PREDICTIVE CLV MODELING FOR A SUBSCRIPTION-BASED MEAL DELIVERY SERVICE

1. Background and Problem Statement:

A national meal delivery subscription startup, offering weekly curated meal kits, had gained rapid traction in urban markets. However, the company noticed fluctuating subscriber retention rates and inconsistent revenue per user. Marketing spend was uniform across user segments, and customer success teams lacked clarity on which users were likely to churn or deliver long-term value. To address these issues, the business required a **predictive Customer Lifetime Value (CLV) model** to classify customers by expected value and guide retention, upselling, and acquisition efforts.

2. Objectives:

- To predict CLV for each active and inactive subscriber using historical behavior
- To segment customers into high-, mid-, and low-value tiers based on predicted value
- To identify key behavioral drivers influencing lifetime value
- To provide actionable recommendations to improve retention and profitability

3. Methodology:

3.1 Data Collection and Processing

- **Source:** 18 months of CRM and billing data from 32,000 unique customers
- **Fields Used:**
    - Subscription start and end dates
    - Weekly order value
    - Skip frequency (weeks skipped per quarter)
    - Engagement with marketing emails (open rate, click-through rate)
    - Delivery feedback scores
    - Referral usage
    - Plan type (2-meal, 3-meal, family pack)

3.2 Feature Engineering

- Calculated:
    - Average Order Value (AOV)
    - Active Weeks
    - Tenure in weeks
    - Churn flag (1 = unsubscribed, 0 = active)
    - Net Promoter Score (where available)
    - Coupon usage ratio

3.3 Model Development

- **Approach:** Predictive CLV = AOV × Predicted Tenure
- Predicted tenure modeled using **XGBoost regression**
- Target variable: weeks of future activity
- Evaluation: RMSE for regression, feature importance via SHAP values
- Cross-validation: 5-fold with time-series split

4. Results:

4.1 Model Performance

- RMSE: **4.9 weeks**
- R^2: **0.72**, indicating strong predictive power
- Prediction window: next 26 weeks

4.2 Key Predictors of CLV

Feature	SHAP Rank	Interpretation
Weeks Active (so far)	#1	The longer a customer stays, the longer they are likely to remain active
Skip Frequency	#2	High skip rates predicted lower future retention
Plan Type	#3	Family plans had longer predicted tenure than individual plans
Email Engagement	#4	High open rates positively correlated with tenure

Delivery Rating	#5	Users giving high feedback remained active longer

4.3 Customer Segmentation Based on Predicted CLV

- **High-Value Segment (CLV > \$720):** 18% of customers → generated 46% of revenue
- **Mid-Value Segment (CLV \$400–720):** 41% of customers
- **Low-Value Segment (CLV < \$400):** 41% of customers
- Notably, 62% of high CLV users had referred at least one other subscriber

5. Interpretation and Insights:

- A small segment of customers contributed disproportionately to revenue
- Skip frequency was the strongest behavioral signal for potential churn
- Family plans had higher stability but were underrepresented in acquisition campaigns
- Email and feedback engagement were early signals of long-term customer value

6. Recommendations:

6.1 Acquisition

- Shift paid marketing focus to keywords targeting family meal planning
- Use predicted CLV tiers to inform **CAC limits** by customer segment

6.2 Retention

- Launch engagement campaigns targeting high-skip users with reminders, recipe previews, and personalized nudges
- Incentivize feedback and delivery reviews to gather quality data for further churn prediction
- Create a loyalty program rewarding continuous weekly ordering and referral activity

6.3 Cross-Selling and Upsell

- Offer personalized upsell bundles (e.g., premium recipes, desserts) to high-CLV segments
- Run A/B tests on extending plan duration discounts (e.g., 4-week prepay) to users with >\$600 predicted CLV

7. Future Work:

- Build an **early churn risk classifier** using a binary model to complement the CLV score
- Integrate referral scoring and loyalty value to transition toward a **full Net Customer Value model**
- Use customer sentiment data (from reviews and emails) to enrich behavioral predictors

8. Stakeholder Relevance:

Academic:

- Demonstrates how predictive modeling supports strategic decision-making in a subscription business
- Useful for coursework in customer analytics, predictive modeling, and business intelligence

Corporate:

- Helps SaaS and D2C businesses optimize acquisition ROI and retention strategy
- Offers a replicable structure for integrating predictive CLV into marketing and customer success operations