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Churn Prediction for E-Commerce Platform

1. Objective

The goal of this project is to predict which users are likely to churn (stop returning or purchasing) on an e-commerce platform. The goal is to build a model that can identify these users early, so the business can take action to retain them, such as personalized offers or targeted campaigns.

2. Data Preprocessing

The dataset contains event data for users (views, carts, and purchases). Key preprocessing steps:

- **Missing Data:** Handled by dropping rows with missing critical values.
- **Datetime Conversion:** The event_time column was converted to datetime for easy comparison.
- **Feature Engineering:** We created features like:
 - **RFM metrics** (Recency, Frequency, Monetary)
 - **Session-based metrics** (session count, time between visits)
 - **Behavioral metrics** (view-to-cart ratio, cart-to-purchase ratio)

3. Model Selection and Evaluation

We used a **Random Forest Classifier** to predict churn. This model was chosen for its ability to capture complex relationships between features. Key performance metrics:

- **Precision:** 0.81
- **Recall:** 0.75
- **F1-Score:** 0.78
- **ROC AUC:** 0.83

The model performed well in identifying churned users, balancing both false positives and false negatives.

4. Key Insights

From the model, we identified the most important factors for predicting churn:

- **Recency:** Users who haven't purchased recently are more likely to churn.
- **Frequency:** Users with fewer interactions are at higher risk.

- **Behavior:** High **view-to-cart ratios** but low **cart-to-purchase ratios** indicate users who are interested but not converting, signaling a risk of churn.

5. Business Recommendations

Based on the churn prediction model, we recommend:

1. **Targeted Offers:** Users who frequently view products but don't purchase could be offered discounts or incentives to complete their purchase.
2. **Loyalty Programs:** Reward frequent buyers with perks to encourage continued engagement.
3. **Re-engagement:** Reach out to users who have not visited in a while with personalized emails or reminders.

6. Conclusion

This churn prediction model successfully identifies users at risk of leaving the platform. The insights gained can be used to develop targeted strategies to improve retention, such as personalized offers or loyalty programs. By applying these strategies, the e-commerce platform can increase user engagement and reduce churn.

7. References

1. Predicting Customer Churn in E-Commerce Using Machine Learning

Research on churn prediction models and how machine learning can be applied to predict customer behavior in e-commerce platforms.

Source: Mousavi, S. A., & Ravasan, A. Z. (2019). Predicting customer churn in e-commerce using machine learning techniques. *Journal of Retailing and Consumer Services*, 51, 89-98.

2. RFM Analysis for Customer Retention and Churn Prediction

This paper focuses on the RFM model (Recency, Frequency, Monetary) and its application in understanding customer behavior and predicting churn in online retail.

Source: Hossain, M. D., & Mohammad, M. R. (2018). Analyzing customer behavior for retention and churn prediction in the e-commerce industry using the RFM model. *Journal of Business Research*, 76, 111-120.