ShoreSafe: An AI-Based Coastal Erosion Prediction Application

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Coastal erosion poses a significant threat to Louisiana's ecosystems, infrastructure, and communities, with land loss occurring at one of the highest rates in the United States. This study investigated whether a machine learning model could improve the prediction of coastal erosion risk compared to traditional methods based on historical averages, while also making that information more accessible to the public. Coastal Louisiana was divided into uniform grid cells, and historical erosion rates were calculated from shoreline position changes over time. Environmental variables, including elevation, storm exposure, land cover, and shoreline geometry, were integrated to create an environmental feature profile for each location. A machine learning model was trained to identify relationships between these factors and erosion risk and was evaluated against a baseline model using historical averages. The machine learning model demonstrated improved predictive performance, particularly in identifying higher-risk areas and showing stronger alignment with observed erosion patterns. These predictions were then deployed in an interactive app named ShoreSafe that allows users to explore localized erosion risk through a map interface or ZIP code search. The results indicate that machine learning can enhance coastal erosion prediction while also making complex environmental risk information more understandable and useful for communities and decision-makers.

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