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AutoCoast: A Web-Based Coastal Monitoring Platform

Coastal regions are among the most densely populated and economically important areas in the world, yet they are highly vulnerable to environmental changes and human activities. Shoreline erosion, land use transformation, and rising sea levels pose serious risks to infrastructure, ecosystems, and livelihoods. Monitoring these dynamic landscapes over time is crucial to support effective coastal planning and resilience strategies.
We introduce AutoCoast, a web-based monitoring platform that leverages satellite imagery and modern machine learning techniques to analyze and visualize coastal change from 2015 to 2024. The platform currently focuses on the Baltic Sea region, with the North Sea to follow soon.
At the core of AutoCoast is a custom-developed labeling tool designed to efficiently annotate satellite imagery. By applying active learning, we minimized manual labeling while maximizing dataset quality, resulting in a benchmark dataset based on Sentinel-2 imagery. The dataset includes coastline-specific classes such as sandy beaches, tidal flats, marshlands, cliffs, and anthropogenic structures like dykes and piers. A segmentation model trained on this data enables the identification and classification of coastal ground types.
To improve shoreline accuracy and account for temporal variability, we apply algorithmic corrections such as tidal normalization. Furthermore, we integrate Sentinel-1 radar imagery to better detect elevation-dependent coastal changes, such as cliff erosion, and to complement optical observations in cases of cloud cover or subtle vertical features.
Through an intuitive interface, AutoCoast allows users to define custom coastline representations and explore spatial and temporal patterns of erosion, accretion, and land cover change. The platform provides valuable insights for researchers, planners, and policymakers concerned with long-term coastal dynamics and adaptation.
AutoCoast demonstrates how active learning, efficient labeling, and interactive visualization can be combined into an accessible, scalable tool for coastal monitoring.

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