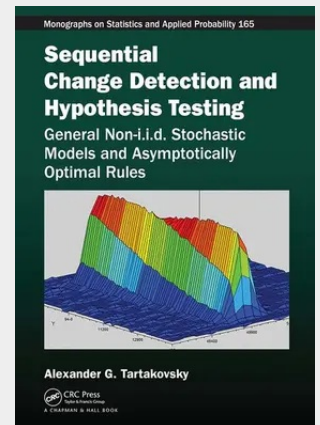


Sequential Change Detection and Hypothesis Testing

General Non-i.i.d. Stochastic Models and Asymptotically Optimal Rules

How can major corporations and governments more quickly and accurately detect and address cyberattacks on their networks? How can local authorities improve early detection and prevention of epidemics? How can researchers improve the identification and classification of space objects in difficult (e.g., dim) settings? These questions, among others in dozens of fields, can be addressed using statistical methods of sequential hypothesis testing and changepoint detection. This book considers sequential changepoint detection for very general non-i.i.d. stochastic models, that is, when the observed data is dependent and non-identically distributed. Previous work has primarily focused on changepoint detection with simple hypotheses and single-stream data. This book extends the asymptotic theory of change detection to the case of composite hypotheses as well as for multi-stream data when the number of affected streams is unknown. These extensions are more relevant for practical applications, including in modern, complex information systems and networks. These extensions are illustrated using Markov, hidden Markov, state-space, regression, and autoregression models, and several applications, including near-Earth space informatics and cybersecurity are discussed. This book is aimed at graduate students and researchers in statistics and applied probability who are familiar with complete convergence, Markov random walks, renewal and nonlinear renewal theories, Markov renewal theory, and uniform ergodicity of Markov processes. Key features: - Design and optimality properties of sequential hypothesis testing and change detection algorithms (in Bayesian, minimax, pointwise, and other settings) - Consideration of very general non-i.i.d. stochastic models that include Markov, hidden Markov, state-space linear and non-linear models, regression, and autoregression models - Multiple decision-making problems, including quickest change detection-identification - Real-world applications to object detection and tracking, near-Earth space informatics, computer network surveillance and security, and other topics



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