



Machine and Deep Learning Methods for Texture Image Classification



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- Main research area: development of methods and techniques for texture classification (statistical, structural, model-based, transform-based) with main applications in remote sensing and precision agriculture









Al synergy Source: I Ilea; A Miclea; R. Terebes, Polarimetric Image Classification using Texture Features based on the Gray Level Co-occurrence Matrix and Local Binary Patterns, 2023 International Symposium on Signals, Circuits and Systems (ISSCS). doi: 10.1109/ISSCS58449.2023.10190953



Texture classification models (1/2)



GLCM and LBP-Based Descriptors", Applied Sciences 11, no. 5: 2332, DOI: 10.3390/app11052332, WOS:000627990600001



Texture classification models (2/2)



Plant species classification experiment

Operator	AlexNet-rel u3	MRELBP	OCCBM3D ELBP
Feature /ector size Feature	384	800	4800
extraction ime for all mages [s]	321	25962	109177
Average Accuracy	99.86±0.05	98.36±0.2	99.69±0.08
Precision Recall	99.86±0.07 99.69±0.21	98.23±0.34 97.38±0.4	99.69±0.09 99.42±0.2
F1 score	99.77	97.8	99.56



Features from shallower layers – relevant for texture classification Decision time for one image for AlexNet ~ 30 ms

Source: S. Barburiceanu, S. Meza, B. Orza, R. Malutan, and R. Terebes, "Convolutional Neural Networks for Texture Feature Extraction. Applications to Leaf Disease Classification in Precision Agriculture," IEEE Access, pp. 1–1, 2021, doi: 10.1109/ACCESS.2021.3131002



Hyperspectral image classification







Classification accuracy of the proposed method higher (93.85%) when compared to deep learning methods using disjoint samples (82.97%)



Source: Miclea, A., R.Terebes, S. Meza, and M. Cislariu. 2022. "On Spectral-Spatial Classification of Hyperspectral Images Using Image Denoising and Enhancement Techniques, Wavelet Transforms and Controlled Data Set Partitioning" Remote Sensing 14, no. 6: 1475. https://doi.org/10.3390/rs14061475





Open for **research collaborations** and **joint research proposals** on development of **texture image analysis and classification methods or systems** based on feature engineering or on Deep Learning models

