```
[1] "# of discriminatory genes = 1"

[1] "fold change for discriminatory genes: 1"

[1] "fold change for nondiscriminatory genes: 0.1"

choose_k
  2
100
```

The optimal number of clusters K is set as the most frequently found K from the 100 simulations tabulated above. It is found by using the BIC criterion after running the unpenalized EM algorithm on K spanning from 2 to 8.

Using the last set of simulated counts, I ran a grid search across varying tuning parameters. As done in Pan et al, I fixed $\lambda_1 = 1$, and searched over $\lambda_2 = (0.1, 0.2, ..., .2)$ and $\tau = (0.1, 0.2, ..., 2)$:

```
[1] "lambda1, lambda2, tau, BIC:"

      [,1] [,2] [,3]     [,4]
 [1,]    1  0.3  0.1 19096.04
 [2,]    1  0.3  0.2 19096.04
 [3,]    1  0.3  0.3 19096.04
 [4,]    1  0.3  0.4 19096.04
 [5,]    1  0.3  0.5 19096.04
 [6,]    1  0.3  0.6 19096.04
 [7,]    1  0.3  0.7 19096.04
 [8,]    1  0.3  0.8 19096.04
 [9,]    1  0.3  0.9 19096.04
[10,]    1  0.3  1.0 19096.04
[11,]    1  0.3  1.1 19096.04
[12,]    1  0.3  1.2 19096.04
[13,]    1  0.3  1.3 19096.04
[14,]    1  0.3  1.4 19096.04
[15,]    1  0.3  1.5 19096.04
[16,]    1  0.3  1.6 19096.04
[17,]    1  0.4  0.1 19096.04
[18,]    1  0.4  0.2 19096.04
[19,]    1  0.4  0.3 19096.04
[20,]    1  0.4  0.4 19096.04
[21,]    1  0.4  0.5 19096.04
[22,]    1  0.4  0.6 19096.04
[23,]    1  0.4  0.7 19096.04
[24,]    1  0.4  0.8 19096.04
[25,]    1  0.4  0.9 19096.04
[26,]    1  0.4  1.0 19096.04
[27,]    1  0.4  1.1 19096.04
```

```
[28,]    1  0.4  1.2 19096.04
[29,]    1  0.4  1.3 19096.04
[30,]    1  0.4  1.4 19096.04
[31,]    1  0.4  1.5 19096.04
[32,]    1  0.5  0.1 19096.04
[33,]    1  0.5  0.2 19096.04
[34,]    1  0.5  0.3 19096.04
[35,]    1  0.5  0.4 19096.04
[36,]    1  0.5  0.5 19096.04
[37,]    1  0.5  0.6 19096.04
[38,]    1  0.5  0.7 19096.04
[39,]    1  0.5  0.8 19096.04
[40,]    1  0.5  0.9 19096.04
[41,]    1  0.5  1.0 19096.04
[42,]    1  0.5  1.1 19096.04
[43,]    1  0.5  1.2 19096.04
[44,]    1  0.5  1.3 19096.04
[45,]    1  0.5  1.4 19096.04
[46,]    1  0.6  0.1 19096.04
[47,]    1  0.6  0.2 19096.04
[48,]    1  0.6  0.3 19096.04
[49,]    1  0.6  0.4 19096.04
[50,]    1  0.6  0.5 19096.04
[51,]    1  0.6  0.6 19096.04
[52,]    1  0.6  0.7 19096.04
[53,]    1  0.6  0.8 19096.04
[54,]    1  0.6  0.9 19096.04
[55,]    1  0.6  1.0 19096.04
[56,]    1  0.6  1.1 19096.04
[57,]    1  0.6  1.2 19096.04
[58,]    1  0.6  1.3 19096.04
[59,]    1  0.7  0.1 19096.04
[60,]    1  0.7  0.2 19096.04
[61,]    1  0.7  0.3 19096.04
[62,]    1  0.7  0.4 19096.04
[63,]    1  0.7  0.5 19096.04
[64,]    1  0.7  0.6 19096.04
[65,]    1  0.7  0.7 19096.04
[66,]    1  0.7  0.8 19096.04
[67,]    1  0.7  0.9 19096.04
[68,]    1  0.7  1.0 19096.04
[69,]    1  0.7  1.1 19096.04
[70,]    1  0.7  1.2 19096.04
[71,]    1  0.8  0.1 19096.04
[72,]    1  0.8  0.2 19096.04
[73,]    1  0.8  0.3 19096.04
```

```
 [74,]    1  0.8  0.4 19096.04
 [75,]    1  0.8  0.5 19096.04
 [76,]    1  0.8  0.6 19096.04
 [77,]    1  0.8  0.7 19096.04
 [78,]    1  0.8  0.8 19096.04
 [79,]    1  0.8  0.9 19096.04
 [80,]    1  0.8  1.0 19096.04
 [81,]    1  0.8  1.1 19096.04
 [82,]    1  0.9  0.1 19096.04
 [83,]    1  0.9  0.2 19096.04
 [84,]    1  0.9  0.3 19096.04
 [85,]    1  0.9  0.4 19096.04
 [86,]    1  0.9  0.5 19096.04
 [87,]    1  0.9  0.6 19096.04
 [88,]    1  0.9  0.7 19096.04
 [89,]    1  0.9  0.8 19096.04
 [90,]    1  0.9  0.9 19096.04
 [91,]    1  0.9  1.0 19096.04
 [92,]    1  1.0  0.1 19096.04
 [93,]    1  1.0  0.2 19096.04
 [94,]    1  1.0  0.3 19096.04
 [95,]    1  1.0  0.4 19096.04
 [96,]    1  1.0  0.5 19096.04
 [97,]    1  1.0  0.6 19096.04
 [98,]    1  1.0  0.7 19096.04
 [99,]    1  1.0  0.8 19096.04
[100,]    1  1.0  0.9 19096.04
[101,]    1  1.1  0.1 19096.04
[102,]    1  1.1  0.2 19096.04
[103,]    1  1.1  0.3 19096.04
[104,]    1  1.1  0.4 19096.04
[105,]    1  1.1  0.5 19096.04
[106,]    1  1.1  0.6 19096.04
[107,]    1  1.1  0.7 19096.04
[108,]    1  1.1  0.8 19096.04
[109,]    1  1.2  0.1 19096.04
[110,]    1  1.2  0.2 19096.04
[111,]    1  1.2  0.3 19096.04
[112,]    1  1.2  0.4 19096.04
[113,]    1  1.2  0.5 19096.04
[114,]    1  1.2  0.6 19096.04
[115,]    1  1.2  0.7 19096.04
[116,]    1  1.3  0.1 19096.04
[117,]    1  1.3  0.2 19096.04
[118,]    1  1.3  0.3 19096.04
[119,]    1  1.3  0.4 19096.04
```

```
[120,]    1  1.3  0.5 19096.04
[121,]    1  1.3  0.6 19096.04
[122,]    1  1.4  0.1 19096.04
[123,]    1  1.4  0.2 19096.04
[124,]    1  1.4  0.3 19096.04
[125,]    1  1.4  0.4 19096.04
[126,]    1  1.4  0.5 19096.04
[127,]    1  1.5  0.1 19096.04
[128,]    1  1.5  0.2 19096.04
[129,]    1  1.5  0.3 19096.04
[130,]    1  1.5  0.4 19096.04
[131,]    1  1.6  0.1 19096.04
[132,]    1  1.6  0.2 19096.04
[133,]    1  1.6  0.3 19096.04
[134,]    1  1.7  0.1 19096.04
[135,]    1  1.7  0.2 19096.04
[136,]    1  1.8  0.1 19096.04
```

The results of the final run based on optimal tuning parameters are below:
Below are the summary of results:

```
[1] "Mean pi: 0.599130434782609" "Mean pi: 0.400869565217391"

[1] "First 3 genes:"

         [,1]     [,2]
[1,] 2.884714 4.845111
[2,] 5.018187 5.167064
[3,] 4.532746 4.672364

[1] "Last 3 genes:"

           [,1]     [,2]
 [98,] 6.313619 6.485256
 [99,] 5.868429 6.031674
[100,] 6.292547 6.460700

[1] "Mean % of nondiscriminatory genes: 0.9878"

[1] "Mean ARI: 1"

[1] "Mean sensitivity: 1"

[1] "Mean false positive rate: 0.00222222222222222"
```