# Package 'RankMetric'

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**Type** Package

**Title** Calculates the Distance between Rankings for different Metrics

**Version** 0.0.0.9000

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**Description** This package calculates the distance between any pair of full or partial rankings for the metrics given in Metric Methods for Analyzing Partially Ranked Data by Critchlow. It allows for tied rankings.

**Depends** R (>= 3.3.1)

**License** GPL-3

**LazyData** true

**LinkingTo** Rcpp

**Imports** Rcpp , LIStest, stats

**RoxygenNote** 6.1.0

**Suggests** knitr, rmarkdown

**VignetteBuilder** knitr

**NeedsCompilation** yes

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`cayley` *Cayley's Distance*

---

## Description

`cayley` returns Cayley's distance between two full rankings.

## Usage

```
cayley(x, y)
```

## Arguments

| | |
|---|---|
| `x, y` | integer vectors |

## Value

Returns Cayley's distance between `x` and `y`

## Author(s)

Lucy Small, <lucy.small@ucdconnect.ie>

## Examples

```
x = c(3,1,2,5,4)
y = c(1,2,3,4,5)
cayley(x,y)
```

## cayleyE *Cayley's Distance with Ties*

### Description

Computes Cayley's distance between two rankings, where items with equal ranking are now permitted. The number of items placed in the ith category must be the same. The number of groups must be 2 or 3, as Cayley's distance is undefined in other cases.

### Usage

```
cayleyE(x, y)
```

### Arguments

| | |
|---|---|
| x, y | integer vectors |

### Value

Returns Cayley's distance between the two rankings.

### Author(s)

Lucy Small, <lucy.small@ucdconnect.ie>

### Examples

```
a = c(3,1,2,2,3)
b = c(1,2,2,3,3)
cayleyE(a,b)
```

## cayleyP *Cayley's Distance for Partial rankings*

### Description

Computes Cayley's distance between two partial rankings.

### Usage

```
cayleyP(a, b, k)
```

### Arguments

| | |
|---|---|
| a, b | integer vectors |
| k | integer |

### Value

Returns Cayley's distance between two partial rankings, where only the first k items have been ranked. No ties are permitted.

## Author(s)

Lucy Small, <lucy.small@ucdconnect.ie>

## Examples

```
a = c(3,1,2,5,4)
b = c(1,2,3,4,5)
k=3
cayleyP(a,b,k)
```

---

`distance` *Metrics for Rankings*

---

## Description

Calculates the distances between a set of rankings or permutations, using one of six metrics.

## Usage

```
distance(x, metric, perm = TRUE, ranktype = "full", k = 2)
```

## Arguments

| | |
|---|---|
| `x` | matrix where each row is a ranking or a permutation |
| `metric` | a distance metric, one of<br>• `"kendall"`<br>• `"ulam"`<br>• `"spearrho"`, spearman's rho<br>• `"spearfoot"`, spearman's footrule<br>• `"hamming"`<br>• `"cayley"` |
| `perm` | `TRUE` for a matrix of permutations, `FALSE` for a matrix of rankings |
| `ranktype` | indicates the type of ranking<br>• `"full"` full ranking<br>• `"partial"`, partial ranking with no ties<br>• `"sametimes"`, ties allowed, the same number must be ranked 1st, 2nd etc<br>• `"anyties"`, ties allowed any number can be ranked 1st, 2nd etc |
| `k` | the number of items ranked in a partial ranking |

## Value

Returns a matrix of the distances between all the rankings/ permutations in the input matrix. If `ranktype` is `"anyties"` the function will work for any type of partial ranking or ranking with ties. However using `"full"` for complete rankings or `"partial"` for partial ranking with no ties for that kind of data will run faster.

If the ranking of some of the items is not known or given they can be left as `NA`.

## Author(s)

Lucy Small, <lucy.small@ucdconnect.ie>

## References

http://www.springer.com/gp/book/9780387962887

## Examples

```
x = t(matrix(replicate(10,sample(1:5,5)),ncol=10))
distance(x,metric = "spearfoot",perm = FALSE,"full")
```

---

# fifa16 *Voting data from 2016 FIFA Best Player of the Year*

---

## Description

This is the voting data with voter covariates from the FIFA Best Player of the Year 2016 award. There were 23 candidates on the shortlist and 450 voters. Each voter provides their top-3 choices. The voters were the national captains, manager, and one media representative from each country.

FIFA, the world football governing body, divides member countries into six continental confederations, which each organise continental national and club competitions. The confederation of each voter is given.

## Usage

```
data(fifa16)
```

## Format

A data frame with 450 voters (rows) and 30 variables (columns). The first four columns give the voter `name`, `role` (captain, manager or media), `country` of origin and `confederation`(AFC, CAF, CONCAF,CONMEBOL or UEFA). Columns `vote1`, `vote2`, `vote3` give the names of the candidates chosen by each voter as their top-3 ranking. The remaining columns (8:30) give the full partial rankings in permutation form. The votes are arbitrarily filled in after the top-3.

## Source

http://resources.fifa.com/mm/Document/the-best/PlayeroftheYear-Men/02/86/27/05/faward_MenPlayer2016_Neutral.pdf

## ham *Hamming Distance*

### Description

Returns the Hamming distance between two full rankings.

### Usage

```
ham(a, b)
```

### Arguments

| | |
|---|---|
| a, b | integer vectors |

### Value

The Hamming distance between the two rankings.

### Author(s)

Lucy Small, <lucy.small@ucdconnect.ie>

### Examples

```
a = c(3,1,2,5,4)
b = c(1,2,3,4,5)
ham(a,b)
```

## hamE *Hamming Distance with Ties*

### Description

Computes the Hamming distance between two rankings, where items with equal ranking are now permitted. The number of items placed in the ith category must be the same.

### Usage

```
hamE(x, y)
```

### Arguments

| | |
|---|---|
| x, y | integer vectors |

### Value

Returns the Hamming distance between the two rankings.

### Author(s)

Lucy Small, <lucy.small@ucdconnect.ie>

### Examples

```
a = c(3,1,2,2,3)
b = c(1,2,2,3,3)
hamE(a,b)
```

---

hamG *Hamming Distance for any Number of Ties*

---

### Description

Computes Hamming distance between two rankings, where any number of items with equal rankings are now permitted in each ranking.

### Usage

```
hamG(x, y)
```

### Arguments

| | |
|---|---|
| x, y | integer vectors |

### Value

Returns Hamming distance between the two rankings.

### Author(s)

Lucy Small, <lucy.small@ucdconnect.ie>

### Examples

```
a = c(3,1,2,2,3)
b = c(1,2,3,4,4)
hamG(a,b)
```

## hamP *Hamming Distance for Partial rankings*

### Description

Computes the Hamming distance between two partial rankings.

### Usage

```
hamP(a, b, k)
```

### Arguments

| | |
|---|---|
| a, b | integer vectors |
| k | integer |

### Value

Returns the Hamming distance between the two partial rankings, where only the first k items have been ranked. No ties are permitted.

### Author(s)

Lucy Small, <lucy.small@ucdconnect.ie>

### Examples

```
a = c(3,1,2,5,4)
b = c(1,2,3,4,5)
k=3
hamP(a,b,k)
```

## inv *Inverse Permutation*

### Description

Computes the inverse of a permutation.

### Usage

```
inv(x)
```

### Arguments

| | |
|---|---|
| x | an integer vector |

### Value

Returns the inverse permutation of a vector.

### Author(s)

Lucy Small, <lucy.small@ucdconnect.ie>

### Examples

```
a = c(3,1,2,5,4)
inv(a)
```

---

## kend *Kendall's Tau*

---

### Description

Computes Kendall's tau between two full rankings.

### Usage

```
kend(a, b)
```

### Arguments

| | |
|---|---|
| a, b | integer vectors |

### Value

Returns Kendall's tau between two full rankings.

### Author(s)

Lucy Small, <lucy.small@ucdconnect.ie>

### Examples

```
a = c(3,1,2,5,4)
b = c(1,2,3,4,5)
kend(a,b)
```

---

## kendE *Kendall's Tau for Tankings with Ties*

---

### Description

Computes Kendall's tau between two rankings, where items with equal ranking are now permitted. The number of items placed in the ith category must be the same.

### Usage

```
kendE(x, y)
```

### Arguments

| | |
|---|---|
| x, y | integer vectors |

### Value

Returns Kendall's tau between the two rankings.

### Author(s)

Lucy Small, <lucy.small@ucdconnect.ie>

### Examples

```
a = c(3,1,2,2,3)
b = c(1,2,2,3,3)
kendE(a,b)
```

---

## kendG *Kendall's Tau for any Number of Ties*

---

### Description

Computes Kendall's tau between two rankings, where any number of items with equal ranking are now permitted in each ranking.

### Usage

```
kendG(x, y)
```

### Arguments

| | |
|---|---|
| x, y | integer vectors |

### Value

Returns Kendall's tau between the two rankings.

### Author(s)

Lucy Small, <lucy.small@ucdconnect.ie>

### Examples

```
a = c(3,1,2,2,3)
b = c(1,2,3,4,4)
kendG(a,b)
```

## kendP — *Kendall's Distance for Partial rankings*

### Description

Computes Kendall's distance between two partial rankings.

### Usage

```
kendP(a, b, k)
```

### Arguments

| | |
|---|---|
| a, b | integer vectors |
| k | integer |

### Value

Returns Kendall's distance between two rankings x and y, where we care about the first k ranked items only

### Author(s)

Lucy Small, <lucy.small@ucdconnect.ie>

### Examples

```
a = c(3,1,2,5,4)
b = c(1,2,3,4,5)
k=3
kendP(a,b,k)
```

## labour — *Voting data from the 2010 UK Labour leadership election.*

### Description

There are 5 candidates and 266 rankings, some of which are partial rankings. The candidates are Diane Abbott, Ed Balls, Andy Burnham, David Miliband and Ed Miliband. Each voter ranks at least one candidate.

### Usage

```
data(labour)
```

### Format

A data frame with 234 rows and 11 variables

## Source

https://docs.google.com/spreadsheets/d/1e-gx4Km2ywG85kJCf_byJdMZvdP4QkPHGjPKy_meO30/edit?hl=en&hl=en#gid=0

## References

https://web.archive.org/web/20110101171158/http://www2.labour.org.uk/leadership-mps-and-meps

---

# spear *Spearman's Rho*

---

## Description

Computes Spearman's rho between two full rankings.

## Usage

```
spear(a, b)
```

## Arguments

| | |
|---|---|
| a, b | integer vectors |

## Value

Returns Spearman's rho between the two rankings.

## Author(s)

Lucy Small, <lucy.small@ucdconnect.ie>

## Examples

```
a = c(3,1,2,5,4)
b = c(1,2,3,4,5)
spear(a,b)
```

---

# spearE *Spearman's Rho for rankings with Ties*

---

## Description

Computes Spearman's rho between two rankings, where items with equal ranking are now permitted. The number of items placed in the ith category must be the same.

## Usage

```
spearE(x, y)
```

### Arguments

| | |
|---|---|
| x, y | integer vectors |

### Value

Returns Spearman's rho between the two rankings.

### Author(s)

Lucy Small, <lucy.small@ucdconnect.ie>

### Examples

```
a = c(3,1,2,2,3)
b = c(1,2,2,3,3)
spearE(a,b)
```

---

## spearfoot *Spearman's Footrule*

---

### Description

Computes Spearman's Footrule between two full rankings.

### Usage

```
spearfoot(a, b)
```

### Arguments

| | |
|---|---|
| a, b | integer vectors |

### Value

Returns Spearman's footrule between the two rankings.

### Author(s)

Lucy Small, <lucy.small@ucdconnect.ie>

### Examples

```
a = c(3,1,2,5,4)
b = c(1,2,3,4,5)
spearfoot(a,b)
```

## spearfootE *Spearman's Footrule with Ties*

### Description

Computes Spearman's footrule between two rankings, where items with equal ranking are now permitted. The number of items placed in the ith category must be the same.

### Usage

```
spearfootE(x, y)
```

### Arguments

| | |
|---|---|
| x, y | integer vectors |

### Value

Returns Spearman's footrule between the two rankings.

### Author(s)

Lucy Small, <lucy.small@ucdconnect.ie>

### Examples

```
a = c(3,1,2,2,3)
b = c(1,2,2,3,3)
spearfootE(a,b)
```

## spearfootG *Spearman's Footrule for any Number of Ties*

### Description

Computes Spearman's footrule between two rankings, where any number of items with equal rankings are now permitted in each ranking.

### Usage

```
spearfootG(x, y)
```

### Arguments

| | |
|---|---|
| x, y | integer vectors |

### Value

Returns Spearman's footrule between the two rankings.

### Author(s)

Lucy Small, <lucy.small@ucdconnect.ie>

### Examples

```
a = c(3,1,2,2,3)
b = c(1,2,3,4,4)
spearfootG(a,b)
```

---

## spearfootP *Spearman's Footrule for Partial rankings*

---

### Description

Computes Spearman's footrule between two partial rankings.

### Usage

```
spearfootP(a, b, k)
```

### Arguments

| | |
|---|---|
| a, b | integer vectors |
| k | integer |

### Value

Returns Spearman's footrule between two partial rankings, where only the first k items have been ranked. No ties are permitted.

### Author(s)

Lucy Small, <lucy.small@ucdconnect.ie>

### Examples

```
a = c(3,1,2,5,4)
b = c(1,2,3,4,5)
k=3
spearfootP(a,b,k)
```

## spearG *Spearman's Rho for any Number of Ties*

### Description

Computes Spearman's rho between two rankings x and y, where any number of items with equal rankings are now permitted in each ranking. The number of items ranked r for the two rankings can vary.

### Usage

```
spearG(x, y)
```

### Arguments

| | |
|---|---|
| x, y | integer vectors |

### Value

Returns Spearman's rho between two rankings x and y

### Author(s)

Lucy Small, <lucy.small@ucdconnect.ie>

### Examples

```
a = c(3,1,2,2,3)
b = c(1,2,3,4,4)
spearG(a,b)
```

## spearP *Spearman's Rho for Partial rankings*

### Description

Computes Spearman's rho between two partial rankings.

### Usage

```
spearP(a, b, k)
```

### Arguments

| | |
|---|---|
| a, b | integer vectors |
| k | integer |

### Value

Returns Spearman's rho between two rankings x and y, where we care about the first k ranked items only

### Author(s)

Lucy Small, <lucy.small@ucdconnect.ie>

### Examples

```
a = c(3,1,2,5,4)
b = c(1,2,3,4,5)
k=3
spearP(a,b,k)
```

---

## ulam *Ulam's Distance*

---

### Description

Computes Ulam's distance between two full rankings.

### Usage

```
ulam(a, b)
```

### Arguments

| | |
|---|---|
| a, b | integer vectors |

### Value

Returns Ulam's distance between the two rankings.

### Author(s)

Lucy Small, <lucy.small@ucdconnect.ie>

### Examples

```
a = c(3,1,2,5,4)
b = c(1,2,3,4,5)
ulam(a,b)
```

## ulamE *Ulam's distance with Ties*

### Description

Computes Ulam's distance between two rankings, where items with equal ranking are now permitted. The number of items placed in the ith category must be the same.

### Usage

```
ulamE(x, y)
```

### Arguments

| | |
|---|---|
| x, y | integer vectors |

### Value

Returns Ulam's distance between the two rankings.

### Author(s)

Lucy Small, <lucy.small@ucdconnect.ie>

### Examples

```
a = c(3,1,2,2,3)
b = c(1,2,2,3,3)
ulamE(a,b)
```

## ulamG *Ulam's distance for any Number of Ties*

### Description

Computes Ulam's distance between two rankings, where any number of items with equal rankings are now permitted in each ranking.

### Usage

```
ulamG(x, y)
```

### Arguments

| | |
|---|---|
| x, y | integer vectors |

### Value

Returns Ulam's distance between the two rankings.

### Author(s)

Lucy Small, <lucy.small@ucdconnect.ie>

### Examples

```
a = c(3,1,2,2,3)
b = c(1,2,3,4,4)
ulamG(a,b)
```

---

## ulamP *Ulam's Distance for Partial rankings*

---

### Description

Computes Ulam's distance between two partial rankings.

### Usage

```
ulamP(a, b, k)
```

### Arguments

| | |
|---|---|
| a, b | integer vectors |
| k | integer |

### Value

Returns Ulam's distance between two partial rankings, where only the first k items have been ranked. No ties are permitted.

### Author(s)

Lucy Small, <lucy.small@ucdconnect.ie>

### Examples

```
a = c(3,1,2,5,4)
b = c(1,2,3,4,5)
k=3
ulamP(a,b,k)
```

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