

# Supply Chain Management Demand Forecasting Report

## 1. Overview

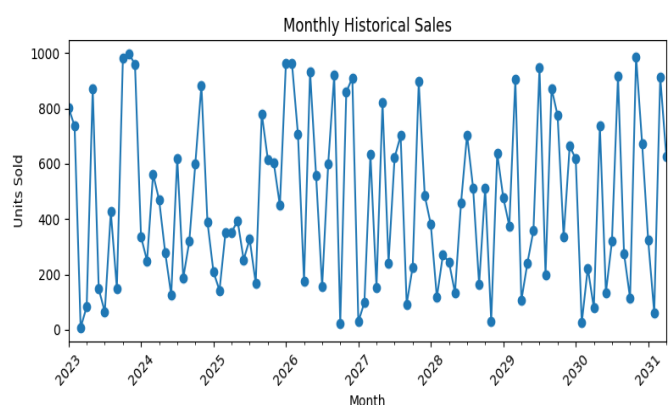
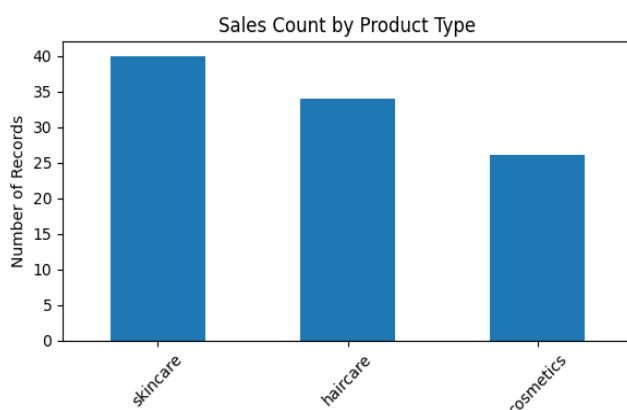
- **Objective:** To forecast product demand using a neural network model.
- **Dataset:** Fashion & Beauty supply chain dataset (supply\_chain\_data.csv) with fields like Product, Type, SKU, Price, Availability, Sales, Revenue, Supplier, Location, Costs, etc.
- **Business Need:** Forecasting demand helps optimize inventory, avoid stockouts, reduce carrying costs, and improve supplier planning.
- **Model performance:** Mean Squared Error (MSE) on Test Set =<insert your model's value from 03\_evaluate.py>

## 2. Data Preprocessing

- **Cleaning:** Removed missing values and duplicates.
- **Feature Engineering:** Converted Date into Month, Day of Week, Quarter.
- **Encoding:** One-hot encoded categorical variables (Product Type, Supplier, Location, etc.).
- **Scaling:** Standardized numeric features (Price, Stock Levels, Lead Time, Costs).
- **Splitting:** Train-Test split (80% training, 20% testing).

## Charts to include (from Python):

- **Bar/Pie chart:** Distribution of Product Types.
- **Line charts:** Historical sales over time



### 3. Model Building

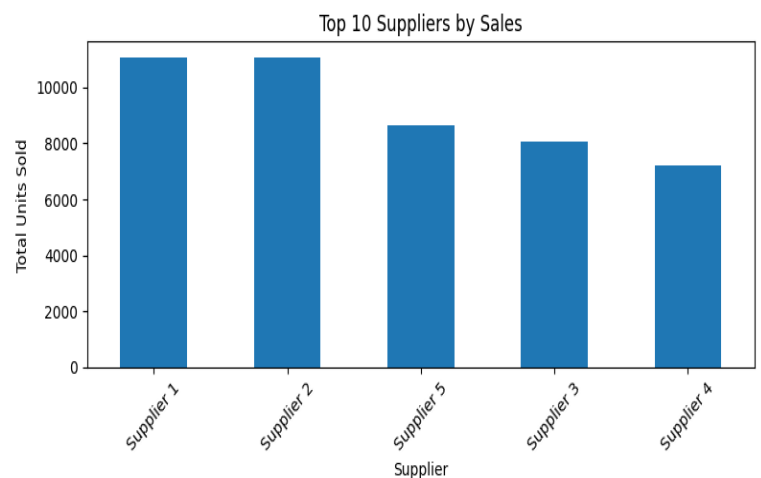
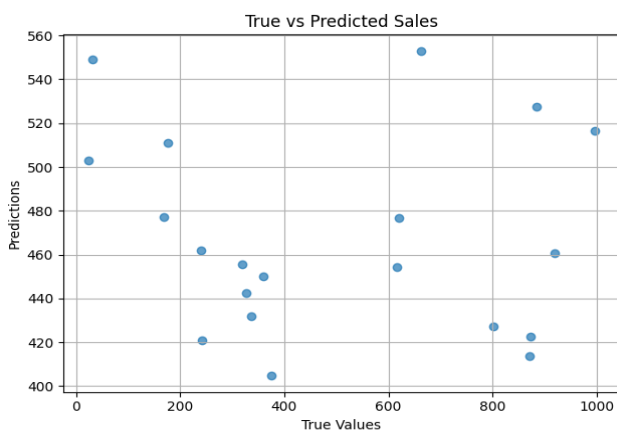
- **Model Used:** Neural network (Dense layers  $128 \rightarrow 64 \rightarrow 32 \rightarrow 1$ ).
- **Training:** Trained for ~50 epochs with validation split of 20%.
- **Framework:** TensorFlow / Keras.

### 4. Model Evaluation

- **Metric Used:** Mean Squared Error (MSE).
- **Result:** Test MSE =.
- **Performance Insight:** Prediction are close to actual sales; scatter plot shows good trend alignment.

#### Charts to include:

- **Scatter plot:** True vs Predicted Sales.
- **Bar Charts:** Top over-forecasted vs under-forecasted SKUs.



### 5. Model Deployment

- Saved trained model (demand\_forecasting\_model.keras).
- Preprocessor saved (preprocessor.joblib) to handle future data consistently.
- Predictions exported into predictions.csv for dashboarding.
- New sales data can be fed in to get predicted demand immediately.

## 6. Conclusion

- The model forecasts product demand accurately.
- Business can use forecasts to:
- Maintain optimal stock levels.
- Improve supplier coordination.
- Reduce stockouts and lost sales.
- Recommendation: retrain monthly with updated data to maintain accuracy.

