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Nota di contenuto	Cover; Title Page; Copyright; Contents; Preface; Acknowledgments; Chapter 1 Introduction; 1.1 Systems and their characteristics; 1.1.1 Classes of systems; 1.1.2 System states; 1.1.3 Change of state; 1.1.4 Thermodynamic entropy; 1.1.5 Evolutive connotation of entropy; 1.1.6 Statistical mechanical entropy; 1.2 Informational entropies; 1.2.1 Types of entropies; 1.2.2 Shannon entropy; 1.2.3 Information gain function; 1.2.4 Boltzmann, Gibbs and Shannon entropies; 1.2.5 Negentropy; 1.2.6 Exponential entropy; 1.2.7 Tsallis entropy; 1.2.8 Renyi entropy; 1.3 Entropy, information, and uncertainty 1.3.1 Information 1.3.2 Uncertainty and surprise; 1.4 Types of uncertainty; 1.5 Entropy and related concepts; 1.5.1 Information content of data; 1.5.2 Criteria for model selection; 1.5.3 Hypothesis testing; 1.5.4 Risk assessment; Questions; References; Additional References; Chapter 2 Entropy Theory; 2.1 Formulation of entropy; 2.2 Shannon entropy; 2.3 Connotations of information and entropy; 2.3.1 Amount of information; 2.3.2 Measure of information; 2.3.3 Source of

information; 2.3.4 Removal of uncertainty; 2.3.5 Equivocation; 2.3.6 Average amount of information; 2.3.7 Measurement system 2.3.8 Information and organization 2.4 Discrete entropy: univariate case and marginal entropy; 2.5 Discrete entropy: bivariate case; 2.5.1 Joint entropy; 2.5.2 Conditional entropy; 2.5.3 Transinformation; 2.6 Dimensionless entropies; 2.7 Bayes theorem; 2.8 Informational correlation coefficient; 2.9 Coefficient of nontransferred information; 2.10 Discrete entropy: multidimensional case; 2.11 Continuous entropy; 2.11.1 Univariate case; 2.11.2 Differential entropy of continuous variables; 2.11.3 Variable transformation and entropy; 2.11.4 Bivariate case; 2.11.5 Multivariate case 2.12 Stochastic processes and entropy 2.13 Effect of proportional class interval; 2.14 Effect of the form of probability distribution; 2.15 Data with zero values; 2.16 Effect of measurement units; 2.17 Effect of averaging data; 2.18 Effect of measurement error; 2.19 Entropy in frequency domain; 2.20 Principle of maximum entropy; 2.21 Concentration theorem; 2.22 Principle of minimum cross entropy; 2.23 Relation between entropy and error probability; 2.24 Various interpretations of entropy; 2.24.1 Measure of randomness or disorder; 2.24.2 Measure of unbiasedness or objectivity 2.24.3 Measure of equality 2.24.4 Measure of diversity; 2.24.5 Measure of lack of concentration; 2.24.6 Measure of flexibility; 2.24.7 Measure of complexity; 2.24.8 Measure of departure from uniform distribution; 2.24.9 Measure of interdependence; 2.24.10 Measure of dependence; 2.24.11 Measure of interactivity; 2.24.12 Measure of similarity; 2.24.13 Measure of redundancy; 2.24.14 Measure of organization; 2.25 Relation between entropy and variance; 2.26 Entropy power; 2.27 Relative frequency; 2.28 Application of entropy theory; Questions; References; Additional Reading Chapter 3 Principle of Maximum Entropy

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#### Sommario/riassunto

Entropy Theory and its Application in Environmental and Water Engineering responds to the need for a book that deals with basic concepts of entropy theory from a hydrologic and water engineering perspective and then for a book that deals with applications of these concepts to a range of water engineering problems. The range of applications of entropy is constantly expanding and new areas finding a use for the theory are continually emerging. The applications of concepts and techniques vary across different subject areas and this book aims to relate them directly to practical problems

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