

Table of Contents

I Automating Scientific Discovery

Knowledge Engineering for Automated Scientific Discovery	3
<i>Larisa N. Soldatova</i>	
The Relevance of Natural Kinds to the Computational Discovery of Novel Scientific Variables	21
<i>Benjamin C. Jantzen</i>	
Data-Driven and Knowledge-Based Approach to Scientific Discovery	43
<i>Mitsuhiro Odaka, Morgan Magnin, and Katsumi Inoue</i>	
Automated Scientific Discovery of Mind and Behavior	61
<i>Sebastian Musslick, Younes Strittmatter, and Marina Dubova</i>	
The Use of AI-Robotic Systems for Scientific Discovery	99
<i>Alexander H. Gower, Konstantin Korovin, Daniel Brunnsåker, Filip Kronström, Gabriel K. Reder, Ievgeniia A. Tiukova, Ronald S. Reiserer, John P. Wikswo, and Ross D. King</i>	

II Equation Discovery and Symbolic Regression

Expediting Symbolic Regression for Science Using Scientific Approaches	125
<i>Md Nasim, Nan Jiang, and Yexiang Xue</i>	
Deep Symbolic Optimization: Reinforcement Learning for Symbolic Mathematics	147
<i>Conor F. Hayes, Felipe Leno Da Silva, Jiachen Yang, T. Nathan Mundhenk, Chak Shing Lee, Jacob F. Pettit, Claudio Santiago, Sookyoung Kim, Joanne T. Kim, Ignacio Aravena Solis, Ruben Glatt, Andre R. Goncalves, Alexander Ladd, Ahmet Can Solak, Thomas Desautels, Daniel Faissol, Brenden K Petersen, and Mikel Landañuela</i>	
Neural-Guided Equation Discovery	178
<i>Jannis Brugger, Mattia Cerrato, David Richter, Cedric Derstroff, Daniel Maninger, Sajjad Shumaly, Mira Mezini, and Stefan Kramer</i>	
Generative Models for Equation Discovery	216
<i>Sebastian Mežnar, Jure Brence, Sašo Džeroski, and Ljupčo Todorovski</i>	

XVIII Table of Contents

Ramanujan Machine – Generating Conjectures on Fundamental Constants	240
<i>Itay Beit-Halachmi, Rotem Elimelech, Ofir David, Ofir Razon, Michael Shalyt, and Ido Kaminer</i>	

III Discovering Models of Dynamical Systems

Computational Discovery of Quantitative Process Models	261
<i>Pat Langley</i>	
Discovering Polynomial and Quadratic Structure in Nonlinear Ordinary Differential Equations	284
<i>Boris Kramer and Gleb Pogudin</i>	
A Comprehensive Review of Latent Space Dynamics Identification Algorithms for Intrusive and Non-Intrusive Reduced-Order-Modeling	303
<i>Christophe Bonneville, Xiaolong He, April Tran, Jun Sur R. Park, William Fries, Daniel A. Messenger, Siu Wun Cheung, Yeonjong Shin, David M. Bortz, Debojyoti Ghosh, Jiun-Shyan Chen, Jonathan Belof, and Youngsoo Choi</i>	
Progressive Learning for Subsurface Physics	336
<i>Teeratorn Kadeethum, Daniel O'Malley, Youngsoo Choi, Hari S. Viswanathan, and Hongkyu Yoon</i>	
Process-Based Modelling of Natural and Urban Catchments	364
<i>Matej Radinja, Nataša Atanasova, Sašo Džeroski, and Mateja Škerjanec</i>	

IV Artificial Intelligence for Science

Artificial Intelligence for Science	397
<i>Sašo Džeroski</i>	