UNDERGRADUATE THESIS

IMPLEMENTATION OF A HYBRID ARIMA-XGBOOST MODEL FOR WEEKLY SALES FORECASTING OF EYEGLASS FRAME PRODUCTS

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IMPLEMENTATION OF A HYBRID ARIMA-XGBOOST MODEL FOR WEEKLY SALES FORECASTING OF EYEGLASS FRAME PRODUCTS

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ABSTRACT

Student Name / NPM	:	Ria Amelia Shinta Putricia Hendra / 22081010248
Undergraduate Thesis Title	:	Implementation of a Hybrid ARIMA-XGBoost Model for Weekly Sales Forecasting of Eyeglass Frame Products
Thesis Supervisor	:	1. Dr. Eng. Ir. Anggraini Puspita Sari, S.T., M.T. 2. Yisti Vita Via, S.ST., M.Kom.

Inventory management for eyeglass frame products requires accurate planning because demand changes over time and varies across Stock Keeping Units (SKUs). Inaccurate demand estimation may cause overstock or stockouts; therefore, forecasting is needed to support measurable inventory decisions. This study implements a Hybrid ARIMA-XGBoost model to forecast weekly sales of eyeglass frame products at Grand Optic and applies the results to inventory policy calculations. The data comprise 4,713 daily sales transactions from 2021 to 2025, weekly stock data, and product master data covering 500 SKUs. Daily transactions were transformed into 261 weekly sales observations and chronologically divided into training data for 2021–2024 and testing data for 2025. ARIMA was used to capture linear patterns, while XGBoost modelled nonlinear relationships based on historical features. Predictions from both models were combined using a weighted ensemble approach. Performance was evaluated using MAE, RMSE, and MAPE. The results show that an ARIMA weight of 0.05 and an XGBoost weight of 0.95 produced the best performance, with an MAE of 1.716390, RMSE of 2.296153, MAPE of 9.987841%, and prediction accuracy of 90.012159%. The forecast was then distributed to the SKU level and used to calculate safety stock, reorder points, restock status, recommended restock quantities, and restock priorities by considering service levels and lead time. All results were presented through a decision support system dashboard to support more systematic, effective, and data-driven inventory planning.

Keywords: Hybrid ARIMA-XGBoost, Weighted Ensemble, Sales Forecasting, Inventory Management, Decision Support System Dashboard

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The author realizes that this thesis still has limitations and shortcomings. Therefore, constructive criticism and suggestions are highly appreciated for future improvement. The author hopes that this thesis can benefit readers and serve as a useful reference for further research related to sales forecasting, inventory management, and decision support systems.

Surabaya, July 15, 2026

Author

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