

1. Record Nr.	UNINA9910151657603321
Autore	Stark Henry <1938->
Titolo	Probability statistics and random processes for engineers // Henry Stark, John W. Woods
Pubbl/distr/stampa	Boston, [Massachusetts] : , : Pearson, , 2012 ©2012
ISBN	1-292-01399-0
Edizione	[Fourth edition.]
Descrizione fisica	1 online resource (857 pages)
Collana	Always Learning
Disciplina	621.382/2
Soggetti	Signal processing - Mathematics Probabilities Stochastic processes
Lingua di pubblicazione	Inglese
Formato	Materiale a stampa
Livello bibliografico	Monografia
Note generali	Bibliographic Level Mode of Issuance: Monograph
Nota di bibliografia	Includes bibliographical references at the end of each chapters and index.
Nota di contenuto	Cover -- Contents -- Preface -- 1 Introduction to Probability -- 1.1 Introduction: Why Study Probability? -- 1.2 The Different Kinds of Probability -- Probability as Intuition -- Probability as the Ratio of Favorable to Total Outcomes (Classical Theory) -- Probability as a Measure of Frequency of Occurrence -- Probability Based on an Axiomatic Theory -- 1.3 Misuses, Miscalculations, and Paradoxes in Probability -- 1.4 Sets, Fields, and Events -- Examples of Sample Spaces -- 1.5 Axiomatic Definition of Probability -- 1.6 Joint, Conditional, and Total Probabilities -- Independence -- Compound Experiments -- 1.7 Bayes' Theorem and Applications -- 1.8 Combinatorics -- Occupancy Problems -- Extensions and Applications -- 1.9 Bernoulli Trials-Binomial and Multinomial Probability Laws -- Multinomial Probability Law -- 1.10 Asymptotic Behavior of the Binomial Law: The Poisson Law -- 1.11 Normal Approximation to the Binomial Law -- Summary -- Problems -- References -- 2 Random Variables -- 2.1 Introduction -- 2.2 Definition of a Random Variable -- 2.3 Cumulative Distribution Function -- Properties of $F_{\text{sub}(X)}(x)$ -- Computation of $F_{\text{sub}(X)}(x)$ -- 2.4 Probability Density Function (pdf) -- Four Other Common Density Functions -- More Advanced Density Functions -- 2.5 Continuous, Discrete, and Mixed Random Variables --

Some Common Discrete Random Variables -- 2.6 Conditional and Joint Distributions and Densities -- Properties of Joint CDF $F_{XY}(x,y)$ -- 2.7 Failure Rates -- Summary -- Problems -- References -- Additional Reading -- 3 Functions of Random Variables -- 3.1 Introduction -- Functions of a Random Variable (FRV): Several Views -- 3.2 Solving Problems of the Type $Y = g(X)$ -- General Formula of Determining the pdf of $Y = g(X)$ -- 3.3 Solving Problems of the Type $Z = g(X, Y)$ -- 3.4 Solving Problems of the Type $V = g(X, Y)$, $W = h(X, Y)$. Fundamental Problem -- Obtaining f_{VW} Directly from f_{XY} -- 3.5 Additional Examples -- Summary -- Problems -- References -- Additional Reading -- 4 Expectation and Moments -- 4.1 Expected Value of a Random Variable -- On the Validity of Equation 4.1-8 -- 4.2 Conditional Expectations -- Conditional Expectation as a Random Variable -- 4.3 Moments of Random Variables -- Joint Moments -- Properties of Uncorrelated Random Variables -- Jointly Gaussian Random Variables -- 4.4 Chebyshev and Schwarz Inequalities -- Markov Inequality -- The Schwarz Inequality -- 4.5 Moment-Generating Functions -- 4.6 Chernoff Bound -- 4.7 Characteristic Functions -- Joint Characteristic Functions -- The Central Limit Theorem -- 4.8 Additional Examples -- Summary -- Problems -- References -- Additional Reading -- 5 Random Vectors -- 5.1 Joint Distribution and Densities -- 5.2 Multiple Transformation of Random Variables -- 5.3 Ordered Random Variables -- 5.4 Expectation Vectors and Covariance Matrices -- 5.5 Properties of Covariance Matrices -- Whitening Transformation -- 5.6 The Multidimensional Gaussian (Normal) Law -- 5.7 Characteristic Functions of Random Vectors -- Properties of CF of Random Vectors -- The Characteristic Function of the Gaussian (Normal) Law -- Summary -- Problems -- References -- Additional Reading -- 6 Statistics: Part 1 Parameter Estimation -- 6.1 Introduction -- Independent, Identically, Observations -- Estimation of Probabilities -- 6.2 Estimators -- 6.3 Estimation of the Mean -- Properties of the Mean-Estimator Function (MEF) -- Procedure for Getting a -confidence Interval on the Mean of a Normal Random Variable When X Is Known -- Confidence Interval for the Mean of a Normal Distribution When X Is Not Known. Procedure for Getting a -Confidence Interval Based on n Observations on the Mean of a Normal Random Variable when X Is Not Known -- Interpretation of the Confidence Interval -- 6.4 Estimation of the Variance and Covariance -- Confidence Interval for the Variance of a Normal Random variable -- Estimating the Standard Deviation Directly -- Estimating the covariance -- 6.5 Simultaneous Estimation of Mean and Variance -- 6.6 Estimation of Non-Gaussian Parameters from Large Samples -- 6.7 Maximum Likelihood Estimators -- 6.8 Ordering, more on Percentiles, Parametric Versus Nonparametric Statistics -- The Median of a Population Versus Its Mean -- Parametric versus Nonparametric Statistics -- Confidence Interval on the Percentile -- Confidence Interval for the Median When n Is Large -- 6.9 Estimation of Vector Means and Covariance Matrices -- Estimation of -- Estimation of the covariance K -- 6.10 Linear Estimation of Vector Parameters -- Summary -- Problems -- References -- Additional Reading -- 7 Statistics: Part 2 Hypothesis Testing -- 7.1 Bayesian Decision Theory -- 7.2 Likelihood Ratio Test -- 7.3 Composite Hypotheses -- Generalized Likelihood Ratio Test (GLRT) -- How Do We Test for the Equality of Means of Two Populations? -- Testing for the Equality of Variances for Normal Populations: The F-test -- Testing Whether the Variance of a Normal Population Has a Predetermined Value -- 7.4 Goodness of Fit -- 7.5 Ordering, Percentiles, and Rank -- How Ordering is Useful in Estimating Percentiles and the Median -- Confidence Interval for the

Median When n Is Large -- Distribution-free Hypothesis Testing:
 Testing If Two Population are the Same Using Runs -- Ranking Test for
 Sameness of Two Populations -- Summary -- Problems -- References
 -- 8 Random Sequences -- 8.1 Basic Concepts -- Infinite-length
 Bernoulli Trials -- Continuity of Probability Measure.
 Statistical Specification of a Random Sequence -- 8.2 Basic Principles of
 Discrete-Time Linear Systems -- 8.3 Random Sequences and Linear
 Systems -- 8.4 WSS Random Sequences -- Power Spectral Density --
 Interpretation of the psd -- Synthesis of Random Sequences and
 Discrete-Time Simulation -- Decimation -- Interpolation -- 8.5 Markov
 Random Sequences -- ARMA Models -- Markov Chains -- 8.6 Vector
 Random Sequences and State Equations -- 8.7 Convergence of Random
 Sequences -- 8.8 Laws of Large Numbers -- Summary -- Problems --
 References -- 9 Random Processes -- 9.1 Basic Definitions -- 9.2
 Some Important Random Processes -- Asynchronous Binary Signaling
 -- Poisson Counting Process -- Alternative Derivation of Poisson
 Process -- Random Telegraph Signal -- Digital Modulation Using
 Phase-Shift Keying -- Wiener Process or Brownian Motion -- Markov
 Random Processes -- Birth-Death Markov Chains -- Chapman-
 Kolmogorov Equations -- Random Process Generated from Random
 Sequences -- 9.3 Continuous-Time Linear Systems with Random Inputs
 -- White Noise -- 9.4 Some Useful Classifications of Random Processes
 -- Stationarity -- 9.5 Wide-Sense Stationary Processes and LSI Systems
 -- Wide-Sense Stationary Case -- Power Spectral Density -- An
 Interpretation of the psd -- More on White Noise -- Stationary
 Processes and Differential Equations -- 9.6 Periodic and
 Cyclostationary Processes -- 9.7 Vector Processes and State Equations
 -- State Equations -- Summary -- Problems -- References -- 10
 Advanced Topics in Random Processes -- 10.1 Mean-Square (m.s.)
 Calculus -- Stochastic Continuity and Derivatives [10-1] -- Further
 Results on m.s. Convergence [10-1] -- 10.2 Mean-Square Stochastic
 Integrals -- 10.3 Mean-Square Stochastic Differential Equations --
 10.4 Ergodicity [10-3] -- 10.5 Karhunen-Loeve Expansion [10-5] --
 10.6 Representation of Bandlimited and Periodic Processes.
 Bandlimited Processes -- Bandpass Random Processes -- WSS Periodic
 Processes -- Fourier Series for WSS Processes -- Summary --
 Appendix: Integral Equations -- Existence Theorem -- Problems --
 References -- 11 Applications to Statistical Signal Processing -- 11.1
 Estimation of Random Variables and Vectors -- More on the
 Conditional Mean -- Orthogonality and Linear Estimation -- Some
 Properties of the Operator E -- 11.2 Innovation Sequences and Kalman
 Filtering -- Predicting Gaussian Random Sequences -- Kalman
 Predictor and Filter -- Error-Covariance Equations -- 11.3 Wiener
 Filters for Random Sequences -- Unrealizable Case (Smoothing) --
 Causal Wiener Filter -- 11.4 Expectation-Maximization Algorithm --
 Log-likelihood for the Linear Transformation -- Summary of the E-M
 algorithm -- E-M Algorithm for Exponential Probability Functions --
 Application to Emission Tomography -- Log-likelihood Function of
 Complete Data -- E-step -- M-step -- 11.5 Hidden Markov Models
 (HMM) -- Specification of an HMM -- Application to Speech Processing
 -- Efficient Computation of $P[E|M]$ with a Recursive Algorithm -- Viterbi
 Algorithm and the Most Likely State Sequence for the Observations --
 11.6 Spectral Estimation -- The Periodogram -- Bartlett's Procedure-
 Averaging Periodograms -- Parametric Spectral Estimate -- Maximum
 Entropy Spectral Density -- 11.7 Simulated Annealing -- Gibbs Sampler
 -- Noncausal Gauss-Markov Models -- Compound Markov Models --
 Gibbs Line Sequence -- Summary -- Problems -- References --
 Appendix A: Review of Relevant Mathematics -- A.1 Basic Mathematics

-- Sequences -- Convergence -- Summations -- Z-Transform -- A.2 Continuous Mathematics -- Definite and Indefinite Integrals -- Differentiation of Integrals -- Integration by Parts -- Completing the Square -- Double Integration -- Functions -- A.3 Residue Method for Inverse Fourier Transformation.
Fact.

Sommario/riassunto

For courses in Probability and Random Processes. Probability, Statistics, and Random Processes for Engineers, 4e is a comprehensive treatment of probability and random processes that, more than any other available source, combines rigor with accessibility. Beginning with the fundamentals of probability theory and requiring only college-level calculus, the book develops all the tools needed to understand more advanced topics such as random sequences, continuous-time random processes, and statistical signal processing. The book progresses at a leisurely pace, never assuming more knowledge than contained in the material already covered. Rigor is established by developing all results from the basic axioms and carefully defining and discussing such advanced notions as stochastic convergence, stochastic integrals and resolution of stochastic processes.
