

Contents

Preface — VII

Sonawane P. M.

1 Understanding artificial intelligence: an introduction, history, and foundations — 1

Aditi Praful Thapliyal, Ayushika Mishra, and Kumud Pant

2 Basics of machine learning (ML) and deep learning (DL), secondary data source and training, application and AI tools, challenges, and future perspectives of AI — 25

Jaya, Rajni Kumari, V. Vivekanand, and Nidhi Pareek

3 Cellular image classification and identification of genetic variations using artificial intelligence — 47

Shree Kumari G. R., Mohanasrinivasan V., Lokesh Ravi, and Poornima D. S.

4 Artificial intelligence in bacterial staining and cell counting — 65

Manohar Rahiya, Rajni Kumari, V. Vivekanand, and Nidhi Pareek

5 Use of artificial intelligence in the prediction of microbial species — 79

Vivek Pandya and Kinjal Upadhyay

6 Transformative AI applications in environmental microbiology: pioneering research and sustainable solutions — 97

Vidhi Jain, Nafees Ahmed, Krishnaveer Singh Jhala, Pradeep Kumar, and

Namita Ashish Singh

7 AI in food production and processing: applications and challenges — 125

Dominic Panaligan, Riann Martin Sarza, and Isaac Cornelius Bensley Sy

8 Artificial intelligence in microbial food safety — 153

Nileema S. Gore, Rutuja Suryavanshi, Sushma Thakur, and Priyanka Patil

9 AI in plant growth promotion and plant disease management — 183

Nitish Kumar Singh, Jaikee Kumar Singh, Vivek Chandra Verma,
Syed Mohammad Nasar Ata, and Raghvendra Dubey

**10 Role of artificial intelligence (AI) and machine learning (ML) in disease
forecasting and disease epidemiology — 207**

A. H. D. Pushpa Latha, S. Padmavathi, B. Varalakshmi, and D. Aruna Padma

11 Artificial intelligence in diagnostics — 229

Pratishtaa Jain, Jeevan Kumar M., Lokesh Ravi, and Debasish Kar

12 Artificial intelligence in bacterial culture plate images — 263

Nitish Kumar Singh, Jaikee Kumar Singh, Vivek Chandra Verma,
Syed Mohammad Nasar Ata, and Aprajita Singh

13 Prediction of antimicrobial activity using artificial intelligence — 281

Vaidya Mayuri, Jategaonkar Vinaya, Harale Geetanjali, and Patil Shweta

14 Artificial intelligence and MALDI-TOF MS — 313

Hem Chandra Pant, Himani Sivaraman, Naveen Gaurav, Harsh Vardhan Pant,
Hridoyjit Phukon, Pankaj Kumar, and R. C. Dubey

**15 Artificial intelligence in clinical microbiology: regeneration of diagnostics
techniques using GANs and reinforcement learning for drug discovery
and development in human welfare — 337**

Hardik S. Shah, Kinchit K. Shah, and Priti H. Patel

16 Reimagining perfusion bioreactors with artificial intelligence — 357

Index — 381