Multi-Scanning Based Recurrent Neural Network for Hyperspectral Image Classification

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Motivation-1

In the HSI, the pixels in a local patch may have significant appearance variations, and this will affect the final classification accuracy by CNN-based methods.



Idea-1

Instead of using CNN-based methods, we want to introduce RNN for learning the spatial-spectral feature of the HSI.



Motivation-2

The situation of unbalanced and limited labeled pixels in the HSI is severe.



Idea-2

Inspired by data augmentation, we want to augment the cropped patches for those limited label pixels before being fed into neural networks.



Proposed method

Multi-scanning strategy: In order to feed a local patch into RNN, we must transfer the patch into the sequence. But there's no fixed scanning direction exists. Take 3*3 patch as an example. Start from first pixel.



In 16 directions, each of them is paired with another one. Forward and backforward direction sequences are better to construct a bidirectional-RNN



1-direction: 91.839% 4-directions: 92.531% 8-directions: 93.106% 16-directions: 93.989% 3D-CNN: 90.488%

1. My method can fully explore the spatial and spectral information together to discriminate each pixel.

- 2. The results by my method become more accurate and smoother in the flat region.
- 3. The boundary or outlines of regions are clearer.
- 4. We hope it is a viable alternative for using CNN-based method in this task.

Thank you