MAPPING PEATLAND BASED ON RANDOM FOREST METHOD

Bachelor's thesis

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Specialty: 106 Geography
Educational program: Cartography, Geinformatics and Cadastre

ABSTRACT

The relevance of the research lies in peatlands, as a unique ecosystem on Earth, cover an area of over 4 million square kilometers and hold significant environmental and ecologi0cal value. However, due to climate change and anthropogenic disturbances, peatlands are undergoing continuous degradation, posing challenges to their sustained contribution to global aquatic ecosystems. Mapping peatlands serves as the foundation for understanding and conserving this ecosystem, as well as for the sustainable utilization of peat resources. Yet, traditional mapping methods face challenges such as low accuracy at large scales, difficulty in handling complex multi-feature data with traditional remote sensing techniques, and the high spatiotemporal heterogeneity of large-scale peatland ecological conditions, making ground surveys costly and real-time updates of peatland distribution difficult. Furthermore, quantitatively describing peatland changes remains challenging. With the advancement of remote sensing technology, the importance of peatland mapping is increasingly evident. Both domestic and international research on peatland mapping focus on exploring the application of high-resolution remote sensing imagery and machine learning algorithms.

The object of the research is the peatland mapping and **the subject is the study of** the mapping peatland based on random forest method.

This study focuses on the administrative areas of Lower Oulunkaari and Koillismaa in Central Northern Ostrobothnia, Finland. **The purpose of** the research is by combining machine learning methods to explore the optimal method

of extracting remote sensing information for peatlands to improve the accuracy of peatland mapping.

Utilizing Sentinel-1 multi-polarization radar imagery and Sentinel-2 multispectral remote sensing imagery, a multi-source remote sensing image dataset was constructed on the GEE platform to identify the optimal feature variables for peatland mapping. Subsequently, a high-resolution peatland extraction model based on the Random Forest algorithm was developed and compared with a traditional remote sensing image classification model using the Maximum Likelihood method. Finally, the spatiotemporal changes of peatlands in the study area were analyzed based on the identified optimal feature set.

The key tasks addressed in this study are as follows:

1) Selecting appropriate parameters for the Random Forest algorithm can improve its accuracy and avoid redundant computational data, thereby preventing a decrease in model performance.

2) The spatiotemporal heterogeneity of peatlands and the quantity of features are the primary factors influencing the importance assessment of peatland features. The combination of optical, texture, and radar features provides more informative data, thereby enhancing the resolution and accuracy of maps.

3) Analyzing the key reasons for peatland classification mapping based on the optimal feature set can improve mapping accuracy and reduce generalization.

Structure of the work. The qualification work consists of introduction, three chapters and conclusions. The reference list includes 72 positions.The thesis is laid out on 48 pages. Contains 13 figures and 3 tables.