

# Package ‘PLPE’

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**Title** Local Pooled Error Test for Differential Expression with Paired High-throughput Data

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**Depends** R (>= 2.6.2), Biobase (>= 2.5.5), LPE, MASS, methods

**Description** This package performs tests for paired high-throughput data.

**biocViews** Proteomics, Microarray, DifferentialExpression

**LazyLoad** yes

**LazyData** yes

**License** GPL (>= 2)

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|                 |                                                |
|-----------------|------------------------------------------------|
| am.trans.paired | <i>Local Pooled Error Test for Paired Data</i> |
|-----------------|------------------------------------------------|

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**Description**

This is internal function in lpe.paired.

**Usage**

am.trans.paired(y, design)

**Author(s)**

HyungJun Cho and Jae K. Lee

**References**

Cho H, Smalley DM, Ross MM, Theodorescu D, Ley K and Lee JK (2007). Statistical Identification of Differentially Labelled Peptides from Liquid Chromatography Tandem Mass Spectrometry, Proteomics, 7:3681-3692.

**See Also**

[lpe.paired.default](#)

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|                   |                                                |
|-------------------|------------------------------------------------|
| base.error.paired | <i>Local Pooled Error Test for Paired Data</i> |
|-------------------|------------------------------------------------|

---

**Description**

This is internal function in lpe.paired.

**Usage**

base.error.paired(x, design,est.A, estimator, q, data.type)

**Author(s)**

HyungJun Cho and Jae K. Lee

**References**

Cho H, Smalley DM, Ross MM, Theodorescu D, Ley K and Lee JK (2007). Statistical Identification of Differentially Labelled Peptides from Liquid Chromatography Tandem Mass Spectrometry, *Proteomics*, 7:3681-3692.

**See Also**

[lpe.paired.default](#)

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generate.null

*Local Pooled Error Test for Paired Data*

---

**Description**

This is internal function in lpe.paired.

**Usage**

```
generate.null(x, design, q)
```

**Arguments**

|        |                                                                                        |
|--------|----------------------------------------------------------------------------------------|
| x      | data matrix                                                                            |
| design | design matrix; condition index in the first column and pair index in the sceond column |
| q      | quantile for intervals of intensities                                                  |

**Value**

|        |                                                                                        |
|--------|----------------------------------------------------------------------------------------|
| design | design matrix; condition index in the first column and pair index in the sceond column |
| q      | quantile for intervals of intensities                                                  |

**Author(s)**

HyungJun Cho and Jae K. Lee

**References**

Cho H, Smalley DM, Ross MM, Theodorescu D, Ley K and Lee JK (2007). Statistical Identification of Differentially Labelled Peptides from Liquid Chromatography Tandem Mass Spectrometry, *Proteomics*, 7:3681-3692.

**See Also**

[lpe.paired.default](#)

lpe.paired

*Local Pooled Error Test for Paired Data***Description**

This investigates differential expression for paired high-throughput data.

**Usage**

```
lpe.paired(x,...)
```

**Arguments**

|     |                                                                       |
|-----|-----------------------------------------------------------------------|
| x   | an object for which the extraction of model lpe.paired is meaningful. |
| ... | other arguments                                                       |

**Value**

|     |                                                                                        |
|-----|----------------------------------------------------------------------------------------|
| x   | design matrix; condition index in the first column and pair index in the second column |
| ... | data type: 'ms' for mass spectrometry data, 'cdna' for cDNA microarray data            |

**Author(s)**

HyungJun Cho and Jae K. Lee

**References**

Cho H, Smalley DM, Ross MM, Theodorescu D, Ley K and Lee JK (2007). Statistical Identification of Differentially Labelled Peptides from Liquid Chromatography Tandem Mass Spectrometry, *Proteomics*, 7:3681-3692.

**See Also**

[lpe.paired.default](#)

**Examples**

```
#LC-MS/MS proteomic data for platelets MPs
library(PLPE)
data(plateletSet)
x <- exprs(plateletSet)
x <- log2(x)

cond <- c(1, 2, 1, 2, 1, 2)
pair <- c(1, 1, 2, 2, 3, 3)
design <- cbind(cond, pair)
```

```
out <- lpe.paired(x, design, q=0.1, data.type="ms")
out$test.out[1:10,]
```

---

lpe.paired.default      *Local Pooled Error Test for Paired Data*


---

## Description

This investigates differential expression for paired high-throughput data.

## Usage

```
## Default S3 method:
lpe.paired(x, design, data.type, q=0.01, probe.ID = NULL, estimator="median", w=0.5, w.estimator="fixed")
```

## Arguments

|             |                                                                                                        |
|-------------|--------------------------------------------------------------------------------------------------------|
| x           | data matrix                                                                                            |
| design      | design matrix; condition index in the first column and pair index in the second column                 |
| q           | quantile for intervals of intensities                                                                  |
| probe.ID    | probe set IDs; if NULL, row numbers are assigned.                                                      |
| data.type   | data type: 'ms' for mass spectrometry data, 'cdna' for cDNA microarray data                            |
| estimator   | specification for the estimator: 'median', 'mean' and 'huber'                                          |
| w           | weight parameter between individual variance estimate and pooling variance estimate, $0 \leq w \leq 1$ |
| w.estimator | two approaches to estimate the weight: 'random' or 'fixed'                                             |
| iseed       | seed number                                                                                            |
| ...         | other arguments                                                                                        |

## Value

|             |                                                                                                        |
|-------------|--------------------------------------------------------------------------------------------------------|
| design      | design matrix; condition index in the first column and pair index in the second column                 |
| data.type   | data type: 'ms' for mass spectrometry data, 'cdna' for cDNA microarray data                            |
| q           | quantile for intervals of intensities                                                                  |
| estimator   | specification for the estimator: 'median', 'mean' and 'huber'                                          |
| w.estimator | two approaches to estimate the weight: 'random' or 'fixed'                                             |
| w           | weight parameter between individual variance estimate and pooling variance estimate, $0 \leq w \leq 1$ |
| test.out    | matrix for test results                                                                                |

**Author(s)**

HyungJun Cho and Jae K. Lee

**References**

Cho H, Smalley DM, Ross MM, Theodorescu D, Ley K and Lee JK (2007). Statistical Identification of Differentially Labelled Peptides from Liquid Chromatography Tandem Mass Spectrometry, *Proteomics*, 7:3681-3692.

**See Also**

[lpe.paired](#)

**Examples**

```
#LC-MS/MS proteomic data for platelets MPs
library(PLPE)
data(plateletSet)
x <- exprs(plateletSet)
x <- log2(x)

cond <- c(1, 2, 1, 2, 1, 2)
pair <- c(1, 1, 2, 2, 3, 3)
design <- cbind(cond, pair)

out <- lpe.paired(x, design, q=0.1, data.type="ms")
out$test.out[1:10,]
summary(out)
```

---

|                |                     |
|----------------|---------------------|
| lpe.paired.fdr | <i>FDR for PLPE</i> |
|----------------|---------------------|

---

**Description**

This computes FDR for PLPE.

**Usage**

```
lpe.paired.fdr(x, ...)
```

**Arguments**

|     |                 |
|-----|-----------------|
| x   | data matrix     |
| ... | other arguments |

**Author(s)**

HyungJun Cho and Jae K. Lee

## References

Cho H, Smalley DM, Ross MM, Theodorescu D, Ley K and Lee JK (2007). Statistical Identification of Differentially Labelled Peptides from Liquid Chromatography Tandem Mass Spectrometry, *Proteomics*, 7:3681-3692.

## See Also

[lpe.paired.fdr.default](#)

## Examples

```
#LC-MS/MS proteomic data for platelets MPs
library(PLPE)
data(plateletSet)
x <- exprs(plateletSet)
x <- log2(x)

cond <- c(1, 2, 1, 2, 1, 2)
pair <- c(1, 1, 2, 2, 3, 3)
design <- cbind(cond, pair)

out <- lpe.paired(x, design, q=0.1, data.type="ms")
out.fdr <- lpe.paired.fdr(x,obj=out)
out.fdr$FDR[1:10,]
```

---

`lpe.paired.fdr.default`

*FDR for PLPE*

---

## Description

This computes FDR for PLPE.

## Usage

```
## Default S3 method:
lpe.paired.fdr(x, obj, n.iter=5, lambda=0.9, ...)
```

## Arguments

|                     |                                                      |
|---------------------|------------------------------------------------------|
| <code>x</code>      | data matrix                                          |
| <code>obj</code>    | object created from <code>lpe.paired</code>          |
| <code>n.iter</code> | number of iterations                                 |
| <code>lambda</code> | numeric vector of probabilities with values in [0,1] |
| <code>...</code>    | other argument                                       |

**Value**

|                          |                                                                                                        |
|--------------------------|--------------------------------------------------------------------------------------------------------|
| <code>design</code>      | design matrix; condition index in the first column and pair index in the second column                 |
| <code>data.type</code>   | data type: 'ms' for mass spectrometry data, 'cdna' for cDNA microarray data                            |
| <code>estimator</code>   | specification for the estimator: 'median', 'mean' and 'huber'                                          |
| <code>w.estimator</code> | two approaches to estimate the weight: 'random' or 'fixed'                                             |
| <code>w</code>           | weight parameter between individual variance estimate and pooling variance estimate, $0 \leq w \leq 1$ |
| <code>pi0</code>         | estimated proportion of non-null peptides                                                              |
| <code>FDR</code>         | matrix for test results including FDRs                                                                 |
| <code>...</code>         | other arguments                                                                                        |

**Author(s)**

HyungJun Cho and Jae K. Lee

**References**

Cho H, Smalley DM, Ross MM, Theodorescu D, Ley K and Lee JK (2007). Statistical Identification of Differentially Labelled Peptides from Liquid Chromatography Tandem Mass Spectrometry, *Proteomics*, 7:3681-3692.

**See Also**

[lpe.paired.fdr](#)

**Examples**

```
#LC-MS/MS proteomic data for platelets MPs
library(PLPE)
data(plateletSet)
x <- exprs(plateletSet)
x <- log2(x)

cond <- c(1, 2, 1, 2, 1, 2)
pair <- c(1, 1, 2, 2, 3, 3)
design <- cbind(cond, pair)

out <- lpe.paired(x, design, q=0.1, data.type="ms")
out.fdr <- lpe.paired.fdr(x,obj=out)
out.fdr$FDR[1:10,]
```

---

|             |                                             |
|-------------|---------------------------------------------|
| plateletSet | <i>LCMS proteomic data for platelet MPs</i> |
|-------------|---------------------------------------------|

---

**Description**

This data set consists of LC-MS/MS data with three replicates of paired samples.

**Source**

Garcia BA, Smalley DM, Cho H, Shabanowitz J, Ley K and Hunt DF (2005). The Platelet Microparticle Proteome, Journal of Proteome Research, 4:1516-1521.

---

|                  |                                                |
|------------------|------------------------------------------------|
| print.lpe.paired | <i>Local Pooled Error Test for Paired Data</i> |
|------------------|------------------------------------------------|

---

**Description**

This print lpe.paired.

**Usage**

```
## S3 method for class 'lpe.paired'  
print(x,...)
```

**Arguments**

|     |                                   |
|-----|-----------------------------------|
| x   | an object created from lpe.paired |
| ... | other arguments                   |

**Author(s)**

HyungJun Cho and Jae K. Lee

**References**

Cho H, Smalley DM, Ross MM, Theodorescu D, Ley K and Lee JK (2007). Statistical Identification of Differentially Labelled Peptides from Liquid Chromatography Tandem Mass Spectrometry, Proteomics, 7:3681-3692.

**Examples**

```
#LC-MS/MS proteomic data for platelets MPs
library(PLPE)
data(plateletSet)
x <- exprs(plateletSet)
x <- log2(x)

cond <- c(1, 2, 1, 2, 1, 2)
pair <- c(1, 1, 2, 2, 3, 3)
design <- cbind(cond, pair)

out <- lpe.paired(x, design, q=0.1, data.type="ms")
out
```

---

`print.lpe.paired.fdr`    *Local Pooled Error Test for Paired Data*

---

**Description**

This prints `lpe.paired.fdr`

**Usage**

```
## S3 method for class 'lpe.paired.fdr'
print(x,...)
```

**Arguments**

|                  |                                                |
|------------------|------------------------------------------------|
| <code>x</code>   | an object created from <code>lpe.paired</code> |
| <code>...</code> | other arguments                                |

**Author(s)**

HyungJun Cho and Jae K. Lee

**References**

Cho H, Smalley DM, Ross MM, Theodorescu D, Ley K and Lee JK (2007). Statistical Identification of Differentially Labelled Peptides from Liquid Chromatography Tandem Mass Spectrometry, *Proteomics*, 7:3681-3692.

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|                    |                                                |
|--------------------|------------------------------------------------|
| summary.lpe.paired | <i>Local Pooled Error Test for Paired Data</i> |
|--------------------|------------------------------------------------|

---

## Description

This summarize lpe.paired.

## Usage

```
## S3 method for class 'lpe.paired'  
summary(object,...)
```

## Arguments

|     |                                   |
|-----|-----------------------------------|
| x   | an object created from lpe.paired |
| ... | other arguments                   |

## Author(s)

HyungJun Cho and Jae K. Lee

## References

Cho H, Smalley DM, Ross MM, Theodorescu D, Ley K and Lee JK (2007). Statistical Identification of Differentially Labelled Peptides from Liquid Chromatography Tandem Mass Spectrometry, *Proteomics*, 7:3681-3692.

## Examples

```
#LC-MS/MS proteomic data for platelets MPs  
library(PLPE)  
data(plateletSet)  
x <- exprs(plateletSet)  
x <- log2(x)  
  
cond <- c(1, 2, 1, 2, 1, 2)  
pair <- c(1, 1, 2, 2, 3, 3)  
design <- cbind(cond, pair)  
  
out <- lpe.paired(x, design, q=0.1, data.type="ms")  
summary(out)
```

---

`summary.lpe.paired.fdr`*Local Pooled Error Test for Paired Data*

---

**Description**

This summarize lpe.paired.

**Usage**

```
## S3 method for class 'lpe.paired.fdr'  
summary(object,...)
```

**Arguments**

|                  |                                   |
|------------------|-----------------------------------|
| <code>x</code>   | an object created from lpe.paired |
| <code>...</code> | other arguments                   |

**Author(s)**

HyungJun Cho and Jae K. Lee

**References**

Cho H, Smalley DM, Ross MM, Theodorescu D, Ley K and Lee JK (2007). Statistical Identification of Differentially Labelled Peptides from Liquid Chromatography Tandem Mass Spectrometry, *Proteomics*, 7:3681-3692.

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