BEHAVIOR-DRIVEN CART ABANDONMENT OFFER STRATEGY FOR A FASHION E-COMMERCE PLATFORM

1. Background and Problem Statement:

A mid-sized fashion e-commerce brand faced a persistent challenge: nearly 68% of shopping carts were abandoned before checkout. While email reminders and generic 10% off coupons were used, they yielded inconsistent and marginal results. The marketing team lacked clarity on which customer behaviors actually signaled purchase intent and which offer types could effectively convert abandoners. A project was initiated to create **behavior-based cart recovery strategies** using predictive insights and personalized incentives.

2. Objectives:

- To identify behavioral patterns that signal cart abandonment versus likely conversion
- To use decision tree analysis to segment abandoners based on intent indicators
- To design tailored offers based on urgency and cart value
- To measure the recovery rate, revenue lift, and cost efficiency of the new strategy

3. Methodology:

3.1 Data Collection

- Analyzed behavior of 42,000 cart events over 3 months
- Data fields included:
    - Cart value
    - Session duration
    - Number of items
    - Category of products (e.g., dresses, shoes, accessories)
    - Device type (mobile/desktop)
    - Time since first visit
    - Referral source

3.2 Modeling: Cart Abandonment Classification

- Labeled carts as **converted** (purchased within 12 hours) or **abandoned**
- Used **decision tree classifier** (CART algorithm) to model behavior splits
- Visualized splits and predictor strength using seaborn and sklearn.tree
- Top abandonment predictors:
    - Mobile device + high cart value + <3 mins session time
    - Multiple accessories with no apparel item
    - Referral from discount aggregator site

3.3 Offer Design and Deployment

Offers were **not blanket discounts**, but behavior-triggered:

Behavior Segment	Offer Trigger
High-value cart + <5 mins session on mobile	10% off + express shipping (expires in 6 hrs)
Single-item cart from accessory category	"Complete the Look" bundle suggestion
Referral source = deal site	Display anchor price + "Locked at this price"

- Offers deployed via **Klaviyo email flows** + **on-exit popups** via OptiMonk
- Control group received no incentive

4. Results:

Metric	Control Group	Offer Group	Uplift
Cart Recovery Rate	11.8%	**26.3%**	+14.5%
Revenue from Recovered Carts	\$28,000	**\$67,400**	+140.7%
Average Discount Applied	10% flat	6.1% avg	–39% savings
Time to Conversion	14.2 hrs	**4.6 hrs**	Faster action

- Behavior-specific offers not only recovered more carts but did so with **lower average discount**
- Customers responded strongly to **urgency** and **contextual messages** rather than generic promos

- Bundling accessories with apparel outperformed single-item reminders by 22%

5. Interpretation and Insights:

- Segmenting abandoners based on **device, cart size, and source** was key to predicting recovery likelihood
- Mobile users needed **fast, low-friction incentives** (free shipping worked better than discount alone)
- Showing **value locks** (anchored savings) helped reduce discount dependency
- Visual reminders (e.g., styled outfit bundle) triggered emotional decision-making better than price nudges

6. Recommendations:

6.1 Expand Triggers

- Add **browser scroll-depth** and **repeat visitor flags** as next-layer triggers
- Integrate product margin data to ensure high-profit SKUs get premium placement in recovery bundles

6.2 Offer Timing Personalization

- Test timing of emails (1 hr vs. 4 hrs vs. next morning) for each segment
- Use local time zone logic for scheduling high urgency offers

6.3 Scaling and Automation

- Link cart behavior triggers to ad retargeting pixels (e.g., show bundled ad on Instagram if cart had multiple accessories)
- Build in real-time data feed for higher frequency analysis

7. Future Work:

- Build a **predictive checkout abandonment model** with logistic regression or gradient boosting
- Use visual click tracking tools (e.g., Hotjar) to understand micro drop-off points
- Run offer-experimentation on PDP level before add-to-cart stage

8. Stakeholder Relevance:

Academic:

- Illustrates decision tree classification and cart funnel analytics in a retail context
- Relevant for courses in predictive modeling, digital UX, and e-commerce marketing analytics

Corporate:

- Provides a scalable cart recovery framework tailored to customer behavior
- Reduces offer wastage by aligning incentives with purchase intent
- Enhances customer experience by offering **contextual, rather than generic, incentives**