

PREFACE

Since it first appeared in 1978, *Advanced Methods in Physiological Modeling: The White Noise Approach* by P. Z. Marmarelis and M. Z. Marmarelis has been the standard reference for the field of nonlinear system identification, especially as applied in biomedical engineering and physiology. Despite being long out of print, Marmarelis and Marmarelis is still, in many cases, the primary reference. Over the years, dramatic advances have been made in the field, many of which became practical only with the advent of widespread computing power. Many of these newer developments have been described in the three volumes of the series *Advanced Methods in Physiological Modeling*, edited by V. Z. Marmarelis. While these volumes have been an invaluable resource to many researchers, helping them to stay abreast of recent developments, they are all collections of research articles. As a resource for someone starting out in the field, they are somewhat lacking. It is difficult for a newcomer to the field to see the relationships between myriad contributions. Choosing which approach is best for a given application can be an arduous task, at best.

This textbook developed out of a review article (Westwick and Kearney, 1998) on the same subject. The goal of the review article was to bring the various analyses that have been developed by several groups of researchers into a common notation and framework, and thus to elucidate the relationships between them. The aim of this book was to go one step farther and to provide this common framework along with the background necessary to bring the next generation of systems physiologists into the fold.

In this book, we have attempted to provide the student with an overview of many of the techniques currently in use, and some of the earlier methods as well. Everything is presented in a common notation and from a consistent theoretical framework. We hope that the relationships between the methods and their relative strengths and weaknesses will become apparent to the reader. The reader should be well-equipped to make an informed decision as to which techniques to try, when faced with an identification or modeling problem.

