# H3P1

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*4/8/2020"*
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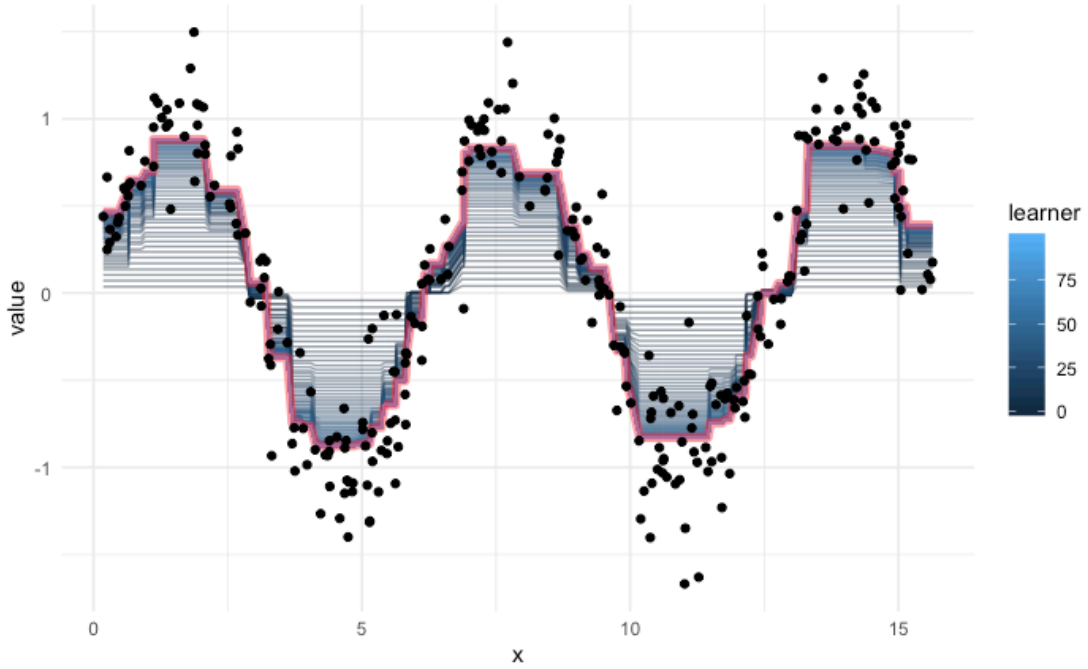
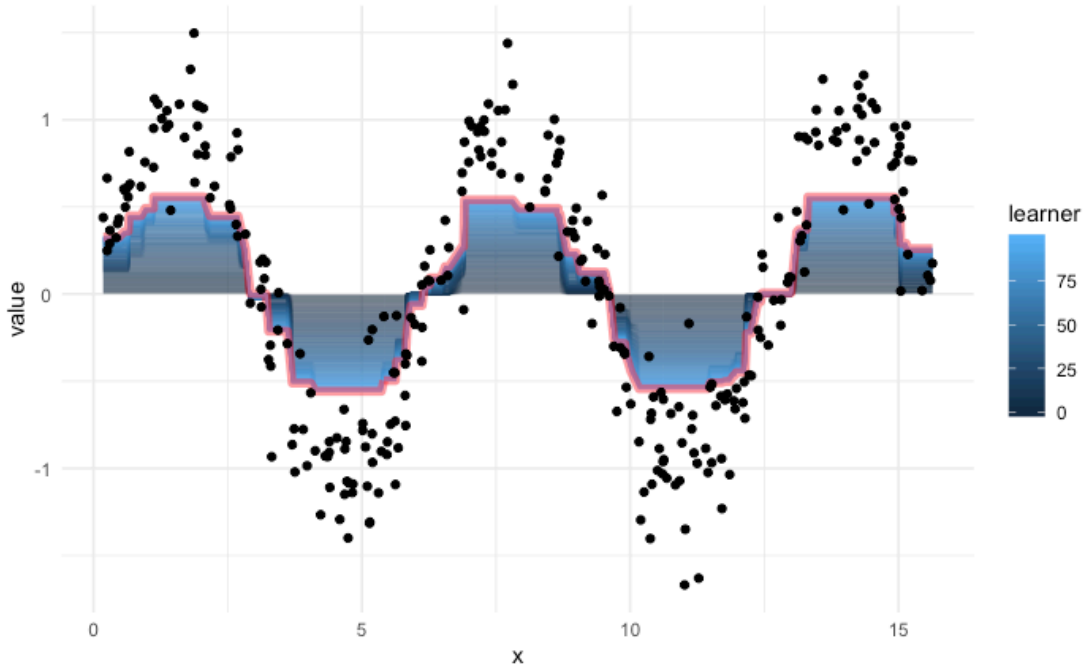
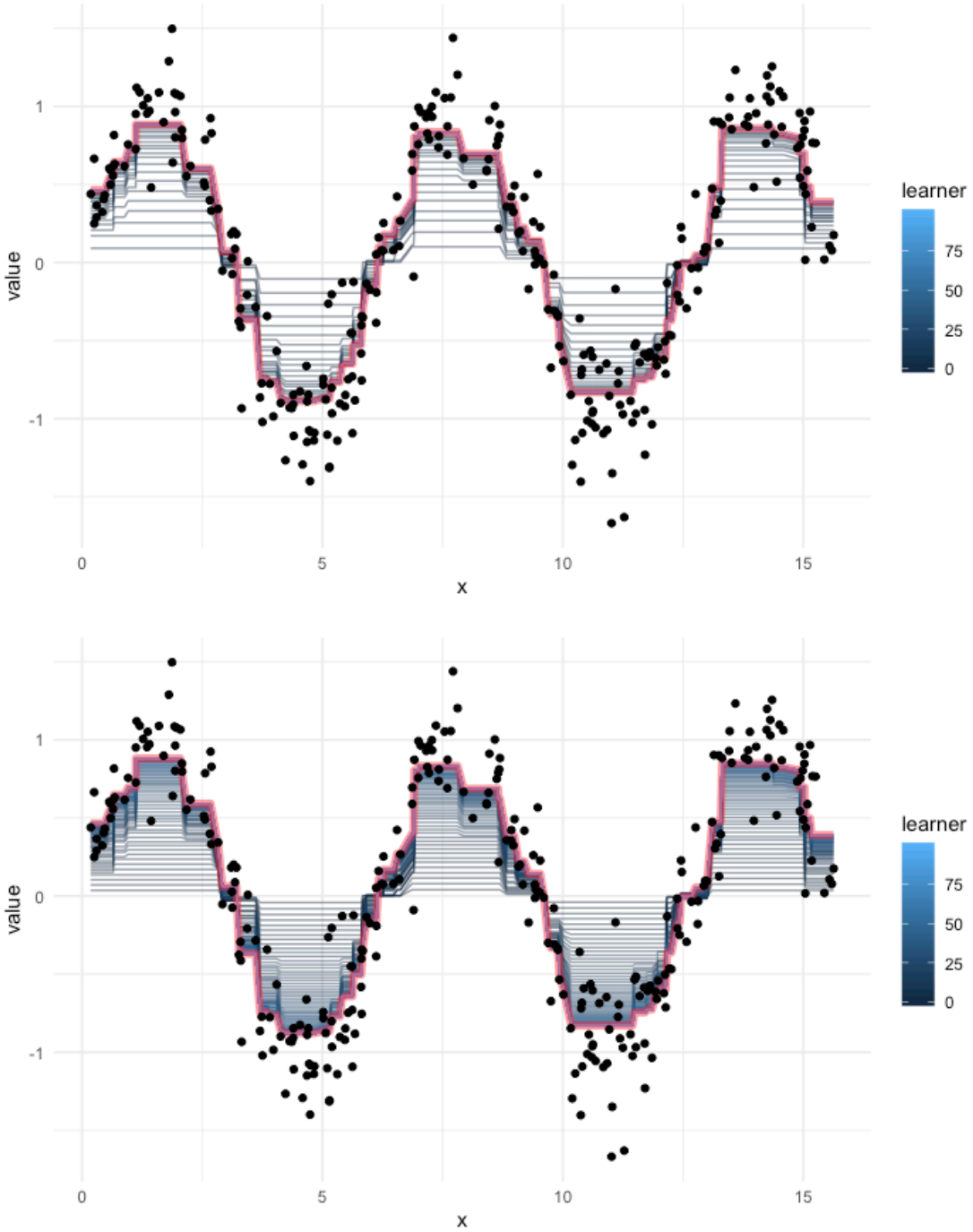
**# Question 1**

**## Q0**



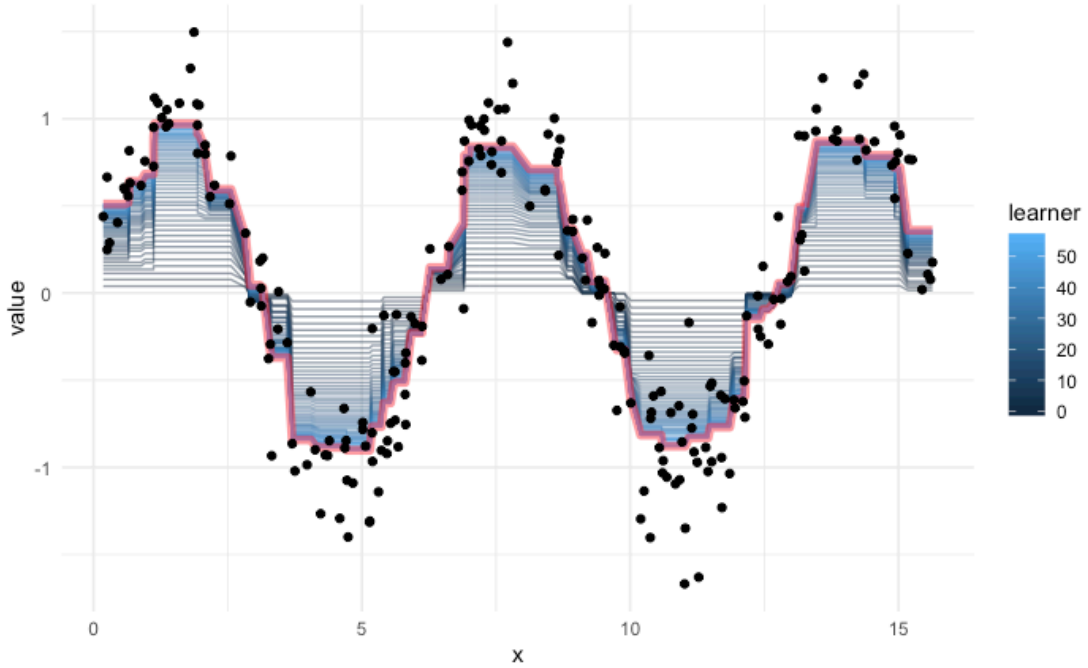

**## Q1**






**# Q2: Using a validation and test set**

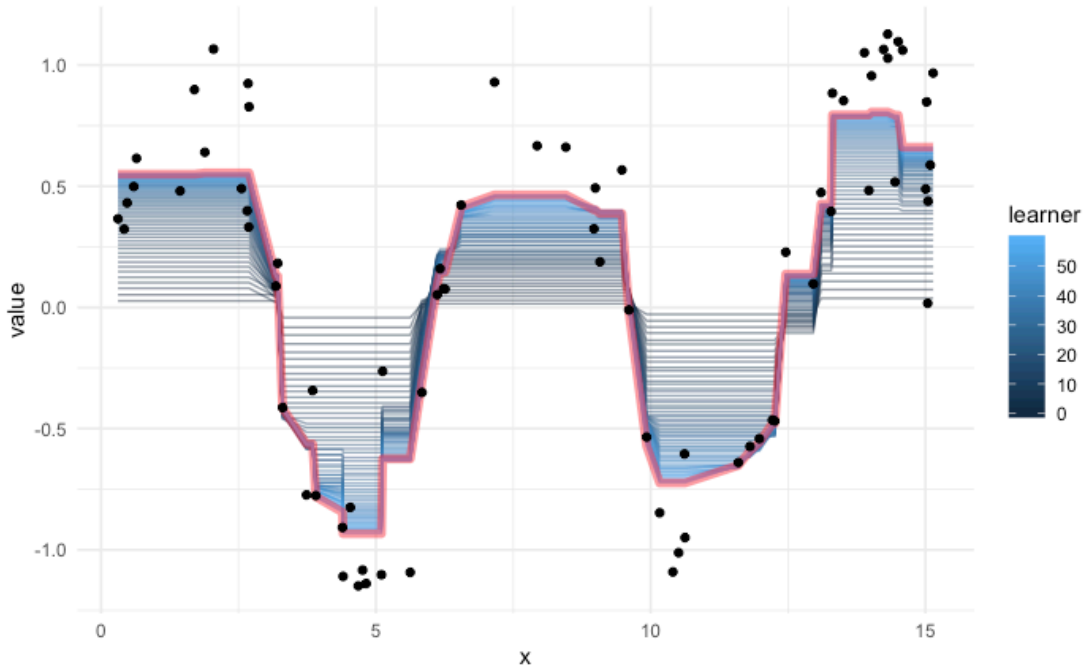
**### A**




**### B**

Since the learning iteration stops at 60, we have 60 trees.

**### C**




The RMSE is about 0.216.

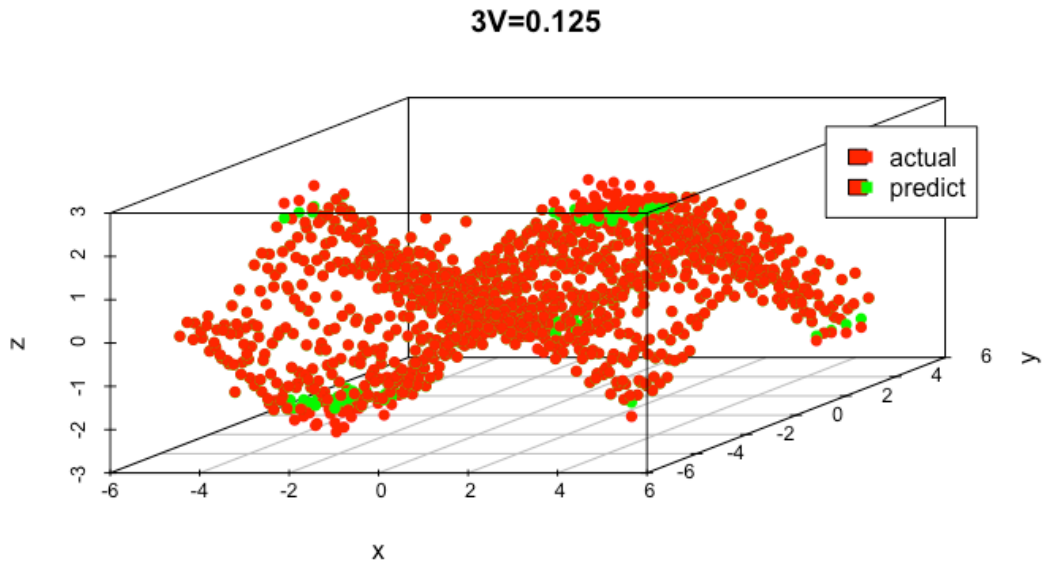
**## Q3**

In this case, the best tree's minsplit is 2, maxdepth is 5 and the RMSE of the this tree is

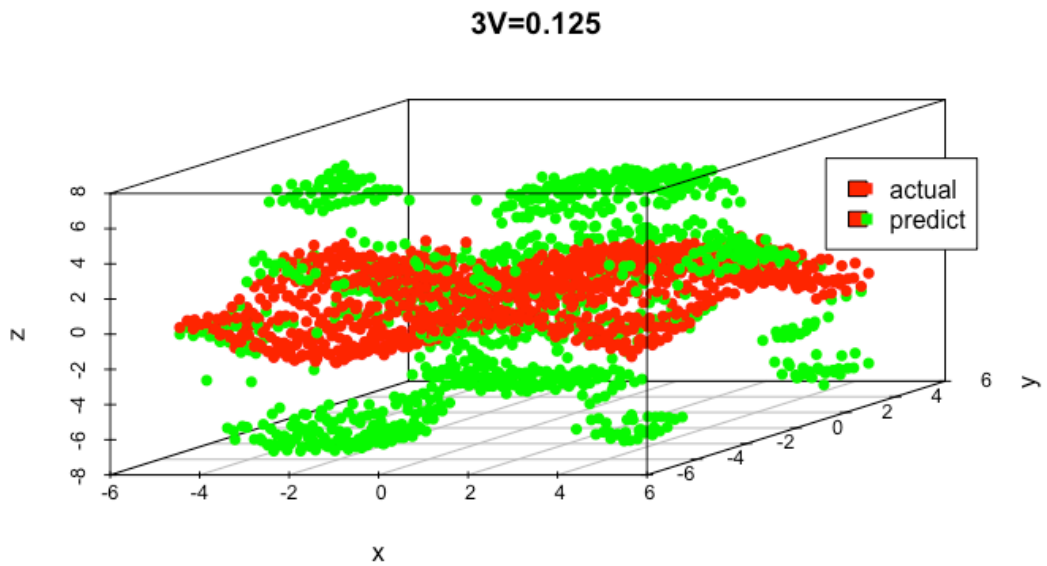
0.13.

**## P2 (please ignore the titles of graphs)**

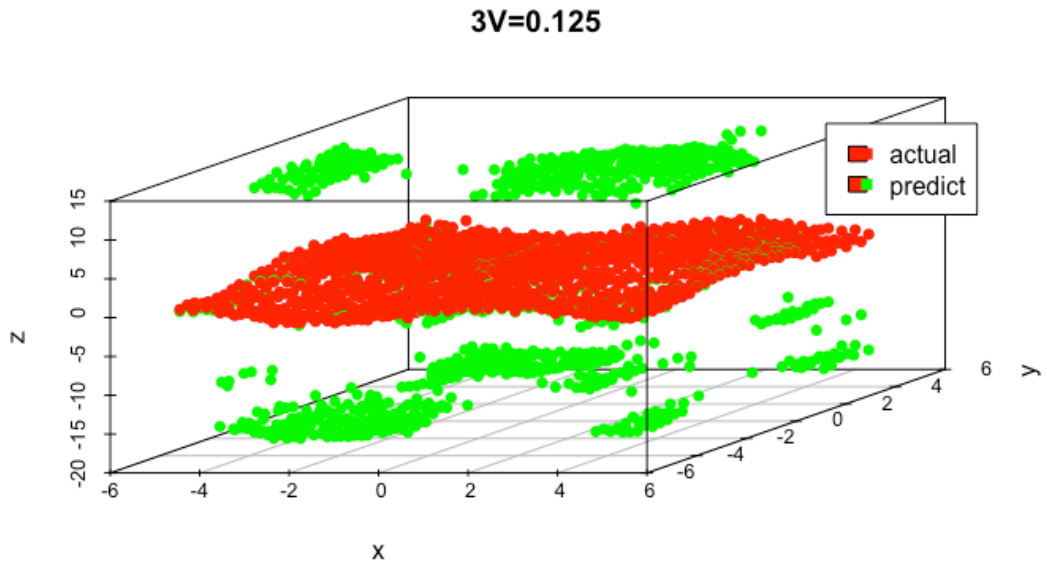
V=0.01

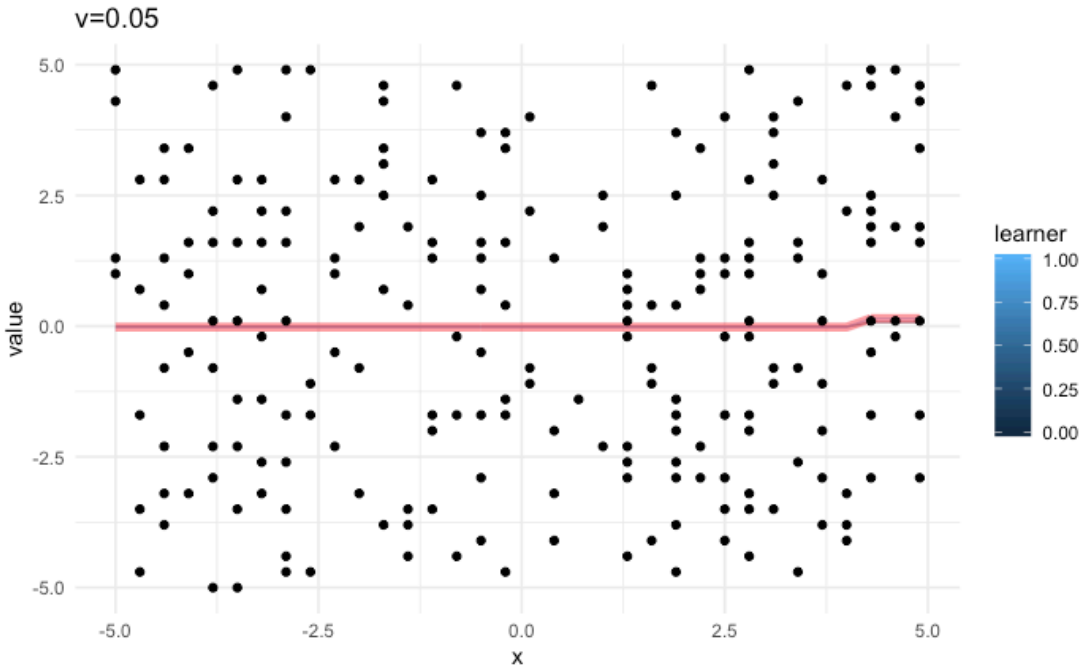



V=0.05




V=0.125




There is only 1 tree with RMSE 0.001350553.
In this case, the best tree's minsplit is 2, maxdepth is 5 and the RMSE of the this tree is 0.04.

**# Question 2**

**## part 1**
**### a**
Yes. It shows the two points are really close in the dimension.

**### b**

Perplexity value is the  expected number of nearest neighbors to the point.

**### c**

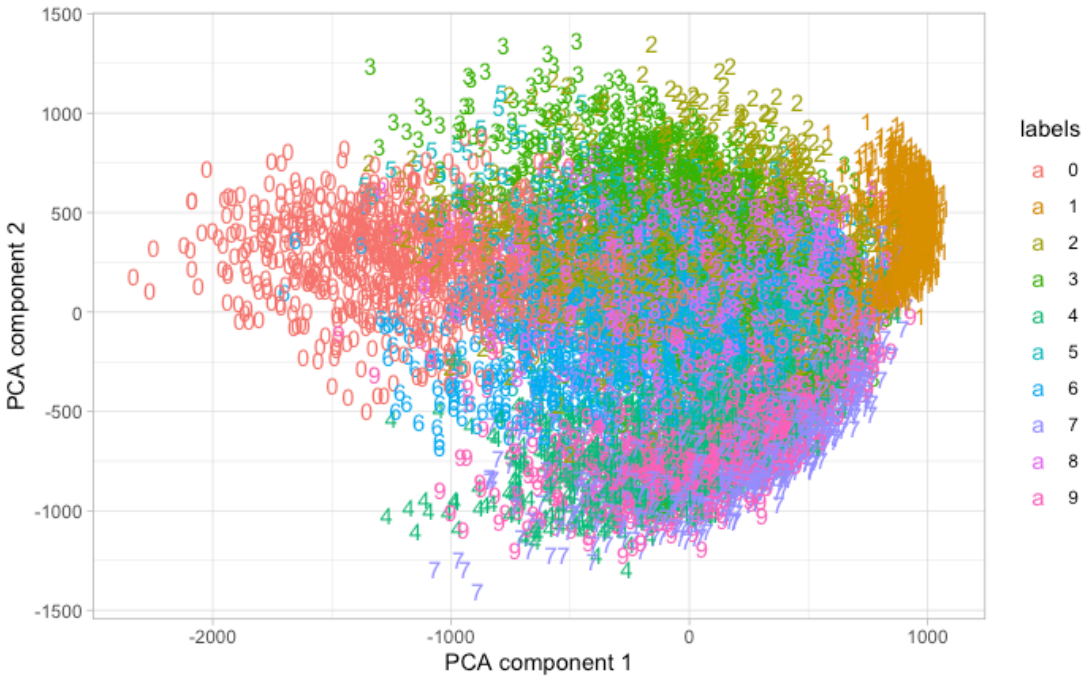
If the steps is small, there might have early stop. Once the number of steps get larger, the outcome will be converge and stable.

**### d**

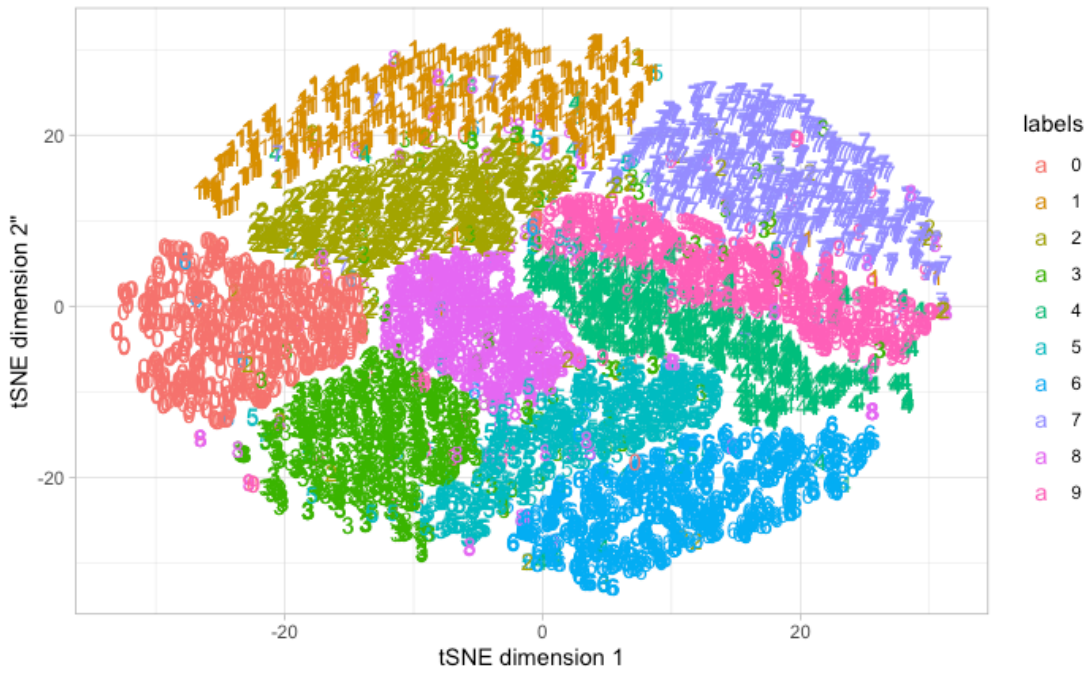
Because to explain topological information generally need multiple perplexities to have a view.

**## part 2**

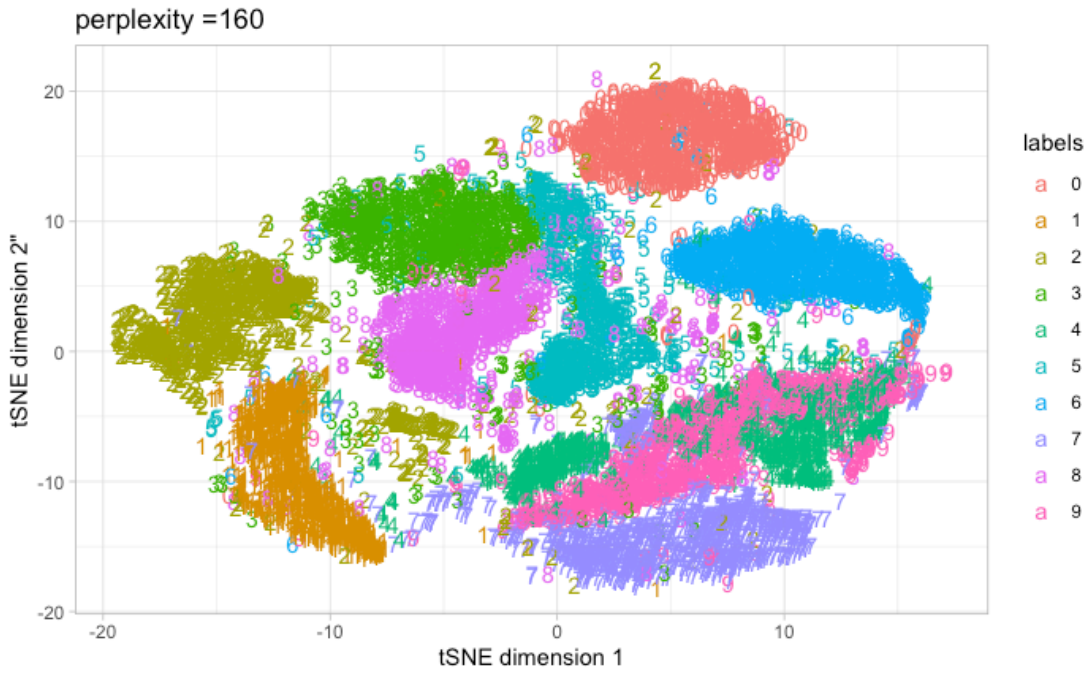
**###a**

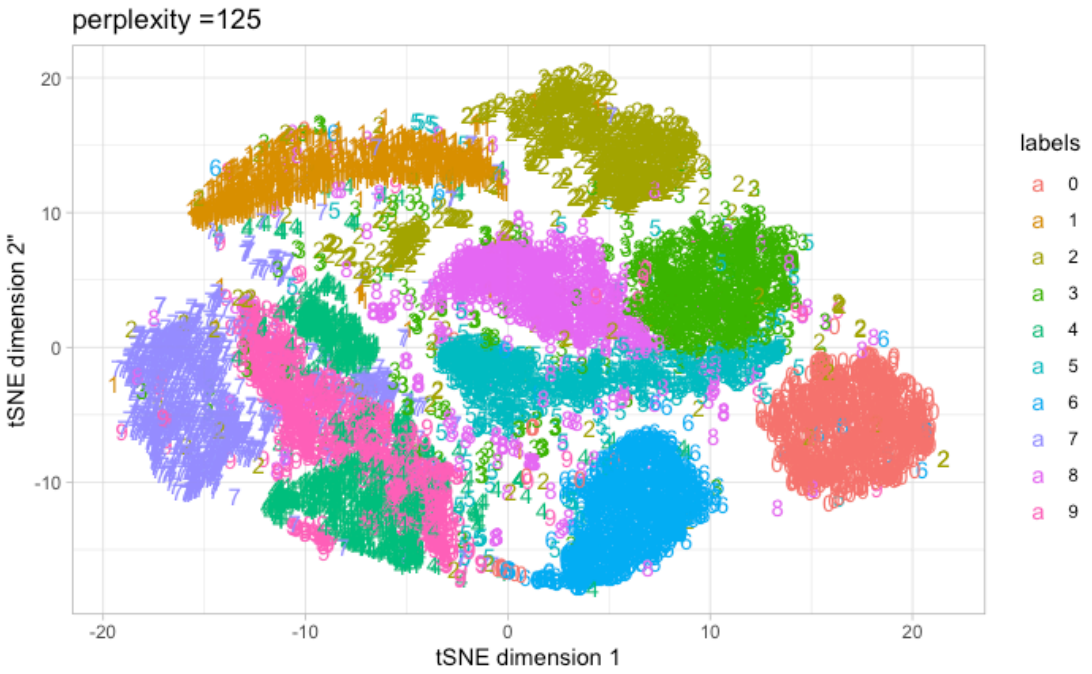


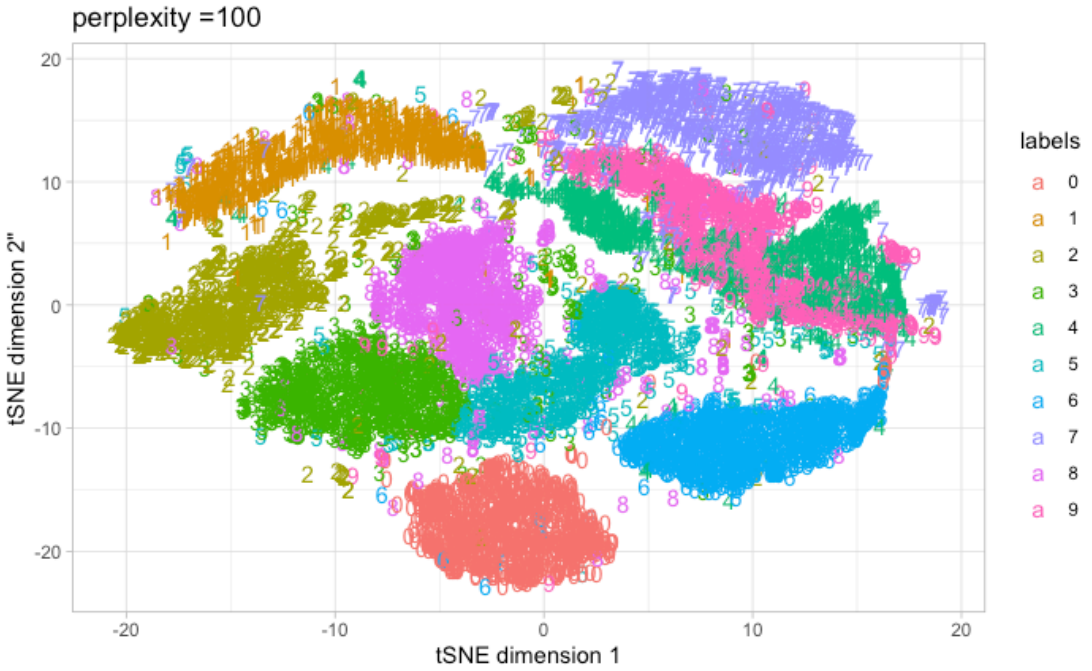

**### b**

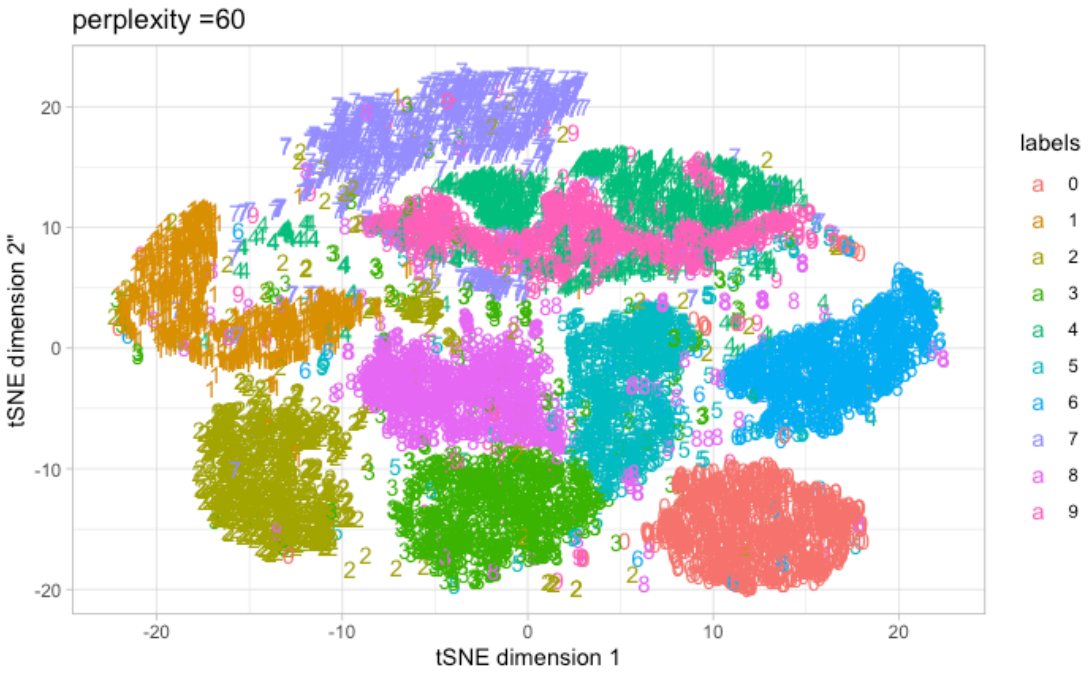

tSNE dimension 2"
20
0
-20
-20
0
20
tSNE dimension 1
labels
a 0
a 1
a 2
a 3
a 4
a 5
a 6
a 7
a 8
a 9

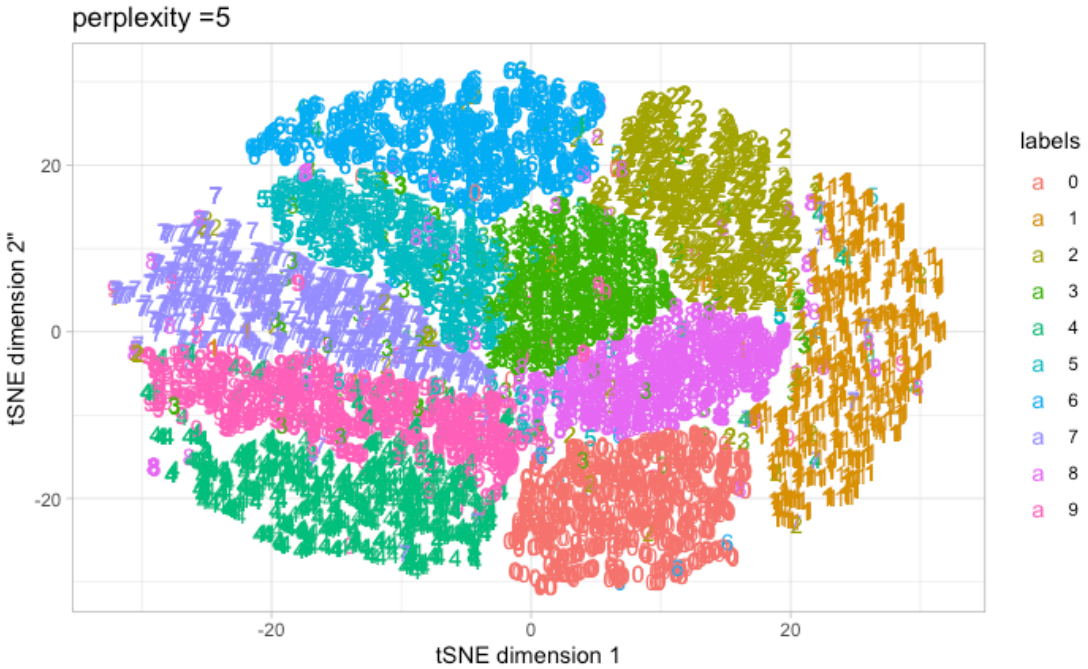
### c


perplexity =160
tSNE dimension 2"
20
10
0
-10
-20
-20
-10
0
10
tSNE dimension 1
labels
a 0
a 1
a 2
a 3
a 4
a 5
a 6
a 7
a 8
a 9


perplexity =125
tSNE dimension 2"
tSNE dimension 1
20
10
0
-10
-20
-20
-10
0
10
20
labels
a 0
a 1
a 2
a 3
a 4
a 5
a 6
a 7
a 8
a 9

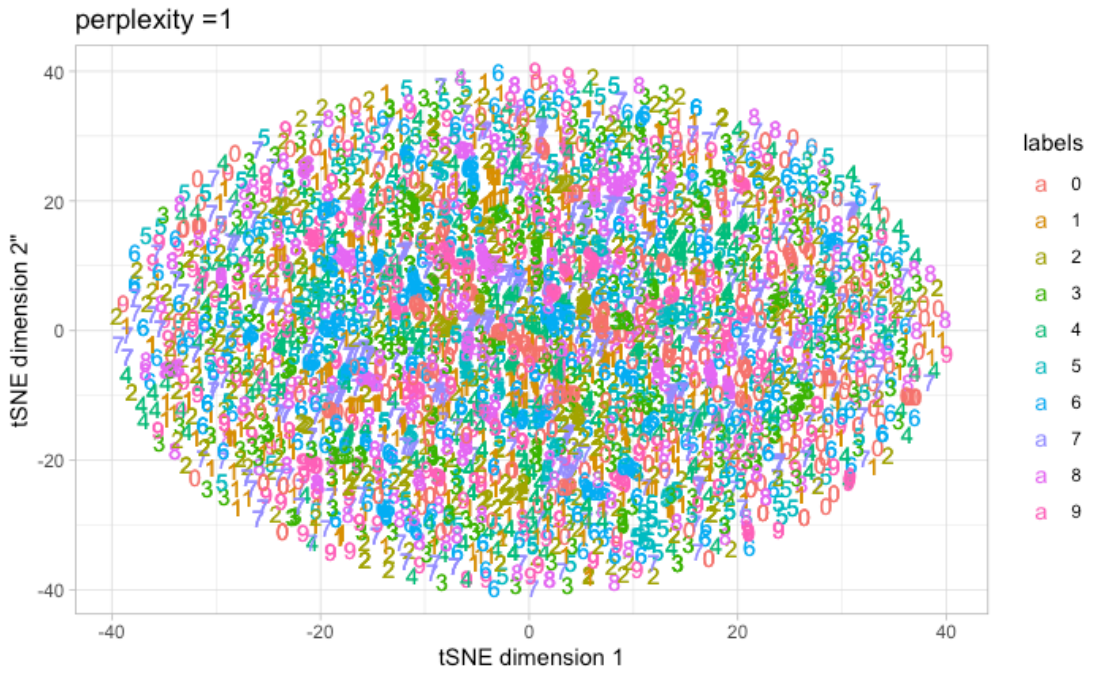

perplexity =100
tSNE dimension 2"
tSNE dimension 1
20
10
0
-10
-20
-20
-10
0
10
20
labels
a 0
a 1
a 2
a 3
a 4
a 5
a 6
a 7
a 8
a 9




So, we can see, the larger the perplexity, the clearer the bound.

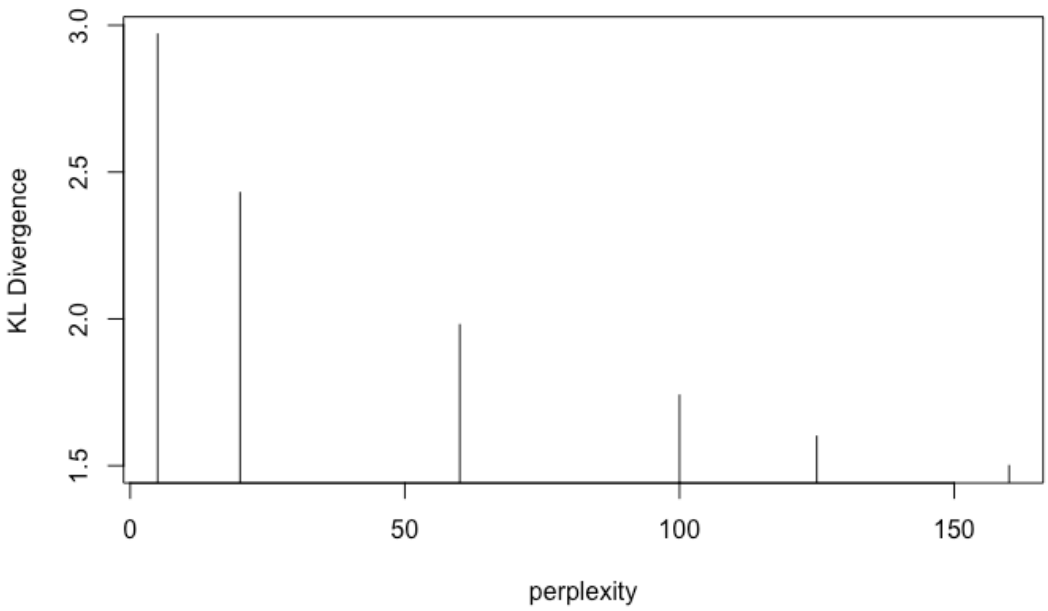
**### d**



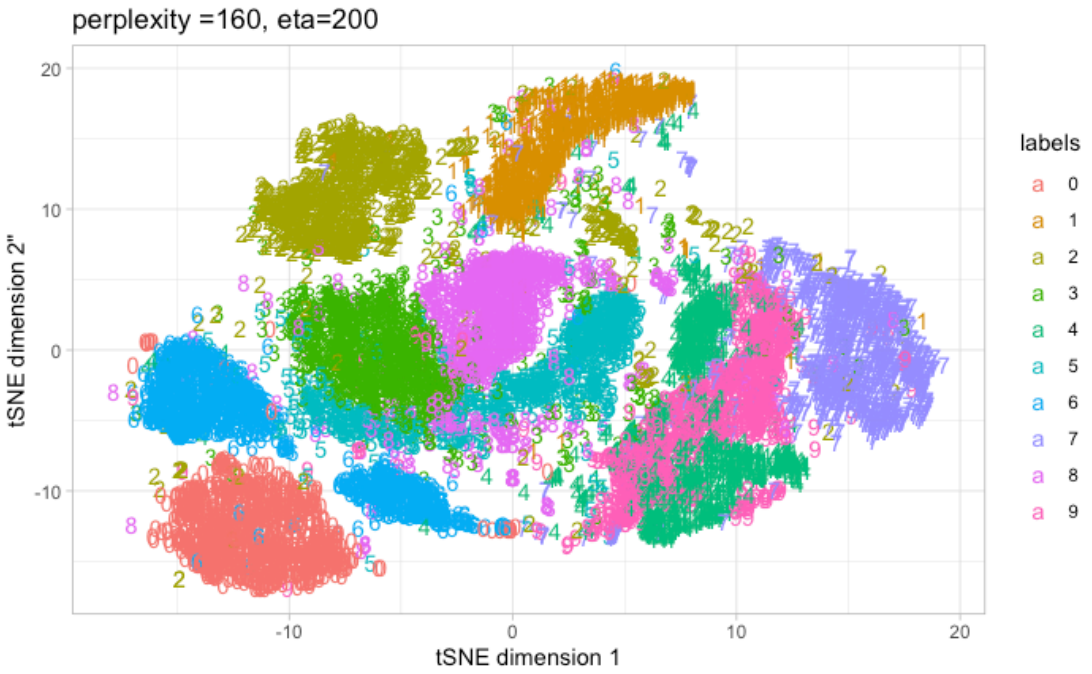

**### e**

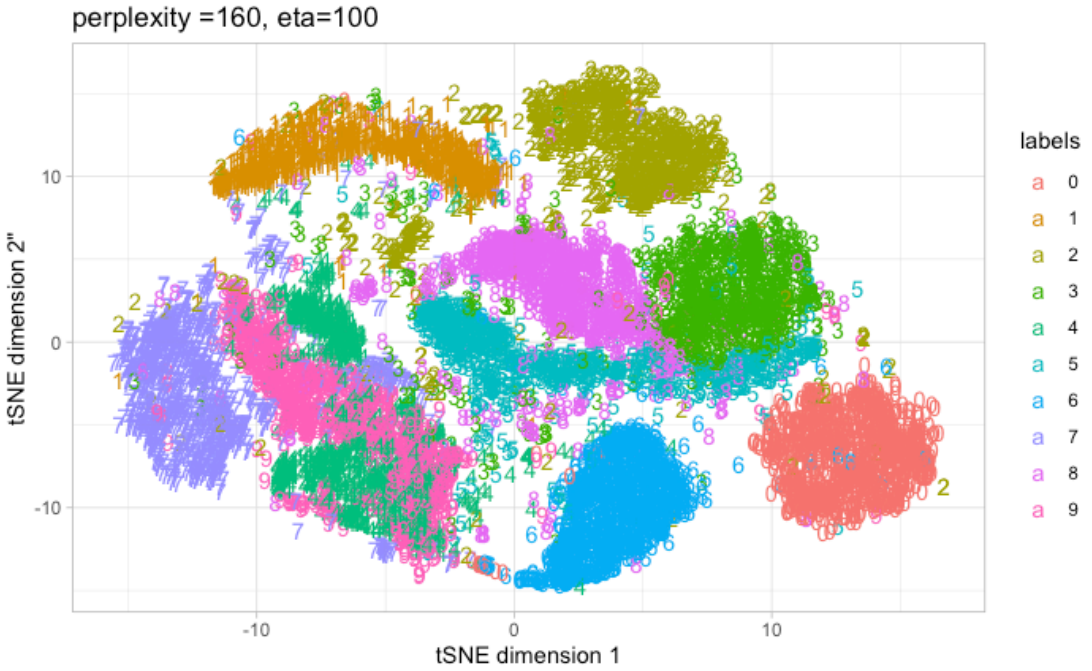
From c and d, we can say there will be a really clear bound.

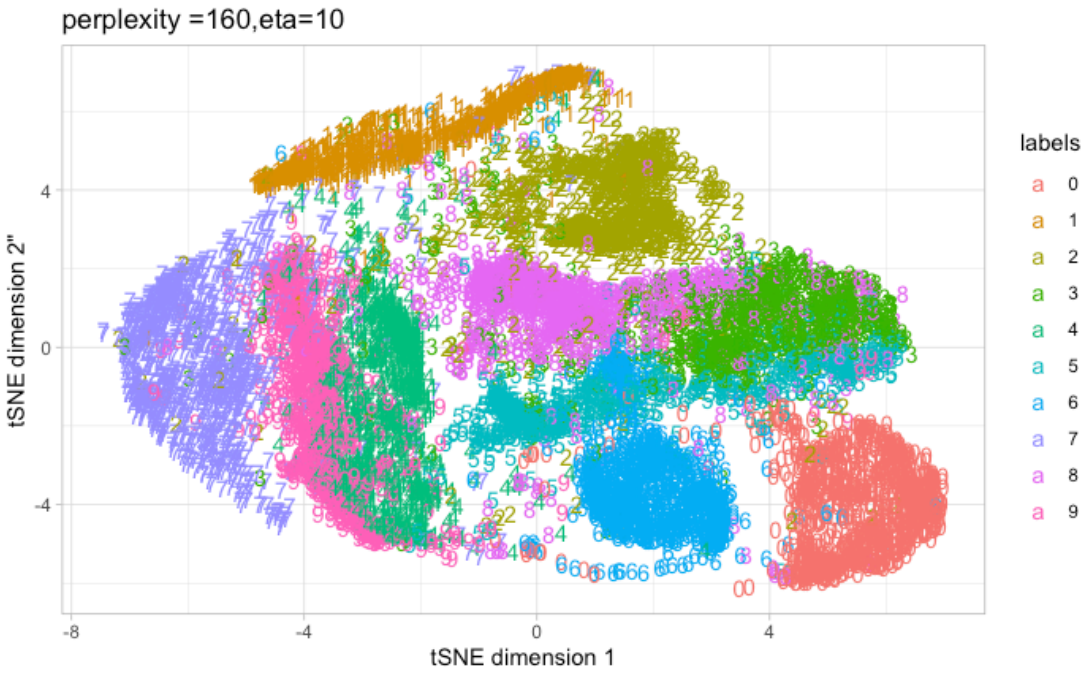
**### f**




**### g**


perplexity =160, eta=200
tSNE dimension 2"
tSNE dimension 1
20
10
0
-10
-10
0
10
20
labels
a 0
a 1
a 2
a 3
a 4
a 5
a 6
a 7
a 8
a 9


perplexity =160, eta=100
tSNE dimension 2"
tSNE dimension 1
10
0
-10
-10
0
10
labels
a 0
a 1
a 2
a 3
a 4
a 5
a 6
a 7
a 8
a 9




Easily to find, the larger the eta, the smaller the running time. The graphs look no big difference than previous pics.