

Package ‘shuffleCI’

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Type Package

Title Confidence Intervals Compared via Shuffling

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Depends R (>= 3.4.0),plotrix

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Description Scripts and exercises that use card shuffling to teach confidence interval comparisons for different estimators.

License GPL-3

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ktau*Kendall's tau*

Description

Calculates Kendall's tau distance

Usage

```
ktau(list)
```

Arguments

list A list of numbers

Details

Returns the Kendall's tau distance between the input list and the sorted list 1,2,...n.

Value

The Kendall's tau distance.

Author(s)

Kyle Caudle

References

Kendall, M. G. (1938). A new measure of rank correlation. *Biometrika*, 30(1/2), 81-93.

Examples

```
ktau(c(1,4,2,5,6,3,7))
```

rseq*Rising Sequences*

Description

Determines the number of rising sequences in a list of numbers.

Usage

```
rseq(x)
```

Arguments

x List of numbers

Details

A rising sequence is maximal consecutively increasing subsequence.

Ex: 1,4,2,5,6,3,7 There are 3 rising sequences in this list.

(1,4,5,6,7),(2,3)

Value

nrise - the number of rising sequences.

Author(s)

Kyle Caudle

References

Mann, B. (1995). How many times should you shuffle a deck of cards. Topics in Contemporary Probability and Its Applications, 15, 1-33.

Williams, C. O. (1912). A card reading. The Magician Monthly, 8, 67.

Examples

```
rseq(c(1,4,2,5,6,3,7))
```

shuffle

Riffle Shuffle

Description

This function simulates a standard riffle shuffle of a deck of 52 playing cards.

Usage

```
shuffle(deck)
```

Arguments

deck A list of numbers. 1:52 would simulate a deck of cards in sequential order.

Details

The algorithm is based on the Gilbert-Shannon-Reeds method.

Value

Returns a shuffled list (i.e. deck)

Author(s)

Kyle Caudle

References

Gilbert, E. (1955). Theory of shuffling. Technical memorandum, Bell Laboratories.

Examples

```
shuffle(1:52)
```

sigtest

Significance Testing

Description

This function uses Kendall's tau and Rising sequences to determine how many times to shuffle a an ordinary deck of 52 playing cards.

Usage

```
sigtest(nreps)
```

Arguments

nreps Number of experiment repetitions (should be at least 30/Central Limit Theorem)

Details

According to the Bayer & Diaconis paper, after 7 shuffles there is no benefit to shuffling any more. This simulation shows that using Kendall's tau to show this doesn't work because the variance of the Kendall's distance is too large. However, if one looks at rising sequences, the variability is smaller therefore it is possible to show the Bayer & Diaconis result.

Value

Plots confidence intervals for each method. The print method returns the p-values from two sample t-test for the sequential interval comparisons (i.e. intervals: 3-4,4-5,5-6,6-7,7-8,8-9 and 9-10).

Author(s)

Kyle Caudle

References

Bayer, D., & Diaconis, P. (1992). Trailing the dovetail shuffle to its lair. *The Annals of Applied Probability*, 294-313.

Examples

```
sigtest(15)
```

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