

LSGI Distinguished Lecture Series

Advanced machine learning methods for per-pixel remote sensing image classification



*by Prof. Peijun Du,
Nanjing University,
China*

Date : 26 October (Monday), 2015
Time : 3:30 PM
Venue : ZN604

Abstract

Land cover classification is one of the most important tasks of remote sensing image processing and applications. Many classifiers have been designed and adopted in different case studies, but it is commonly agreed that there is not an optimal classifier from both theoretical and practical aspects. In this talk, we intend to give a systematic review to the applications of advanced machine learning methods to per-pixel land cover classification from three aspects: uses of novel classifiers, combination of multiple features, and uses of multiple classifier systems, which are actually the hot topics of recent studies, evidenced by a lot of publications.

The classifiers for land cover classification from remote sensing images are always closely linked with the advances of pattern recognition and machine learning, from maximum likelihood classifier, decision tree, artificial neural network, support vector machine to artificial immune system. The past years evidenced the systematic uses of support vector machine to land cover classification. Some major issues of support vector machine for land cover classification are reviewed firstly. Furthermore, another advanced tool, extreme learning machine (ELM), has been applied to remote sensing image classification recently, so a further review is conducted. Based on the reviews, we summarize some kernel ideas of introducing a novel pattern recognition and machine learning methods to land cover classification.

In parallel with novel classifiers, another very important trend is the use of multiple features for land cover classification to compensate the limitations of spectral features. In addition to original spectral data, some spectral indices and features can be derived and used, for example, vegetation index, principal components, K-T transform components, and other indices related to impervious surface, water and built-up land. Spatial features extracted from original images, for example, textural metrics by GLCM and wavelet transform, morphological profiles (MPs), and markov random field, can be combined with spectral features, leading to spatial-spectral classification. Besides, polarimetric features derived from PolSAR images are also effective to enhance the performance of optical image classification. Furthermore, temporal features are also helpful to improve the discrimination ability of land cover types, for example, vegetation types.

Considering there is not a best classifier for different uses, even for a single image different classifiers have different performances on different classes, it is important to combine the advantages of multiple classifiers. Finally, we give a summary on the uses of multiple classifier systems to land cover classification, from both parallel and sequential classifier combination aspects. Specially, some modern decision forest methods, including Random Forest and Rotation Forest, are introduced to land cover classification, and their uses and merits are evaluated based on some case studies.

This paper intends to review some hot topics of per-pixel classification from three aspects, rather than covering all issues related to land cover classification. More reviews on other branches are also expected in the near future.

Biography

Peijun Du is a Professor of Remote Sensing at the Department of Geographic Information Sciences, Nanjing University, and the deputy director of the Key Laboratory for Satellite Mapping Technology and Applications of National Administration of Surveying, Mapping and Geoinformation (NASG), China. After receiving his Ph.D. degree from China University of Mining and Technology in 2001, he had been employed by the same university until he joined Nanjing University in 2011. He was a postdoctoral fellow at Shanghai JiaoTong University from February 2002 to March 2004, and was a senior visiting scholar at the University of Nottingham and the GIPSA-Lab, Grenoble Institute of Technology, France.

All interested are welcome

Please visit <https://myacs.polyu.edu.hk/utis/mysurvey/index.php/427211/lang-en> to fill in the registration form. All registered attendees will receive a Certificate of Attendance after the lecture.

