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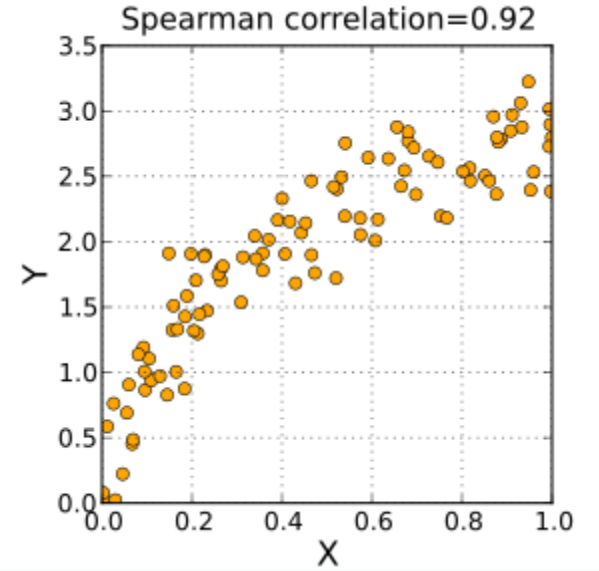
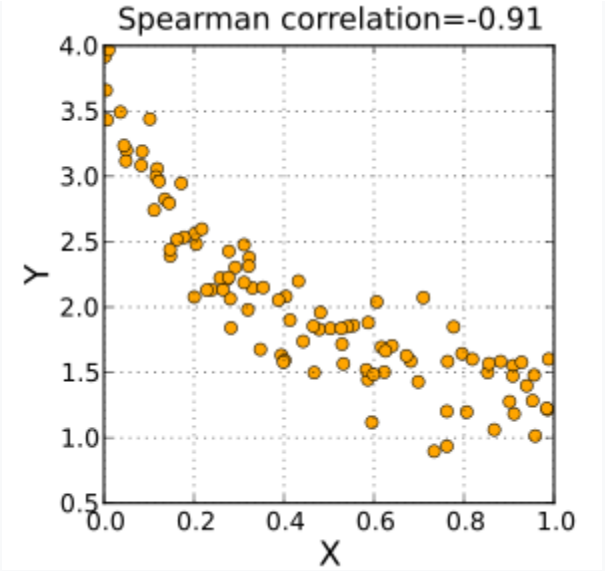
Spearman's rank correlation coefficient

Interpretation

Positive and negative Spearman rank correlations



A positive Spearman correlation coefficient corresponds to an increasing monotonic trend between *X* and *Y*.



A negative Spearman correlation coefficient corresponds to a decreasing monotonic trend between *X* and *Y*.

The sign of the Spearman correlation indicates the direction of association between *X* (the independent variable) and *Y* (the dependent variable). If *Y* tends to increase when *X* increases, the Spearman

correlation coefficient is positive. If Y tends to decrease when X increases, the Spearman correlation coefficient is negative. A Spearman correlation of zero indicates that there is no tendency for Y to either increase or decrease when X increases. The Spearman correlation increases in magnitude as X and Y become closer to being perfectly monotone functions of each other. When X and Y are perfectly monotonically related, the Spearman correlation coefficient becomes 1. A perfectly monotone increasing relationship implies that for any two pairs of data values X_i, Y_i and X_j, Y_j, that $X_i - X_j$ and $Y_i - Y_j$ always have the same sign. A perfectly monotone decreasing relationship implies that these differences always have opposite signs.

The Spearman correlation coefficient is often described as being "nonparametric". This can have two meanings. First, a perfect Spearman correlation results when X and Y are related by any monotonic function. Contrast this with the Pearson correlation, which only gives a perfect value when X and Y are related by a *linear* function. The other sense in which the Spearman correlation is nonparametric is that its exact sampling distribution can be obtained without requiring knowledge (i.e., knowing the

parameters) of the joint probability distribution of X and Y.