

Principles of Digital Image Processing

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Preface

Digital Image Processing (DIP) has become an indispensable field in today's technology-driven world, influencing areas such as medical imaging, remote sensing, computer vision, multimedia, artificial intelligence, robotics, and security systems. The rapid growth of digital devices and imaging technologies has created a strong demand for professionals who understand not only how images are captured and displayed, but also how they are processed, analyzed, and interpreted using computational techniques.

The book "Principles of Digital Image Processing" is designed to provide a clear and systematic introduction to the fundamental concepts, theories, and techniques of digital image processing. It emphasizes both the mathematical foundations and the practical aspects required to understand how digital images are represented, enhanced, transformed, compressed, and analyzed. The content is presented in a simple and structured manner to help learners gradually build confidence in the subject.

This book covers essential topics such as image formation and representation, sampling and quantization, intensity transformations, spatial and frequency domain techniques, image enhancement, image restoration, color image processing, image segmentation, morphological operations, feature extraction, and an introduction to image compression. Wherever possible, concepts are explained with illustrations, examples, and step-by-step explanations to make learning intuitive and engaging.

The primary audience for this book includes undergraduate and postgraduate students of Computer Science, Information Technology, Electronics, Electrical Engineering, and related disciplines. It will also be useful for researchers, educators, and professionals who wish to refresh their knowledge or gain a foundational understanding of digital image processing concepts.

An effort has been made to align the content with common university syllabi while maintaining conceptual clarity and practical relevance. This book aims to bridge the gap between theory and application, enabling readers to apply image processing principles to real-world problems.

The author sincerely hopes that this book will serve as a valuable learning resource and inspire readers to explore advanced topics and research opportunities in the fascinating field of digital image processing. Constructive feedback and suggestions for improvement are always welcome for future editions.

Authors

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Dr. Selvamani is a renowned academician and researcher in the field of Computer Science, with 26 years of teaching experience. She holds a Master's degree in Computer Applications (MCA) from Bharath Institute of Technology, an M.Phil from Periyar University, and a Ph.D from Mother Teresa University. With a strong research focus, Dr. Selvamani has published over 10 research papers in reputed international journals, contributing significantly to the field of Computer Science. Her research interests include cyber security using Artificial Intelligence, Deep learning.

Dr. Selvamani is committed to academic excellence and has demonstrated expertise in teaching and research, inspiring students and colleagues alike.



Dr. P. Sujatha holds a Doctoral degree in Computer Science from Vels Institute of Science, Technology and Advanced Studies (VISTAS) awarded in 2013. She obtained her M.Phil. in Computer Science in 2004, Master of Computer Science in 1999—securing a University Rank—and qualified the State Eligibility Test (SET) in 2016. She is currently serving as Professor and Head in the Department of Computer Applications, School of Computing Sciences, VISTAS. With 26 years of teaching experience at both undergraduate and postgraduate levels, she has made significant contributions to academia and research. As a recognized research supervisor at VISTAS, she has successfully produced 10 Ph.D. and 9 M.Phil. scholars, and is presently guiding 8 doctoral researchers. Her research expertise encompasses Image Processing, Network Security, and Data Mining. Dr. Sujatha has published around 100 research papers in reputed international journals indexed in Scopus, Web of Science (WoS), and UGC-approved listings. She has also authored 10 textbooks and presented over 95 papers in various international conferences. An active academic contributor, she serves on the Editorial and Review Boards of several reputed journals and is frequently invited as a resource person for international conferences. Her dedication to academia has earned her several honors, including recognition for Excellence in Teaching in Higher Education for her outstanding and futuristic educational practices. She is also an active member of professional

bodies such as the Computer Society of India (CSI) – Chennai Chapter and the International Association of Engineers (IAENG), among others..



D. Sudha is an accomplished academic professional with over 13 years of teaching experience. She is currently an Assistant Professor in the Department of Computer Science at S.I.V.E.T. College, Gowrivakkam, Chennai, India, and is pursuing a part-time Ph.D. in computer science at Vels Institute of Science, Technology and Advanced Studies, Chennai-117. She holds the degrees M.C.A. and M.Phil. She has qualified for the State Eligibility Test (SET).

Her research interests span machine learning, deep learning, quantum computing, artificial intelligence, and women's health. She has made significant academic contributions, including publishing book chapters and presenting her work at various national and international conferences. She has published her article in prestigious journals like Springer Nature.

Beyond academics, she is an active member of the Enviro Club and serves as the coordinator of the ECO Club, reflecting her commitment to environmental initiatives and student engagement.