EE4390
Intelligent systems and Machine Learning

Hotel Revenue Forecasting

Group 11

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Feature Engineering

Foundational Features:

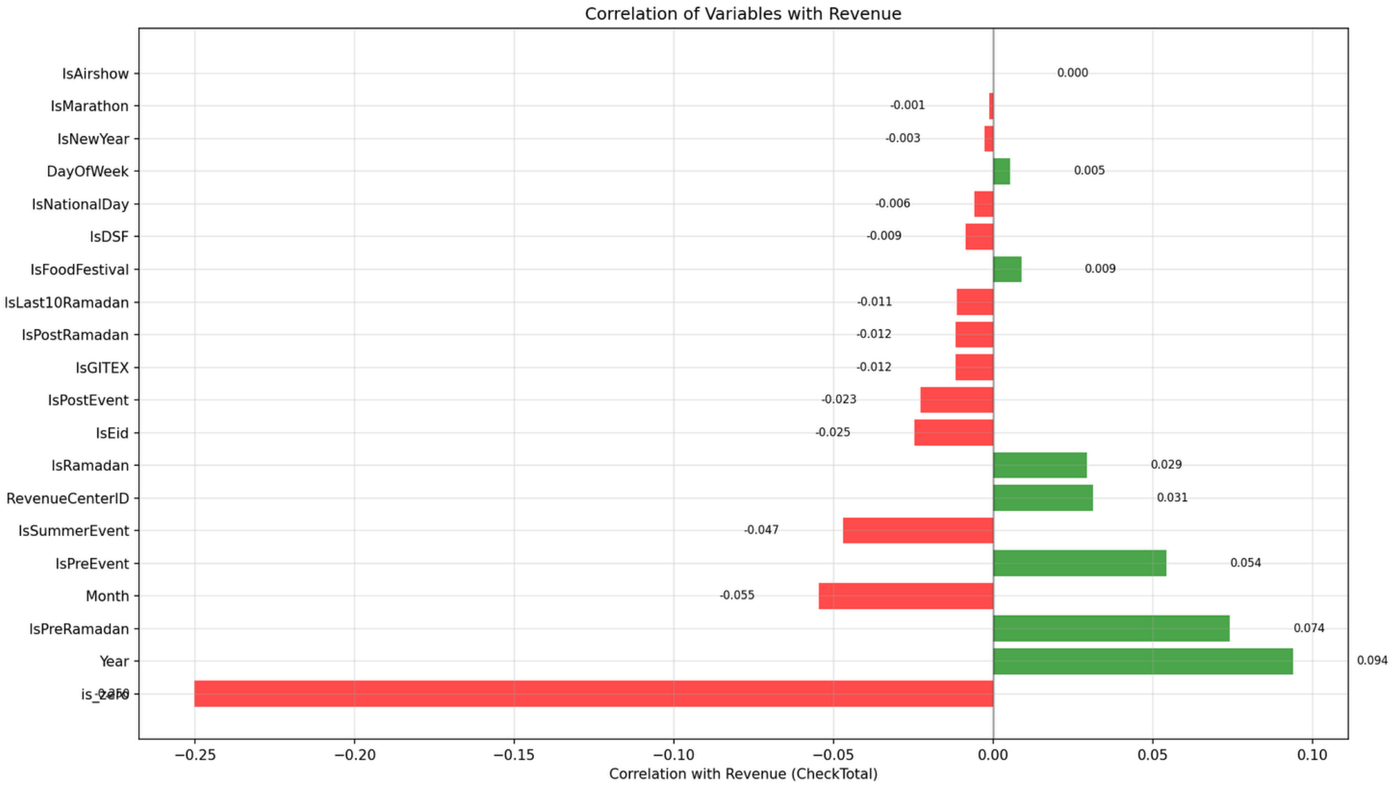
- **Temporal**
- **Weekend**

Islamic Calendar & Holiday Analysis

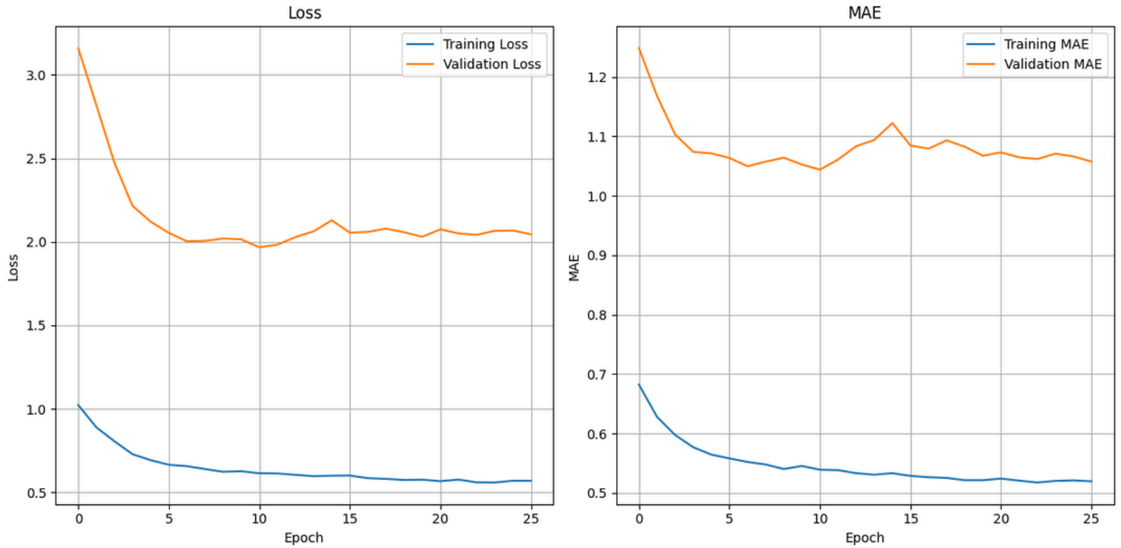
- **Ramadan Segmentation**
- **Eid Cycles**

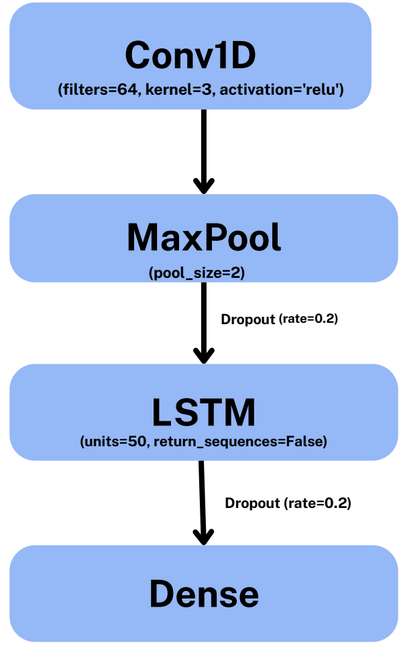
Behavioral Features

- **Tourism Intensity**



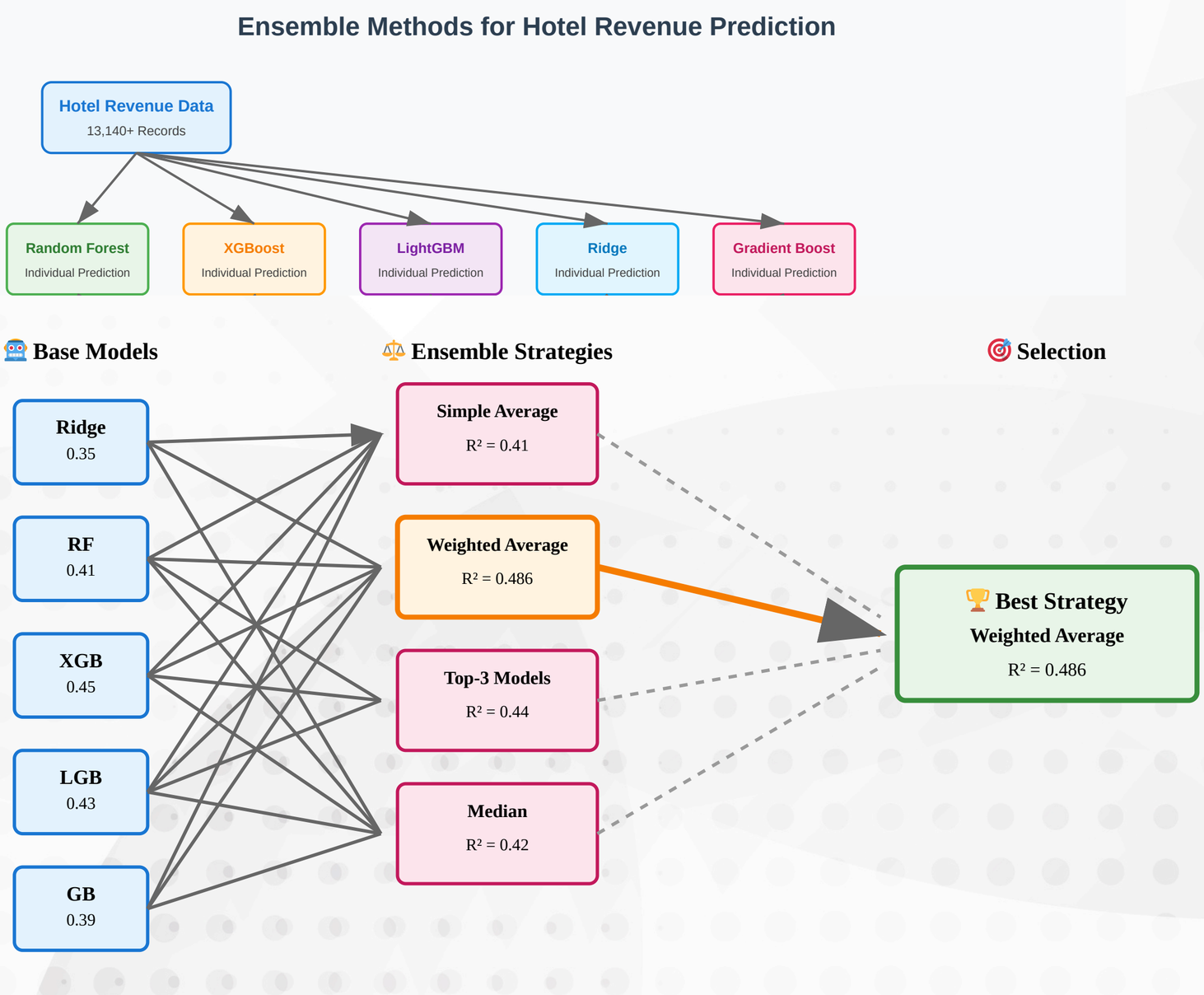
Initial Approach: LSTM + CNN





We observed a very high Mean Squared Error (MSE) and a low R-Squared value

The Ensemble Model



Results

Best Individual Model

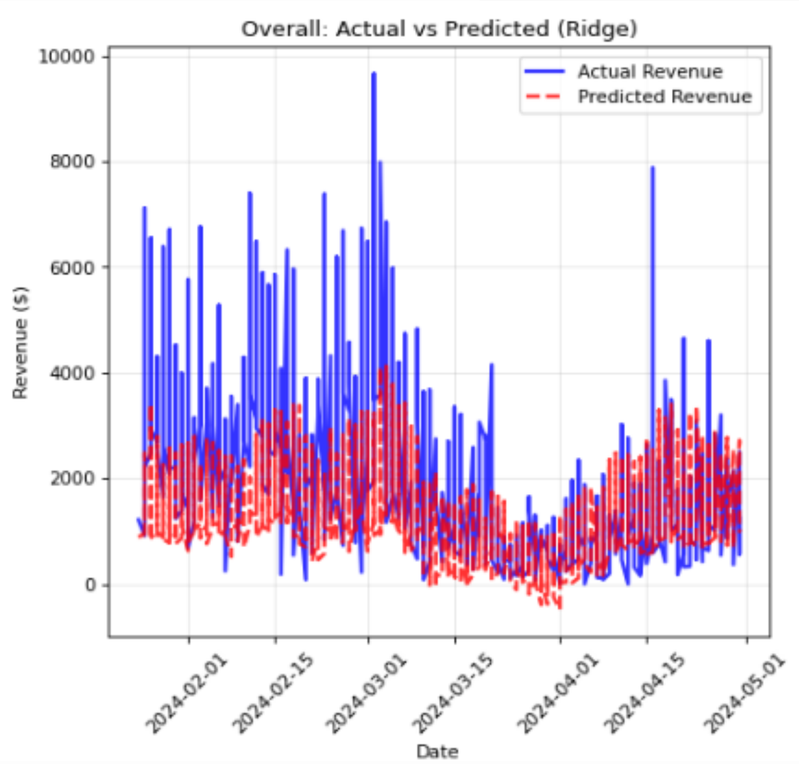
ridge R^2 = 0.503

Best Ensemble Strategy

top3_average R^2 = 0.471

Total Models Trained

5 Base models + ensemble strategies



Performance Highlights:

✓ Ensemble approach provides stable predictions across time periods

✓ Strong correlation between actual and predicted values observed

✓ Model identifies high-revenue periods and some seasonal dips

Challenges

- **Limited Data Availability**
  - Insufficient historical records for robust training
  - Reduced model generalization capability
- **Deep Learning Implementation Barriers**
  - Insufficient data volume for neural networks
  - Traditional ML outperformed due to dataset size
- **Model Selection Complexity**
  - No single optimal model found
  - Required ensemble approach for best results
- **Zero Revenue Frequency**
  - High zero-value entries created imbalance
  - Skewed learning patterns
- **Data Quality Issues**
  - Inconsistent patterns and missing values
  - Extensive preprocessing required

Thank You