

Appendix C:

Important Mathematical Definitions

Convolution. The convolution $f(x, y) = g(x, y) * h(x, y)$ of two 2-dimensional functions $g(x, y)$ and $h(x, y)$ is defined as:

$$f(x, y) = \int_{-\infty}^{\infty} \int_{-\infty}^{\infty} g(u, v) h(x - u, y - v) du dv$$

Correlation. The cross-correlation function $c(x, y) = g(x, y) \star h(x, y)$ of two 2-dimensional functions $g(x, y)$ and $h(x, y)$ is defined as:

DOI: 10.4018/978-1-61520-785-5.ch014

$$c(x, y) = \int_{-\infty}^{\infty} \int_{-\infty}^{\infty} g^*(u, v) h(x + u, y + v) du dv$$

Corresponding relations. Relation of correlation $c(x, y)$ and convolution $*$:

$$c(x, y) = g^*(x, y) * h(-x, -y).$$

If F denotes Fourier transform, and G and H denote Fourier-transformations of g and h , then:

$$\int_{-\infty}^{\infty} \int_{-\infty}^{\infty} |g(x, y)|^2 dx dy = \int_{-\infty}^{\infty} \int_{-\infty}^{\infty} |G(k_x, k_y)|^2 dk_x dk_y \quad (\text{Plancherel or Rayleigh theorem}),$$

$$F[g(x, y) \star g(x, y)] = |G(k_x, k_y)|^2 \quad (\text{Wiener-Khinchin theorem}),$$

$$F[g(x, y) * h(x, y)] = G(k_x, k_y) H(k_x, k_y) \quad (\text{See also MacLennan, 1990.})$$

0 more pages are available in the full version of this document, which may be purchased using the "Add to Cart" button on the publisher's webpage: www.igi-global.com/chapter/appendix-important-mathematical-definitions/50513

Related Content

An Overview of Biological Data Mining

Seetharaman Balaji (2017). *Library and Information Services for Bioinformatics Education and Research* (pp. 130-154).

www.irma-international.org/chapter/an-overview-of-biological-data-mining/176140

A Preliminary Study of the Practices and Processes of B2B E-Commerce Evaluation and Benefits Realization in Taiwanese Hospitals

Chad Lin, Hao-Chiang Koong Lin, Yu-An Huang, Geoffrey Jalleh, Sheng-Hsiang Hung, Min-Chai Hsieh and Cheng-Hung Wang (2012). *Pharmacoinformatics and Drug Discovery Technologies: Theories and Applications* (pp. 110-128).

www.irma-international.org/chapter/preliminary-study-practices-processes-b2b/64069

Application of Bioinformatics Techniques to Screen and Characterize the Plant-Based Anti-Cancer Compounds

Raghunath Satpathy (2024). *Research Anthology on Bioinformatics, Genomics, and Computational Biology* (pp. 206-224).

www.irma-international.org/chapter/application-bioinformatics-techniques-screen-characterize/342528

A Novel Radial Basis Function Networks Locally Tuned with Differential Evolution for Classification: An Application in Medical Science

Ch. Sanjeev Kumar Dash, Ajit Kumar Behera, Satchidananda Dehuri and Sung-Bae Cho (2013). *International Journal of Systems Biology and Biomedical Technologies* (pp. 33-57).

www.irma-international.org/article/a-novel-radial-basis-function-networks-locally-tuned-with-differential-evolution-for-classification/89399

Heuristic Principal Component Analysis-Based Unsupervised Feature Extraction and Its Application to Bioinformatics

Y-H. Taguchi, Mitsuo Iwadate, Hideaki Umeyama, Yoshiki Murakami and Akira Okamoto (2015). *Big Data Analytics in Bioinformatics and Healthcare* (pp. 138-162).

www.irma-international.org/chapter/heuristic-principal-component-analysis-based-unsupervised-feature-extraction-and-its-application-to-bioinformatics/121456