SUSTAINABLE INTELLIGENCE:

Machine Learning for Environmental Solutions

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Sustainable Intelligence: Machine Learning for Environmental Solutions

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Sustainable Intelligence: Machine Learning for Environmental Solutions

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Preface

The environmental challenges confronting our world today demand innovative, multidisciplinary solutions. Climate change, biodiversity loss, resource depletion, and environmental degradation are complex issues that can no longer be addressed through traditional methods alone. At this critical juncture, the fusion of technology and environmental science offers a transformative opportunity—one where machine learning can become a vital force for sustainable progress.

Sustainable Intelligence: Machine Learning for Environmental Solutions is the result of a collaborative effort by five authors, each bringing unique expertise from the fields of machine learning, environmental science, data analytics, and sustainability studies. Our diverse perspectives have been united by a shared belief: technology, when guided by ethical considerations and environmental consciousness, holds the power to drive meaningful ecological change.

In this book, we explore how machine learning is being applied to real-world environmental problems—from predicting climate trends and protecting endangered species to optimizing renewable energy systems and enhancing conservation efforts. We also address the ethical responsibilities, limitations, and potential unintended consequences of using AI in sensitive environmental contexts.

Our hope is to inspire researchers, students, technologists, environmental advocates, and policymakers to see machine learning not just as a technological advancement, but as a catalyst for a more sustainable and resilient future.

This work is a testament to the power of collaboration—across disciplines, across technologies, and across human and ecological boundaries. We believe that sustainable intelligence is not just about smarter algorithms; it's about building a smarter, more compassionate relationship with our planet.

Thank you for joining us on this journey toward harnessing innovation for a healthier world.

Ackowledgement

Writing Sustainable Intelligence: Machine Learning for Environmental Solutions has been a remarkable journey, one that reflects the shared passion and dedication of five individuals united by a common goal: to harness the power of technology for a more sustainable planet.

As co-authors, we are deeply grateful to our families and friends for their endless support, patience, and encouragement throughout this endeavor. Your belief in us kept our momentum strong, even during the most challenging phases of writing and research.

We extend our heartfelt thanks to the mentors, researchers, and industry experts who generously shared their insights and expertise with us. Your contributions have greatly enriched the depth and breadth of this book, helping us bridge the fields of machine learning, environmental science, and sustainable development.

A special note of appreciation goes to the editorial and publishing teams who believed in our vision. Your guidance, precision, and attention to detail helped shape this work into what it is today.

We also want to acknowledge the many organizations, environmentalists, data scientists, and technologists across the world who are leading innovative efforts toward a greener future. Your work served as an inspiration for many of the solutions and case studies presented here.

Finally, to our readers: thank you for choosing to embark on this journey with us. We hope that this book serves as a catalyst for new ideas, actions, and collaborations that will drive positive change for our planet. Together, through sustainable intelligence, we believe we can build a better future.

With sincere gratitude,

Dr Heramb Nayak
Dr Devinder Singh Hooda
Dr Jasbir Singh
Dr Ajay Kumar Phogat
Ms. Monika

About the Authors

Dr. Heramb Nayak is an eminent scholar in the field of Travel & Tourism, Hospitality and Management. He (Associate Professor) in Maharaja Surajmal Institute under IP university) is MTA (specialization in Tourism), MBA in Marketing, M.A in Eng literature, Ph. D in Management, from Monad University, UGC/NET qualified and 22 years of Cooperate and teaching experience. He has published more than 25 research papers, UGC Care, national and international journals. He has presented more than 10 research papers in various national and international conferences.

He has attended more than 21 national and international seminar and conferences. He has designed the course of Tourism, Travel & Hospitality for GGSIPU, Delhi University &Jamia Islamia Hamdard University.

Devinder Singh Hooda (Ph.D), is faculty in Economics at Indira Gandhi University, Meerpur-Rewari (Haryana) India. He did his Ph.D degree in Economics from MDU Rohtak. Previously, he taught at Satyawati College (Eve), University of Delhi and Maharshi Dayanand University, Rohtak. He has an enriched teaching experience of 15 years to his credit in the area of microeconomics, international economics and public finance & policies. He has published more than 30 research papers in peer reviewed national and international journals of repute. He has presented more than 45 research papers in national and international conferences/seminars. Two doctoral degree and five M.Phil have been successfully awarded under his supervision.

He has participated in more than ten workshops/ FDPs/ refresher courses etc. Dr. Hooda successfully organized

more than five conferences and workshops. His interest area of research is gender budgeting, public economics & policies and Issues in international economics. Recently he is working on Indian pharmaceutical industry and competitiveness. He has published 2 books, the one is 'Management of Commercial Banks' and the other is Gender Responsive Budgeting in India-Impact, Challenges and Future Directions. He has been the member of various academic and administrative bodies at IGU like member of Academic Council, University court member and CPC etc. Presently, he is the member of the Board of Post Graduate Studies & Research in Economics and member of Departmental Research Advisory Committee and IQAC/NAAC coordinator of Department. He is the life member of economic and professional bodies like Indian Economic Association, Indian Political Economy Association, Indian Health Economics & Policy Association, Society for Pathways to Sustainability.

Dr. Jasbir Singh is an eminent scholar in the field of Economics and Money & Banking. He (Associate Prof. (Dy. Director) in Maharaja Surajmal Institute under IP university) is M.A Economics (specialization in Money and Banking), M. A Rural Development, MBA in IBM, M Phil in Eco. Ph D in Eco (in Banking), from M. D. University, UGC/NET qualified and 23 years teaching experience in MDU as well as IP university. He has published more than 100 research papers in Scopus, ABDC, UGC Care, national and international journals. He has presented more than 30 research papers in various national and international conferences.

He has attended more than 40 national and international seminar and conferences as like IIT Roorkee. He is Editor in- Chief of the African Journal on Economic and Development Polices

(AJEDP) and Member of Editorial Board in Journal: International Invention Journal of Arts and Social Sciences (IIJASS), and in Journal: Comprehensive Research Journal of Management and Business Studies (CRJMBS). More than 13 students have completed their M. Phil and more than 10 students their Ph. D under his supervision. Four books have published.

Dr. Ajay Kumar Phogat is working as an Assistant Professor in Maharaja Surajmal Institute (Affiliated to GGSIPU, Dwarka, New Delhi). He has 15 years of teaching experience in various courses (B.Tech, BCA & BBA). Previously he worked as Assistant Professor (Computer Science & Engineering) in Accurate Institute of Management & Technology, Gr. Noida (U.P.) Affiliated to UPTU. He did his Ph.D. & M.Tech in Information Technology from University School of Information Communication Technology, GGS Indraprastha University. He did MCA from Maharshi Dayanand University, Rohtak. He has done his graduation from Delhi University. He also did two years diploma in Software Technology from CMC, New Delhi.

Field Of Interest:

His areas of interest are Programming languages, Algorithms, DBMS and Data Mining & Data Warehouse. He has published research papers in ESCI journals and presented papers in various National and International conferences.

Monika is a dedicated scholar at Deenbandhu Chhotu Ram University of Science and Technology (DCRUST), Murthal, in the Department of Management. She holds a B.Com (Hons) and an M.Com, and is qualified with UGC-NET JRF in both Commerce and Management. With over seven years of academic experience, her specialization lies in finance. Monika's work reflects a strong commitment to bridging academic theory with real-world financial practices, making her a valuable voice in the field of management education and research.

Table of Contents

Chapter 1: 1 - 18

Introduction to Sustainable Intelligence

Chapter 2: 19 – 36

Fundamentals of Machine Learning for Environmental Applications

Chapter 3: 37 - 55

Climate Change Monitoring and Prediction

Chapter 4: 56 - 73

Biodiversity Conservation and Wildlife Monitoring

Chapter 5: 74 - 91

Pollution Detection and Control

Chapter 6: 92 - 110

Smart Agriculture and Water Management

Chapter 7: 111 - 128

Urban Sustainability and Smart Citiesa

Chapter 8: 129 - 147

Challenges, Future Trends, and Policy Implications

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