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Predicting Car Sales in Indonesia Using Long Short-Term Memory and Gated Recurrent Unit Algorithms

I Putu Agung Bayupati

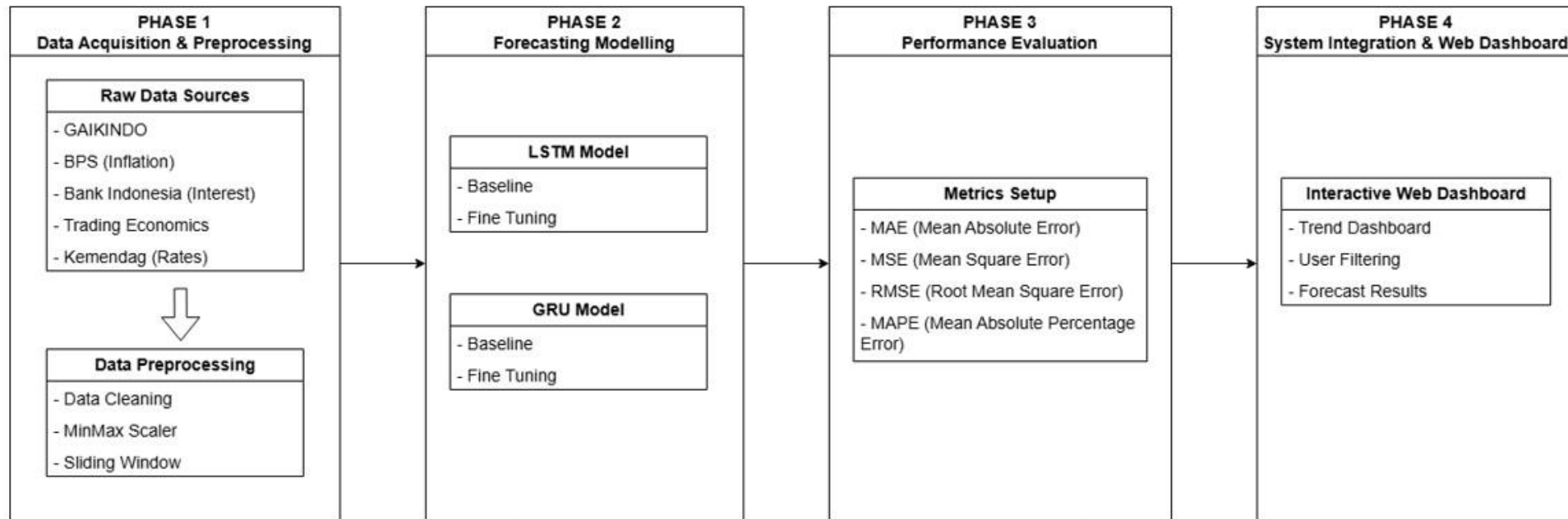
I Made Mahardika Dharmajaya

Desy Purnami Singgih Putri

Research Problem

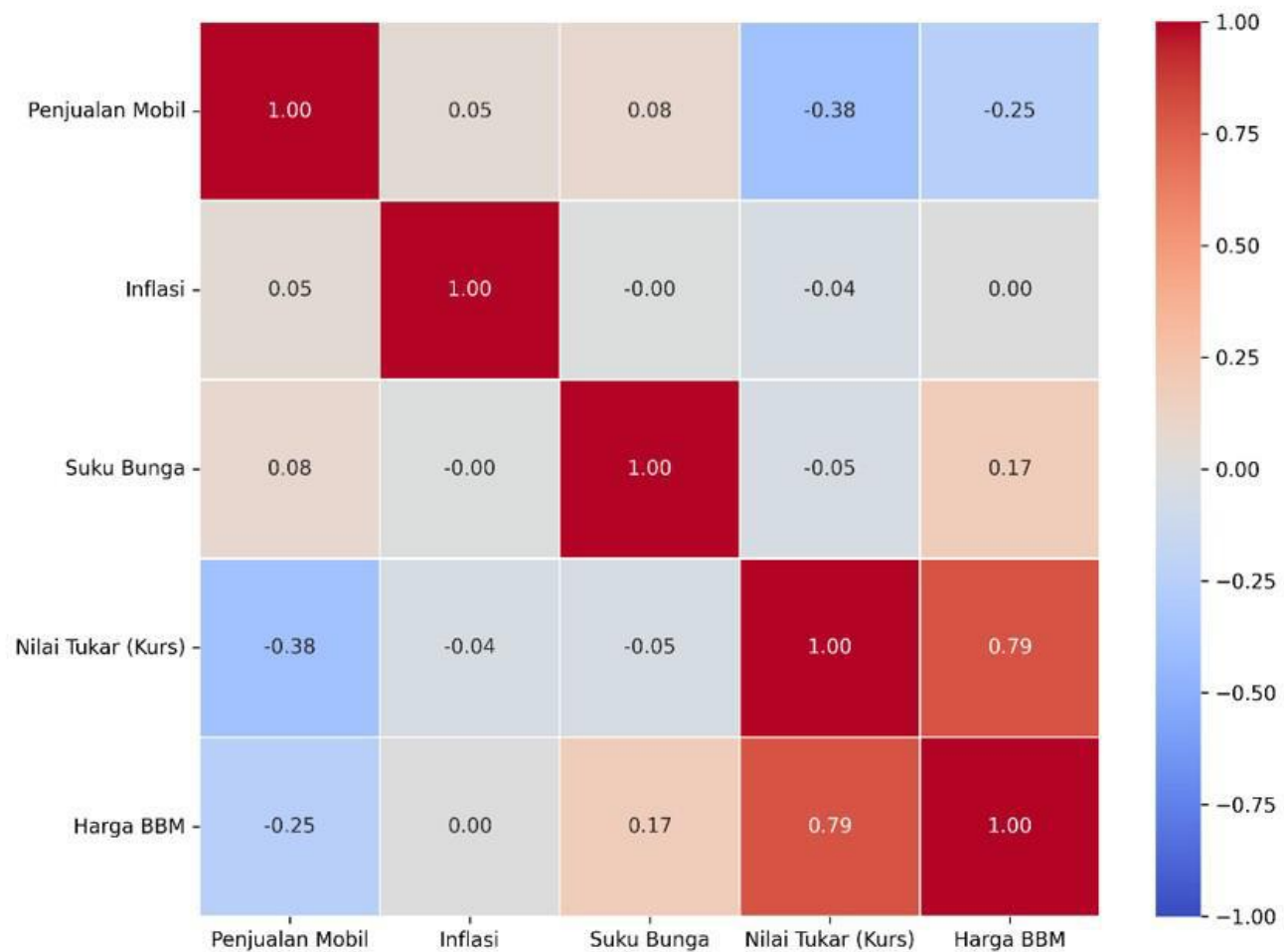
- ▶ Building on deep learning approaches for time - series prediction compares LSTM and GRU models using passenger car sales data and macroeconomic indicators spanning from 2015 to 2025
- ▶ Evaluate model accuracy across multiple time horizons and present the prediction through an interactive web-based dashboard

Methodology



Results And Discussion

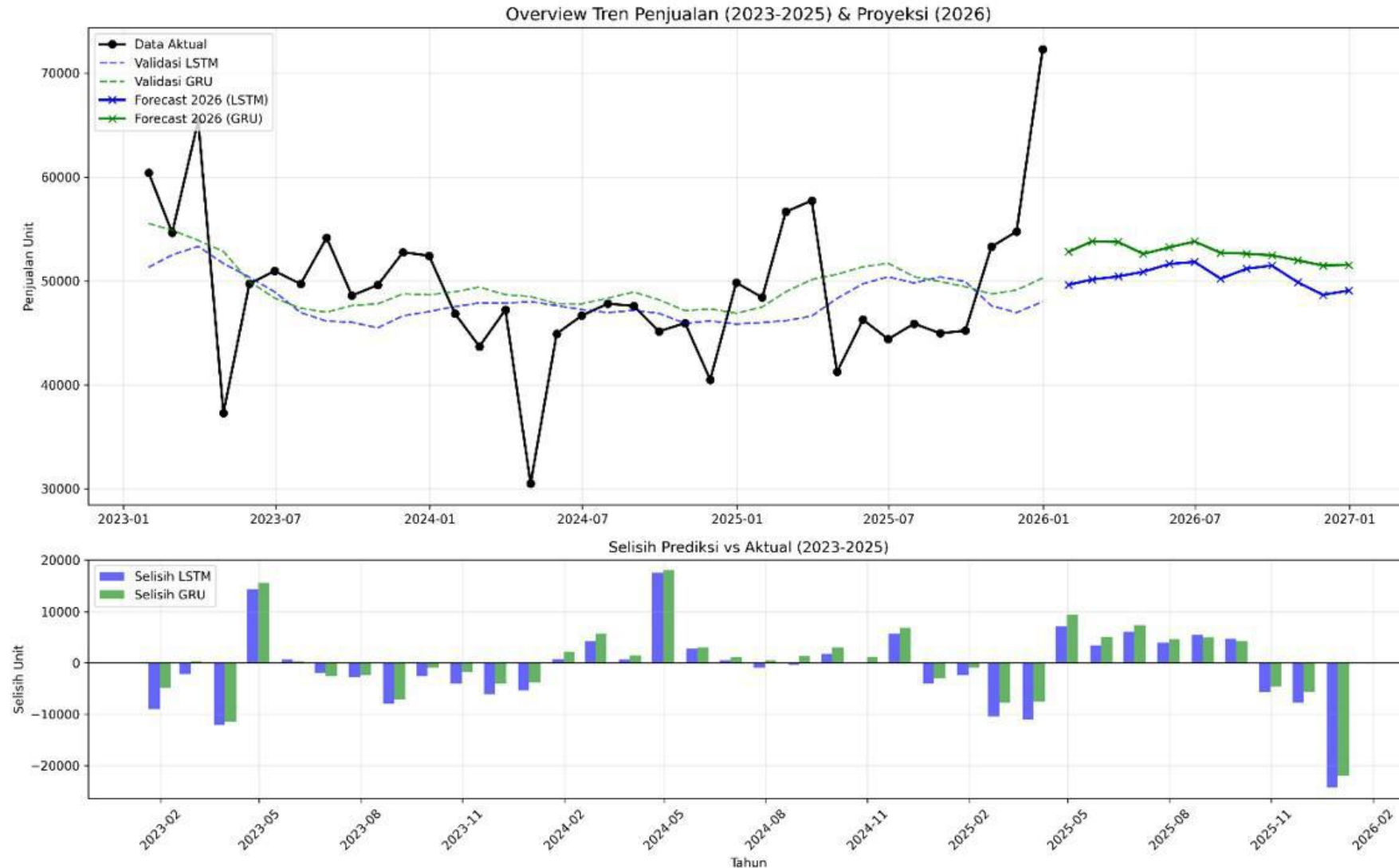
Matriks Korelasi Pearson:
Penjualan Mobil vs Variabel Makroekonomi



Performance Evaluation of Optimized Prediction Models

Model	MAE	MSE	RMSE	MAPE
LSTM	5,994.03	69,248,438.64	8,321.56	12.56%
GRU	5,800.46	61,282,488.23	7,828.31	12.49%

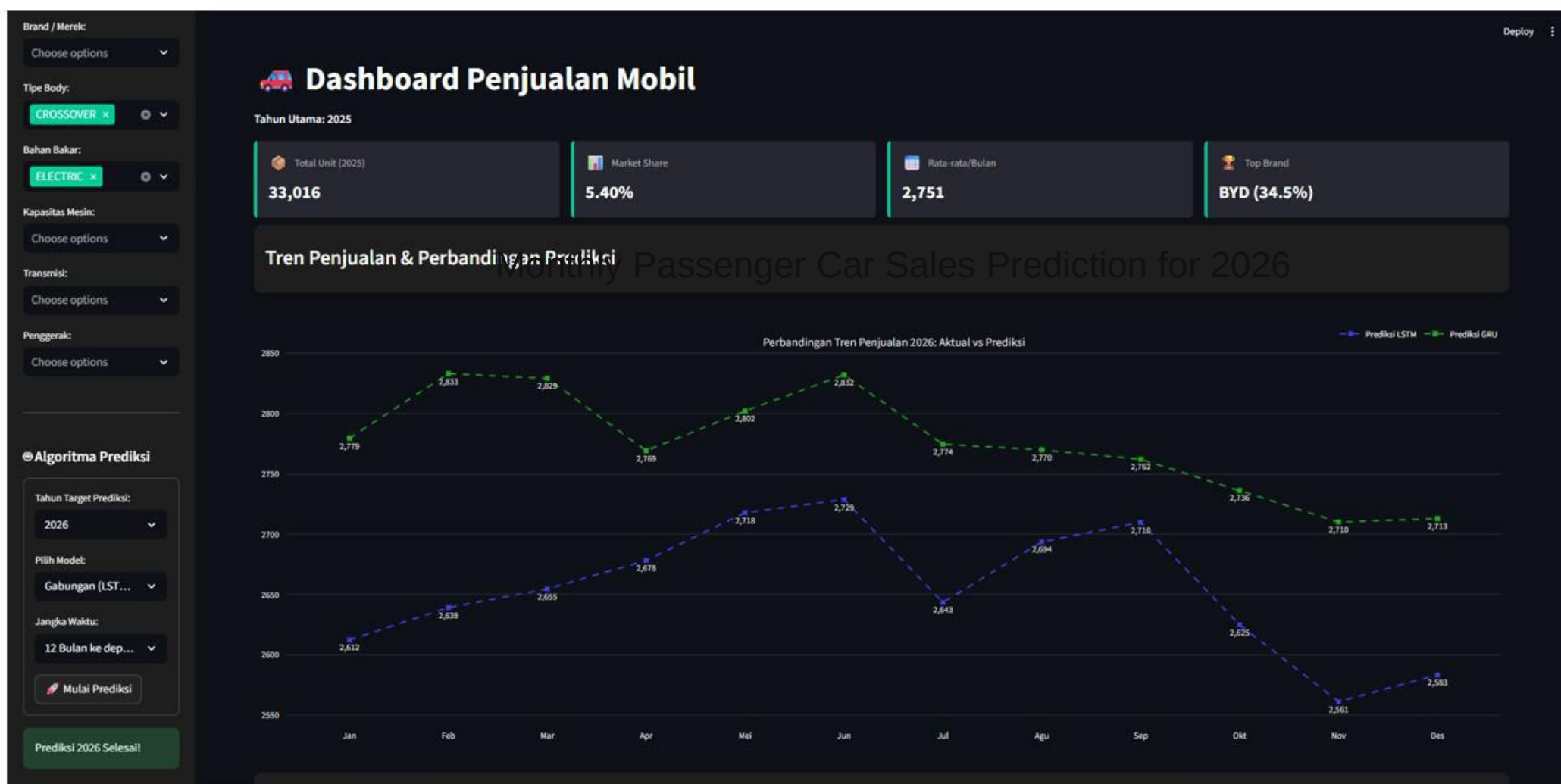
Continuous Actual vs. Predicted Car Sales Trajectory (2023-2025)



Monthly Passenger Car Sales Prediction for 2026

Month (2026)	LSTM Prediction (Units)	GRU Prediction (Units)
January	49,620	52,791
February	50,128	53,807
March	50,422	53,733
April	50,869	52,594
May	51,621	53,219
June	51,826	53,787
July	50,209	52,697
August	51,162	52,608
September	51,467	52,460
October	49,858	51,970
November	48,649	51,473
December	49,067	51,527

Sales Prediction Dashboard Interface with Multi-Filter Selection



CONCLUSION

After hyperparameter optimization, the GRU model emerged as superior, achieving the lowest error rates (MAE of 5,800.46, RMSE of 7,828.31, and MAPE of 12.49%) and a fast training time of 2.97 seconds per epoch. The top-performing setup used 256 hidden units, a batch size of 32, a standard architecture, and a learning rate of 0.0005.