Measuring and testing dependences by correlation of distance

https://projecteuclid.org/download/pdfview_1/euclid.aos/1201012979

▼ What did the authors try to accomplish?

- Introduce Distance correlation as a new measure of dependence between random vectors

▼ What were the key elements of the approach?

- Distance Correlation

$$D_{Cor} = \sqrt{\frac{V_n^2(X,Y)}{V_n^2(X)V_n^2(Y)}}$$

With Distance Covariance

$$V_n^2(X,Y) = \frac{1}{n^2}\sum_{k,l=1}^{n} A_{k,l}B_{k,l}$$

$$V_n^2(X) = V_n^2(X,X)$$

And

$$A_{k,l} = a_{k,l} - \bar{a}_{k\cdot} - \bar{a}_{\cdot l} + \bar{a}_{\cdot\cdot}$$

$$a_{k.l} = |X_k - X_l|_p$$

$$\bar{a}_{k\cdot} = \frac{1}{n}\sum_{l=1}^{n} a_{k,l}$$

$$\bar{a}_{\cdot l} = \frac{1}{n}\sum_{k=1}^{n} a_{k,l}$$

$$\bar{a}_{..} = \frac{1}{n^2} \sum_{k,l=1}^{n} a_{k,l}$$

B is defined analogously for Y

- in [0, 1] with 0 = completely independent
- sensitive to all types of departures from independence, including nonlinear or nonmonotone dependence structure.

▼ What can you use yourself?

- Distance Correlation
- Implementation: https://gist.github.com/satra/aa3d19a12b74e9ab7941

▼ What other references do you want to follow?

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