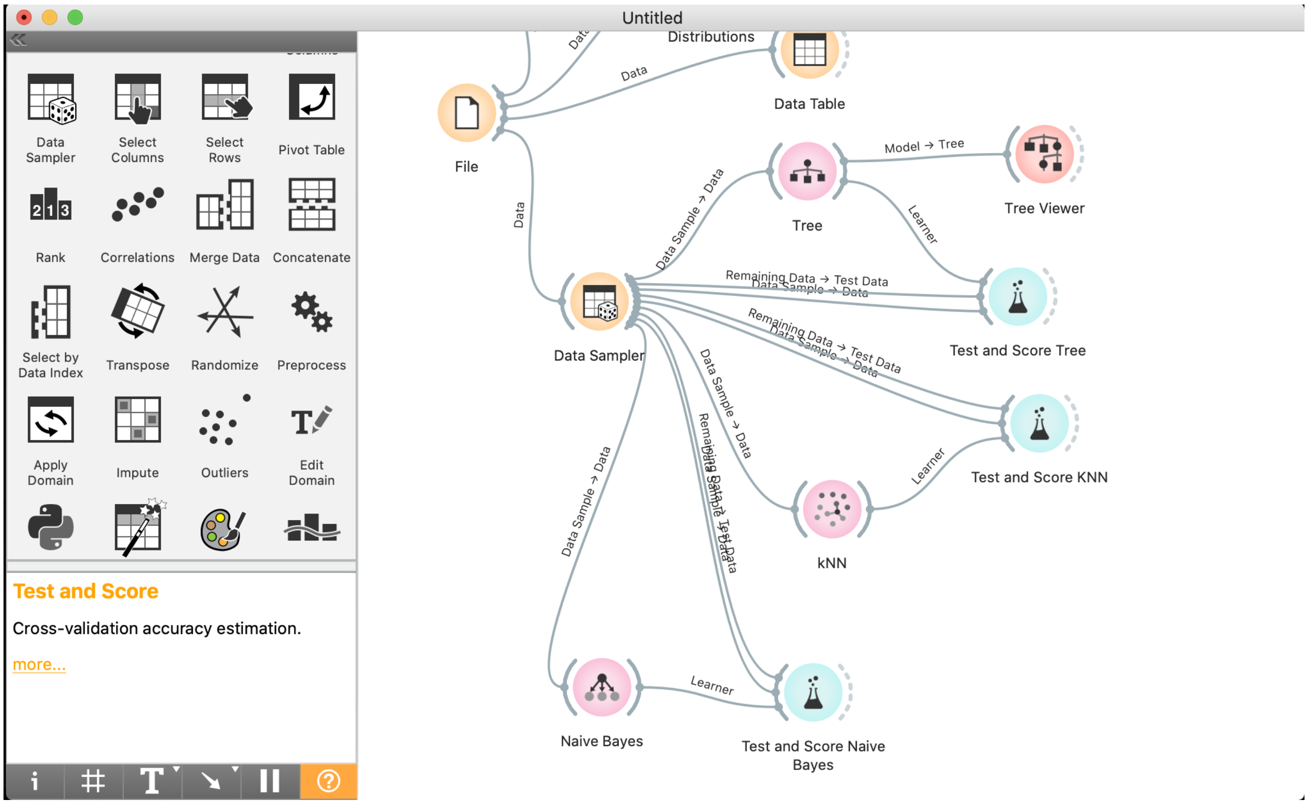
Training Scores:



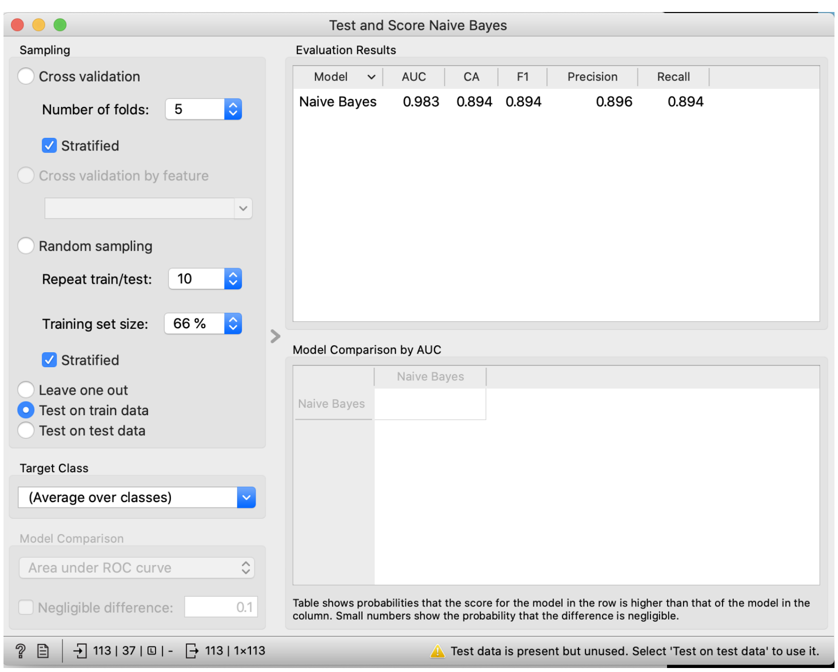
Testing Scores:



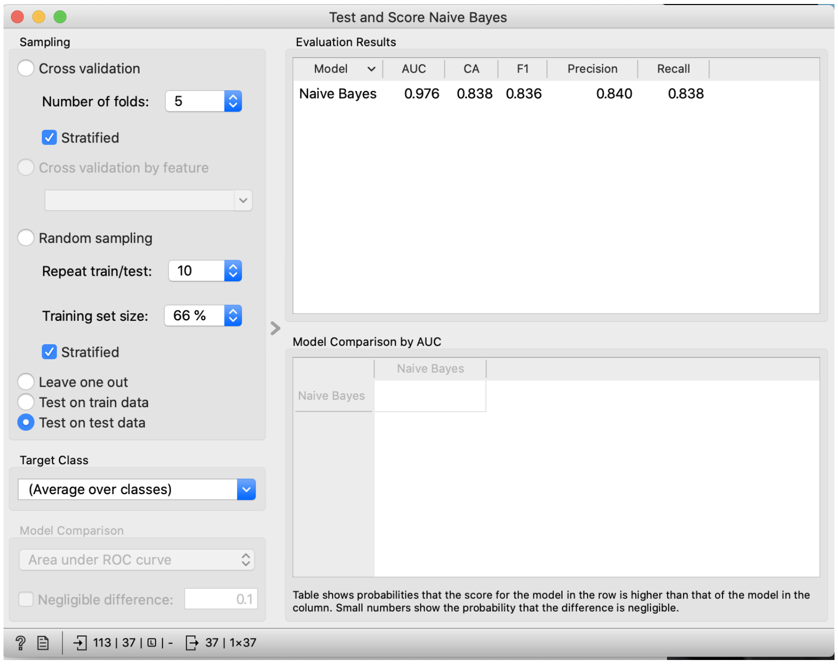
Naive Bayesian



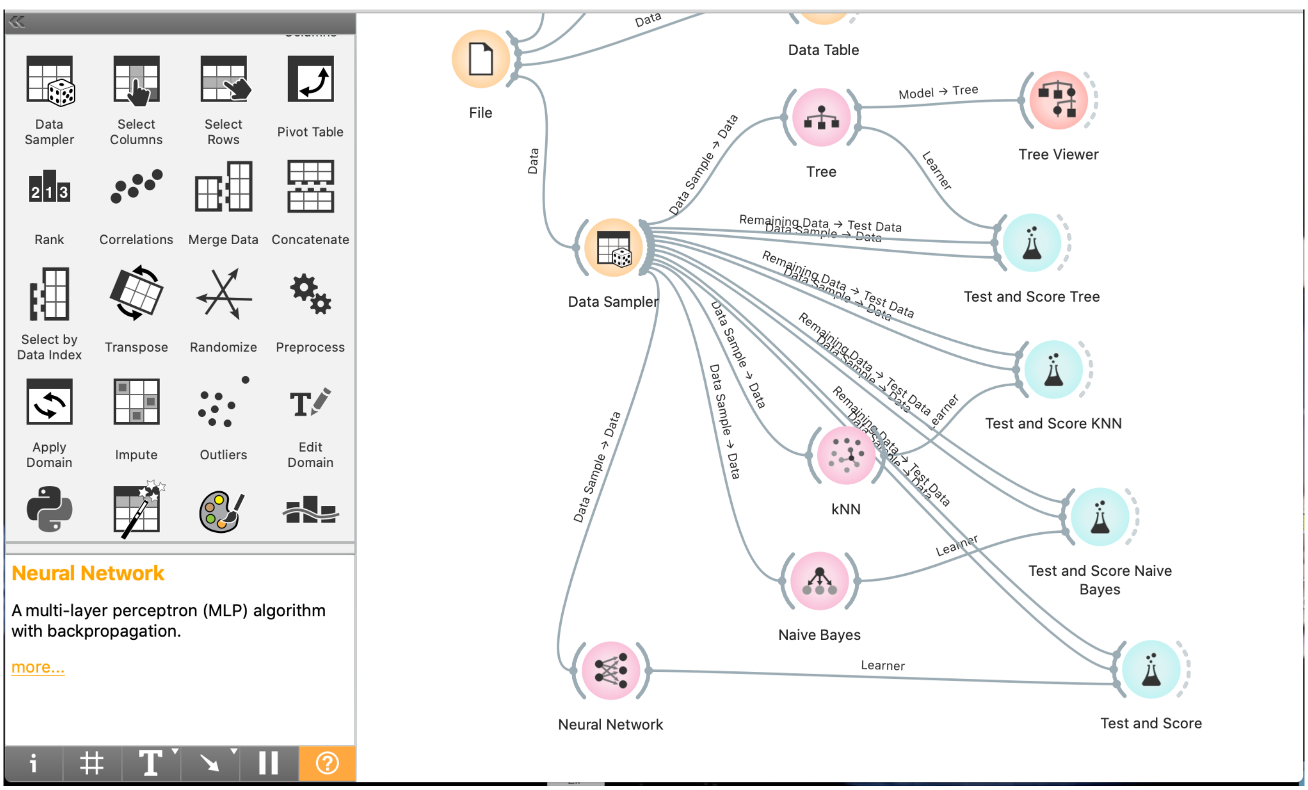
There was no way to edit the Naive Bayesian Algorithm Training Score:

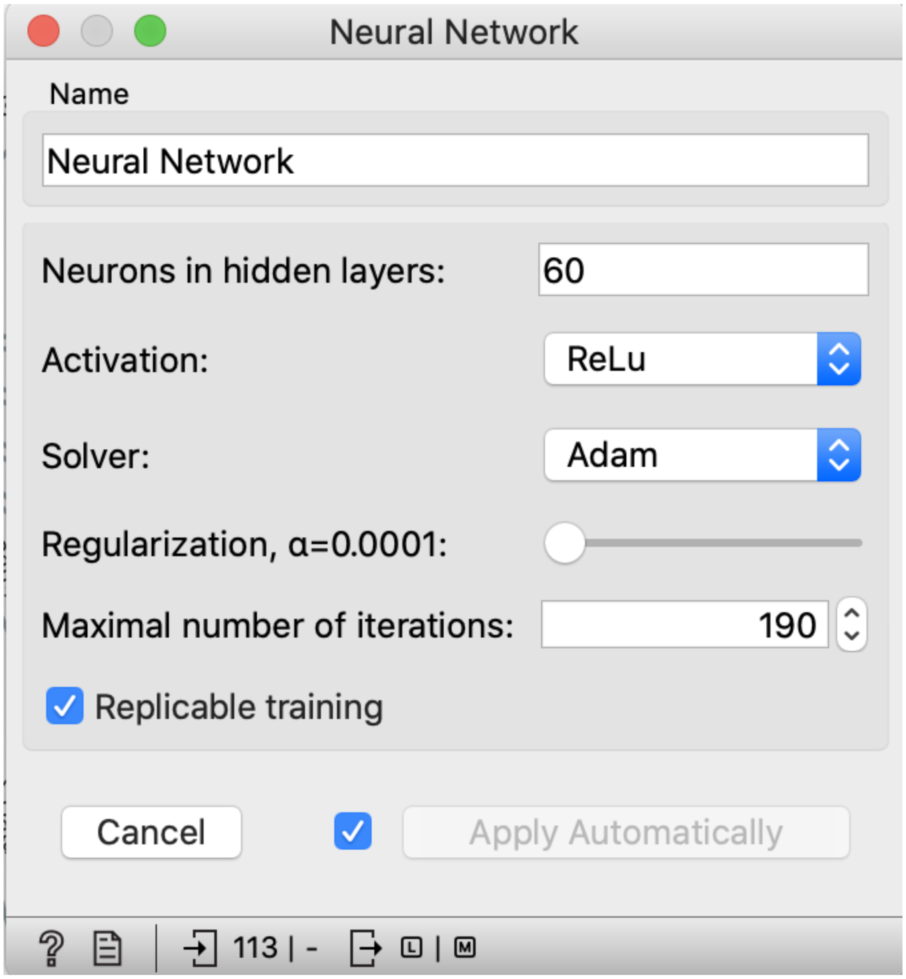


Testing Score:

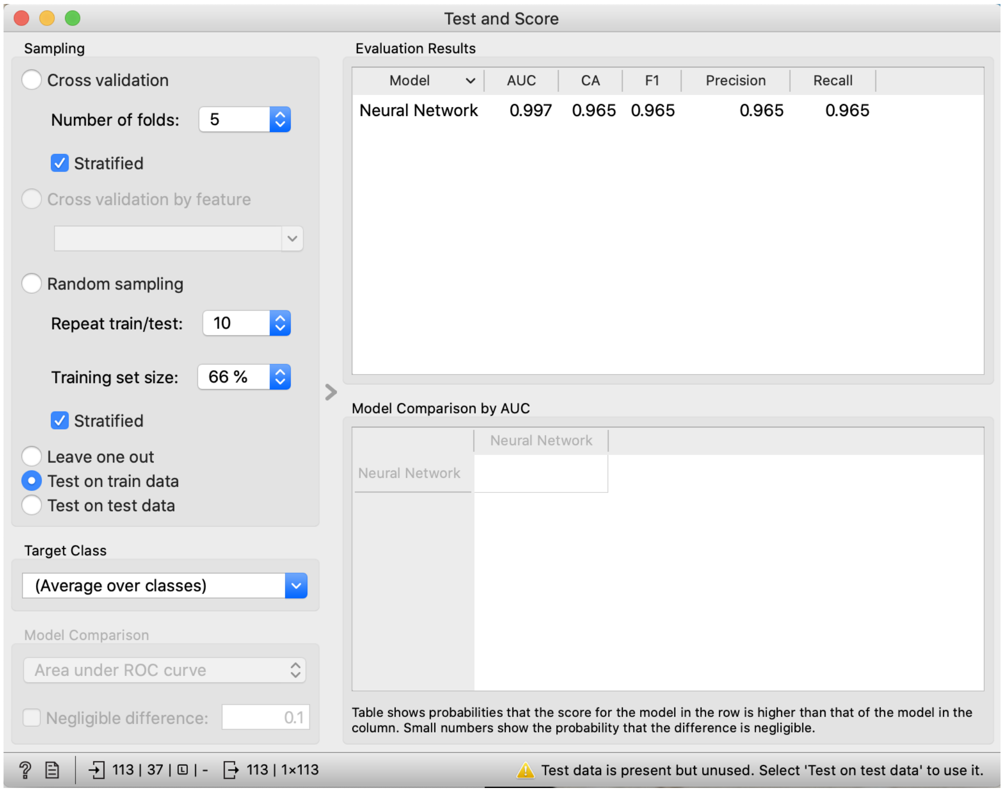


Neural Network

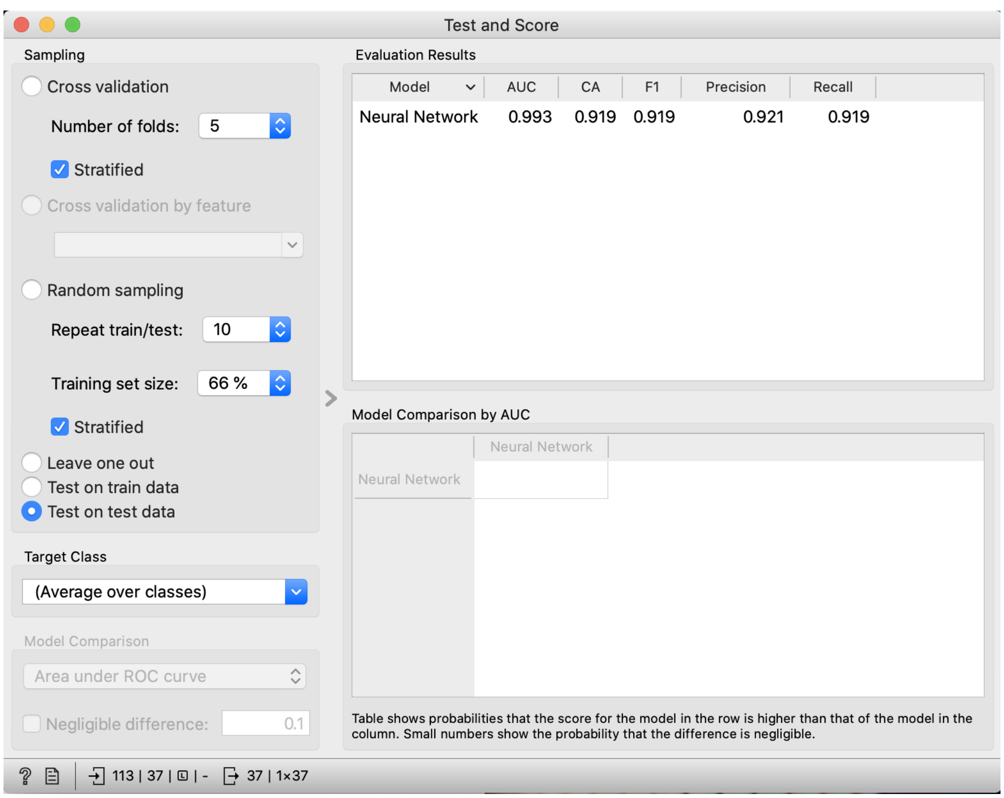




Training Score:

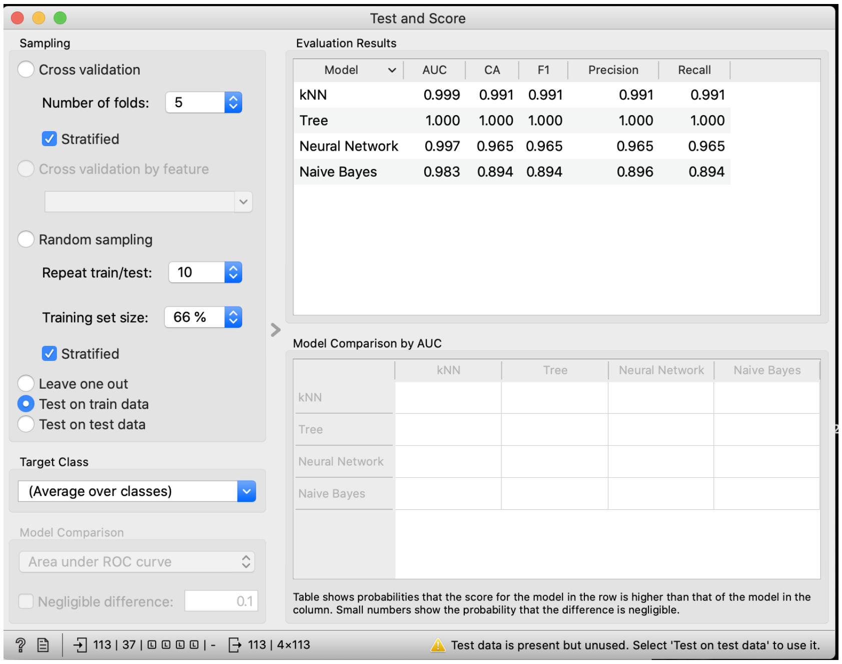


Testing Score:



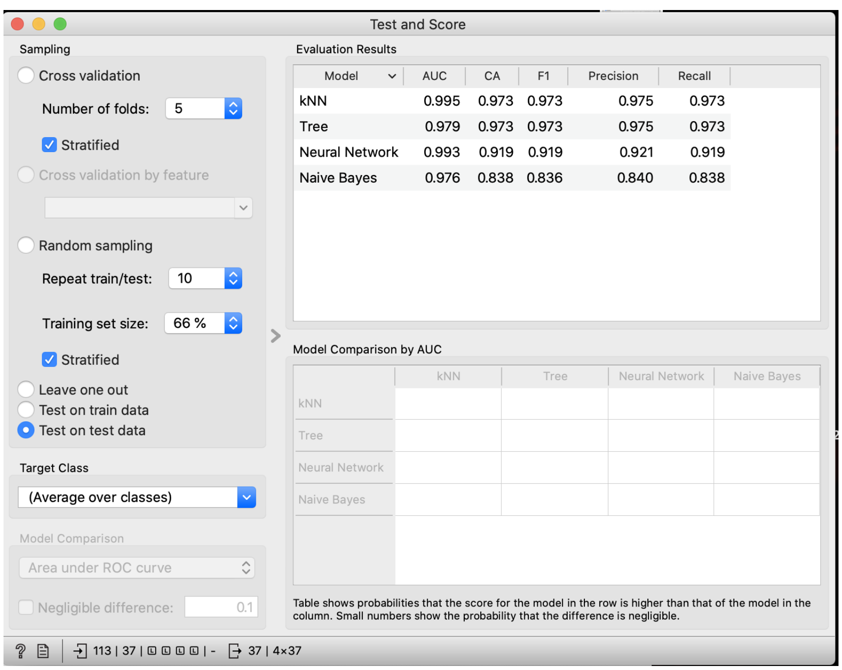
All together scores:

Training:



Model	AUC	CA	F1	Precision	Recall
kNN	0.999	0.991	0.991	0.991	0.991
Tree	1.000	1.000	1.000	1.000	1.000
Neural Network	0.997	0.965	0.965	0.965	0.965
Naive Bayes	0.983	0.894	0.894	0.896	0.894

Testing:



Model	AUC	CA	F1	Precision	Recall
kNN	0.995	0.973	0.973	0.975	0.973
Tree	0.979	0.973	0.973	0.975	0.973
Neural Network	0.993	0.919	0.919	0.921	0.919
Naive Bayes	0.976	0.838	0.836	0.840	0.838

3: Backprop

Consider the example network and initial weights given in https://mattmazur.com/2015/03/17/a-step-by-step-backpropagation-example/ compute the weight updates for W5 and W1 with when target outputs are <0.02,

0.98>

$h1_{net} = 0.3775$
$out_{h1} = 0.59326992$
$out_{o1} = 0.75136507$
$out_{o2} = 0.772928465$
$Error_{o1} = \frac{1}{2}(0.98 - 0.75136507)^2 = 0.26744$
$Error_{o2} = \frac{1}{2}(0.02 - 0.772928465)^2 = 0.02143$

$Error_{total} = Error_{o1} + Error_{o2} = 0.26744 + 0.02143 = 0.28887$
$\frac{\delta Error_{total}}{\delta w_5} = \frac{\delta Error_{total}}{\delta out_{o1}} * \frac{\delta out_{o1}}{\delta net_{o1}} * \frac{\delta net_{o1}}{\delta w_5}$
$\frac{\delta Error_{total}}{\delta out_{o1}} = -(target_{o1} - out_{o1}) = -(0.02 - 0.75136507) = 0.73136507$
$\frac{\delta out_{o1}}{\delta net_{o1}} = out_{o1}(1 - out_{o1}) = 0.75136507(1 - 0.75136507) = 0.186815602$
$\frac{\delta net_{o1}}{\delta w_5} = out_{h1} = 0.59326992$
$\frac{\delta Error_{total}}{\delta w_5} = \frac{\delta Error_{total}}{\delta out_{o1}} * \frac{\delta out_{o1}}{\delta net_{o1}} * \frac{\delta net_{o1}}{\delta w_5} = 0.73136507 * 0.186815602 * 0.59326992 = 0.08105870993$
New value of $w_5 = w_5 - \frac{\delta Error_{total}}{\delta w_5} = 0.4 - 0.08105870993 = 0.31894129007$

$\frac{\delta Error_{total}}{\delta w_1} = \frac{\delta Error_{total}}{\delta out_{h1}} * \frac{\delta out_{h1}}{\delta net_{h1}} * \frac{\delta net_{h1}}{\delta w_1}$
$\frac{\delta net_{h1}}{\delta w_1} = i_1 = 0.05$
$\frac{\delta out_{h1}}{\delta net_{h1}} = out_{h1}(1 - out_{h1}) = 0.59326992(1 - 0.59326992) = 0.231300709$
$\frac{\delta Error_{total}}{\delta out_{h1}} = \frac{\delta Error_{o1}}{\delta out_{h1}} + \frac{\delta Error_{o2}}{\delta out_{h1}}$
$\frac{\delta Error_{o1}}{\delta out_{h1}} = \frac{\delta Error_{o1}}{\delta net_{o1}} * \frac{\delta net_{o1}}{\delta out_{h1}}$
$\frac{\delta Error_{o1}}{\delta out_{o1}} = -(target_{o1} - out_{o1}) = -(0.02 - 0.75136507) = 0.73136507$
$\frac{\delta out_{o1}}{\delta net_{o1}} = out_{o1}(1 - out_{o1}) = 0.75136507(1 - 0.75136507) = 0.186815602$
$\frac{\delta Error_{o1}}{\delta net_{o1}} = \frac{\delta Error_{o1}}{\delta net_{o1}} * \frac{\delta net_{o1}}{\delta out_{h1}} = 0.73136507 * 0.186815602 = 0.13849562$
$\frac{\delta net_{o2}}{\delta out_{h1}} = w_5 = 0.40$
$\frac{\delta Error_{o1}}{\delta out_{h1}} = \frac{\delta Error_{o1}}{\delta net_{o1}} * \frac{\delta net_{o1}}{\delta out_{h1}} = 0.13849562 * 0.40 = 0.055399425$
$\frac{\delta Error_{o2}}{\delta out_{o2}} = -(target_{o2} - out_{o2}) = -(0.98 - 0.0.772928465) = -0.20707$
$\frac{\delta out_{o2}}{\delta net_{o2}} = out_{o2}(1 - out_{o2}) = 0.772928465(1 - 0.772928465) = 0.17551005299$
$\frac{\delta Error_{o2}}{\delta net_{o2}} = \frac{\delta Error_{o2}}{\delta net_{o2}} * \frac{\delta net_{o2}}{\delta out_{h1}} = -0.20707 * 0.17551005299 = -0.03634286667$
$\frac{\delta net_{o2}}{\delta out_{h1}} = w_6 = 0.45$
$\frac{\delta Error_{o2}}{\delta out_{h1}} = \frac{\delta Error_{o2}}{\delta net_{o2}} * \frac{\delta net_{o2}}{\delta out_{h1}} = -0.03634286667 * 0.45 = -0.01635429$
$\frac{\delta Error_{total}}{\delta out_{h1}} = \frac{\delta Error_{o1}}{\delta out_{h1}} + \frac{\delta Error_{o2}}{\delta out_{h1}} = 0.055399425 - 0.01635429 = 0.039045135$
$\frac{\delta Error_{total}}{\delta w_1} = \frac{\delta Error_{total}}{\delta out_{h1}} * \frac{\delta out_{h1}}{\delta net_{h1}} * \frac{\delta net_{h1}}{\delta w_1} = 0.05 * 0.231300709 * 0.039045135 = 0.00045155837$
new value of $w_1 = w_1 - \frac{\delta Error_{total}}{\delta w_1} = 0.15 - 0.00045155837 = 0.14954844163$