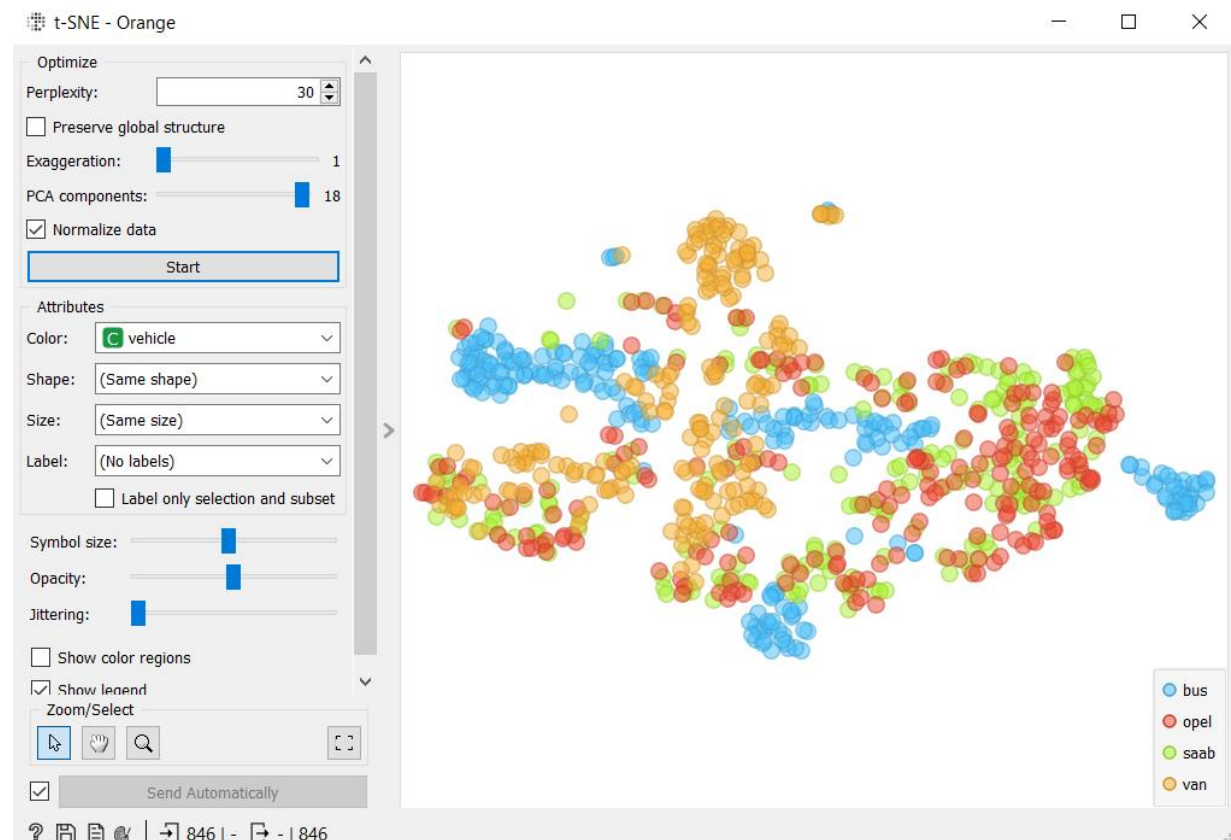


## Anastasia Psarou - Lab 5. Advanced classifiers

a) Select the dataset which is not too regular (such as glass, but other are welcome!). Read about it and try to understand features.

I choose "Vehicle Silhouettes" Dataset.

b) Visualize the dataset employing t-SNE to show that its regularity is poor.



Classes are not very distinguishable between each other.

c) Use SVM and Neural Network classifiers as the baseline. Select the metaparameters producing the best F1 values for these classifiers.

The best F1 value I got for SVM is:

Model	Train time [s]	Test time [s]	AUC	CA	F1	Precision	Recall	LogLoss	Specificity
SVM	1.615	0.085	0.948	0.781	0.774	0.783	0.781	0.472	0.928

The values I used to get this result are:

SVM - Orange
?
×

Name

SVM

SVM Type

☐ SVM
 Cost (C):

Regression loss epsilon ( $\epsilon$ ):

☒ v-SVM
 Regression cost (C):

Complexity bound (v):

Kernel

☐ Linear
 Kernel:  $\exp(-g|x-y|^2)$

☐ Polynomial
 g:

☒ RBF

☐ Sigmoid

Optimization Parameters

Numerical tolerance:

☐ Iteration limit:

☒ Apply Automatically

?
📄
→
-
←
📄
|
-
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-

As far as Neural Network is concerned the best results of F1 I get is:

Model	Train time [s]	Test time [s]	AUC	CA	F1	Precision	Recall	LogLoss	Specificity
Neural Network	5.668	0.058	0.962	0.851	0.851	0.851	0.851	2.928	0.950

This happens with these parameters:

Neural Network - Orange

Name: Neural Network

Neurons in hidden layers: 110

Activation: ReLu

Solver: L-BFGS-B

Regularization,  $\alpha=0.0001$ : [Slider]

Maximal number of iterations: 200

☒ Replicable training

Buttons: Cancel, ☒ Apply Automatically

Toolbar: ? [Icon] | [Icon] - [Icon] [Icon] | -

**d) Your main task is to show how the performance of MLP is changing with #layers. However, when increasing the number of layers, you should remember that the number of NN parameters is CONSTANT!!!**

An effort was made to maintain the parameters constant at 2200. Having 18 features and 4 classes a 1 hidden layer Neural Network of 100 neurons a 2 hl of  $(2^*)37$ , a 3 hl of  $(3^*)28$ , a 4 hl of  $(4^*)24$ , a 5 hl of  $(5^*)21$ , a 10 hl of  $(10^*)14$ , a 15 hl of  $(15^*)12$  were used.

**f) Formulate conclusions.**

At first, by increasing the numbers of layers we can have better performances with the Neural Network as a classifier, peaking at 4 layers. Although, after that the performance starts to drop little by little and at 10 layers we observe worse performance than the initial one layer.