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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 moments4.4 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 referencesProblems; 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 that 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 referencesProblems; 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 practitionersIndependent 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