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Collana	Adaptive and learning systems for signal processing, communications, and control
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Nota di contenuto	Contents; Preface; 1 Introduction; 1.1 Linear representation of multivariate data; 1.1.1 The general statistical setting; 1.1.2 Dimension reduction methods; 1.1.3 Independence as a guiding principle; 1.2 Blind source separation; 1.2.1 Observing mixtures of unknown signals; 1.2.2 Source separation based on independence; 1.3 Independent component analysis; 1.3.1 Definition; 1.3.2 Applications; 1.3.3 How to find the independent components; 1.4 History of ICA; Part I: MATHEMATICAL PRELIMINARIES; 2 Random Vectors and Independence; 2.1 Probability distributions and densities 2.2 Expectations and moments 2.3 Uncorrelatedness and independence; 2.4 Conditional densities and Bayes' rule; 2.5 The multivariate gaussian density; 2.6 Density of a transformation; 2.7 Higher-order statistics; 2.8 Stochastic processes *; 2.9 Concluding remarks and references; Problems; 3 Gradients and Optimization Methods; 3.1 Vector and matrix gradients; 3.2 Learning rules for unconstrained optimization; 3.3 Learning rules for constrained optimization; 3.4 Concluding

remarks and references; Problems; 4 Estimation Theory; 4.1 Basic concepts; 4.2 Properties of estimators
4.3 Method of moments; 4.4 Least-squares estimation; 4.5 Maximum likelihood method; 4.6 Bayesian estimation *; 4.7 Concluding remarks and references; Problems; 5 Information Theory; 5.1 Entropy; 5.2 Mutual information; 5.3 Maximum entropy; 5.4 Negentropy; 5.5 Approximation of entropy by cumulants; 5.6 Approximation of entropy by nonpolynomial functions; 5.7 Concluding remarks and references; Problems; Appendix proofs; 6 Principal Component Analysis and Whitening; 6.1 Principal components; 6.2 PCA by on-line learning; 6.3 Factor analysis; 6.4 Whitening; 6.5 Orthogonalization
6.6 Concluding remarks and references; Problems; Part II: BASIC INDEPENDENT COMPONENT ANALYSIS; 7 What is Independent Component Analysis?; 7.1 Motivation; 7.2 Definition of independent component analysis; 7.3 Illustration of ICA; 7.4 ICA is stronger than whitening; 7.5 Why gaussian variables are forbidden; 7.6 Concluding remarks and references; Problems; 8 ICA by Maximization of Nongaussianity; 8.1 "Nongaussian is independent"; 8.2 Measuring nongaussianity by kurtosis; 8.3 Measuring nongaussianity by negentropy; 8.4 Estimating several independent components; 8.5 ICA and projection pursuit
8.6 Concluding remarks and references; Problems; Appendix proofs; 9 ICA by Maximum Likelihood Estimation; 9.1 The likelihood of the ICA model; 9.2 Algorithms for maximum likelihood estimation; 9.3 The infomax principle; 9.4 Examples; 9.5 Concluding remarks and references; Problems; Appendix proofs; 10 ICA by Minimization of Mutual Information; 10.1 Defining ICA by mutual information; 10.2 Mutual information and nongaussianity; 10.3 Mutual information and likelihood; 10.4 Algorithms for minimization of mutual information; 10.5 Examples; 10.6 Concluding remarks and references; Problems
11 ICA by Tensorial Methods

Sommario/riassunto

A comprehensive introduction to ICA for students and practitioners
Independent Component Analysis (ICA) is one of the most exciting new topics in fields such as neural networks, advanced statistics, and signal processing. This is the first book to provide a comprehensive introduction to this new technique complete with the fundamental mathematical background needed to understand and utilize it. It offers a general overview of the basics of ICA, important solutions and algorithms, and in-depth coverage of new applications in image processing, telecommunications, audio signal processing, and
