```
library(PLIER)
```

```
## Loading required package:  RColorBrewer
## Loading required package:  gplots
##
## Attaching package:  'gplots'
## The following object is masked from 'package:stats':
##
##    lowess
## Loading required package:  pheatmap
## Loading required package:  glmnet
## Loading required package:  Matrix
## Loading required package:  foreach
## Loaded glmnet 2.0-10
## Loading required package:  rsvd
```

1 Some Notes

PLIER runs reasonably fast but to get the best performance we recommend that you use linear algebra libraries optimized for your system. For Ubuntu and Windows you can follow instructions at http://brettklamer.com/diversions/statistical/faster-blas-in-r/.

2 Vaccination Dataset

Load data

```
data(bloodCellMarkersIRISDMAP)
data(svmMarkers)
data(canonicalPathways)
data(vacData)
```

Construct a joint pathway matrix by merging canonicalPathways, bloodCellMarkersIRISDMAP and svmMarkers and select genes appearing in both gene expression profile and the joint pathway matrix.

```
allPaths=combinePaths(bloodCellMarkersIRISDMAP, svmMarkers,canonicalPathways)
cm.genes=commonRows(allPaths, vacData)
```

Normalize the data and approximate the number of latent variables in the data by num.pc(). The result is 26. Note: num.pc() is quite conservative and we recommend to set this value about 30 to 50% higher. We set k=34 and all other parameters to be default.

```r
vacDataN=rowNorm(vacData)
num.pc(vacDataN)
```

```
## [1] 26
```

```r
plierResult=PLIER(vacDataN[cm.genes,], allPaths[cm.genes,],k=34, trace=T)
```

```
## Warning in PLIER(vacDataN[cm.genes, ], allPaths[cm.genes, ], k =
34, trace = T): Removing 2 pathways with too few genes
## Computing SVD
## Done
```

```
## [1] 69.72916
## [1] "L2 is set to 69.7291569994379"
## [1] "L1 is set to 34.8645784997189"
```

```
## errorY (SVD based:best possible) = 0.3495
## iter1 errorY= 0.9891, Bdiff= 18860, Bkappa=6.267
## iter2 errorY= 0.8378, Bdiff= 0.688, Bkappa=36.99
## iter3 errorY= 0.7123, Bdiff= 0.1211, Bkappa=37.46
## iter4 errorY= 0.6896, Bdiff= 0.02602, Bkappa=39.61
## iter5 errorY= 0.6776, Bdiff= 0.01449, Bkappa=47.46
## iter6 errorY= 0.6688, Bdiff= 0.0107, Bkappa=50.36
## iter7 errorY= 0.6626, Bdiff= 0.00795, Bkappa=58.78
## iter8 errorY= 0.6581, Bdiff= 0.006054, Bkappa=66.59
## iter9 errorY= 0.6547, Bdiff= 0.004791, Bkappa=72.7
## iter10 errorY= 0.6521, Bdiff= 0.003943, Bkappa=74.99
## iter11 errorY= 0.6499, Bdiff= 0.00339, Bkappa=79.17
## iter12 errorY= 0.648, Bdiff= 0.00304, Bkappa=81.83
## iter13 errorY= 0.6463, Bdiff= 0.002828, Bkappa=81.87
## iter14 errorY= 0.6447, Bdiff= 0.002694, Bkappa=81.07
## iter15 errorY= 0.6432, Bdiff= 0.002562, Bkappa=62.91
## iter16 errorY= 0.6418, Bdiff= 0.002353, Bkappa=35.77
## iter17 errorY= 0.6405, Bdiff= 0.00206, Bkappa=35.7
## iter18 errorY= 0.6395, Bdiff= 0.001715, Bkappa=35.35
## iter19 errorY= 0.6386, Bdiff= 0.001408, Bkappa=35.44
## Updating L3, current fraction= 0, target=0.7
## 0 positive columns at L3=0.5
## 0 positive columns at L3=0.250001
## 0 positive columns at L3=0.125001
## 1 positive columns at L3=0.062501
## 6 positive columns at L3=0.031251
## 15 positive columns at L3=0.015626
## 26 positive columns at L3=0.007813
## 18 positive columns at L3=0.01172
## 23 positive columns at L3=0.009767
```

```
## L3 is set to 0.009767 in 9 iterations
## iter20 errorY= 0.6335, prior information ratio= 0.06, Bdiff= 0.001716,
Bkappa=44.19;pos.  col.  U=23
## iter21 errorY= 0.6311, prior information ratio= 0.09, Bdiff= 0.001564,
Bkappa=43.18;pos.  col.  U=23
## iter22 errorY= 0.6296, prior information ratio= 0.12, Bdiff= 0.001385,
Bkappa=42;pos.  col.  U=20
## iter23 errorY= 0.6284, prior information ratio= 0.13, Bdiff= 0.001242,
Bkappa=64.37;pos.  col.  U=18
## iter24 errorY= 0.6275, prior information ratio= 0.14, Bdiff= 0.001116,
Bkappa=64.16;pos.  col.  U=18
## iter25 errorY= 0.6269, prior information ratio= 0.14, Bdiff= 0.00102,
Bkappa=65.67;pos.  col.  U=18
## iter26 errorY= 0.6264, prior information ratio= 0.14, Bdiff= 0.0009475,
Bkappa=83.9;pos.  col.  U=18
## iter27 errorY= 0.6259, prior information ratio= 0.15, Bdiff= 0.0008814,
Bkappa=59.32;pos.  col.  U=18
## iter28 errorY= 0.6255, prior information ratio= 0.15, Bdiff= 0.0008254,
Bkappa=75.73;pos.  col.  U=18
## iter29 errorY= 0.6252, prior information ratio= 0.17, Bdiff= 0.0007674,
Bkappa=77.2;pos.  col.  U=16
## iter30 errorY= 0.6249, prior information ratio= 0.17, Bdiff= 0.000705,
Bkappa=78.69;pos.  col.  U=16
## iter31 errorY= 0.6246, prior information ratio= 0.17, Bdiff= 0.0006435,
Bkappa=75.19;pos.  col.  U=15
## iter32 errorY= 0.6243, prior information ratio= 0.17, Bdiff= 0.0005878,
Bkappa=76.88;pos.  col.  U=15
## iter33 errorY= 0.6241, prior information ratio= 0.18, Bdiff= 0.0005374,
Bkappa=69.87;pos.  col.  U=15
## iter34 errorY= 0.6239, prior information ratio= 0.19, Bdiff= 0.0004878,
Bkappa=70.67;pos.  col.  U=15
## iter35 errorY= 0.6237, prior information ratio= 0.18, Bdiff= 0.0004414,
Bkappa=79;pos.  col.  U=15
## iter36 errorY= 0.6235, prior information ratio= 0.2, Bdiff= 0.0003917,
Bkappa=79.14;pos.  col.  U=13
## iter37 errorY= 0.6234, prior information ratio= 0.22, Bdiff= 0.0003403,
Bkappa=75.79;pos.  col.  U=12
## iter38 errorY= 0.6232, prior information ratio= 0.21, Bdiff= 0.0002958,
Bkappa=75.86;pos.  col.  U=12
## iter39 errorY= 0.6231, prior information ratio= 0.23, Bdiff= 0.0002569,
Bkappa=85.44;pos.  col.  U=12
## Updating L3, current fraction= 0.3529, target=0.7
## 21 positive columns at L3=0.004932
## 34 positive columns at L3=0.002515
## 24 positive columns at L3=0.003724
```

```
## L3 is set to 0.003724 in 3 iterations
## iter40 errorY= 0.6213, prior information ratio= 0.1, Bdiff= 0.0002615,
Bkappa=86.08;pos.  col.  U=24
## iter41 errorY= 0.6205, prior information ratio= 0.13, Bdiff= 0.0002203,
Bkappa=95.1;pos.  col.  U=24
## iter42 errorY= 0.62, prior information ratio= 0.14, Bdiff= 0.0001867,
Bkappa=95.03;pos.  col.  U=24
## iter43 errorY= 0.6197, prior information ratio= 0.14, Bdiff= 0.0001609,
Bkappa=94.79;pos.  col.  U=24
## iter44 errorY= 0.6196, prior information ratio= 0.14, Bdiff= 0.000141,
Bkappa=94.44;pos.  col.  U=25
## iter45 errorY= 0.6194, prior information ratio= 0.15, Bdiff= 0.0001254,
Bkappa=94.1;pos.  col.  U=25
## iter46 errorY= 0.6194, prior information ratio= 0.15, Bdiff= 0.000113,
Bkappa=94.23;pos.  col.  U=25
## iter47 errorY= 0.6193, prior information ratio= 0.15, Bdiff= 0.0001028,
Bkappa=94.36;pos.  col.  U=25
## iter48 errorY= 0.6192, prior information ratio= 0.14, Bdiff= 9.491e-05,
Bkappa=94.44;pos.  col.  U=26
## iter49 errorY= 0.6192, prior information ratio= 0.15, Bdiff= 8.896e-05,
Bkappa=91.41;pos.  col.  U=26
## iter50 errorY= 0.6191, prior information ratio= 0.15, Bdiff= 8.418e-05,
Bkappa=91.14;pos.  col.  U=26
## iter51 errorY= 0.619, prior information ratio= 0.14, Bdiff= 8.054e-05,
Bkappa=90.85;pos.  col.  U=26
## iter52 errorY= 0.619, prior information ratio= 0.15, Bdiff= 7.756e-05,
Bkappa=90.56;pos.  col.  U=26
## iter53 errorY= 0.6189, prior information ratio= 0.15, Bdiff= 7.487e-05,
Bkappa=90.28;pos.  col.  U=26
## iter54 errorY= 0.6189, prior information ratio= 0.14, Bdiff= 7.248e-05,
Bkappa=83.74;pos.  col.  U=26
## iter55 errorY= 0.6188, prior information ratio= 0.13, Bdiff= 7.12e-05,
Bkappa=83.57;pos.  col.  U=26
## iter56 errorY= 0.6188, prior information ratio= 0.13, Bdiff= 6.976e-05,
Bkappa=99.26;pos.  col.  U=26
## iter57 errorY= 0.6187, prior information ratio= 0.13, Bdiff= 6.818e-05,
Bkappa=99.01;pos.  col.  U=26
## iter58 errorY= 0.6187, prior information ratio= 0.14, Bdiff= 6.679e-05,
Bkappa=25.58;pos.  col.  U=25
## iter59 errorY= 0.6187, prior information ratio= 0.14, Bdiff= 6.523e-05,
Bkappa=35.55;pos.  col.  U=25
## Updating L3, current fraction= 0.7353, target=0.7
## 0 positive columns at L3=0.188038
## 4 positive columns at L3=0.095881
## 10 positive columns at L3=0.049802
```

```
## 11 positive columns at L3=0.026763
## 13 positive columns at L3=0.015243
## 19 positive columns at L3=0.009483
## 20 positive columns at L3=0.006603
## 21 positive columns at L3=0.005163
## 22 positive columns at L3=0.004443
## 24 positive columns at L3=0.004084
## L3 is set to 0.004084 in 10 iterations
## iter60 errorY= 0.6188, prior information ratio= 0.15, Bdiff= 6.303e-05,
Bkappa=35.55;pos.  col.  U=24
## iter61 errorY= 0.6188, prior information ratio= 0.15, Bdiff= 6.094e-05,
Bkappa=84.82;pos.  col.  U=24
## iter62 errorY= 0.6188, prior information ratio= 0.15, Bdiff= 5.891e-05,
Bkappa=72.66;pos.  col.  U=24
## iter63 errorY= 0.6188, prior information ratio= 0.15, Bdiff= 5.69e-05,
Bkappa=72.65;pos.  col.  U=24
## iter64 errorY= 0.6188, prior information ratio= 0.14, Bdiff= 5.473e-05,
Bkappa=72.7;pos.  col.  U=24
## iter65 errorY= 0.6187, prior information ratio= 0.14, Bdiff= 5.278e-05,
Bkappa=72.79;pos.  col.  U=24
## iter66 errorY= 0.6187, prior information ratio= 0.14, Bdiff= 5.071e-05,
Bkappa=72.9;pos.  col.  U=24
## iter67 errorY= 0.6186, prior information ratio= 0.14, Bdiff= 4.89e-05,
Bkappa=73.03;pos.  col.  U=24
## iter68 errorY= 0.6186, prior information ratio= 0.14, Bdiff= 4.693e-05,
Bkappa=73.23;pos.  col.  U=24
## iter69 errorY= 0.6186, prior information ratio= 0.14, Bdiff= 4.494e-05,
Bkappa=73.44;pos.  col.  U=24
## iter70 errorY= 0.6185, prior information ratio= 0.14, Bdiff= 4.395e-05,
Bkappa=73.66;pos.  col.  U=24
## iter71 errorY= 0.6185, prior information ratio= 0.14, Bdiff= 4.202e-05,
Bkappa=85.72;pos.  col.  U=24
## iter72 errorY= 0.6185, prior information ratio= 0.13, Bdiff= 4.02e-05,
Bkappa=85.82;pos.  col.  U=24
## iter73 errorY= 0.6184, prior information ratio= 0.14, Bdiff= 3.862e-05,
Bkappa=72.68;pos.  col.  U=24
## iter74 errorY= 0.6184, prior information ratio= 0.14, Bdiff= 3.687e-05,
Bkappa=72.92;pos.  col.  U=25
## iter75 errorY= 0.6183, prior information ratio= 0.14, Bdiff= 3.535e-05,
Bkappa=73.15;pos.  col.  U=25
## iter76 errorY= 0.6183, prior information ratio= 0.14, Bdiff= 3.375e-05,
Bkappa=73.38;pos.  col.  U=25
## iter77 errorY= 0.6183, prior information ratio= 0.14, Bdiff= 3.229e-05,
Bkappa=73.59;pos.  col.  U=25
```

```
## iter78 errorY= 0.6182, prior information ratio= 0.14, Bdiff= 3.097e-05,
Bkappa=63.29;pos.  col.  U=25
## iter79 errorY= 0.6182, prior information ratio= 0.14, Bdiff= 2.976e-05,
Bkappa=63.47;pos.  col.  U=25
## Updating L3, current fraction= 0.7353, target=0.7
## 0 positive columns at L3=0.206217
## 3 positive columns at L3=0.10515
## 10 positive columns at L3=0.054617
## 10 positive columns at L3=0.02935
## 13 positive columns at L3=0.016717
## 18 positive columns at L3=0.0104
## 18 positive columns at L3=0.007242
## 21 positive columns at L3=0.005663
## 22 positive columns at L3=0.004873
## 22 positive columns at L3=0.004478
## 23 positive columns at L3=0.004281
## L3 is set to 0.004281 in 11 iterations
## iter80 errorY= 0.6183, prior information ratio= 0.14, Bdiff= 2.894e-05,
Bkappa=55;pos.  col.  U=23
## iter81 errorY= 0.6183, prior information ratio= 0.14, Bdiff= 2.797e-05,
Bkappa=55.12;pos.  col.  U=23
## iter82 errorY= 0.6183, prior information ratio= 0.14, Bdiff= 2.717e-05,
Bkappa=55.29;pos.  col.  U=23
## iter83 errorY= 0.6183, prior information ratio= 0.13, Bdiff= 2.659e-05,
Bkappa=55.45;pos.  col.  U=23
## iter84 errorY= 0.6182, prior information ratio= 0.14, Bdiff= 2.594e-05,
Bkappa=55.62;pos.  col.  U=23
## iter85 errorY= 0.6182, prior information ratio= 0.14, Bdiff= 2.574e-05,
Bkappa=55.8;pos.  col.  U=23
## iter86 errorY= 0.6182, prior information ratio= 0.15, Bdiff= 2.517e-05,
Bkappa=55.97;pos.  col.  U=22
## iter87 errorY= 0.6182, prior information ratio= 0.15, Bdiff= 2.476e-05,
Bkappa=56.14;pos.  col.  U=22
## iter88 errorY= 0.6181, prior information ratio= 0.15, Bdiff= 2.445e-05,
Bkappa=56.31;pos.  col.  U=22
## iter89 errorY= 0.6181, prior information ratio= 0.15, Bdiff= 2.42e-05,
Bkappa=56.48;pos.  col.  U=22
## iter90 errorY= 0.6181, prior information ratio= 0.14, Bdiff= 2.403e-05,
Bkappa=56.64;pos.  col.  U=22
## iter91 errorY= 0.6181, prior information ratio= 0.14, Bdiff= 2.401e-05,
Bkappa=56.81;pos.  col.  U=22
## iter92 errorY= 0.618, prior information ratio= 0.14, Bdiff= 2.39e-05,
Bkappa=56.98;pos.  col.  U=22
## iter93 errorY= 0.618, prior information ratio= 0.14, Bdiff= 2.402e-05,
Bkappa=57.16;pos.  col.  U=22
```

```
## iter94 errorY= 0.618, prior information ratio= 0.14, Bdiff= 2.425e-05,
Bkappa=57.34;pos.  col.  U=22
## iter95 errorY= 0.6179, prior information ratio= 0.14, Bdiff= 2.46e-05,
Bkappa=57.52;pos.  col.  U=22
## iter96 errorY= 0.6179, prior information ratio= 0.14, Bdiff= 2.504e-05,
Bkappa=57.71;pos.  col.  U=22
## iter97 errorY= 0.6179, prior information ratio= 0.14, Bdiff= 2.542e-05,
Bkappa=57.9;pos.  col.  U=22
## iter98 errorY= 0.6178, prior information ratio= 0.14, Bdiff= 2.578e-05,
Bkappa=58.09;pos.  col.  U=22
## iter99 errorY= 0.6178, prior information ratio= 0.14, Bdiff= 2.607e-05,
Bkappa=58.27;pos.  col.  U=22
## Updating L3, current fraction= 0.6471, target=0.7
## 33 positive columns at L3=0.002162
## 31 positive columns at L3=0.003221
## 26 positive columns at L3=0.003751
## 24 positive columns at L3=0.004016
## L3 is set to 0.004016 in 4 iterations
## iter100 errorY= 0.6177, prior information ratio= 0.14, Bdiff= 2.692e-05,
Bkappa=58.51;pos.  col.  U=24
## iter101 errorY= 0.6176, prior information ratio= 0.14, Bdiff= 2.722e-05,
Bkappa=58.73;pos.  col.  U=24
## iter102 errorY= 0.6175, prior information ratio= 0.14, Bdiff= 2.727e-05,
Bkappa=58.93;pos.  col.  U=24
## iter103 errorY= 0.6175, prior information ratio= 0.14, Bdiff= 2.742e-05,
Bkappa=59.14;pos.  col.  U=24
## iter104 errorY= 0.6174, prior information ratio= 0.14, Bdiff= 2.753e-05,
Bkappa=59.35;pos.  col.  U=24
## iter105 errorY= 0.6174, prior information ratio= 0.15, Bdiff= 2.771e-05,
Bkappa=59.55;pos.  col.  U=23
## iter106 errorY= 0.6174, prior information ratio= 0.15, Bdiff= 2.782e-05,
Bkappa=59.76;pos.  col.  U=23
## iter107 errorY= 0.6174, prior information ratio= 0.15, Bdiff= 2.764e-05,
Bkappa=59.97;pos.  col.  U=23
## iter108 errorY= 0.6173, prior information ratio= 0.15, Bdiff= 2.753e-05,
Bkappa=60.19;pos.  col.  U=23
## iter109 errorY= 0.6173, prior information ratio= 0.15, Bdiff= 2.741e-05,
Bkappa=76.81;pos.  col.  U=23
## iter110 errorY= 0.6173, prior information ratio= 0.15, Bdiff= 2.735e-05,
Bkappa=77.03;pos.  col.  U=23
## iter111 errorY= 0.6173, prior information ratio= 0.15, Bdiff= 2.732e-05,
Bkappa=77.25;pos.  col.  U=23
## iter112 errorY= 0.6172, prior information ratio= 0.15, Bdiff= 2.728e-05,
Bkappa=77.48;pos.  col.  U=23
```

```
## iter113 errorY= 0.6172, prior information ratio= 0.15, Bdiff= 2.702e-05,
Bkappa=77.71;pos.  col.  U=23
## iter114 errorY= 0.6172, prior information ratio= 0.15, Bdiff= 2.669e-05,
Bkappa=77.95;pos.  col.  U=23
## iter115 errorY= 0.6172, prior information ratio= 0.15, Bdiff= 2.645e-05,
Bkappa=78.19;pos.  col.  U=23
## iter116 errorY= 0.6171, prior information ratio= 0.15, Bdiff= 2.621e-05,
Bkappa=78.43;pos.  col.  U=23
## iter117 errorY= 0.6171, prior information ratio= 0.15, Bdiff= 2.585e-05,
Bkappa=78.68;pos.  col.  U=23
## iter118 errorY= 0.6171, prior information ratio= 0.15, Bdiff= 2.551e-05,
Bkappa=78.93;pos.  col.  U=23
## iter119 errorY= 0.6171, prior information ratio= 0.15, Bdiff= 2.506e-05,
Bkappa=79.18;pos.  col.  U=23
## Updating L3, current fraction= 0.6765, target=0.7
## L3 not changed
## iter120 errorY= 0.6171, prior information ratio= 0.15, Bdiff= 2.466e-05,
Bkappa=79.45;pos.  col.  U=23
## iter121 errorY= 0.6171, prior information ratio= 0.15, Bdiff= 2.434e-05,
Bkappa=79.75;pos.  col.  U=23
## iter122 errorY= 0.6171, prior information ratio= 0.15, Bdiff= 2.413e-05,
Bkappa=80.06;pos.  col.  U=23
## iter123 errorY= 0.617, prior information ratio= 0.15, Bdiff= 2.393e-05,
Bkappa=55.4;pos.  col.  U=23
## iter124 errorY= 0.617, prior information ratio= 0.15, Bdiff= 2.379e-05,
Bkappa=55.59;pos.  col.  U=23
## iter125 errorY= 0.617, prior information ratio= 0.15, Bdiff= 2.362e-05,
Bkappa=55.81;pos.  col.  U=23
## iter126 errorY= 0.617, prior information ratio= 0.15, Bdiff= 2.351e-05,
Bkappa=56.09;pos.  col.  U=23
## iter127 errorY= 0.617, prior information ratio= 0.15, Bdiff= 2.339e-05,
Bkappa=56.36;pos.  col.  U=23
## iter128 errorY= 0.617, prior information ratio= 0.15, Bdiff= 2.335e-05,
Bkappa=56.61;pos.  col.  U=23
## iter129 errorY= 0.617, prior information ratio= 0.15, Bdiff= 2.326e-05,
Bkappa=56.86;pos.  col.  U=23
## iter130 errorY= 0.617, prior information ratio= 0.15, Bdiff= 2.313e-05,
Bkappa=57.12;pos.  col.  U=23
## iter131 errorY= 0.617, prior information ratio= 0.15, Bdiff= 2.299e-05,
Bkappa=57.38;pos.  col.  U=23
## iter132 errorY= 0.617, prior information ratio= 0.15, Bdiff= 2.29e-05,
Bkappa=57.65;pos.  col.  U=23
## iter133 errorY= 0.617, prior information ratio= 0.15, Bdiff= 2.293e-05,
Bkappa=57.91;pos.  col.  U=24
```

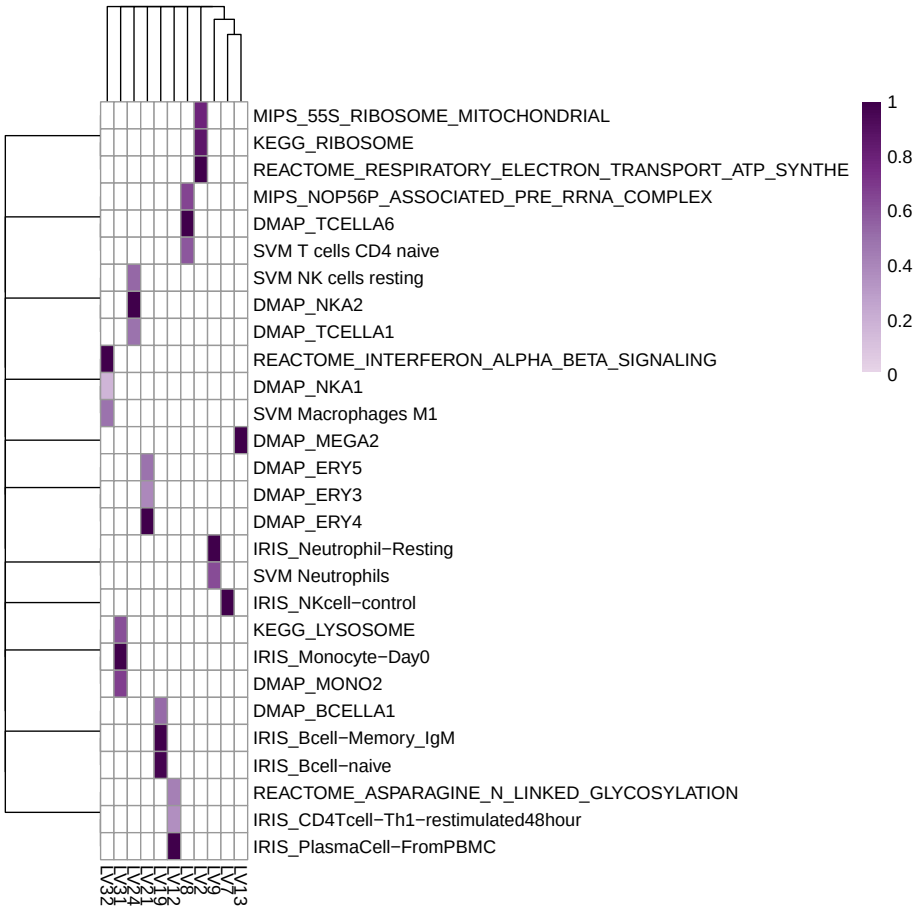
```
## iter134 errorY= 0.6169, prior information ratio= 0.14, Bdiff= 2.546e-05,
Bkappa=58.17;pos.  col.  U=24
## iter135 errorY= 0.6169, prior information ratio= 0.14, Bdiff= 2.662e-05,
Bkappa=58.43;pos.  col.  U=24
## Bdiff is not decreasing
## iter136 errorY= 0.6169, prior information ratio= 0.14, Bdiff= 2.746e-05,
Bkappa=58.72;pos.  col.  U=24
## Bdiff is not decreasing
## iter137 errorY= 0.6169, prior information ratio= 0.14, Bdiff= 2.776e-05,
Bkappa=59.03;pos.  col.  U=24
## Bdiff is not decreasing
## iter138 errorY= 0.6169, prior information ratio= 0.14, Bdiff= 2.81e-05,
Bkappa=59.32;pos.  col.  U=24
## Bdiff is not decreasing
## iter139 errorY= 0.6169, prior information ratio= 0.15, Bdiff= 3.573e-05,
Bkappa=59.59;pos.  col.  U=24
## Bdiff is not decreasing
## Updating L3, current fraction= 0.7059, target=0.7
## L3 not changed
## iter140 errorY= 0.6168, prior information ratio= 0.15, Bdiff= 4.238e-05,
Bkappa=59.84;pos.  col.  U=24
## Bdiff is not decreasing
## converged at  iteration 140 Bdiff is not decreasing
## There are 14  LVs with AUC>0.75
```

In the interest of speed we provide a pre-computed version though for this example it will only take a around a minute.

```
data(plierResult)
```

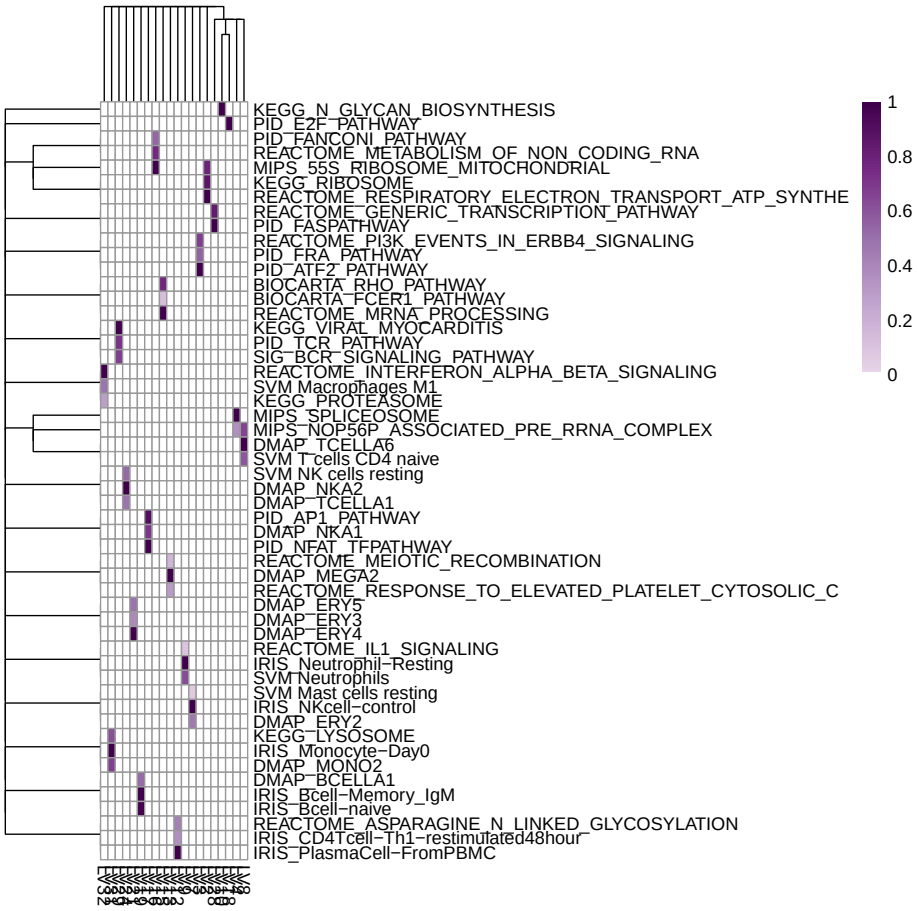
Visualize the U matrix with default cutoffs

```
plotU(plierResult, auc.cutoff = 0.75, pval.cutoff = 0.01, top = 3)
```



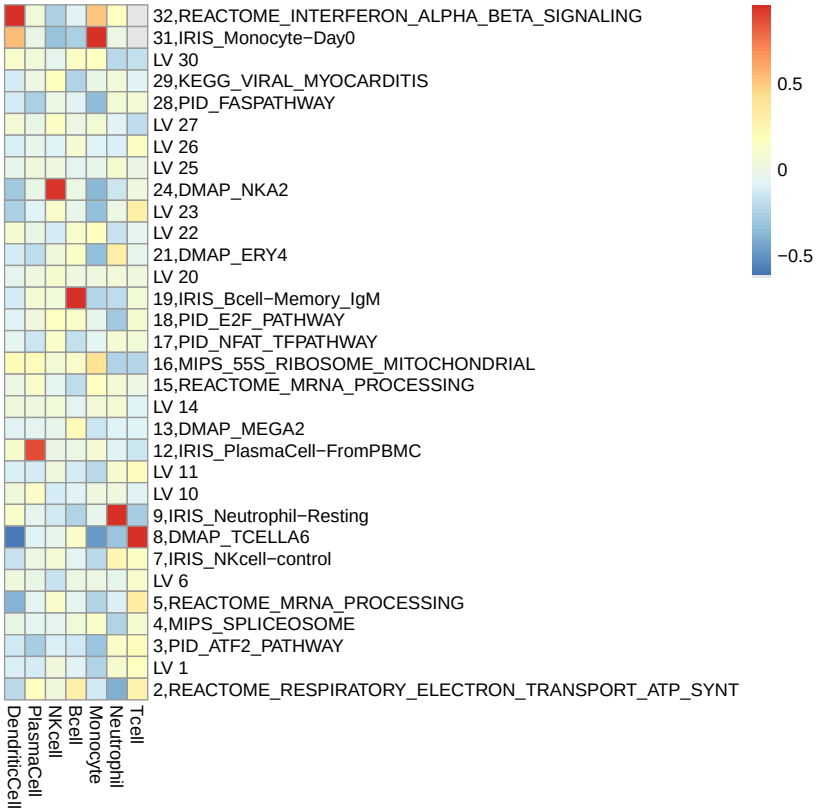
Visualize the U matrix with more permissive cutoffs

```
plotU(plierResult, auc.cutoff = 0.6, pval.cutoff = 0.05, top = 3)
```



We can correlate the decomposition result with SPVs from CellCODE like this.

```
data(SPVs)
plotMat(cor(t(plierResult$B), SPVs), scale = F)
```



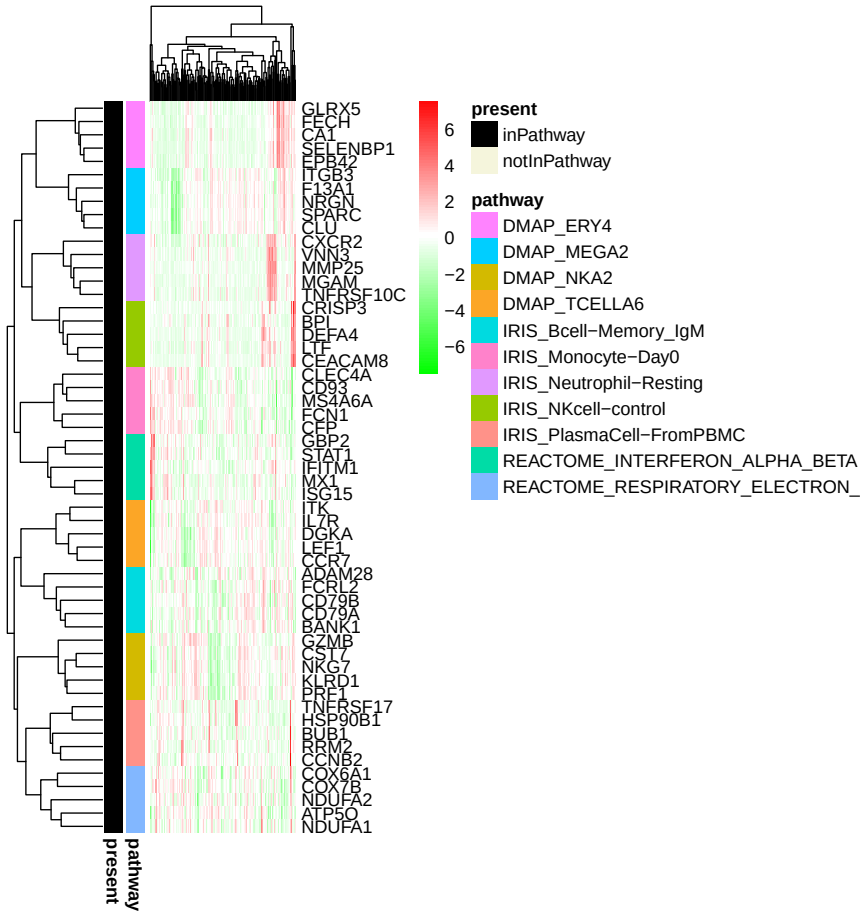
We have nice one-to-one correspondence, though the "DendriticCell" signature from CellCODE is more closely related to the Type-I interferon transcriptional response so it is probably not cell-type induced variation.

We can see that LVs 1, 8, 9, 11, 16, 21, 33 roughly correspond to major cell-types and we can use this to derive data-driven cell-type markers, which can be plugged into the CellCODE pipeline.

```
markers=plierResToMarkers(plierResult, allPaths, index = c( 1, 8, 9, 11, 16, 21, 33))

## Genes not matched uniquely:

colnames(markers)

## [1] "LV 1"
## [2] "8,DMAP_TCELLA6"
## [3] "9,IRIS_Neutrophil-Resting"
## [4] "16,MIPS_55S_RIBOSOME_MITOCHONDRIAL"
## [5] "21,DMAP_ERY4"
```

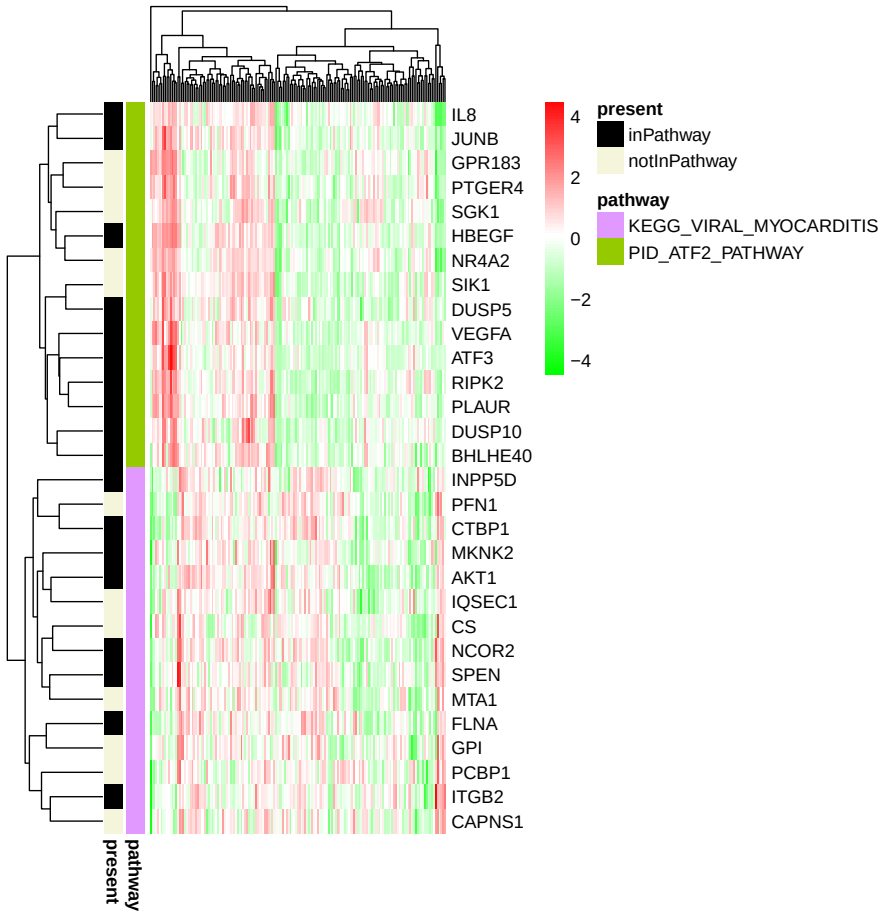
We can also visualize the top genes and their pathway associations. Note: only LVs with pathway association are plotted.

```
indexToPlot=which(apply(plierResult$Uauc,2,max)>0.75)
plotTopZ(plierResult, vacDataN, allPaths, top = 5, index =  indexToPlot)
```



Let's plot some of the less reliable LVs

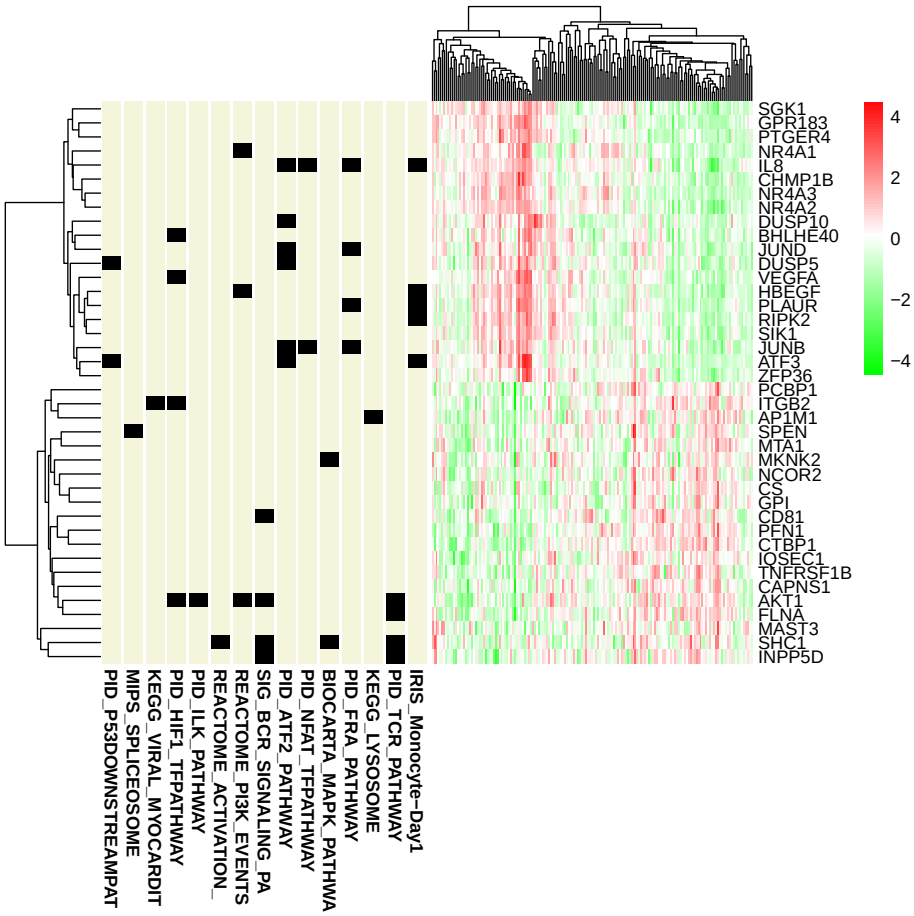
```
plotTopZ(plierResult, vacDataN, allPaths, top = 15, index =  c(3,29))
```



We can see that in this case not all genes have the pathway(s) annotation like this.

Since each LV may (and often is) be associated with more than one pathway it can be useful to visualize all the different annotations.

```
plotTopZallPath(plierResult, vacDataN, allPaths, top = 20, index =  c(3,29), regress = T)
```


SGK1
GPR183
PTGER4
NR4A1
IL8
CHMP1B
NR4A3
NR4A2
DUSP10
BHLHE40
JUND
DUSP5
VEGFA
HBEGF
PLAUR
RIPK2
SIK1
JUNB
ATF3
ZFP36
PCBP1
ITGB2
AP1M1
SPEN
MTA1
MKNK2
NCOR2
CS
GPI
CD81
PFN1
CTBP1
IQSEC1
TNFRSF1B
CAPNS1
AKT1
FLNA
MAST3
SHC1
INPP5D
4
2
0
−2
−4
PID_P53DOWNSTREAMPAT
MIPS_SPLICEOSOME
KEGG_VIRAL_MYOCARDIT
PID_HIF1_TFPATHWAY
PID_ILK_PATHWAY
REACTOME_ACTIVATION_
REACTOME_PI3K_EVENTS
SIG_BCR_SIGNALING_PA
PID_ATF2_PATHWAY
PID_NFAT_TFPATHWAY
BIOCARTA_MAPK_PATHWA
PID_FRA_PATHWAY
KEGG_LYSOSOME
PID_TCR_PATHWAY
IRIS_Monocyte−Day1