

ABSTRACT

Stock prices are volatile and non linear, and most Indonesian retail investors rely on lagging technical indicators such as MACD which generate false signals during trend reversals. This study develops an integrated decision support framework for PT Bank Negara Indonesia (BBNI) that converts daily OHLCV data into objective Buy, Hold, and Sell recommendations across three stages: a multi-output CNN for price forecasting, K-Means clustering for regime labeling, and supervised classification. The CNN, built with four convolutional blocks (filter depths 16-32-32-64), a residual skip connection, and dual output heads trained on a $3 \times 3 \times 1$ spatial OHLCV matrix, achieved a training accuracy of 98.00% (RMSE 1.0154) and validation accuracy of 97.41% (RMSE 0.9714) on 643 daily observations from 2 January 2023 to 22 September 2025. K-Means ($k = 3$) partitioned the data into Hold (240), Buy (224), and Sell (179) regimes, on which Decision Tree, Random Forest, and Naive Bayes classifiers trained in RapidMiner achieved test accuracies of 97.20%, 97.51%, and 94.87% respectively. Random Forest was selected as the optimal model based on its highest accuracy and most diagonal dominant confusion matrix, exceeding the MACD benchmark of 30.28% directional accuracy on 142 testable signals by over 67 percentage points and surpassing published benchmarks from comparable studies. This study confirms that a learning based OHLCV pipeline outperforms the closing price indicator in terms of accuracy, fulfilling all research objectives by delivering a transparent system that can improve decision making through objective Buy, Hold, and Sell recommendations for BBNI stock.

Keywords: stock trading decision; convolutional neural network; K-Means clustering; Random Forest; MACD; BBNI