Mathematical Foundations of Information Theory (Dover Books on Mathematics)

By A. Ya. Khinchin, Mathematics

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The first comprehensive introduction to information theory, this book places the work begun by Shannon and continued by McMillan, Feinstein, and Khinchin on a rigorous mathematical basis. For the first time, mathematicians, statisticians, physicists, cyberneticists, and communications engineers are offered a lucid, comprehensive introduction to this rapidly growing field.

In his first paper, Dr. Khinchin develops the concept of entropy in probability theory as a measure of uncertainty of a finite "scheme," and discusses a simple application to coding theory. The second paper investigates the restrictions previously placed on the study of sources, channels, and codes and attempts "to give a complete, detailed proof of both … Shannon theorems, assuming any ergodic source and any stationary channel with a finite memory."

Partial Contents: I. The Entropy Concept in Probability Theory — Entropy of Finite Schemes. The Uniqueness Theorem. Entropy of Markov chains. Application to Coding Theory. II. On the Fundamental Theorems of Information Theory — Two generalizations of Shannon's inequality. Three inequalities of Feinstein. Concept of a source. Stationarity. Entropy. Ergodic sources. The E property. The martingale concept. Noise. Anticipation and memory. Connection of the channel to the source. Feinstein's Fundamental Lemma. Coding. The first Shannon theorem. The second Shannon theorem.

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