Artificial Intelligence Methods in the Environmental Sciences

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Editors

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Springer

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Preface

This book is the product of the efforts of a group of people affiliated with the Committee on Artificial Intelligence Applications to Environmental Science of the American Meteorological Society (AMS). This committee has sponsored four two-day short courses or workshops on the applications of Artificial Intelligence (AI) techniques in the environmental sciences and is currently planning its seventh conference. Although it began as a loose knit group of AI practitioners, it has evolved with the field to help guide the development of new methods and their applications in the environmental sciences. Several authors and editors have authored or coauthored full books of their own, some on the AI methods themselves and others related to specific environmental science topics.

The idea to band together to write a book grew during the planning phase for the third Short Course held in Atlanta, GA in January 2006 in conjunction with the Annual Meeting of the AMS. While preparing materials for a short course, we wondered why not also compile our lectures and demonstrations in book form? The idea began there, but continued to expand. We did not want to be merely an amalgamation of different topics, but rather to have a sensible organization and a common theme. The organization was suggested by the Springer reviewers who convinced us to divide the book into a teaching portion (Part I, which motivates and introduces the primary AI techniques) and a showing portion (Part II, which comprises example applications of the techniques). Developing the common theme required many email exchanges between the editors and a final real-life discussion between authors at the 2006 Short Course. Thus was born the "red thread" that weaves the book together. The red thread blends cultures in several senses. The American editors talked about weaving a thread through the book to tie it together while the Italian editor wrote about drawing a "red line" through the book to make the connections clear. So the "red thread" is a cultural blending of ideas in very much the same sense as AI is a blending of traditional techniques with the more recent ones for making sense of data. We wish to be careful to avoid too much of a contrast, since in some sense, AI is just a new terminology for codifying very old ways of making sense of data. Chapter 1 emphasizes this point by showing the development of traditional dynamics-based modeling for weather forecasting, then developing the basic data-based AI concepts. In a similar vein, Chapter 2 relates some traditional statistical models with more recent ideas developed in AI and machine learning circles.

Although our styles of presentation may differ, this book was edited to maintain a consistent "spirit." We have used the red thread to weave the fabric of the methods

into a tapestry that pictures the "natural" data-driven AI methods in the light of the more traditional modeling techniques.

The editors wish to thank the Springer editors; the American Meteorological Society, particularly the Scientific and Technological Activities Commission that sponsors the Committee and has supported our conferences, short courses, and workshops; and particularly, all the participants in our events who have helped us to continue to think of fresh ideas for applications.

Sue Ellen Haupt, Antonello Pasini, and Caren Marzban
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