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S. N. Merchant
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Preface

The present era of technological advancements is moving at a very fast pace. It is therefore essential to keep oneself abreast with all the recent developments in various engineering domains. The book discusses various state-of-the-art developments in the diverse area of communications, data processing and signal processing, and the endeavor has been to bring together some of these developments in a concise platform that would benefit students, researchers, academicians and industry people. The chapters presented in the book have been selected on the basis of relevance and mathematical deliberations on the topics. Apart from the above-listed domains, this book has additionally included topics on social issues providing advanced technological solutions.

Chapter “[Deep Semantic Segmentation for Self-driving Cars](#)” introduces the technique of semantic segmentation of urban scene for a self-driving car that comprises three sub-systems in navigation, viz. lane finding, urban scene understanding and geo-positioning. In Chapter “[Shot Boundary Detection Using Artificial Neural Network](#),” hybrid video shot boundary detection process using feature extraction by mean log difference is discussed in combination with artificial neural network techniques. A system for leaf parameter analysis is proposed in Chapter “[Custard Apple Leaf Parameter Analysis, Leaf Diseases, and Nutritional Deficiencies Detection Using Machine Learning](#),” where detection of N, P and K deficiencies and leaf diseases is accomplished using K-nearest neighbors (k-NN) and support vector machine (SVM) algorithms. A typical problem of recognizing and removing the rain streaks on photographs by an improved convolutional neural network (CNN) architecture is discussed in Chapter “[Single Image Rain Removal Using Convolutional Neural Network](#).” A study of voice samples for two disorders—hypo and hyper—along with normal voice samples is considered in Chapter “[A Robust Approach of Estimating Voice Disorder Due to Thyroid Disease](#)” to create a databank for three classes—normal, hypo and hyper. A combined classifier, i.e., SVM and HMM (hidden Markov model), was utilized.

In Chapter “[Face Recognition Using Golden Ratio for Door Access Control System](#),” a combination of Viola–Jones face detection method with characteristics of extracting golden ratio is discussed to improve the security of sensitive places

through facial recognition. This book has included chapters on topics such as underwater detection of objects, adaptive background subtraction models for shot detection, acoustic classification and evaluation of bird species using support vector machine and artificial neural networks. In Chapter “[Feature-Based Model for Landslide Prediction Using Remote Sensing and Digital Elevation Data](#),” a study to generate landslide susceptible maps and landslide hazard zonation maps is presented using the digital elevation model for the prediction of future landslides. Chapter “[Emotion Recognition using Gamma Correction Technique Applied to HOG and LBP Features](#)” discusses techniques on emotion recognition using gamma correction when applied to histogram of oriented gradient (HOG) and LBP features. The book also includes diverse areas on images and speech signal processing, besides the above-mentioned topics such as analysis of vocal tract parameters of speech, 3D reconstruction of plant features with non-destructive plant growth monitoring systems, digital image watermarking by fusion of wavelet and curvelet transform, and content-based image retrieval (CBIR) techniques.

This book also features many recent advancements on machine learning algorithms. Chapter “[Automatic Gear Sorting Using Wireless PLC Based on Computer Vision](#)” discusses conversion of wired PLC into wireless PLC by interfacing the PLC with the Wi-Fi module to enable real-time surveillance and control of the system of equipment sorting via Wi-Fi module interfacing with PLC. Chapter “[Machine Learning Feature Selection in Archery Performance](#)” discusses machine learning feature selection in Archery performance using Boruta algorithm, Chapter “[Skin Lesion Classification Using Deep Learning](#)” deliberates on skin lesion classification using deep learning, Chapter “[Deep Learning-Based Paperless Attendance Monitoring System](#)” deals with deep learning-based paperless attendance monitoring system, and Chapter “[Image Analytics to Detect Cigarette in an Image Using Deep Learning](#)” deals with image analytics to detect cigarette in an image using deep learning.

In the domain of antenna design and communication, Chapter “[Frequency and Pattern Reconfigurable Antenna for WLAN and WiMAX Application](#)” proposes an innovative bow tie frequency and pattern reconfigurable antenna for WLAN and WiMAX applications. Chapter “[Design of a Power Efficient Multiband Patch Antenna](#)” gives a design consideration of multiband patch antenna. Chapter “[A Frequency Reconfigurable Antenna for Sub-GHz and TV White Space Applications](#)” discusses a frequency reconfigurable antenna for sub-GHz and TV white space. Chapter “[Comparative Analysis of Least Squares Method and Extended Kalman Filter for Position Estimation in GPS Receiver](#)” provides a comparative analysis of position estimation techniques in a GPS receiver by using the least squares (LS) method and extended Kalman filter method (EKF). Fair scheduling non-orthogonal random access for 5G networks is presented in Chapter “[Fair Scheduling Non-orthogonal Random Access for 5G Networks](#).” Chapter “[An Improved Carrier Frequency Offset Estimation Under Narrowband Interference in OFDM Cognitive Radio](#)” surveys various techniques to estimate carrier frequency offset (CFO) for OFDM cognitive radio.

This book has also included few interesting power-related chapters. Chapter “[Trends in Energy Management System for Smart Microgrid—An Overview](#)” reviews several energy management systems developed based on different strategic approaches available for microgrid on demand-side management. Chapter “[Discontinuous PWM Techniques to Eliminate Over-Charging Effects in Four-Level Five-Phase Induction Machine Drives](#)” presents equivalent circuit modeling of a Li-ion battery cell and its state of charge estimation using the Kalman filter algorithm in MATLAB Simulink. A Transition Based Odd/Full Invert (TBO/FI) coding scheme, which focuses on crosstalk avoidance and low dynamic power consumption in NoC links, is also discussed. Chapter “[Efficient Design of Drone Flight Control Using Delay Tolerant Algorithm](#)” presents a study to reduce the human error parameter in the probable causes for drone crashes.

Various social issues are also presented by authors with their technical solutions. In Chapter “[IRIS: An Application for the Visually Impaired Using Google Cloud API](#),” the authors present the design considerations of a cost-effective and efficient visual aid which proposes a smart stick (IRIS) to help the user in obstacle detection and navigation. Chapter “[Implementation of Hand Gesture Recognition System to Aid Deaf-Dumb People](#)” considers a time system for hand gesture recognition that acknowledges hand gestures and then converts them into text and voice. Statistical validity of pre-smoking and post-smoking impact on heart rate variability among middle-age men is presented in Chapter “[Statistical Validity of Presmoking and Postsmoking Impact on Heart Rate Variability Among Middle Age Men](#).” Chapter “[Analysis of Chronic Joint Pain Using Soft Computing Techniques](#)” analyzes the chronic joint pain remedies using soft computing techniques.

A critical evaluation of each submitted chapter by at least two expert reviewers was carried out. The authors re-submitted with all suggested alterations given by the expert panel. The book would definitely be of immense help to passionate researchers, students and industry persons.

Mumbai, India
Pune, India
Pune, India

S. N. Merchant
Debashis Adhikari
Krishna Warhade

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