Package: MATES (via r-universe)

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Title Multi-view Aggregated Two Sample Tests

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Description This package is an implementation of the estimation and inference procedure of a multi-view aggregated two-sample test of equal distribution.

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BugReports https://github.com/ZexiCAI/MATES/issues

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Contents

MATES-package 2
asy_cov 2
asy_mean 3
degree_distribution 3
MATES 4
MATES_test 5

optimalwithrank_curnode 5
Out_direct 6
P_Knear_rank 6
rank_mats 7
Rise_Rank 7

Index **8**

`MATES-package` *MATES*

Description

This package is an implementation of the estimation and inference procedure of a multi-view aggregated two-sample test of equal distribution.

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See Also

Useful links:

- https://github.com/ZexiCAI/MATES
- Report bugs at https://github.com/ZexiCAI/MATES/issues

`asy_cov` *Find the permutation covariance*

Description

This function takes a list of numeric matrices and uses a C++ backend to find the permutation covariance

Usage

```
asy_cov(R_list, m, n)
```

Arguments

R_list	A list of numeric matrices with length S
m	An integer representing the number of sample in X
n	An integer representing the number of sample in Y

Value

A numeric matrix with row and column 2*S

---

asy_mean *Find the permutation mean*

Description

This function takes a list of numeric matrices and uses a C++ backend to find the permutation mean.

Usage

```
asy_mean(R_list, m, n)
```

Arguments

R_list	A list of numeric matrices with length S
m	An integer representing the number of sample in X
n	An integer representing the number of sample in Y

Value

A numeric vector with length 2*S

---

degree_distribution *Auxiliary function to compute rank matrix*

Description

This function is used in 'P_Knear_rank' to compute the degrees

Usage

```
degree_distribution(G, sampleIDs)
```

MATES *MATES test statistic with two samples (recommended for general use)*

Description

This function takes two data matrices (m x d and n x d) and other parameters to compute the MATES test statistic. It only implements the same distance, graph, and weight options across all views. For other combinations, please compute the corresponding view matrices (R_list) and use the MATES_stat function directly.

Usage

```
MATES(
  X,
  Y,
  S = 4,
  dt = "manhattan",
  gh = "NNG",
  wt = "kernel",
  pow = 0.8,
  perm = NULL
)
```

Arguments

X	A numeric matrix of size m x d
Y	A numeric matrix of size n x d
S	An integer representing the number of moments to use
dt	A character string indicating the distance metric to use ("manhattan" or "Lp")
gh	A character string indicating the graph type to use ("NNG", "MST", or "rNNG")
wt	A character string indicating the weight function to use ("kernel", "rank", "distance", or "plain")
pow	A numeric representing the number of neighbors to use for graph, if pow = 0, then use default value 10; otherwise use round(N^pow)
perm	An integer indicating the number of permutation (default is NULL, which uses closed form)

Value

A list with the MATES test statistic (test.stat) and p-value (pval)

Examples

```
# MATES(X,Y,S=4,dt="manhattan",gh="NNG",wt="kernel",pow=0.8)
```

MATES_test *MATES test statistic with pre-computed view matrices*

Description

This function takes a list of view matrices (R_list) and other parameters to compute the MATES test statistic.

Usage

```
MATES_test(UxUy, R_list, m, n, perm = NULL)
```

Arguments

UxUy	A numeric vector of length 2*S containing the Ux and Uy statistics for each view
R_list	A list of numeric matrices with length S
m	An integer representing the number of sample in X
n	An integer representing the number of sample in Y
perm	An integer indicating the number of permutation (default is NULL, which uses closed form)

Value

A list with the MATES test statistic (test.stat) and p-value (pval)

optimalwithrank_curnode *Auxiliary function to compute rank matrix*

Description

This function is used in 'P_Knear_rank'

Usage

```
optimalwithrank_curnode(k, cur_neis, neighbor, degree, lambda, rowrank)
```

Out_direct *Auxiliary function to compute rank matrix*

Description

get outdirect nodes for each node

Usage

```
Out_direct(K, nodes)
```

P_Knear_rank *Compute k-rNNG graph*

Description

This function builds penalized K nearest neighbor graphs with rank The output is a list containing the graph and the degree distribution

Usage

```
P_Knear_rank(M, K = round(nrow(M)^0.8), lambda = 0.3)
```

Arguments

M	A numeric matrix representing the distance matrix
K	An integer representing the number of neighbors to use
lambda	A numeric representing the penalty parameter

Value

A list containing the truncated KNN graph (trun_KNN) and the degree distribution (degree)

References

Zhu, Y., & Chen, H. (2023). A new robust graph for graph-based methods. *arXiv preprint arXiv:2307.15205*.

rank_mats *Compute rank matrix*

Description

This function computes the rank matrix based on the specified graph type and number of neighbors.

Usage

```
rank_mats(S, Dd, gtype, k)
```

Arguments

S	A numeric matrix representing the similarity matrix
Dd	A dist object representing the distance matrix
gtype	A character string indicating the graph type to use ("NNG", "MST", or "rNNG")
k	A numeric representing the number of neighbors to use for graph

References

Zhu, Y., & Chen, H. (2023). A new robust graph for graph-based methods. *arXiv preprint arXiv:2307.15205*.

Rise_Rank *RISE rank matrix*

Description

The rank function to calculate rank of elements of a matrix. Two possible methods: the overall rank and the row-wise rank.

Usage

```
Rise_Rank(S, method = "overall")
```

Arguments

S	A numeric matrix representing the similarity matrix
method	A character string indicating the ranking method to use ("overall" or "row")

Value

A numeric matrix representing the rank matrix

Index

_PACKAGE *(*MATES-package*)*, 2

asy_cov, 2
asy_mean, 3

degree_distribution, 3

MATES, 4
MATES-package, 2
MATES_test, 5

optimalwithrank_curnode, 5
Out_direct, 6

P_Knear_rank, 6

rank_mats, 7
Rise_Rank, 7