Doctoral Thesis Title: Application of deep learning techniques for the analysis and monitoring of coastal environments.

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Abstract: This thesis will focus on the extraction and analysis of coastline evolution from satellite images, with the aim of developing a methodology capable of detecting, quantifying, and representing the morphological changes that occur on the coastline over time. The coastline is a dynamic indicator that is sensitive to multiple natural and anthropogenic factors, such as wave action, tides, currents, sedimentary inputs, and coastal urbanization. Therefore, its analysis is essential for understanding erosion and accretion processes, assessing the risks associated with coastal retreat, and supporting sustainable coastal zone planning.

To this end, different digital raster image processing techniques and deep learning models will be used to automate the detection of the coastline in different environmental and temporal conditions. Different convolutional neural network architectures will be evaluated to accurately segment land and water areas, reducing the influence of factors such as clouds, shadows, or variations in lighting. In this regard, a second line of work will be dedicated to developing an automated cloud detection system to improve image quality and optimize coastal analysis processes. Finally, satellite image super-resolution techniques will be explored using deep learning models in order to increase spatial resolution and obtain more detailed representations of the coastal environment. The aim is to establish a comprehensive and reproducible methodology that contributes to the study, monitoring, and sustainable management of coastal areas.

References:
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