

Using the robsel package

This vignette illustrates the basic usage of the `robsel` package to estimate of the regularization parameter for Graphical Lasso.

Data

We use a 100-by-5 matrix from generate from normal distribution.

```
x <- matrix(rnorm(100*5),ncol=5)
```

Using robsel functions

Estimate of the regularization parameter for Graphical Lasso

The function `robsel` estimates λ , a regularization parameter for Graphical Lasso at a prespecified confidence level α .

```
library(robsel)
lambda <- robsel(x)
lambda
#> [1] 0.1336524
```

Graphical Lasso algorithm with λ from Robust Selection

The function `robsel.glasso` returns estimates a sparse inverse covariance matrix using Graphical Lasso with regularization parameter estimated from Robust Selection

```
A <- robsel.glasso(x)
A
#> $alpha
#> [1] 0.9
#>
#> $lambda
#> [1] 0.1380719
#>
#> $Sigma
#> $Sigma[[1]]
#>      [,1]      [,2]      [,3]      [,4]      [,5]
#> [1,] 1.178615 0.000000 0.00000000 0.0000000 0.0000000
#> [2,] 0.000000 1.123979 0.00000000 0.0000000 0.0000000
#> [3,] 0.000000 0.000000 0.83786493 0.0000000 0.01712515
#> [4,] 0.000000 0.000000 0.00000000 0.9608984 0.0000000
#> [5,] 0.000000 0.000000 0.01712515 0.0000000 0.82116024
#>
#>
#> $Omega
#> $Omega[[1]]
#>      [,1]      [,2]      [,3]      [,4]      [,5]
#> [1,] 0.8484535 0.0000000 0.00000000 0.000000 0.0000000
```

```

#> [2,] 0.0000000 0.8896964 0.0000000 0.000000 0.0000000
#> [3,] 0.0000000 0.0000000 1.19401874 0.000000 -0.02490104
#> [4,] 0.0000000 0.0000000 0.0000000 1.040693 0.0000000
#> [5,] 0.0000000 0.0000000 -0.02490104 0.000000 1.21830841

```

Use RobSel with multiple prespecified confidence levels

We can use multiple α simultaneously with Robust Selection

```

alphas <- c(0.1, 0.5, 0.9)
lambdas <- robsel(x, alphas)
lambdas
#> [1] 0.2723751 0.1987018 0.1339750

```

```

robsel.fits <- robsel.glasso(x, alphas)
robsel.fits
#> $alpha
#> [1] 0.1 0.5 0.9
#>
#> $lambda
#> [1] 0.2985923 0.1942806 0.1275134
#>
#> $Sigma
#> $Sigma[[1]]
#>      [,1]      [,2]      [,3]      [,4]      [,5]
#> [1,] 1.339135 0.000000 0.000000 0.000000 0.000000
#> [2,] 0.000000 1.284499 0.000000 0.000000 0.000000
#> [3,] 0.000000 0.000000 0.9983853 0.000000 0.000000
#> [4,] 0.000000 0.000000 0.000000 1.121419 0.000000
#> [5,] 0.000000 0.000000 0.000000 0.000000 0.9816806
#>
#> $Sigma[[2]]
#>      [,1]      [,2]      [,3]      [,4]      [,5]
#> [1,] 1.234824 0.000000 0.000000 0.000000 0.000000
#> [2,] 0.000000 1.180188 0.000000 0.000000 0.000000
#> [3,] 0.000000 0.000000 0.8940736 0.000000 0.000000
#> [4,] 0.000000 0.000000 0.000000 1.017107 0.000000
#> [5,] 0.000000 0.000000 0.000000 0.000000 0.8773689
#>
#> $Sigma[[3]]
#>      [,1]      [,2]      [,3]      [,4]      [,5]
#> [1,] 1.168056 0.00000 0.0000000 0.0000000 0.0000000
#> [2,] 0.000000 1.11342 0.0000000 0.0000000 0.0000000
#> [3,] 0.000000 0.00000 0.82730639 0.0000000 0.02768369
#> [4,] 0.000000 0.00000 0.0000000 0.9503398 0.0000000
#> [5,] 0.000000 0.00000 0.02768369 0.0000000 0.81060170
#>
#>
#> $Omega
#> $Omega[[1]]
#>      [,1]      [,2]      [,3]      [,4]      [,5]
#> [1,] 0.7467505 0.0000000 0.0000000 0.0000000 0.0000000
#> [2,] 0.0000000 0.7785134 0.0000000 0.0000000 0.0000000
#> [3,] 0.0000000 0.0000000 1.001617 0.0000000 0.0000000

```

```

#> [4,] 0.000000 0.000000 0.000000 0.8917275 0.000000
#> [5,] 0.000000 0.000000 0.000000 0.000000 1.018661
#>
#> $Omega[[2]]
#>      [,1]      [,2]      [,3]      [,4]      [,5]
#> [1,] 0.8098322 0.0000000 0.0000000 0.0000000 0.0000000
#> [2,] 0.0000000 0.8473229 0.0000000 0.0000000 0.0000000
#> [3,] 0.0000000 0.0000000 1.118476 0.0000000 0.0000000
#> [4,] 0.0000000 0.0000000 0.0000000 0.9831807 0.0000000
#> [5,] 0.0000000 0.0000000 0.0000000 0.0000000 1.139771
#>
#> $Omega[[3]]
#>      [,1]      [,2]      [,3]      [,4]      [,5]
#> [1,] 0.856123 0.0000000 0.0000000 0.000000 0.00000000
#> [2,] 0.000000 0.8981334 0.0000000 0.000000 0.00000000
#> [3,] 0.000000 0.0000000 1.21012497 0.000000 -0.04132822
#> [4,] 0.000000 0.0000000 0.0000000 1.052255 0.00000000
#> [5,] 0.000000 0.0000000 -0.04132822 0.000000 1.23506294

```