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## CHAPTER 5

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# Correlation and linear regression

## 5.1 Correlation

Let  $(x_1, y_1), (x_2, y_2), \dots, (x_n, y_n)$  represent  $n$  points on a scatterplot. Then the **correlation coefficient**, denoted by  $r$ , is the average of the products of the  $z$ -scores, except that we divide by  $n - 1$  instead of  $n$ . That is

$$r = \frac{1}{n - 1} \sum_{i=1}^n \left( \frac{x_i - \bar{x}}{s_x} \right) \left( \frac{y_i - \bar{y}}{s_y} \right) \quad (5.1)$$

where  $s_x$  and  $s_y$  are the standard deviation for  $x$  and  $y$  respectively.

Equivalently, the correlation coefficient can be given as

$$r = \frac{\sum_{i=1}^n (x_i - \bar{x})(y_i - \bar{y})}{\sqrt{\sum_{i=1}^n (x_i - \bar{x})^2} \sqrt{\sum_{i=1}^n (y_i - \bar{y})^2}}$$

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**Huangqi Zhang**



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*Revue Roumaine de Physique*, 1988 [Order and Fluctuations in Equilibrium and Nonequilibrium Statistical Mechanics](#)

G. Nicolis, G. Dewel, J. W. Turner, 1981-02-16 Coverage of the XVIIth Solvay Conference on Physics held at the Universit Libre in Brussels from November 20 to November 24 1978 Provides an account of the different areas of physics where transition to ordered behavior occurs and reveals the similarities and differences of involved concepts and techniques **American Journal of Physics**, 1978 **Neutrons, X-rays and Light: Scattering Methods Applied to Soft Condensed Matter** P. Lindner, Th. Zemb, 2002-10-30 Scattering experiments using X ray light and neutron sources in historical order are key techniques for studying structure and dynamics in systems containing colliods polymers surfactants and biological macromolecules summarized here as soft condensed matter The education in this field in Europe is very heterogeneous and frequently inadequate which severely limits an efficient use of these methods especially at large scale facilities The series of Bombannes schools and the completely revised and updated second edition of the lecture notes are devoted to a practical approach to current methodology of static and dynamic techiques Basic information on data interpretation on the complementarity of the different types of radiation as well as information on recent applications and developments is presented The aim is to avoid over as well as under exploitation of data **Applications of Mathematics in Modern Optics** William H. Carter, 1982 **Principles of Optics** Max Born, Emil Wolf, 1970 **Inverse Source Problems in Optics** H.P. Baltes, 1978-11 With contributions by numerous experts *Reviews in Global Analysis, 1980-86 as Printed in Mathematical Reviews*, 1988 International Urology and Nephrology, 1983 **Third International Symposium on Precision Mechanical Measurements**, 2006

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