INRAM-3DCNN: Multi-Scale Convolutional Neural Network Based on Residual and Attention Module Combined with Multilayer Perceptron for Hyperspectral Image Classification

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Abstract : In recent years, due to the continuous improvement of deep learning theory, Convolutional Neural Network (CNN) has played a great superior performance in the research of Hyperspectral Image (HSI) classification. Since HSI has rich spatial-spectral information, only utilizing a single dimensional or single size convolutional kernel will limit the detailed feature information received by CNN, which limits the classification accuracy of HSI. In this paper, we design a multi-scale CNN with MLP based on residual and attention modules (INRAM-3DCNN) for the HSI classification task. We propose to use multiple 3D convolutional kernels to extract the packet feature information and fully learn the spatial-spectral features of HSI while designing residual 3D convolutional branches to avoid the decline of classification accuracy due to network degradation. Secondly, we also design the 2D Inception module with a joint channel attention mechanism to quickly extract key spatial feature information at different scales of HSI and reduce the complexity of the 3D model. Due to the high parallel processing capability and nonlinear global action of the Multilayer Perceptron (MLP), we use it in combination with the previous CNN structure for the final classification process. The experimental results on two HSI datasets show that the proposed INRAM-3DCNN method has superior classification performance and can perform the classification task excellently.

Keywords : INRAM-3DCNN, residual, channel attention, hyperspectral image classification

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