March 21 tensor clustering

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1 Verification of the method of choosing k,r,l

Here I set n=20, p=20, q=20, the simulation results are shown as table 1. The accuracy rate is $\frac{times\ of\ choosing\ true\ k,r,l}{total\ simulation\ times}$.

2 Correction in last summary

In fact we cannot use such a definition to find the error rate in the last summary. The reason is after labeling all the modes, the labels may be different though the clustering results are the same. In this case, the mus tensor would be different from the original one even if the clustering result is correct. So we change our method of estimating the model into comparing the zeros we got in our model and the zeros in true tensor.

3 The simulation result of chooseLambda()

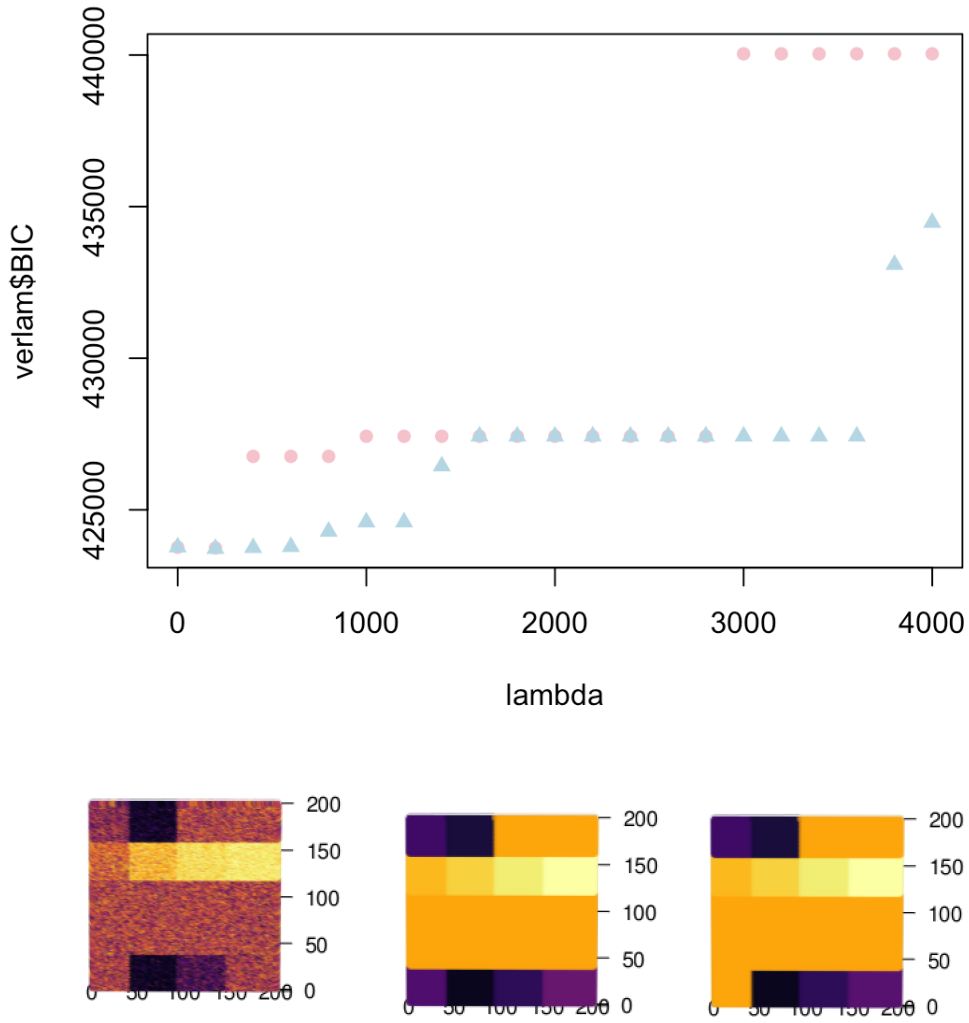
3.1 matrix situation

Problem: the label2() is unstable when λ is big I need to improve the label2() to make it more stable. Here is several result by applying $\lambda = 3000$.

```
> tc = label2(test,4,5,1,threshold=1e-10,lambda=3000,sim.times=10,trace=FALSE)
> mc = sparseBC(test[,,1],4,5,lambda=3000,center = FALSE)
> similarityC<-adjustedRand(tc$Cs,mc$Cs,randMethod=c("Rand"))
> similarityD<-adjustedRand(tc$Ds,mc$Ds,randMethod=c("Rand"))
> cat("The similarity of two clustering result is ",similarityC,",",similarityD,".\n
    ")
> tcBIC = tensor.calculateBIC(test,tc,"original")
> mcBIC = CalculateBIC(test[,,1],mc,"original")
> cat("The BIC calculated by tensorsparse is", tcBIC[1], ", the BIC calculated by
    sparseBC is", mcBIC, ".\n")
```

k	r	l	accuracy rate	mean k	mean r	mean l	noise	sim.times
2	2	4	1	2(0)	2(0)	4(0)	1	5
4	3	4	1	4(0)	3(0)	4(0)	1	5
2	4	3	1	2(0)	4(0)	3(0)	1	5
4	3	4	1	4(0)	3(0)	4(0)	2	5
2	4	3	0.8	2(0)	3.8(0.2)	3(0)	2	5
2	3	4	1	2(0)	3(0)	4(0)	1	10
2	4	4	0.9	2(0)	4(0)	3.9(0.1)	1	10
3	3	3	1	3(0)	3(0)	3(0)	1	10
3	2	3	1	3(0)	2(0)	3(0)	1	10

Table 1: n=20,p=20,q=20, simulation of choosing k,r,l



By running the lines above, sometimes we can get different result as follows.

```
The similarity of two clustering result is  1 , 1 .
The BIC calculated by tensorsparse is 427425.6 , the BIC calculated by sparseBC is 4
    27425.6 .

The similarity of two clustering result is  0.7232161 , 1 .
The BIC calculated by tensorsparse is 440040 , the BIC calculated by sparseBC is 427
    425.6 .
```

Here is the result of chooseLambda()(the pink dots) and sparseBC.BIC()(the blue triangles) (accoring to figure 3.1). And after checking, the result of sparseBC.BIC() is correct but chooseLambda() is not stable, and the cause is label2(). And here we choose the $\lambda = 200$ which was selected by sparseBC.BIC() and chooseLambda(). And the results of label2() is as figure 3.1.

A Rprofile of sparse.choosekrl()

This time I use multicore to run this function. Under the Mac/linux/Unix operation system, the speed of the code would be much faster than before. Here is the new Rprofile of this function:

```
$by.self
```

```
                    self.time self.pct total.time total.pct
#54                      0.56       56       0.56        56
<no location>            0.22       22       0.22        22
tensorsparse.R#85        0.08        8       0.08         8
#22                      0.04        4       0.04         4
#32                      0.04        4       0.04         4
#65                      0.04        4       0.04         4
#53                      0.02        2       0.02         2

$by.total
                    total.time total.pct self.time self.pct
#54                       0.56        56      0.56       56
<no location>             0.22        22      0.22       22
tensorsparse.R#85         0.08         8      0.08        8
#27                       0.08         8      0.00        0
#22                       0.04         4      0.04        4
#32                       0.04         4      0.04        4
#65                       0.04         4      0.04        4
#53                       0.02         2      0.02        2

$by.line
                    self.time self.pct total.time total.pct
#22                      0.04        4       0.04         4
#27                      0.00        0       0.08         8
#32                      0.04        4       0.04         4
#53                      0.02        2       0.02         2
#54                      0.56       56       0.56        56
#65                      0.04        4       0.04         4
<no location>            0.22       22       0.22        22
tensorsparse.R#85        0.08        8       0.08         8

$sample.interval
[1] 0.02

$sampling.time
[1] 1
```

Moreover, to speed up the functions, I change many for loops into mcapply.