# Package: energymethod (via r-universe)

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**Type** Package

**Title** Two-Sample Test of many Functional Means using the Energy Method

**Version** 1.1

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**Description** Given two samples of size n_1 and n_2 from a data set where each sample consists of K functional observations (channels), each recorded on T grid points, the function energy method implements a hypothesis test of equality of channel-wise mean at each channel using the bootstrapped distribution of maximum energy to control family wise error. The function energy_method_complex accomodates complex valued functional observations.

**License** GPL-3

**Imports** Rcpp (>= 1.0.14)

**LinkingTo** Rcpp, RcppArmadillo

**RoxygenNote** 7.3.2

**NeedsCompilation** yes

**Author** David Colin Decker [aut, cre]

**Repository** https://cran.r-universe.dev

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**RemoteUrl** https://github.com/cran/energymethod

**RemoteRef** HEAD

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## Contents

energy_method *Implements the two sample paired or independent energy method*

## Description

This function takes two samples of high-dimensional functional data, implements the energy method, and returns a p-value for the global test of equality of mean and a channel-wise p-value for each functional coordinate.

## Usage

```
energy_method(sample_1, sample_2, num_bootstrap_reps, seed, type)
```

## Arguments

| | |
|---|---|
| sample_1 | A three dimensional array with dimension attribute (K,T,n_1) where K is the number of channels, T is the number of functional recordings, and n_1 is the sample size. |
| sample_2 | A three dimensional array with dimension attribute (K,T,n_1) where K is the number of channels, T is the number of functional recordings, and n_2 is the sample size. |
| num_bootstrap_reps | A number. The number of bootstrap resamples to use when implementing the test |
| seed | A number. The seed used for randomness in bootstrap procedure |
| type | A sting. Either "paired" or "independent"" |

## Value

A list containg the p-values of the test for the global hypothesis and channel-wise hypotheses, as well as summary information about the samples.

## Author(s)

David Colin Decker

## References

Article on energy method forthcoming

## Examples

```
K=10
T=100
n_1=10
n_2=20
sample_1 = array(rnorm (K*T*n_1), dim=c(K, T, n_1))
```

```
sample_2 = array(rnorm (K*T*n_2), dim=c(K, T, n_2))
energy_method(sample_1, sample_2, num_bootstrap_reps=1000, seed=123, type="independent")
```

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`energy_method_complex` *Implements the two sample paired or independent energy method*

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## Description

This function takes two samples of complex-valued high-dimensional functional data, implements the energy method, and returns a p-value for the global test of equality of mean and a channel-wise p-value for each functional coordinate.

## Usage

```
energy_method_complex(sample_1, sample_2, num_bootstrap_reps, seed, type)
```

## Arguments

| | |
|---|---|
| `sample_1` | A three dimensional complex array with dimension attribute (K,T,n_1) where K is the number of channels, T is the number of functional recordings, and n_1 is the sample size. |
| `sample_2` | A three dimensional complex array with dimension attribute (K,T,n_1) where K is the number of channels, T is the number of functional recordings, and n_2 is the sample size. |
| `num_bootstrap_reps` | A number. The number of bootstrap resamples to use when implementing the test |
| `seed` | A number. The seed used for randomness in bootstrap procedure |
| `type` | A sting. Either "paired" or "independent"" |

## Value

A list containg the p-values of the test for the global hypothesis and channel-wise hypotheses, as well as summary information about the samples.

## Author(s)

David Colin Decker

## References

Article on energy method forthcoming

## Examples

```
K=10
T=100
n_1=10
n_2=20
  sample_1_real=array(rnorm(K*T*n_1), dim=c(K,T,n_1))
  sample_1_complex=array(rnorm(K*T*n_1), dim=c(K,T,n_1))

 sample_1<-array(complex(real=sample_1_real, imaginary=sample_1_complex), dim=c(K,T,n_1))

  sample_2_real=array(rnorm(K*T*n_2), dim=c(K,T,n_2))
  sample_2_complex=array(rnorm(K*T*n_2), dim=c(K,T,n_2))

 sample_2<-array(complex(real=sample_2_real, imaginary=sample_2_complex), dim=c(K,T,n_2))
energy_method_complex(sample_1, sample_2, num_bootstrap_reps=1000, seed=123, type="independent")
```

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energymethod *Energy Method*

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## Description

Given two samples from a multi-channel functional distribtution, this package implements the energy method to perform a test of equality of mean. It returns channel-wise p-values and the global p-value.

## Author(s)

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