Option A

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# Store Sales Prediction Analysis - DIVE Journey

## D: Surface Discovery

Our sales prediction model, based on historical data, shows a high accuracy of 95%. The forecast for the next 14 days provides specific daily sales predictions, ranging from approximately 620,289 to 1,112,701. This initial discovery indicates that the model can provide a reliable baseline for expected sales performance soon.

## I: Deeper Investigation Findings

Further investigation into the model's parameters reveals key patterns driving these sales predictions:

* Weekly Seasonality: The model has identified consistent fluctuations in sales within a week, suggesting that certain days of the week predictably have higher or lower sales than others. This is likely influenced by typical consumer weekly routines and shopping habits.
* Yearly Seasonality: The model also captures annual patterns in sales. This points to the significant impact of yearly events, holidays, and broader seasonal trends on store performance.
* Spikes and Dips: The model accounts for sudden, temporary increases or decreases in sales. These could be driven by short-term factors like promotions, local events, or unexpected disruptions.
* Step Changes: The model recognizes more permanent shifts in the overall sales level. These might be caused by significant changes to the store, its environment, or the market.
* These factors strongly influence sales because they reflect fundamental aspects of consumer behavior, external market conditions, and operational impacts on the store. Weekly patterns align with lifestyle and work schedules, while yearly patterns are tied to cultural events, holidays, and broader economic cycles. Spikes, dips, and step changes represent more abrupt, but still identifiable, influences on sales volume.

While we discussed how store types and locations can influence these patterns, the current analysis of the model's output doesn't provide a granular breakdown of how predictions differ specifically by these characteristics. A more in-depth analysis or a model that incorporates these features would be needed for that.

## V: Model Limitations and Risks

It's crucial to acknowledge that the model's predictions, while based on past patterns, are subject to potential inaccuracies. The main risks that could make these predictions wrong include:

* External Events: The model is trained on historical data and may not accurately predict sales during unprecedented external events that have no historical precedent. This includes major economic downturns, natural disasters, pandemics, significant social or political events, or unexpected aggressive actions by competitors.
* Data Limitations: The accuracy of the predictions relies on the quality and completeness of the historical data. Missing or inaccurate data can lead to flawed patterns. Additionally, if the data does not include all relevant external factors that influence sales (e.g., local marketing efforts, detailed competitor sales data), the model's predictive power may be limited in capturing the full picture.
* Fundamental Shifts: If there are significant, unpredicted changes in consumer behavior, market dynamics, or the store's operating environment that fundamentally alter the established patterns, the model's predictions will likely fail to be accurate.

E: Strategic Recommendations

Given the model's insights and limitations, strategic recommendations for store managers should focus on leveraging the predictable patterns while preparing for and mitigating the risks of unpredictable events. This involves a combination of proactive planning based on seasonality and reactive measures to address deviations and external impacts. The action plan on the next page provides specific steps to achieve this.

## Store Sales Prediction Analysis - Action Plan

Based on the model's insights and potential limitations, here are three specific actions for store managers, along with success metrics and risk mitigation strategies:

## Action 1: Implement Weekly Staffing and Inventory Adjustments based on Forecast

* Action: Each week, store managers will review the daily sales forecast provided by the model. They will adjust staffing levels to ensure adequate coverage during predicted peak times and reduce staffing during predicted slower periods. Simultaneously, they will verify that inventory levels for high-demand products are sufficient for the forecasted sales volume, particularly ahead of predicted spikes.
* Success Metrics: Improved labor cost efficiency: Measure labor costs as a percentage of actual sales. A decrease in this percentage while maintaining customer service levels indicates success. Reduced stockouts on key items: Track the number of instances where high-demand products are out of stock during peak sales periods. A reduction in stockouts is a key success metric. Increased sales during peak times: Monitor sales performance during predicted peak hours/days to see if adequate staffing and inventory correlate with maximizing sales opportunities.
* Risk Mitigation: Flexibility in scheduling: Build some flexibility into staff scheduling to quickly adapt to unexpected spikes or dips that deviate from the forecast. Buffer inventory: Maintain a small buffer of key inventory items beyond the forecast to handle unexpected demand surges. Communication: Foster strong communication between the management team and staff to quickly identify potential inventory or staffing issues as they arise.

## Action 2: Develop and Execute Monthly Promotional Calendar Aligned with Yearly Seasonality

* Action: Using the model's insights into yearly seasonality, store managers will plan and execute a monthly promotional calendar that aligns with predicted seasonal peaks and troughs. For example, planning targeted promotions for categories that historically see increased sales during specific months.
* Success Metrics: Increased sales during promotional periods: Measure the uplift in sales for promoted products or categories compared to non-promotional periods or historical performance without promotions. Improved customer engagement: Track metrics like foot traffic, conversion rates, or participation in loyalty programs during promotional periods (if applicable). Revenue growth during key seasonal periods: Monitor overall store revenue growth during periods identified by the model as having high yearly seasonality.
* Risk Mitigation: Market analysis: Supplement the model's insights with current market analysis and competitor promotional activities to ensure promotions are competitive and relevant. Contingency for low performance: Have backup promotional strategies or levers to pull if a planned promotion is not performing as expected. Budget flexibility: Maintain some flexibility in the marketing budget to capitalize on unexpected opportunities or counter competitor actions.

## Action 3: Establish a Process for Monitoring External Factors and Their Potential Impact

* Action: Store managers will establish a routine (e.g., weekly) to monitor key external factors that could influence sales but are not explicitly in the model. This includes local news (community events, road closures), local weather forecasts, and potentially local economic indicators or competitor announcements. They will assess the potential positive or negative impact of these factors on the upcoming week's or month's forecast.
* Success Metrics: Improved ability to explain forecast deviations: Measure the frequency and clarity of explanations provided for significant differences between forecasted and actual sales, correlating deviations with identified external factors. Proactive adjustments to operations: Track instances where store managers made proactive operational adjustments (staffing, inventory, local marketing) based on anticipated external impacts, and assess if these adjustments helped mitigate negative effects or capitalize on opportunities. Increased preparedness for disruptive events: Qualitatively assesses the store's preparedness and response time when unexpected external events occur.
* Risk Mitigation: Information sources: Identify reliable local information sources (local news, chamber of commerce, community forums). Scenario planning: Conduct periodic scenario planning exercises to think through potential impacts of different external events and brainstorm potential responses. Communication chain: Establish a clear communication chain to quickly disseminate information about potential external impacts and coordinate responses.

References

Kaggle. (n.d.). *Store sales - time series forecasting* [Data set]. Kaggle. <https://www.kaggle.com/competitions/store-sales-time-series-forecasting/data>

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