FUTURE SALES PREDICTION

**PROJECT OVERVIEW:**

Developing a predictive model for sales forecasting in a retail company is a valuable initiative to optimize inventory management and improve decision-making. Here's a step-by-step guide on how to approach this project:

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**1. Data Collection:**

* Gather historical sales data from the retail company. This dataset should include information like date, product, quantity sold, price, promotions, and any other relevant factors.

**2. Data Preprocessing:**

* Clean the data by handling missing values, outliers, and duplicates.
* Convert date/time data into a datetime format.
* Explore the data through descriptive statistics and visualizations to gain insights.

**3. Feature Engineering:**

* Create relevant features that can impact sales, such as day of the week, holidays, seasonality, and lagged sales.
* Calculate aggregated statistics like rolling averages or moving sums.
* Incorporate external factors like economic indicators or weather data if available.

**4. Data Splitting:**

* Split the data into training and testing sets. A common split ratio is 80% for training and 20% for testing, but it can vary based on the dataset size and project requirements.

**5. Model Selection:**

* Choose appropriate machine learning or time series forecasting models. Some common choices include:
  + Time Series Models: ARIMA, SARIMA, Prophet
  + Machine Learning Models: Random Forest, Gradient Boosting, LSTM, GRU
* Experiment with different models to find the one that performs best on your data.

**6. Model Training:**

* Train the selected model(s) on the training dataset using appropriate hyperparameters.
* Tune the model hyperparameters to improve performance (e.g., grid search, random search, or Bayesian optimization).

**7. Model Evaluation:**

* Use evaluation metrics such as Mean Absolute Error (MAE), Root Mean Square Error (RMSE), Mean Absolute Percentage Error (MAPE), or others to assess the model's accuracy.
* Compare the model's performance on the test set to understand its predictive power.

**8. Hyperparameter Tuning:**

* Fine-tune the model's hyperparameters to achieve the best performance.
* Consider using cross-validation techniques to prevent overfitting.

**9. Model Deployment:**

* Once satisfied with the model's performance, deploy it into a production environment.
* Create a user-friendly interface or API for business users to interact with the model.

**10. Monitoring and Maintenance:** - Continuously monitor the model's performance in the production environment. - Retrain the model periodically to account for changing trends and data shifts.

**11. Business Integration:** - Collaborate with stakeholders to integrate the sales forecasting tool into the company's decision-making processes. - Use the forecasts to optimize inventory management, plan marketing campaigns, and make informed business decisions.

**12. Documentation:** - Document the entire process, including data sources, preprocessing steps, model selection, training, and deployment, for future reference.

Remember that sales forecasting is an ongoing process, and the model may require updates and improvements over time to stay accurate and relevant to the business's needs. Regular feedback and collaboration with domain experts and stakeholders are essential for the success of this project.

**CONCLUSION:**

**Development of a future sales prediction model for the retail company represents a significant step towards improving inventory management and enabling data-driven decision-making. Through a systematic approach that involved data preprocessing, feature engineering, model selection, training, and evaluation, several key insights and outcomes have been achieved**.