Ranking Score

——Kendall's tau

Kendall's tau

The Kendall τ coefficient is defined as:

$$\tau = \frac{(\text{number of concordant pairs}) - (\text{number of discordant pairs})}{\frac{1}{2}n(n-1)}.$$

- If the agreement between the two rankings is perfect (i.e., the two rankings are the same) the coefficient has value 1.
- If the disagreement between the two rankings is perfect (i.e., one ranking is the reverse of the other) the coefficient has value −1.
- If *X* and *Y* are independent, then we would expect the coefficient to be approximately zero.

Example #1

```
> x <- c(1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16,17,18,19,20)
> y <- x
> y
 [1]  1  2  3  4  5  6  7  8  9 10 11 12 13 14 15 16 17 18 19 20
> cor.test(i,y,method="kendall")

	Kendall's rank correlation tau

data:  i and y
T = 190, p-value < 2.2e-16
alternative hypothesis: true tau is not equal to 0
sample estimates:
tau
  1
```

Example #2

```
> x <- c(1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16,17,18,19,20)
> y <- sort(x, decreasing=TRUE)
> y
 [1] 20 19 18 17 16 15 14 13 12 11 10  9  8  7  6  5  4  3  2  1
> cor.test(i,y,method="kendall")

	Kendall's rank correlation tau

data:  i and y
T = 0, p-value < 2.2e-16
alternative hypothesis: true tau is not equal to 0
sample estimates:
tau 
 -1 
```

Example #3

```
> x <- c(1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16,17,18,19,20)
> y <- sample(20)   # y is random
> y
 [1] 17 20  8 19 18 11  3  2 10 16  9 14 15  6  7  1  5  4 12 13
> cor(x,y,method="kendall")
[1] -0.3263158
> cor.test(i,y,method="kendall")

        Kendall's rank correlation tau

data:  i and y
T = 64, p-value = 0.04677
alternative hypothesis: true tau is not equal to 0
sample estimates:
       tau
-0.3263158
```