

## ABSTRAK

### PERBANDINGAN KINERJA ALGORITMA LSTM, BiLSTM, DAN LSTM-AM DALAM PREDIKSI HARGA SAHAM SYARIAH

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Perkembangan pasar saham syariah yang pesat menciptakan kebutuhan akan metode prediksi harga yang akurat untuk membantu investor dalam pengambilan keputusan investasi. Penelitian ini bertujuan untuk membandingkan kinerja tiga algoritma *deep learning* yaitu *Long Short-Term Memory* (LSTM), *Bidirectional LSTM* (BiLSTM), dan LSTM dengan *Attention Mechanism* (LSTM-AM) dalam memprediksi harga saham syariah. Data penelitian menggunakan harga penutupan harian dari lima emiten saham syariah (ANTM, ERAA, KLBF, SMGR, dan WIKA) periode Desember 2016 hingga Desember 2021 yang diperoleh dari *Yahoo Finance*. Metodologi penelitian meliputi tahapan *preprocessing* data menggunakan *Robust Scaling*, pembentukan *time series* dengan time steps 60 hari, *hyperparameter tuning* menggunakan Keras Tuner, dan evaluasi model menggunakan *window cross-validation* dengan 5-fold. Evaluasi kinerja model dilakukan menggunakan metrik *Mean Absolute Percentage Error* (MAPE), *Root Mean Squared Error* (RMSE), dan *R-squared* ( $R^2$ ). Hasil penelitian menunjukkan bahwa BiLSTM memberikan performa terbaik dengan nilai MAPE rata-rata 9,41%, diikuti oleh LSTM dengan 11,87%, sedangkan LSTM-AM memiliki nilai MAPE tertinggi yaitu 19,58%. Model BiLSTM mampu menangkap pola temporal dari dua arah (maju dan mundur) sehingga memberikan prediksi yang lebih akurat, terutama pada saham dengan karakteristik stabil seperti KLBF (MAPE 1,49%), SMGR (MAPE 1,90%), dan WIKA (MAPE 2,86%). Sebaliknya, LSTM-AM menunjukkan performa yang kurang optimal karena mekanisme *Attention* yang diterapkan tidak sesuai dengan karakteristik data harga saham yang memerlukan pertimbangan menyeluruh terhadap seluruh urutan historis. Penelitian ini merekomendasikan penggunaan BiLSTM sebagai metode prediksi harga saham syariah yang paling efektif.

**Kata Kunci:** saham syariah, LSTM, BiLSTM, LSTM-AM, *deep learning*, prediksi harga saham, *time series*

## ABSTRACT

### PERFORMANCE COMPARISON OF LSTM, BILSTM, AND LSTM-AM ALGORITHMS IN ISLAMIC STOCK PRICE PREDICTION

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The rapid development of the Islamic stock market creates a need for accurate price prediction methods to assist investors in making investment decisions. This study aims to compare the performance of three deep learning algorithms: Long Short-Term Memory (LSTM), Bidirectional LSTM (BiLSTM), and LSTM with Attention Mechanism (LSTM-AM) in predicting Islamic stock prices. The research data uses daily closing prices from five Islamic stock issuers (ANTM, ERAA, KLBF, SMGR, and WIKA) from December 2016 to December 2021 obtained from Yahoo Finance. The research methodology includes data preprocessing stages using Robust Scaling, time series formation with 60-day time steps, *hyperparameter tuning* using Keras Tuner, and model evaluation using window cross-validation with 5 folds. Model performance evaluation was conducted using Mean Absolute Percentage Error (MAPE), Root Mean Squared Error (RMSE), and R-squared ( $R^2$ ) metrics. The results show that BiLSTM provides the best performance with an average MAPE value of 9.41%, followed by LSTM with 11.87%, while LSTM-AM has the highest MAPE value of 19.58%. The BiLSTM model can capture temporal patterns from two directions (forward and backward), providing more accurate predictions, especially for stocks with stable characteristics such as KLBF (MAPE 1.49%), SMGR (MAPE 1.90%), and WIKA (MAPE 2.86%). Conversely, LSTM-AM shows suboptimal performance because the applied Attention mechanism is not suitable for stock price data characteristics that require comprehensive consideration of the entire historical sequence. This study recommends using BiLSTM as the most effective method for predicting Islamic stock prices.

**Keywords:** Islamic stocks, LSTM, BiLSTM, LSTM-AM, deep learning, stock price prediction, time series