NICKEL PRICE PREDICTION OPTIMIZATION THROUGH RECURRENT NEURAL NETWORK MODEL IMPLEMENTATION

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ABSTRACT

Predicting nickel prices poses a significant challenge in both the electric vehicle battery and stainless steel industries, as substantial fluctuations in nickel prices can impact investment decision-making strategies. This research aims to implement various Recurrent Neural Network (RNN) models, specifically Long Short-Term Memory (LSTM), Gated Recurrent Unit (GRU), Bidirectional LSTM (BiLSTM), and Bidirectional GRU (BiGRU), to forecast nickel prices. The analysis utilizes historical nickel price data spanning from July 7, 2008, to January 15, 2025, which serves as input for the models. The experimental results indicate that the LSTM model, when optimized with specific hyperparameters—a learning rate of 0.001, a batch size of 32, and 100 epochs—demonstrates superior performance compared to the other models. The model shows the lowest Mean Squared Error (MSE) value of 0.000596557 and the highest R2 Score of 0.888937602. The research conducted substantiates the hypothesis that the RNN model can be implemented effectively for nickel price prediction, with the LSTM model being the optimal choice because it is able to produce more accurate predictions than other alternatives. The findings of this study make a significant contribution to the progress of artificial intelligence-based prediction technology in related industrial sectors.