Perbandingan Metode Proyeksi Kenaikan Muka Air Laut Berbasis *Autoregressive Integrated Moving Average* & *Long Short-Term Memory*. Studi Kasus (Pesisir Utara Banten)

SKRIPSI

Diajukan untuk memenuhi sebagian syarat untuk memperoleh gelar Sarjana Sistem Informasi Kelautan

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PROGRAM STUDI SISTEM INFORMASI KELAUTAN

UNIVERSITAS PENDIDIKAN INDONESIA

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Sebuah skripsi yang diajukan untuk memenuhi salah satu syarat memperoleh gelar Sarjana Sains pada Program Studi Sistem Informasi Kelautan

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Telah berhasil dipertahankan di hadapan Dewan Penguji dan diterima sebagai bagian persyaratan yang diperlukan untuk memperoleh gelar Sarjana Sistem Informasi Kelautan pada Program Studi Sistem Informasi Kelautan Universitas Pendidikan Indonesia

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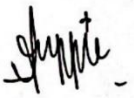
Penguji III	: Luthfi Anzani, S.Pd., M.Si.	ttd	

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ABSTRAK

Muhammad Fikry Akbar, Program Studi Sistem Informasi Kelautan, Judul Skripsi "Perbandingan Metode Proyeksi Kenaikan Muka Air Laut Berbasis Autoregressive Integrated Moving Average & Long Short-Term Memory. Studi Kasus (Pesisir Utara Banten)"

Kenaikan permukaan air laut merupakan salah satu dampak signifikan dari perubahan iklim yang dapat berdampak luas terhadap ekosistem pesisir dan populasi manusia. Dalam konteks ini, penelitian ini bertujuan untuk memprediksi kenaikan muka air laut di Pesisir Utara Banten menggunakan Metode ARIMA (Autoregressive Integrated Moving Average) dan LSTM (Long Short-Term Memory) digunakan untuk melakukan prediksi berdasarkan data historis kenaikan muka air laut dari tahun 2015 hingga 2018. Pendekatan analisis dimulai dengan analisis statistik deskriptif untuk memahami karakteristik data dan uji Augmented Dickey-Fuller untuk memeriksa stasioneritas data. Hasil analisis menunjukkan bahwa data memiliki variasi tinggi dan trend tertentu. Oleh karena itu, penggunaan metode ARIMA dan LSTM yang sensitif terhadap pola waktu dianggap relevan. Hasil penelitian mengungkapkan bahwa model LSTM memberikan performa yang jauh lebih baik daripada model ARIMA dalam memprediksi kenaikan muka air laut. Evaluasi dilakukan menggunakan berbagai metrik kesalahan prediksi, seperti Root Mean Squared Error (RMSE), Mean Absolute Percentage Error (MAPE), Symmetric Mean Absolute Percentage Error (SMAPE), dan Mean Squared Logarithmic Error (MSLE). Model LSTM secara konsisten menghasilkan nilai kesalahan yang lebih rendah, menunjukkan prediksi yang lebih akurat dibandingkan model ARIMA. Melalui penggunaan model LSTM, dapat diperoleh prediksi kenaikan muka air laut di Pesisir Utara Banten untuk periode tujuh hari ke depan. Hasil prediksi tersebut disajikan dalam bentuk data normalisasi dan denormalisasi. Model ini mampu menghasilkan prediksi yang mendekati nilai aktual dengan tingkat akurasi yang tinggi. Hasil penelitian ini memiliki implikasi penting dalam pemodelan fenomena kenaikan muka air laut dan dampaknya terhadap perubahan iklim. Model LSTM yang lebih kompleks dan adaptif terbukti lebih efektif dalam menghadapi tantangan prediksi pada data time series yang kompleks seperti kenaikan muka air laut. Meskipun demikian, perlu diingat bahwa hasil ini harus diinterpretasikan dengan konteks dan keterbatasan model yang digunakan.

Kata kunci: ARIMA, Kenaikan Muka Air Laut, Long Short-Term Memory, Pesisir Utara Banten, Proyeksi

ABSTRACT

Muhammad Fikry Akbar, Marine Information System, "Comparison of Sea Level Rise Projection Methods Based on Autoregressive Integrated Moving Average & Long Short-Term Memory. Case Study (Northern Coast of Banten)".

The rise in sea level is one of the significant impacts of climate change that can have broad effects on coastal ecosystems and human populations. In this context, this study aims to predict sea level rise on the North Coast of Banten using Autoregressive Integrated Moving Average (ARIMA) and Long Short-Term Memory (LSTM) methods to make predictions based on historical sea level rise data from 2015 to 2018. The analytical approach begins with descriptive statistical analysis to understand data characteristics and Augmented Dickey-Fuller tests to examine data stationarity. The analysis results reveal that the data exhibit high variability and specific trends. Therefore, the use of ARIMA and LSTM methods, which are sensitive to time patterns, is considered relevant. The research findings unveil that the LSTM model outperforms the ARIMA model significantly in predicting sea level rise. Evaluation is conducted using various prediction error metrics such as Root Mean Squared Error (RMSE), Mean Absolute Percentage Error (MAPE), Symmetric Mean Absolute Percentage Error (SMAPE), and Mean Squared Logarithmic Error (MSLE). The LSTM model consistently yields lower error values, indicating more accurate predictions compared to the ARIMA model. Through the implementation of the LSTM model, predictions for sea level rise on the North Coast of Banten can be obtained for the upcoming seven days. These prediction results are presented in both normalized and denormalized formats. The model proves its capability to generate predictions that closely approximate actual values with a high level of accuracy. The outcomes of this study hold significant implications for modeling sea level rise phenomena and their climate change impacts. The more complex and adaptive nature of the LSTM model demonstrates its effectiveness in tackling prediction challenges within intricate time series data, such as sea level rise. Nonetheless, it's important to interpret these results within the context and limitations of the utilized model.

Keywords: *ARIMA, Sea Level Rise, Long Short-Term Memory, Banten North Coast, Forecasting*

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DAFTAR REFERENSI

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