



Short Summary:

In response to the escalating challenges facing Biscayne Bay's water quality, a project has been initiated to develop a pioneering machine learning model for precise forecasting and management. The project aims to collect and preprocess comprehensive water quality data, explore various machine learning models for accurate predictions, and ultimately develop a recommendation system for targeted interventions. By achieving these objectives, stakeholders will gain actionable insights to support informed decision-making and proactive management, safeguarding the ecological integrity and sustainability of Biscayne Bay's vital ecosystem.

Long Summary:

The degradation of water quality in Biscayne Bay has become an urgent concern, exacerbated by the rapid pace of urbanization, agricultural activities, and the looming impacts of climate change. These factors collectively pose significant risks to the delicate balance of marine life and the well-being of local communities reliant on the bay's resources.

Recognizing the gravity of these challenges, our project endeavors to pioneer a comprehensive approach to address the complex dynamics of water quality in Biscayne Bay. Our primary objective is to develop and implement a robust predictive framework capable of accurately forecasting key water quality parameters, including chlorophyll levels, dissolved oxygen concentrations, and nutrient levels. By harnessing the power of advanced machine learning models such as Autoregressive Integrated Moving Average (ARIMA), Seasonal Exponential Smoothing (SES), and Long Short-Term Memory (LSTM) networks, in conjunction with traditional time series analysis techniques, we aim to gain deeper insights into the intricate patterns governing water quality fluctuations.

Yet, our ambition extends beyond mere prediction; we aspire to empower strategic environmental management through the deployment of a sophisticated recommendation system. By leveraging the wealth of insights garnered from our predictive framework, this system will categorize distinct areas of the bay into clusters based on predefined water quality standards. Armed with this nuanced understanding, stakeholders will be equipped with targeted recommendations tailored to specific clusters, facilitating informed decision-making aimed at enhancing ecological resilience and safeguarding the long-term sustainability of Biscayne Bay's invaluable resources.

In essence, our project represents a proactive and forward-thinking approach to tackle the multifaceted challenges facing Biscayne Bay. By fusing cutting-edge technology with a steadfast commitment to environmental stewardship, we endeavor to pave the way towards a future where the bay thrives as a vibrant ecosystem, resilient to the pressures of urbanization and climate change, while continuing to enrich the lives of all who depend on its bounty.