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Titolo	Coherence : In Signal Processing and Machine Learning / / by David Ramírez, Ignacio Santamaría, Louis Scharf
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ISBN	3-031-13331-5
Edizione	[1st ed. 2022.]
Descrizione fisica	1 online resource (495 pages)
Disciplina	006.31 621.3822
Soggetti	Signal processing Computer science - Mathematics Mathematical statistics Machine learning Signal, Speech and Image Processing Probability and Statistics in Computer Science Machine Learning Processament de senyals Aprenentatge automàtic Llibres electrònics
Lingua di pubblicazione	Inglese
Formato	Materiale a stampa
Livello bibliografico	Monografia
Nota di bibliografia	Includes bibliographical references (pages 467-482) and index.
Nota di contenuto	Introduction -- Historical perspective, motivating problems, and preview of what is to come -- Least Squares and related -- Classical correlations and coherence -- Coherence in the multivariate normal (MVN) model -- Classical tests for correlation -- One-channel matched subspace detectors -- Adaptive subspace detectors -- Two channel matched subspace detectors -- Detection of spatially-correlated time series -- Coherence and the detection of cyclostationarity -- Partial coherence for testing causality -- Subspace averaging -- Coherence and performance bounds -- Variations on coherence -- Conclusion.
Sommario/riassunto	This book organizes principles and methods of signal processing and machine learning into the framework of coherence. The book contains

a wealth of classical and modern methods of inference, some reported here for the first time. General results are applied to problems in communications, cognitive radio, passive and active radar and sonar, multi-sensor array processing, spectrum analysis, hyperspectral imaging, subspace clustering, and related. The reader will find new results for model fitting; for dimension reduction in models and ambient spaces; for detection, estimation, and space-time series analysis; for subspace averaging; and for uncertainty quantification. Throughout, the transformation invariances of statistics are clarified, geometries are illuminated, and null distributions are given where tractable. Stochastic representations are emphasized, as these are central to Monte Carlo simulations. The appendices contain a comprehensive account of matrix theory, the SVD, the multivariate normal distribution, and many of the important distributions for coherence statistics. The book begins with a review of classical results in the physical and engineering sciences where coherence plays a fundamental role. Then least squares theory and the theory of minimum mean-squared error estimation are developed, with special attention paid to statistics that may be interpreted as coherence statistics. A chapter on classical hypothesis tests for covariance structure introduces the next three chapters on matched and adaptive subspace detectors. These detectors are derived from likelihood reasoning, but it is their geometries and invariances that qualify them as coherence statistics. A chapter on independence testing in space-time data sets leads to a definition of broadband coherence, and contains novel applications to cognitive radio and the analysis of cyclostationarity. The chapter on subspace averaging reviews basic results and derives an order-fitting rule for determining the dimension of an average subspace. These results are used to enumerate sources of acoustic and electromagnetic radiation and to cluster subspaces into similarity classes. The chapter on performance bounds and uncertainty quantification emphasizes the geometry of the Cramèr-Rao bound and its related information geometry.