Can deep learning help us save mangrove forests?

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Mangrove ecosystems of Qeshm Island in the Persian Gulf, Iran. Credit: Neda Bihamta Toosi

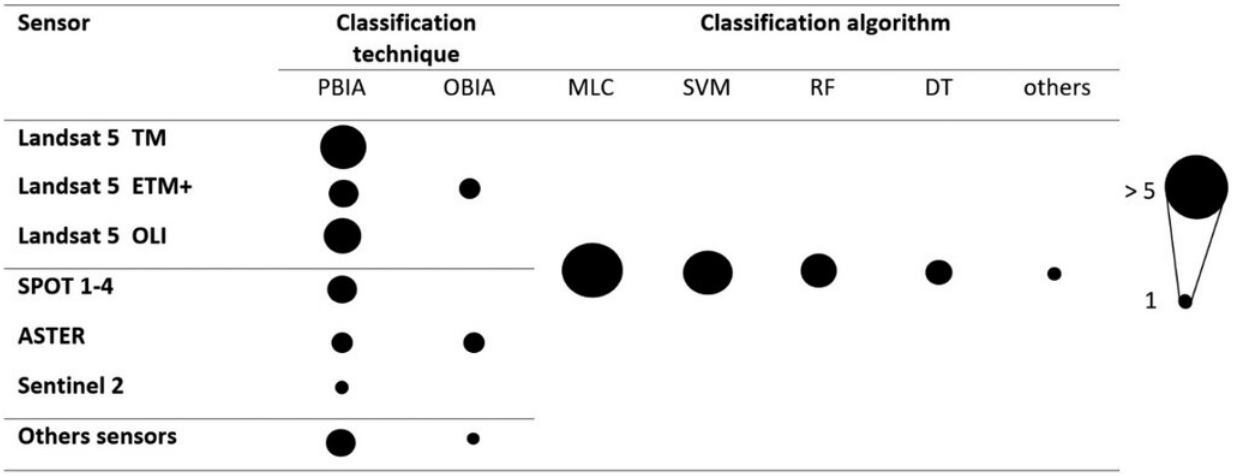
Mangrove forests are an essential component of the coastal zones in tropical and subtropical areas, providing a wide range of goods and ecosystem services that play a vital role in ecology. They are also threatened, disappearing, and degraded across the globe.

One way to stimulate effective mangrove conservation and encourage policies for their protection is to carefully assess mangrove habitats and how they change, and identify fragmented areas. But obtaining this kind of information is not always an easy task.

"Since mangrove forests are located in tidal zones and marshy areas, they are hardly accessible," says Dr. Neda Bihamta Toosi, postdoc at Isfahan University of Technology in Iran working on landscape pattern changes using remote sensing. In a recent study in the journal *Nature Conservation*, together with a team of authors, she explored ways to classify these fragile ecosystems using machine learning.

Comparing the performance of different combinations of satellite images and classification techniques, the researchers looked at how good each method was at mapping mangrove ecosystems.

"We developed a novel method with a focus on landscape ecology for mapping the spatial disturbance of mangrove ecosystems," she explains. "The provided disturbance maps facilitate future management and planning activities for mangrove ecosystems in an efficient way, thus supporting the sustainable conservation of these coastal areas."



PBIA: Pixel-based image analysis; OBIA: Object-based image analysis; MLC: Maximum likelihood classification; SVM: Support Vector Machine; RF: Random Forest; DT: Decision Tree; X: Number of articles. Credit: *Nature Conservation* (2023). DOI: 10.3897/natureconservation.52.89639

The results of the study showed that object-oriented classification of fused Sentinel images can significantly improve the accuracy of mangrove land use/land cover classification.

"Assessing and monitoring the condition of such ecosystems using model-based landscape metrics and principal component analysis techniques is a time- and cost-effective approach. The use of multispectral remote sensing data to generate a detailed land cover map was essential, and freely available Sentinel-2 data will guarantee its continuity in future," explains Dr. Bihamta Toosi.

The research team hopes this approach can be used to provide information on the trend of changes in land cover that affect the development and management of mangrove ecosystems, supporting

better planning and decision-making.

"Our results on the mapping of mangrove ecosystems can contribute to the improvement of management and conservation strategies for these ecosystems impacted by human activities," they write in their study.

More information: Ali Reza Soffianian et al, Evaluating resampled and fused Sentinel-2 data and machine-learning algorithms for mangrove mapping in the northern coast of Qeshm island, Iran, *Nature Conservation* (2023). DOI: 10.3897/natureconservation.52.89639

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