

PROBABILITY AND INFORMATION THEORY

By M. Marsili

CONTENTS

Definition of probability, Kolmogorov axioms, random variables

Stochastic independence, conditional probability, Bayes theorem and inference

Classical probability: Urn models, balls and boxes, random walks

Generating functions: Integer random variables, branching process

Borel-Cantelli lemmas. Laws of large numbers. Limits in probability.

Information, Shannon theorem and the Asymptotic Equipartition Property.

Mutual and relative information. Distributions of maximal entropy.

Limit laws for sums of independent random variables. Applications. Limits of validity of the CLT.

Large deviations: thin tails and fat tails

Limit theorems for extremes: The Random Energy Model.

Examples of correlated variables: Phase transitions

Information theory, statistics and Bayesian inference

SUGGESTED BIBLIOGRAPHY

W. Feller, An Introduction to Probability Theory and its Applications (J.Wiley & Sons 1968).

Cover and Thomas, Elements of Information Theory (J. Wiley & Sons 2006).

E. T. Jaynes, Probability Theory: the logic of science, (Cambridge U. Press 2003).

M. Mezard, A. Montanari, Information, Physics and Computation (Oxford Univ. Press 2009).

C.W. Gardiner, Handbook of stochastic methods (Springer-Verlag, 1985).