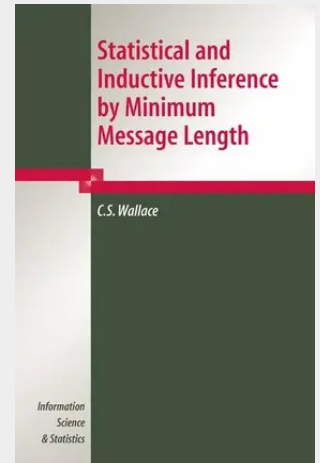


Statistical and Inductive Inference by Minimum Message Length

Since 1965, Prof. Wallace and others have been developing an approach to statistical estimation, hypothesis testing, model selection and their applications in the Artificial Intelligence field of Machine Learning. The approach is based on Information Theory, using concepts from classical Shannon theory and more recent work on Algorithmic Complexity. The new approach has come to be called the Minimum Message Length principle, since it is based on the idea of constructing a message which concisely encodes the available data. Although a range of journal and conference papers has been published on the principle and its application, and several computer programs applying it have been shown to perform well and have been fairly widely used, there is no text providing a thorough treatment of the principle or giving general guidance for its application.

My thanks are due to the many people who have assisted in the work reported here and in the preparation of this book. The work is incomplete and this account of it rougher than it might be. Such virtues as it has owe much to others; the faults are all mine. My work leading to this book began when David Boulton and I attempted to develop a method for intrinsic classification. Given data on a sample from some population, we aimed to discover whether the population should be considered to be a mixture of different types, classes or species of thing, and, if so, how many classes were present, what each class looked like, and which things in the sample belonged to which class. I saw the problem as one of Bayesian inference, but with prior probability densities replaced by discrete probabilities reflecting the precision to which the data would allow parameters to be estimated. Boulton, however, proposed that a classification of the sample was a way of briefly encoding the data: once each class was described and each thing assigned to a class, the data for a thing would be partially implied by the characteristics of its class, and hence require little further description. After some weeks, arguing our cases, we decided on the maths for each approach, and soon discovered they gave essentially the same results. Without Boulton's insight, we may never have made the connection between inference and brief encoding, which is the heart of this work.



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