

Chapter 11

Effectivity of Prediction Enhancement of Land Cover Classification for Remote Sensing Images Using Automatic Feature Learning Model

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ABSTRACT

The proposed approach presents a cost-effective and environmentally friendly solution for classifying land use in urban areas. It relies on optical aerial imagery and decision trees generated from unmanned aircraft systems (UAS) to extract land cover information. The extracted data is then combined with a possession parcel map to establish a connection between land use and cover. The decision tree algorithm takes into account the geometric characteristics of parcels to create a prepared land use parcel map. This approach is versatile and can be applied to different scales of aerial imagery, making it well-suited for city planning and landscape monitoring applications. The technique employs object-oriented image analysis, and the analytic hierarchy process is used to determine the optimal scale for segmenting and classifying images. Image segmentation on various scales is utilized to identify the main land.

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INTRODUCTION

With the advancement of high-resolution remote sensors and computing technology, remote sensing has undergone a significant transformation in its practices and applications (Asner et al. 2010). The availability of remote sensing with high-resolution images has enabled the acquisition of detailed information about the Earth's surface (Abdelhaleem et al., 2020). Aerial images provide the means to meticulously measure the Earth's surface features, representing a highly significant data source for the field of Earth observation. In particular, machine learning techniques are increasingly being used for automated land cover classification on aerial images, with a focus on forest environment photo classification (Abdelhaleem et al. 2021). The paper presents a comprehensive review of current forest photo classification methods, with a particular emphasis on machine learning classifiers and deep learning techniques (Stemmler, 2019).

An image's resolution denotes the level of potential detail present within the visual data. Within the field of remote sensing, we recognize three distinct types of resolution: spatial, spectral, and temporal (Ahmed et al. 2014). The spatial resolution specifically relates to the minimum size of a discernible element that a satellite sensor can identify, or that can be visualized within a satellite image (Ali et al., 2014). The imagery of this caliber, characterized by its exceptional level of detail, is commonly categorized and applied for the intentions of intelligence gathering, surveillance, and reconnaissance (Ashour et al. 2021).

Remote sensing supplants the laborious and expensive process of gathering data on-site, offering swift and repetitive coverage across vast expanses for various day-to-day applications (Regin et al., 2023a). These applications span from weather predictions to assessments of natural calamities or shifts in climate conditions (Angeline et al., 2023). Remote sensing furnishes intricate geographical data. Within the realm of remote sensing image analysis, images captured by satellites and drones are employed for Earth's surface observation (Rajest et al., 2023a). Attributing semantic labels to the acquired images is the primary goal of any image classification-based system, as it allows for their arrangement in a semantic sequence (Rajest et al., 2023b). Remote sensing, picture retrieval, object recognition, scene analysis, content-based image analysis, video analysis, and many more areas of computer vision and digital image processing benefit from this meaningful sequence of images (Regin et al. 2023b). Land cover data can be accurately retrieved using remote sensing, however there may be issues with the data's adequacy (Bose et al., 2023).

Feature extraction and representation at lower and medium levels was the main focus of early approaches to remote sensing image analysis (Regin et al., 2023c). By utilising various combinations of characteristics and machine learning algorithms, these systems have demonstrated impressive performance (Diwedar et al. 2019). Initially, these methods frequently made use of image datasets that were on a smaller scale. There has been a recent shift towards using deep learning models for remote sensing picture analysis (Murugavel & Hernandez, 2023). Using a combination of deep learning techniques has shown far better results than using just one deep learning model (Sajini et al., 2023).

The land-cover data for the years 2006 and 2011 were derived from a combination of land-use vector mapping, SPOT5 satellite imagery, and various high-resolution remote sensing sources. The outcomes reveal significant and progressively rapid alterations in land cover (Chen et al. 2014). The primary focus is to aid decision-makers and stakeholders by offering them the most pertinent and valuable information. Simultaneously, there is an anticipation that this effort will result in the creation of a necessary database with potential utility at the local, national, and global levels (BFD, 2007).

Utilizing a systematic sampling approach, the inventory was executed by measuring specific plots that were spread throughout the entire country (Obaid et al., 2023). Leveraging both existing data and

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