**Time Series Application Analysis**

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**Date Submitted:**

April 24 2024

**Research Title:** Analysis of Land Use and Land Cover Change Using Time-Series Data and Random Forest in North Korea

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**Date of Publication:** September 3, 2021

**Title of Publication:** *Remote Sens.* 2021, *13*(17), 3501; <https://doi.org/10.3390/rs13173501>

**Problem**

* The problem being discussed in the paper is the lack of studies that focus on land use and land cover (LULC) changes in North Korea. North Korea is one of the most degraded forests in the world. The primary reason for this is the conversion of mountainous areas into croplands. The authors of the paper highlights the importance of LULC dynamics in order to have sustainable land management, resource allocation, and policy development.

**Motivation**

* The motivation for writing the paper is to analyze LULC changes in North Korea using time-series data and Random Forest algorithm in order to identify patterns, drivers, and implications of LULC changes. This is important in order to gain knowledge to make informed decisions, conservation efforts, and sustainable development.

**Solution**

* The solution provided by the researchers is to leverage time-series data from satellite imagery and to apply the Random Forest algorithm to predict LULC changes in North Korea. The combination of remote sensing technology and machine learning techniques, the researchers offered a method that analyzes complex spatial data and identifies trends in land use.

**Methodology**

* The methodology proposed in the study is divided into 6 parts: data collection, preprocessing, LULC classification using machine learning algorithm, accuracy assessment, temporal analysis of LULC changes, and interpretation of results. The data collection includes the use of multi-temporal and multi-spectral images to classify forest areas. The preprocessing step includes sorting satellite images from April to July. The selected images obtained are high-resolution images that are also used to reclassify all LULC products into 5 types: built-up, cropland, forest, grassland, and water bodies. For classification, Random Forest algorithm was used; it can handle variables with different characteristics, its insensitivity to noise, and rapid analysis. For change detection, LULC classification results were analyzed using ArcGIS. In order to test the accuracy, a confusion matrix was used to get the overall accuracy, user’s accuracy, producer’s accuracy, and kappa coefficient.

**Result**

* The results of the study demonstrated that the Random Forest algorithm is efficient in classifying LULC types and predicting change over the study period. The analysis revealed that there are trends such as urbanization, deforestation, and agricultural expansion which provides information in the evolving landscape of North Korea. Overall, the study contributes to the better understanding of the drivers and consequences of LULC changes in the regions of North Korea.

**Recommendations**

* Some improvements that can be made is to have a longer study period in order to capture more extensive LULC changes and enable the analysis of long-term trends and patterns. Another one is comparison with other regions to identify common trends and drivers. Last is the expansion of data sources such as surveys, aerial photographs, and other remote sensing technologies in order to further increase the accuracy of LULC classification.

**Reference**

Piao, Y., Jeong, S., Park, S., & Lee, D. (2021b). Analysis of land use and land cover change using Time-Series data and Random Forest in North Korea. *Remote Sensing*, *13*(17), 3501. <https://doi.org/10.3390/rs13173501>