Contents

Part I Hydroinformatics: Integrating Data and Models

1 Some Future Prospects in Hydroinformatics 3
M.B. Abbott

2 Data-Driven Modelling: Concepts, Approaches and Experiences 17
D. Solomatine, L.M. See and R.J. Abrahart

Part II Artificial Neural Network Models

3 Neural Network Hydroinformatics: Maintaining Scientific Rigour 33
R.J. Abrahart, L.M. See and C.W. Dawson

4 Neural Network Solutions to Flood Estimation at Ungauged Sites 49
C.W. Dawson

5 Rainfall-Runoff Modelling: Integrating Available Data and Modern
Techniques 59
S. Srinivasulu and A. Jain

6 Dynamic Neural Networks for Nonstationary Hydrological Time
Series Modeling 71
P. Coulibaly and C.K. Baldwin

7 Visualisation of Hidden Neuron Behaviour in a Neural Network
Rainfall-Runoff Model 87
L.M. See, A. Jain, C.W. Dawson and R.J. Abrahart

8 Correction of Timing Errors of Artificial Neural Network
Rainfall-Runoff Models 101
N.J. de Vos and T.H.M. Rientjes
9 Data-Driven Streamflow Simulation: The Influence of Exogenous Variables and Temporal Resolution ........................................ 113
E. Toth

10 Groundwater Table Estimation Using MODFLOW and Artificial Neural Networks ...................................................... 127
K. Mohammadi

11 Neural Network Estimation of Suspended Sediment: Potential Pitfalls and Future Directions ......................................... 139

Part III Models Based on Fuzzy Logic

12 Fuzzy Logic-Based Approaches in Water Resource System Modelling ................................................................. 165
P.P. Mujumdar and S. Ghosh

13 Fuzzy Rule-Based Flood Forecasting .............................................. 177
A. Bardossy

14 Development of Rainfall–Runoff Models Using Mamdani-Type Fuzzy Inference Systems ........................................ 189
A.P. Jacquin and A.Y. Shamseldin

15 Using an Adaptive Neuro-fuzzy Inference System in the Development of a Real-Time Expert System for Flood Forecasting .. 201
I.D. Cluckie, A. Moghaddamnia and D. Han

16 Building Decision Support Systems based on Fuzzy Inference ...... 215
C.K. Makropoulos, D. Butler and C. Maksimovic

Part IV Global and Evolutionary Optimization

17 Global and Evolutionary Optimization for Water Management Problems ................................................................. 231
D. Savic

18 Conditional Estimation of Distributed Hydraulic Conductivity in Groundwater Inverse Modeling: Indicator-Generalized Parameterization and Natural Neighbors ........................................ 245
F.T-C. Tsai and X. Li

19 Fitting Hydrological Models on Multiple Responses Using the Multiobjective Evolutionary Annealing-Simplex Approach .......... 259
A. Efstratiadis and D. Koutsoyiannis
20 Evolutionary-based Meta-modelling: The Relevance of Using Approximate Models in Hydroinformatics .................................................. 275
S.-T. Khu, D. Savic and Z. Kapelan

21 Hydrologic Model Calibration Using Evolutionary Optimisation .... 291
A. Jain and S. Srinivasulu

22 Randomised Search Optimisation Algorithms and Their Application in the Rehabilitation of Urban Drainage Systems ........ 303
D.P. Solomatine and Z. Vojinovic

23 Neural Network Hydrological Modelling: An Evolutionary Approach ......................................................................................... 319
A.J. Heppenstall, L.M. See, R.J. Abrahart, and C.W. Dawson

Part V Emerging Technologies

24 Combining Machine Learning and Domain Knowledge in Modular Modelling ................................................................. 333
D.P. Solomatine

25 Precipitation Interception Modelling Using Machine Learning Methods – The Dragonja River Basin Case Study .............. 347
L. Stravs, M. Brilly and M. Sraj

26 Real-Time Flood Stage Forecasting Using Support Vector Regression ...................................................................................... 359
P.-S. Yu, S.-T. Chen and I-F. Chang

27 Learning Bayesian Networks from Deterministic Rainfall–Runoff Models and Monte Carlo Simulation ............................. 375
L. Garrote, M. Molina and L. Mediero

28 Toward Bridging the Gap Between Data-Driven and Mechanistic Models: Cluster-Based Neural Networks for Hydrologic Processes .. 389
A. Elshorbagy and K. Parasuraman

29 Applications of Soft Computing to Environmental Hydroinformatics with Emphasis on Ecohydraulics Modelling ................. 405
Q. Chen and A. Mynett

30 Data-Driven Models for Projecting Ocean Temperature Profile from Sea Surface Temperature ........................................ 421
C.D. Doan, S.Y. Liong and E.S. Chan
Part VI Model Integration

31 Uncertainty Propagation in Ensemble Rainfall Prediction Systems used for Operational Real-Time Flood Forecasting 437
  I.D. Cluckie and Y. Xuan

32 OpenMI – Real Progress Towards Integrated Modelling 449
  D. Fortune, P. Gijsbers, J. Gregersen and R. Moore

33 Hydroinformatics – The Challenge for Curriculum and Research, and the “Social Calibration” of Models 465
  J.P. O’Kane

34 A New Systems Approach to Flood Management in the Yangtze River, China 479
  H. Betts, S. Markar and S. Clark

35 Open Model Integration in Flood Forecasting 495
  M. Werner