

ABSTRACT

Stock price prediction is crucial in investment decision-making due to its dynamic and volatile nature. Fluctuations in stock prices are influenced by macroeconomic indicators, market sentiment, and global financial conditions, resulting in complex and non-linear patterns that conventional models struggle to capture. This study employs Extreme Gradient Boosting (XGBoost) to predict PT Kalbe Farma Tbk closing stock price, leveraging its ability to process time series data and model intricate dependencies. XGBoost was chosen for its efficiency in handling large datasets, managing missing values, and applying regularization to prevent overfitting. To enhance model performance ensuring accuracy, robustness, and generalization Particle Swarm Optimization (PSO) and GridSearchCV were used for hyperparameter tuning. PSO, a swarm intelligence-based algorithm, mimics collective behaviors in nature, refining parameters through individual and group adaptation. Meanwhile, GridSearchCV systematically explores parameter spaces via cross-validation to select optimal configurations. These techniques improve efficiency, ensuring better parameter selection and faster convergence. The model was evaluated using Mean Absolute Percentage Error (MAPE). Results show XGBoost without optimization had a MAPE of 1.78%, while PSO optimization reduced it to 1.46%, and GridSearchCV achieved 1.58%. These findings confirm that PSO and GridSearchCV improve XGBoost's predictive accuracy, making it a reliable method for financial market forecasting.

Keywords : PT Kalbe Farma Tbk, Parameter Optimization, Particle Swarm Optimization (PSO), GridSearchCV, Stock Price Prediction, XGBoost