

GREEN ALGORITHMS:

THE ROLE OF AI IN ENVIRONMENTAL SCIENCE



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Green Algorithms: The Role of AI in Environmental Science



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Green Algorithms: The Role of AI in Environmental Science

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Preface

The twenty-first century is marked by both extraordinary technological innovation and unprecedented environmental challenges. As climate change, biodiversity loss, and resource depletion reshape our planet, humanity stands at a crossroads where science and sustainability must converge. Artificial Intelligence (AI), once viewed primarily as a tool for business and industry, has now emerged as a transformative force in environmental science. The concept of Green Algorithms reflects this convergence—emphasizing not only the capacity of AI to advance environmental research but also the responsibility to minimize its ecological footprint.

This book, *Green Algorithms: The Role of AI in Environmental Science*, explores the dynamic intersection between technology and sustainability. It aims to shed light on how AI is being harnessed to optimize renewable energy systems, enhance climate modeling, monitor biodiversity, and revolutionize agriculture, while also critically examining the energy costs and ethical implications of its deployment. By drawing upon diverse case studies and interdisciplinary insights, the book underscores the dual role of AI: as a powerful ally in addressing ecological crises and as a system that must itself be designed with sustainability in mind.

The intention of this work is twofold: first, to provide readers—students, researchers, and practitioners—with a comprehensive understanding of the applications of AI in environmental science; and second, to encourage critical reflection on how algorithms can be made “green” in their conception, development, and application. In doing so, this book aspires to contribute to a growing discourse on responsible innovation.

As you turn the pages, I invite you to engage with the promise and paradox of AI in the Anthropocene. May this exploration inspire new pathways where technological progress and ecological stewardship move hand in hand toward a more sustainable future.

Acknowledgement

We, the authors of Green Algorithms: The Role of AI in Environmental Science, wish to extend our heartfelt gratitude to all those who contributed to the completion of this work. Writing a book of this scope has been both a challenging and enriching journey, and it would not have been possible without the support, guidance, and encouragement of many individuals and institutions.

First, we express our deepest appreciation to our families, whose patience, understanding, and unwavering belief in our work provided us with strength and inspiration throughout this endeavor. Their constant encouragement reminded us of the value of perseverance and the importance of balancing professional commitment with personal life.

We are immensely grateful to our academic mentors and colleagues, who shared their insights and expertise. Their constructive feedback not only enriched the content of this book but also challenged us to think more critically about the intersection of artificial intelligence and environmental science.

We also acknowledge the support of our respective institutions and libraries for providing access to essential resources and research materials. The cooperation of scholars and professionals who generously shared their time and perspectives has been invaluable in shaping the ideas presented in these chapters.

Special thanks are due to our peers and students, whose enthusiasm for exploring new ideas motivated us to continue refining our arguments and deepening our research.

Finally, we would like to acknowledge the editorial team and technical staff, whose diligence, precision, and guidance ensured that our manuscript was transformed into a polished publication.

As four co-authors, this book represents not only an academic collaboration but also a shared vision of contributing meaningfully to the discourse on sustainability and technology. We sincerely hope that this work sparks further dialogue, research, and innovation for a greener future.

Prof.G.Nandhini

Dr. Esther Rakel

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About the Authors



G. Nandhini, Professor and Head, Department of Clinical Nutrition, at Ganga Institute of Health Sciences, Coimbatore, has over 21 years of Academic and Research experience. She is a distinguished academician and researcher with a strong foundation in Food Science, Nutrition and Dietetics. A UGC-NET qualified scholar, she has devoted her career to advancing nutrition science through teaching, research, and academic leadership. She has been honoured with several prestigious awards, including the Best Professor Award, Academic Excellence Award, Best Researcher Award, and Research Excellence Award, recognizing her excellence in teaching, research, and academic service. With over 80 research publications in reputed national and international journals, G. Nandhini has made remarkable contributions to scientific literature. She played a pivotal role in advancing research and has guided more than 45 researchers as a research guide. She is a sought-after resource person, guest speaker, and conference moderator in various National and International conferences and is actively involved in academic responsibilities as a question paper setter, central examiner, and scrutinizing member for various universities. Through her dedication and vision, G. Nandhini continues to inspire students, researchers, and professionals in the field of Clinical Nutrition.



Dr. Esther Rakel, is a dynamic Nursing Educationist with excellent skills in Nursing Leadership over 30 years. The author has pursued the bachelor degree from the esteemed Institution of Madras Medical College and now holds the Ph.D. honor to guide and create a competent and skilled healthcare professionals. Dr. Rakel, is a Dean cum Principal at Ganga College of Nursing, Coimbatore from the year 2009. The outstanding scholastic achievements and her proven ability to manage complex situations have led to grow the Institution as a renowned organization in the past 15 years. The Author choose Creativity to Invent, Experiment and make tasks excellent in its quality. She has presented at Local, State and National, Conferences with an emphasis on Healthcare, Ethics, Leadership, Curriculum and Nursing advancement. Dr. Rakel has authored multiple publications in various National and International journal forum. She has been a driving force of implementing various foreign exchange programs with reputed university. The author has bagged many awards including 'Best Teacher Award', "Best Nurse Educator award", "Educational Excellence award" and the most prestigious "Lifetime Achievement award". The Author intensely believes that, the good deeds and a generous heart are the seeds which can be sowed to reap the crown of grace.



Prathiksha P. N. is a Cloud Developer at Hewlett Packard Enterprise, Bangalore with a strong foundation in Artificial Intelligence and Data Science. She specializes in cloud technologies and enterprise software development, with a keen interest in building scalable, secure, and efficient digital solutions. She completed her B.Tech in Artificial Intelligence and Data Science at KPR Institute of Engineering and Technology, Coimbatore, with a remarkable CGPA of 9.08. Over the years, she has built expertise in machine learning algorithms, data analytics, SQL, Java, Python, and web development technologies such as HTML and CSS. She has undertaken several impactful projects, including a Crop Type Recommendation System using ensemble learning techniques, a Forest Fire Prediction Model with logistic regression, and a KPRIET Event and Circular Management System. Her passion lies in deep learning, predictive modelling, computer vision, and natural language processing. Prathiksha has gained practical exposure through internships at Rigelsoft Technologies (Business Analytics Team) and Xebia Academy, where she worked on real-time ML projects. Alongside academics, she has demonstrated leadership as the IEEE CIS Society Chair, AD Association Joint Secretary (2022), and Girls Hostel Student Committee President. She is also a recipient of several recognitions, including the KPRIET Innosense 2021 Best Idea Award, and has earned certifications such as NPTEL Elite in Data Science for Engineers, NPTEL in Data Mining, and Design Thinking from Taylor's University. She has further strengthened her knowledge with 10+ online certifications from platforms like Coursera and Great Learning. With a strong vision to contribute to the field of Artificial Intelligence, Prathiksha continues to explore the intersections of technology, data, and real-world problem solving.



Prof. Sasirekha K is a dedicated nursing professional with more than 15 years of experience in teaching and clinical practice. The author serves as Professor and Head of Community Health Nursing at Ganga College of Nursing, Coimbatore. She has published several research papers, guided many students in their academic projects, and actively participated in national and international conferences. Her passion for community health is reflected in her involvement in awareness programs on breast cancer, road safety, tuberculosis, and environmental health.

The author has received recognitions including the Faculty of the Year Award and the Academic Excellence Award for her outstanding contributions to nursing education and public health. With her commitment to teaching, research, and service, she continues to inspire students and contribute to society's well-being.

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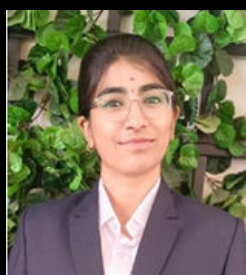
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