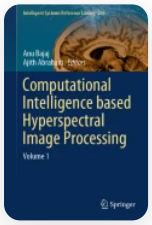
Enhancing Spatial-Spectral Analysis of Hyperspectral and Multispectral Satellite Imagery with Multilevel Thresholding and Multi-Otsu Segmentation

| Chapter | First Online: 26 March 2025

| pp 155–177 | Cite this chapter



Computational Intelligence based Hyperspectral Image Processing

Anindita Das Bhattacharjee, Srijita Sarkar & Snehil Dey

Part of the book series: Intelligent Systems Reference Library ((ISRL,volume 268))

Abstract

This study investigates the applicability of Multilevel Thresholding and Multi-Otsu segmentation algorithms in hyperspectral imaging with detailed analysis using Pines, Pavia University, Salinas, and Multispectral Landsat 8 OLI Imagery of the Saptamukhi region in Sundarbans, West Bengal. The results show that the Multi-Otsu and Multilevel

Thresholding algorithms encounter the highest Peak Signal-to-Noise Ratio (PSNR) values 74.82 and 74.16 respectively for the Indian Pines hyperspectral dataset. The lowest Mean-Squared Error (MSE) and Root Mean-Squared Error (RMSE) values 3.36 MSE and 1.83 RMSE for Multi-Otsu segmentation, 19.28 MSE and 4.40 RMSE for Multilevel Thresholding, are obtained for Pavia University data. To achieve accurate evaluation in the specified spectral context, optimal threshold values have been defined for each spectral band for both algorithms, which creates a balance between the accuracy matrices applied. This work aims to compare and contrast the effectiveness of these algorithms hyperspectral and multispectral data with a discussion of relevant optimization techniques.

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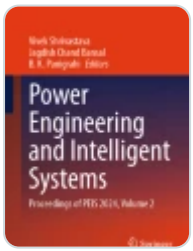

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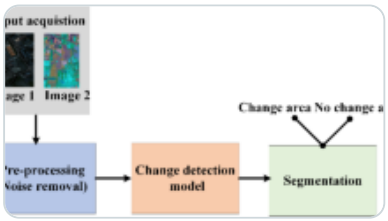

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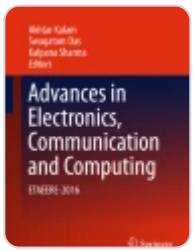

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Das Bhattacharjee, A., Sarkar, S., Dey, S. (2025). Enhancing Spatial-Spectral Analysis of Hyperspectral and Multispectral Satellite Imagery with Multilevel Thresholding and Multi-Otsu Segmentation. In: Bajaj, A., Abraham, A. (eds) Computational Intelligence based Hyperspectral Image Processing. Intelligent Systems Reference Library, vol 268. Springer, Cham. https://doi.org/10.1007/978-3-031-83123-2_6

.RIS .ENW .BIB

DOI
https://doi.org/10.1007/978-3-031-83123-2_6

Published
26 March 2025

Publisher Name
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Print ISBN
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Online ISBN
978-3-031-83123-2

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