

GSAR Test

```
library(igraph)

##
## Attaching package: 'igraph'

## The following objects are masked from 'package:stats':
##
##      decompose, spectrum

## The following object is masked from 'package:base':
##
##      union

WWtest <-
function(object, group, nperm=1000, pvalue.only=TRUE)
{
  if(!(is.matrix(object)))
    stop("'object' must be a matrix where rows are features and
        columns are samples")

  if(is.null(group))
    stop("'group' must be a vector indicating group association.
        Possible values are 1 and 2")

  nv <- ncol(object)

  if(!is.logical(pvalue.only))
    stop("'pvalue.only' must be logical")

  if(length(group) != nv)
    stop("length of 'group' must equal the number of columns in 'object'")

  if(sum(group %in% c(1,2)) < nv)
    stop("all members in 'group' must have values 1 or 2")

  if((sum(group == 1) < 3) || (sum(group == 2) < 3))
    stop("there are less than 3 samples in at least one group")

  object <- object[,c(which(group == 1), which(group == 2))]
  nv1 <- sum(group == 1)
  objt <- aperm(object, c(2,1))
  Wmat <- as.matrix(dist(objt, method="euclidean", diag=TRUE,
    upper=TRUE, p=2))
  gr <- graph_from_adjacency_matrix(Wmat, weighted=TRUE, mode="undirected")
  V(gr)[c(1:nv1)]$color <- "green"
  V(gr)[c((nv1+1):nv)]$color <- "red"
  MST <- mst(gr)
  domain <- V(MST)$color
```

```

runs <- array(0,c(1,nperm))

for(itr in 1:nperm)
{
  randperm <- sample(domain, replace = FALSE)
  mst2 <- MST
  V(mst2)$color <- randperm
  mstWM <- as_adjacency_matrix(MST, type="lower", attr="weight", sparse=FALSE)
  edgeind <- which(mstWM != 0, arr.ind = TRUE, useNames = FALSE)
  runs[itr] <- 1 +
    sum(V(mst2)[edgeind[,1]]$color != V(mst2)[edgeind[,2]]$color)
}

sd_runs <- apply(runs, 1, sd)
W_perm <- (runs - mean(runs)) / sd_runs
mstWM <- as_adjacency_matrix(MST, type = "lower", attr="weight", sparse=FALSE)
edgeind <- which(mstWM != 0, arr.ind=TRUE, useNames=FALSE)
runs_obs <- 1 + sum(V(MST)[edgeind[,1]]$color != V(MST)[edgeind[,2]]$color)
W_obs <- (runs_obs - mean(runs)) / sd_runs
pvalue <- (sum(W_perm <= W_obs) + 1) / (length(W_perm) + 1)
if(pvalue.only) return(pvalue)
if(!pvalue.only) return(list("statistic"=W_obs, "p.value"=pvalue))
}

```

```

x = matrix(c(1,2,4,4,5,5,5,5,3,7,3,3,6,1,3,3,4,8,6,6,2,3,5,5,5,3,2,2,3,7,4,4,2,5,3,3,7,2,7,7), nrow = 4

```

```

lab = c(1,2,2,1,2,1,2,2,1,1)

```

```

WWtest(x, lab, nperm = 10000, pvalue.only = FALSE)

```

```

## $statistic
## [1] -0.6842342
##
## $p.value
## [1] 0.3613639

```

```

x = matrix(c(1,1,1,1,5,5,5,5,2,2,2,2,7,7,7,7,6,6,6,6,3,3,3,3,1,1,1,1,8,8,8,8,9,9,9,9,3,3,3,3), nrow = 4

```

```

lab = c(1,2,1,2,2,1,1,2,2,1)

```

```

WWtest(x, lab, nperm = 10000, pvalue.only = FALSE)

```

```

## $statistic
## [1] -2.847693
##
## $p.value
## [1] 0.00819918

```