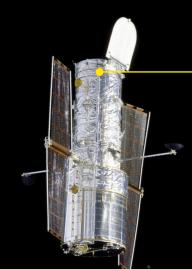
NATIONAL UNIVERSITY OF COMPUTER AND EMERGING SCIENCES PESHAWAR

HYPERSPECTRAL IMAGE DENOISING

ATTENTION AND ADJACENT FEATURES WITH HYBRID DENSE NETWORK

>ABSTRACT

The performance of high-level semantic tasks in hyperspectral images (HSIs) is often unsatisfactory due to the complexity of the imaging environment, corruption, and degeneration. These factors result in different types of noise in HSIs. Although natural image denoising methods have been successful, existing CNN-based HSIs denoising methods continue to face the challenge of inadequate noise suppression and insufficient feature extraction. Therefore, there is still significant room for improvement in this field. To address these challenges, a novel HSIs denoising algorithm based on Attention and Adjacent Features - Hybrid Dense Network (AAFHDN) has been proposed. This algorithm is capable of decomposing high-frequency features, preserving geometrical characteristics as structure prior, and extracting band correlation of the adjacent spatial and multiscale separable spectral features. The effectiveness of the proposed method has been evaluated through experiments on simulated and real-world noisy images. The results demonstrate that the AAFHDN algorithm outperforms existing traditional methods in both quantitative evaluations and visual effects. The improved denoising performance of the proposed method can benefit subsequent classification and target detection tasks in HSIs.



HYPERSPECTRAL

>OBJECTIVE

To invent a novel HSIs denoising network, that utilizes the features of spectral band correlation, and geometrical characteristics, and decomposes high-frequency features. To extract adjacent spatial and multiscale separable spectral features, suppress global frequency noise levels, and preserve real HSIs spatial-spectral information structure prior. To perform well-constructed results than other proposed HSIs methods. To relatively low runtime complexity, robust, flexible, and cost-effective network.

PRACTICAL APPLICATION

The utilization of the AAFHDN application in remote sensing and geoscience industrial settings serves the purpose of reducing noise from hyperspectral images while simultaneously maintaining the integrity of the well-established classification and target detection data.

>TECHNOLOGIES

IDE: Google Colaboratory, Visual Studio Code.

Framework: Pytorch, Django, NodeJS

API: Pytorch Lightning, Tensorflow, Keras, Scikit-Learn, Numpy, Matplotlib, Scipy, Pandas.

\SYSTEM DESIGN

01

HYPERSPECTRAL IMAGE

 Data Preprocessing for Simulated and Real Experiments



I RA

TRAIN AND TEST MODULE

 Noise and Clean splitted data of Spatial-Spectral.



04

GEOMETRICAL CHARACTERISTICS

Multiscale Separable Features Extraction



17

SPECTRAL BANDS CORRELATION

 Noisy and K-Adjacent Bands Image



05

DECOMPOSE FREQUENCY (HIGH AND LOW)

 Attention Modules and Denoiser Network



NOISE IMAGE FEATURES

Noise Bands
Features Collection
and Substitution



08

SIMULATED AND REAL RESULTS EVALUATION

 Quantitative and Qualitative Evaluation



07

CLASSIFICATION AND TARGET DETECTION

Efficient Denoise
Results Predictions

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