The development of these ideas, particularly in the area of dynamical systems, has been extremely rapid, and, in the words of Andreas Weigend and Neil Gershenfeld, the literature is fragmented and anecdotal. In an effort to sort things out, Weigend and Gershenfeld ran a competition in which participants analyzed four data sets. Upon the completion of the competition, a NATO Advanced Research Workshop on Comparative Time Series Analysis was held at the Sante Fe Institute to discuss the results. The present volume is a report of that workshop.

The volume begins with an introduction by Gershenfeld and Weigend covering many aspects of nonlinear time series analysis, the theory of dynamical systems, neural nets, and their own theories about learning and understanding. Reading it is a bit like taking a three-day tour of eight countries: you only know where you are if you have been there before. The balance of the volume is divided into four sections. Section 1 describes the four data sets used in the competition: emissions of NH_3 lasers, a multivariate physiological time series, exchange rate variations, and brightness variations in a white dwarf star. After the competition, a mathematical representation of an unfinished Bach fugue was added, which, in my view, comes perilously close to failing the cuteness test.

The competition had two goals: prediction and characterization. Sections 3 and 4 report on successful entries under these two headings. For prediction, the reports can be grouped into three rough categories: geometric methods, statistical methods, and methods based on neural networks. The distinction between the latter two is illusory. A neural net is essentially nonlinear regression in a black box. For time series analysis, the black box should simulate the brain of a good statistician with an understanding of the process to be modeled. Some may come close. Many don't. But why accept substitutes? Characterization refers to dimension estimation, identifying chaotic dynamics (for example, by estimating the largest Lyapunov exponent), and detecting determinism and nonlinearity. The final section contains some miscellaneous papers, including two on the difficult problem of spatial chaos.

This book is interesting, entertaining, and more than occasionally instructive. I particularly liked Sauer's paper on geometric prediction and the cautionary paper by Theiler, Linsay, and Rubin on the spurious detection of nonlinearity in linear models with long-range dependence. None of the papers is bad. Now to complaints. First, the volume does not manage to sort out the aforementioned fragmented and anecdotal literature. Though this would have been a monumental undertaking, a little more progress might have been made. Part of the problem is the sheer enthusiasm of the contributors. Apart from Theiler *et al.* and Lewis, Ray, and Stevens, who rain ever so gently on the neural net parade, skepticism is not much in evidence. Second, to make the analyses convincing to a wide range of scientists it would have been useful to consider somewhat messier data. There is no shortage. Third, on the technical side, the attitude toward noise in much of this work is rather cavalier. Noise can enter through the process itself (for example, turning a first-order difference equation into a first-order autoregressive process). It can also be observational, so that the process itself is never actually observed. As innocuous as this distinction may seem, it can have important implications for data analysis and modeling. Whole books have been written on the subject. Most of the methods described in this book are based on implicit assumptions (some quite bizarre) about the way in which noise enters the system, and no attention is devoted to the consequences of the alternatives. Finally, I have to wonder whether this exercise is not a little premature. So many basic statistical issues are left unraised—the treatment of noise being just one—that a little more work with pencil and paper seems in order. Despite these reservations, this volume is well worth a look for those interested in modern time series analysis. It may not be the next Box and Jenkins, but it is certainly a step in the right direction.

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