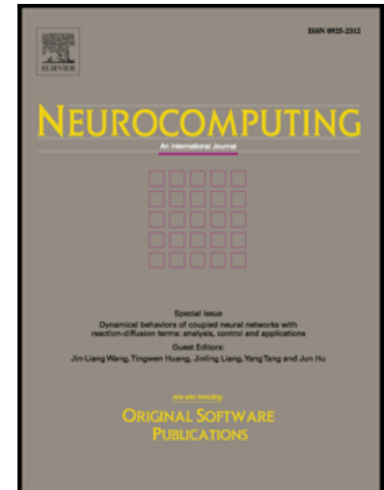


Accepted Manuscript

Multi-scale Hierarchical Recurrent Neural Networks for Hyperspectral Image Classification

Cheng Shi , Chi-Man Pun

PII: S0925-2312(18)30298-4
DOI: [10.1016/j.neucom.2018.03.012](https://doi.org/10.1016/j.neucom.2018.03.012)
Reference: NEUCOM 19414



To appear in: *Neurocomputing*

Received date: 1 August 2017
Revised date: 4 November 2017
Accepted date: 5 March 2018

Please cite this article as: Cheng Shi , Chi-Man Pun , Multi-scale Hierarchical Recurrent Neural Networks for Hyperspectral Image Classification, *Neurocomputing* (2018), doi: [10.1016/j.neucom.2018.03.012](https://doi.org/10.1016/j.neucom.2018.03.012)

This is a PDF file of an unedited manuscript that has been accepted for publication. As a service to our customers we are providing this early version of the manuscript. The manuscript will undergo copyediting, typesetting, and review of the resulting proof before it is published in its final form. Please note that during the production process errors may be discovered which could affect the content, and all legal disclaimers that apply to the journal pertain.

Multi-scale Hierarchical Recurrent Neural Networks for Hyperspectral Image Classification

Cheng Shi and Chi-Man Pun

Department of Computer and Information Sciences

University of Macau, Macau, China

e-mail: cmpun@umac.mo

Abstract

This paper presents a novel hyperspectral image (HSI) classification framework by exploiting multi-scale spectral-spatial features via hierarchical recurrent neural networks. The neighborhood information plays an important role in the image classification process. Convolutional neural networks (CNNs) have been shown to be effective in learning the local features of HSI. However, CNNs do not consider the spatial dependency of non-adjacent image patches. Recurrent neural networks (RNNs) can effectively establish the relationship of non-adjacent image patches, but it can only be applied to single-dimensional (1D) sequence. In this paper, we propose multi-scale hierarchical recurrent neural networks (MHRNNs) to learn the spatial dependency of non-adjacent image patches in the two-dimension (2D) spatial domain. First, to better represent the objects with different scales, we generate multi-scale 3D image patches of central pixel and surrounding pixels. Then, 3D CNNs extract the local spectral-spatial feature from each 3D image patch, respectively. Finally, multi-scale 1D sequences in eight directions are constructed on the 3D local feature domain, and MHRNNs are proposed to capture the spatial dependency of local spectral-spatial features at different scales. The proposed method not only considers the local spectral-spatial features of the HSI, but also captures the spatial dependency of non-adjacent image patches at different scales. Experiments are performed on three real HSI datasets. The results demonstrate the superiority of the proposed method over several state-of-the-art methods in both visual appearance and classification accuracy.

Keywords: Hyperspectral image classification, recurrent neural networks, multi-scale

Download English Version:

<https://daneshyari.com/en/article/6864055>

Download Persian Version:

<https://daneshyari.com/article/6864055>

[Daneshyari.com](https://daneshyari.com)