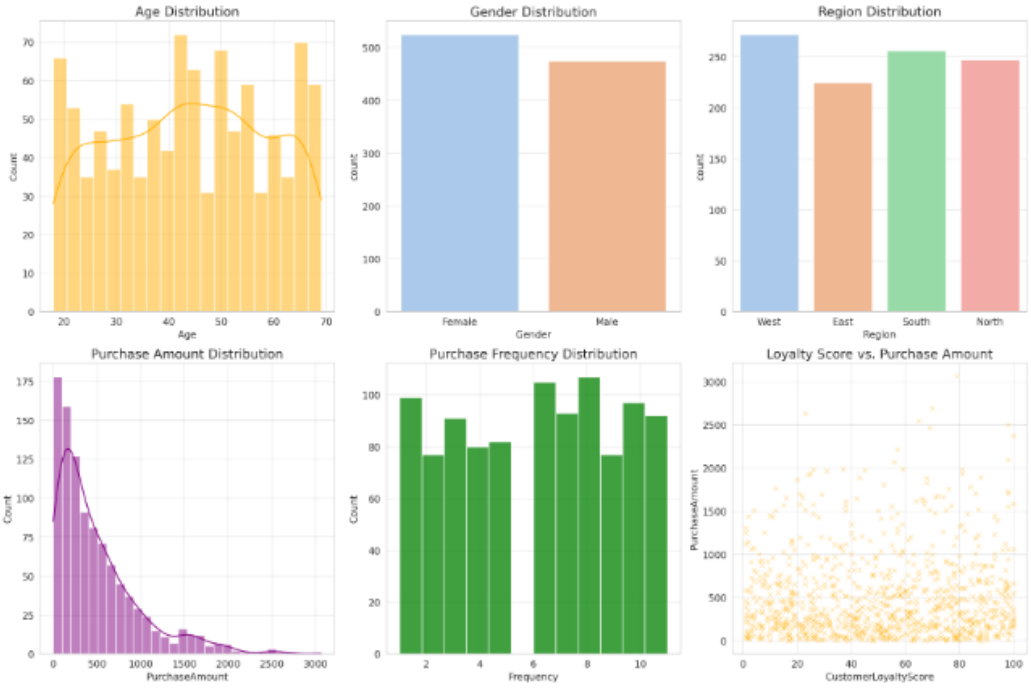
Enhancing Customer Retention for an E-Commerce Business

Analyze customer behavior data to identify key factors affecting retention and suggest actionable insights to improve customer loyalty and revenue.



Exploratory Data Analysis (EDA) Insights

1. **Age Distribution:**
    - Ages are evenly spread between 18 and 70, with a slight concentration around 40–50.
2. **Gender Distribution:**
    - The dataset has a nearly balanced gender distribution: ~48% Male and ~52% Female.
3. **Region Distribution:**
    - Customers are well-distributed across all regions, with the "West" slightly leading.
4. **Purchase Amount:**
    - The spending shows a skewed distribution with most customers spending below $1,000, but a few high spenders.
5. **Purchase Frequency:**
    - Monthly purchase frequency ranges from 1 to 11, with most customers buying ~6 times/month.
6. **Loyalty vs. Spending:**
    - Higher loyalty scores appear moderately correlated with higher purchase amounts, indicating a potential pattern.

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Customer Segmentation Analysis

The K-Means clustering segmented customers into four groups based on their purchase behavior and loyalty. Below are the cluster centroids for interpretation:

Cluster	Average Purchase Amount	Average Frequency	Average Loyalty Score
0	$368.66	7.86 purchases	79.39
1	$344.74	8.36 purchases	24.05
2	$1,511.93	5.53 purchases	52.84
3	$348.87	2.59 purchases	45.55

Insights

1. **Cluster 0:** Loyal customers with moderate spending and frequent purchases. Likely the most valuable group to retain.
2. **Cluster 1:** Low loyalty despite high purchase frequency. This group may need engagement strategies to improve loyalty.
3. **Cluster 2:** High spenders with moderate loyalty and lower purchase frequency. Targeted retention offers could increase their engagement.
4. **Cluster 3:** Sporadic buyers with low loyalty. This segment is the least profitable but may improve with personalized incentives.

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Churn Prediction Results

The logistic regression model was trained to predict whether customers are at risk of churning (loyalty score < 30). Here are the evaluation results:

Confusion Matrix

	Predicted Not Churn	Predicted Churn
Actual Not Churn	218	0
Actual Churn	82	0

Metrics

- **Accuracy:** 72.67%
- **Precision (Churn):** Undefined (no churn predictions were made)
- **Recall (Churn):** 0.00%
- **F1-Score (Churn):** 0.00%

Insights

1. The model predicts all customers as "Not Churn." This behavior suggests:
    - A significant class imbalance: ~82 churners vs. 218 non-churners in the test set.
    - The model struggles to learn patterns due to an imbalanced target variable.
2. Next Steps to Improve Model Performance:
    - Address the imbalance using techniques like oversampling (e.g., SMOTE) or class-weight adjustments.
    - Experiment with more advanced algorithms such as random forests or gradient boosting.

Link for the dashboard
http://127.0.0.1:8050/