

SUSTAINABLE COMPUTING AND OPTIMIZATION

# HANDBOOK OF INTELLIGENT COMPUTING AND OPTIMIZATION FOR SUSTAINABLE DEVELOPMENT

EDITED BY

MUKHDEEP SINGH MANSHAHIA  
VALERIY KHARCHENKO  
ELIAS MUNAPO  
J. JOSHUA THOMAS  
PANDIAN VASANT

 Scrivener  
Publishing

WILEY

This edition first published 2022 by John Wiley & Sons, Inc., 111 River Street, Hoboken, NJ 07030, USA and Scrivener Publishing LLC, 100 Cummings Center, Suite 541J, Beverly, MA 01915, USA

© 2022 Scrivener Publishing LLC

For more information about Scrivener publications please visit [www.scrivenerpublishing.com](http://www.scrivenerpublishing.com).

All rights reserved. No part of this publication may be reproduced, stored in a retrieval system, or transmitted, in any form or by any means, electronic, mechanical, photocopying, recording, or otherwise, except as permitted by law. Advice on how to obtain permission to reuse material from this title is available at <http://www.wiley.com/go/permissions>.

#### **Wiley Global Headquarters**

111 River Street, Hoboken, NJ 07030, USA

For details of our global editorial offices, customer services, and more information about Wiley products visit us at [www.wiley.com](http://www.wiley.com).

#### **Limit of Liability/Disclaimer of Warranty**

While the publisher and authors have used their best efforts in preparing this work, they make no representations or warranties with respect to the accuracy or completeness of the contents of this work and specifically disclaim all warranties, including without limitation any implied warranties of merchantability or fitness for a particular purpose. No warranty may be created or extended by sales representatives, written sales materials, or promotional statements for this work. The fact that an organization, website, or product is referred to in this work as a citation and/or potential source of further information does not mean that the publisher and authors endorse the information or services the organization, website, or product may provide or recommendations it may make. This work is sold with the understanding that the publisher is not engaged in rendering professional services. The advice and strategies contained herein may not be suitable for your situation. You should consult with a specialist where appropriate. Neither the publisher nor authors shall be liable for any loss of profit or any other commercial damages, including but not limited to special, incidental, consequential, or other damages. Further, readers should be aware that websites listed in this work may have changed or disappeared between when this work was written and when it is read.

#### ***Library of Congress Cataloging-in-Publication Data***

ISBN 978-1-119-79182-9

Cover images: Pixabay.Com

Cover design by Russell Richardson

Set in size of 11pt and Minion Pro by Manila Typesetting Company, Makati, Philippines

Printed in the USA

10 9 8 7 6 5 4 3 2 1

<b>36 Gender Classification Using Multispectral Imaging: A Comparative Performance Analysis Between Affine Hull and Wavelet Fusion</b>	<b>785</b>
<i>Narayan Vetrekar, Aparajita Naik and R. S. Gad</i>	
36.1 Introduction	785
36.2 Literature Review	787
36.2.1 Visible Spectrum	787
36.2.2 Cross-Spectral	790
36.2.3 Multispectral	791
36.3 Multispectral Face Database	791
36.4 Methodology	792
36.5 Experiments	794
36.6 Results and Discussion	794
36.6.1 Observation I—Based on Affine Hull Method	795
36.6.2 Observation II—Based on Wavelet Average Fusion	795
36.6.3 Observation III—Comparison of Affine Hull and Wavelet Average Fusion	796
36.7 Conclusions	796
Acknowledgments	797
References	797
<b>37 Polyp Detection Using Deep Neural Networks</b>	<b>801</b>
<i>Nancy Rani, Rupali Verma and Alka Jindal</i>	
37.1 Introduction	801
37.2 Literature Survey	803
37.3 Proposed Methodology	806
37.3.1 Dataset	807
37.3.2 Data Pre-Processing	807
37.3.3 Classification	807
37.3.3.1 Concept of Transfer Learning and Fine Tuning	808
37.3.3.2 VGG16 and VGG19 Model Architecture	808
37.3.4 Polyp Detection	810
37.4 Implementation and Results	810
37.5 Conclusion and Future Work	812
References	813



## Gender Classification Using Multispectral Imaging: A Comparative Performance Analysis Between Affine Hull and Wavelet Fusion

Narayan Vetrekar ✉ Aparajita Naik, R. S. Gad

Book Editor(s): Mukhdeep Singh Manshahia, Valeriy Kharchenko, Elias Munapo, J. Joshua Thomas, Pandian Vasant

First published: 11 February 2022 | <https://doi.org/10.1002/9781119792642.ch36>

 PDF  TOOLS  SHARE

### Summary

Gender classification which is a soft biometric trait has been shown significant attention in biometric literature especially using visible spectrum range. However, there is limited work focusing toward the near-infrared and multispectral imaging spectrum in this direction. Further, considering the potential of multispectral imaging for robust biometric performance, there is a need to understand the methods that can fully utilize the spectrum band information for performance analysis study between the Affine hull subspace learning method and wavelet average fusion method, from which we further learn the extracted features of Affine hull and wavelet fusion method independently using Support Vector Machine (SVM) classifier. To conduct this study, we have employed our multi-spectral facial database collected for 145 subjects in nine narrow spectrum bands amounting to 78,300 sample spectral band images. The extensive experimental results are carried out across six different illumination and using three different feature extraction methods for gender classification. To have a fair comparison, results are repeated for 10 different trials of random selection of the training and the testing samples for both the methods. The average classification obtained indicates the superiority of wavelet fusion method over Affine hull subspace learning method in successfully extracting the unique characteristic information from spectral bands for improved performance.