Paper Title: Neural-Based Hierarchical Approach for Detailed Dominant Forest Species Classification by Multispectral Satellite Imagery

Paper Link: https://ieeexplore.ieee.org/stamp/stamp.jsp?arnumber=9311828

Problem:

Mapping dominant forest species accurately is essential for management and conservation, but conventional surveys are expensive and time-consuming.

Solution:

In comparison to conventional techniques, this study presents a unique neural-based hierarchical strategy that improves the accuracy of dominant forest species classification using satellite data and deep learning.

Summary:

A novel neural-based hierarchical technique for properly detecting dominant forest species from multispectral satellite images is presented in this paper. Traditional forest composition field surveys are time-consuming and costly, emphasising the need for automated and efficient alternatives. This study addresses this issue by combining satellite data and deep learning methods.

Key Contributions:

- Hierarchical model: Decomposes multiclass classification into a series of binary tasks, leveraging semantic connections and reducing complexity.

- Height data integration: Improves accuracy by accounting for age-related variations within species.

- Superior performance: Outperforms multiclass and "one-versus-all" methods, especially for minority species and mixed stands.

Methodology:

- Labeled dataset:Developed for four dominant species in Russia using WorldView and Sentinel-2 imagery.

- Neural network architecture: Optimized for each hierarchical task.

- Height data: Incorporated as an additional input channel.

- Evaluation: F1-score and confusion matrices compared across methods.

Results:

All dominant species, including minority classes, have significantly superior accuracy.
There is the potential for larger application in forest inventory and monitoring.

Limitations and Future Work:

Focus on a single species and location; modification for widespread use is required.Enhance training data and investigate transfer learning.Extend the technique to estimate more forest inventory characteristics.

Conclusion:

This study demonstrates the efficacy of a hierarchical approach for precise and efficient forest species classification using satellite imagery, thereby helping to long-term management and conservation efforts.