Tanvir Islam · Prashant K. Srivastava
Manika Gupta · Xuan Zhu
Saumitra Mukherjee *Editors*

Computational Intelligence Techniques in Earth and Environmental Sciences

Springer

Computational Intelligence Techniques in Earth and Environmental Sciences

Tanvir Islam • Prashant K. Srivastava
Manika Gupta • Xuan Zhu
Saumitra Mukherjee
Editors

Computational Intelligence Techniques in Earth and Environmental Sciences

Springer

Editors
Tanvir Islam
NOAA/NESDIS Center for Satellite Applications and Research
College Park, MD, USA

Cooperative Institute for Research in the Atmosphere
Colorado State University
Fort Collins, CO, USA

Manika Gupta
Department of Civil Engineering
IIT Delhi
Delhi, India

Saumitra Mukherjee
School of Environmental Sciences
Remote Sensing
Jawaharlal Nehru University
New Delhi, India

Prashant K. Srivastava
NASA Goddard Space Flight Center
Greenbelt, MD, USA

ESSIC, University of Maryland
College Park, MD, USA

Xuan Zhu
School of Geography and Environmental Science
Monash University
Melbourne, Australia

ISBN 978-94-017-8641-6 ISBN 978-94-017-8642-3 (eBook)
DOI 10.1007/978-94-017-8642-3
Springer Dordrecht Heidelberg New York London

Library of Congress Control Number: 2014931489

© Springer Science+Business Media Dordrecht 2014
This work is subject to copyright. All rights are reserved by the Publisher, whether the whole or part of the material is concerned, specifically the rights of translation, reprinting, reuse of illustrations, recitation, broadcasting, reproduction on microfilms or in any other physical way, and transmission or information storage and retrieval, electronic adaptation, computer software, or by similar or dissimilar methodology now known or hereafter developed. Exempted from this legal reservation are brief excerpts in connection with reviews or scholarly analysis or material supplied specifically for the purpose of being entered and executed on a computer system, for exclusive use by the purchaser of the work. Duplication of this publication or parts thereof is permitted only under the provisions of the Copyright Law of the Publisher's location, in its current version, and permission for use must always be obtained from Springer. Permissions for use may be obtained through RightsLink at the Copyright Clearance Center. Violations are liable to prosecution under the respective Copyright Law.
The use of general descriptive names, registered names, trademarks, service marks, etc. in this publication does not imply, even in the absence of a specific statement, that such names are exempt from the relevant protective laws and regulations and therefore free for general use.
While the advice and information in this book are believed to be true and accurate at the date of publication, neither the authors nor the editors nor the publisher can accept any legal responsibility for any errors or omissions that may be made. The publisher makes no warranty, express or implied, with respect to the material contained herein.

Printed on acid-free paper

Springer is part of Springer Science+Business Media (www.springer.com)

Contents

Part I General

1 Computational Intelligence Techniques and Applications 3
Xuan Zhu

Part II Classical Intelligence Techniques in Earth and Environmental Sciences

2 Vector Autoregression (VAR) Modeling and Forecasting of Temperature, Humidity, and Cloud Coverage 29
Md. Abu Shahin, Md. Ayub Ali, and A.B.M. Shawkat Ali

3 Exploring the Behavior and Changing Trends of Rainfall and Temperature Using Statistical Computing Techniques 53
Abdus Salam Azad, Md. Kamrul Hasan, M. Arif Imtiazur Rahman, Md. Mustafizur Rahman, and Nashid Shahriar

4 Time Series Model Building and Forecasting on Maximum Temperature Data 79
Amrina Ferdous, Md. Abu Shahin, and Md. Ayub Ali

5 GIS Visualization of Climate Change and Prediction of Human Responses 93
P.K. Nag, Priya Dutta, Varsha Chorsiya, and Anjali Nag

Part III Probabilistic and Transforms Intelligence Techniques in Earth and Environmental Sciences

6 Markov Chain Analysis of Weekly Rainfall Data for Predicting Agricultural Drought 109
A.T.M. Jahangir Alam, M. Sayedur Rahman, and A.H.M. Sadaat

7 **Forecasting Tropical Cyclones in Bangladesh: A Markov Renewal Approach** 129
Md. Asaduzzaman and A.H.M. Mahbub Latif

8 **Performance of Wavelet Transform on Models in Forecasting Climatic Variables** 141
Md. Jahanur Rahman and Md. Al Mehedi Hasan

9 **Analysis of Inter-Annual Climate Variability Using Discrete Wavelet Transform** 155
Md. Khademul Islam Molla, A.T.M. Jahangir Alam, Munmun Akter, A.R. Shoyeb Ahmed Siddique, and M. Sayedur Rahman

Part IV Hybrid Intelligence Techniques in Earth and Environmental Sciences

10 **Modeling of Suspended Sediment Concentration Carried in Natural Streams Using Fuzzy Genetic Approach** 175
Özgür Kişi and Halil İbrahim Fedakar

11 **Prediction of Local Scour Depth Downstream of Bed Sills Using Soft Computing Models** 197
A. Zahiri, H. Md. Azamathulla, and Kh. Ghorbani

12 **Evaluation of Wavelet-Based De-noising Approach in Hydrological Models Linked to Artificial Neural Networks** 209
Vahid Nourani, Aida Hosseini Baghanam, Aida Yahyavi Rahimi, and Farzad Hassan Nejad

13 **Evaluation of Mathematical Models with Utility Index: A Case Study from Hydrology** 243
Dr. Renji Remesan and Dr. Dawei Han

Index 265

Para tener acceso completo a este libro usted debe solicitarlo de maneral formal a la Coordinación del Programa de Doctorado Interinstitucional en Ciencias Ambientales mediante el **Formato de Préstamo Bibliográfico** (descargar formato) y remitirlo al siguiente correo:
dicambientales@unicauca.edu.co

DOCTORADO INTERINSTITUCIONAL EN CIENCIAS AMBIENTALES

Universidad del Cauca