Predicting Coupon Acceptance on E-commerce Platforms

Made By:
Priyanka Kolhe

Objective

The goal of this project is to leverage machine learning techniques to analyze driving scenarios and user attributes collected from an e-commerce website.

By accurately predicting whether users will accept coupons during their journeys, the aim is to optimize coupon distribution strategies and enhance user engagement with the platform's offerings.

The survey describes different driving scenarios including the user’s destination, current time, weather, passenger, coupon attributes, user attributes, and contextual attributes, and then asks the user whether he/she will accept the coupon or not.

About the Data

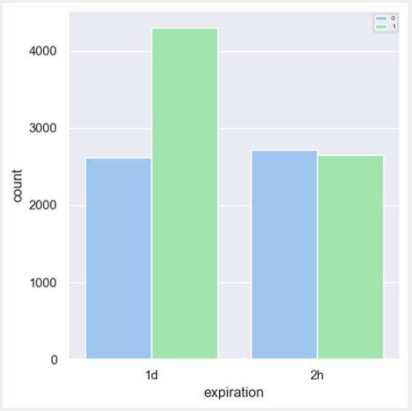
- We have a total of 25 features in this dataset.
- All features are categorical.
- The feature 'Accept (Y/N)' serves as the dependent variable, while all others are independent variables.
- The data features are as follows:

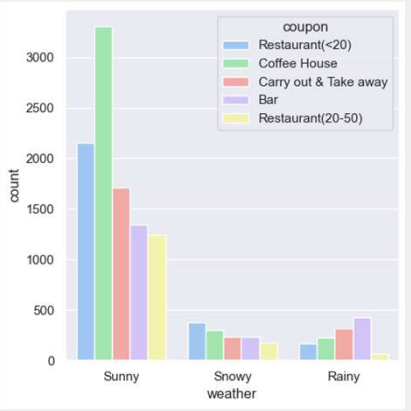
Destination	Expiration	Education	CoffeeHouse	toCoupon_GEQ15min
Passenger	Gender	Occupation	CarryAway	toCoupon_GEQ25min
Weather	Age	Income	RestaurantLessThan20	Direction_Same
Temperature	MaritalStatus	Car	Restaurant20To50	Direction_Opp
Coupon	Has_Children	Bar	toCoupon_GEQ5min	Accept(Y/N?)

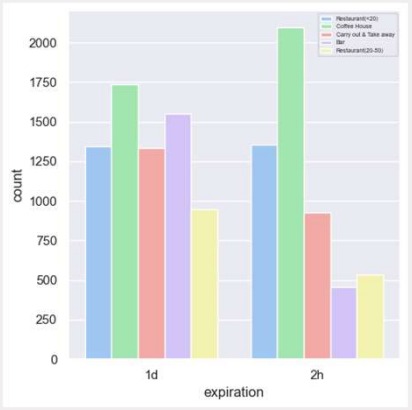
- The data describes the user's driving patterns around the coupon platforms and discusses users' attributes such as marital status, gender, education, occupation, and whether they have children.
- It also provides insights into users' visiting patterns on these platforms.
- Regarding coupons, they include 'Restaurant(20-50)', 'Carry out & Take away', 'Coffee House', 'Restaurant(<20)', and 'Bar'."

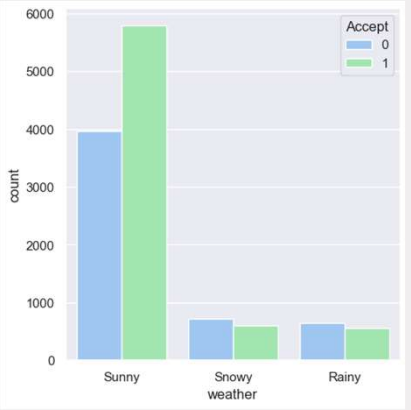
Understanding User Behavior

- In Sunny weather higher chances of accepting the coupon.
- In sunny weather most users are accepting the “Coffee House” coupon.
- The coupon having an expiration of “2h” has a higher chance of acceptance. Mostly “coffee house” coupon.



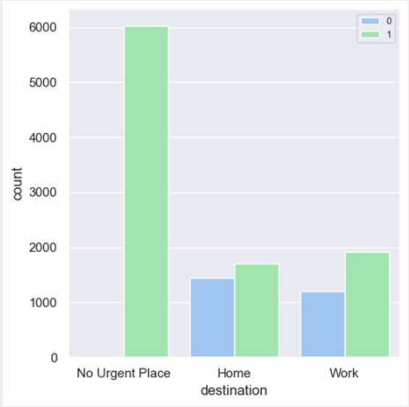


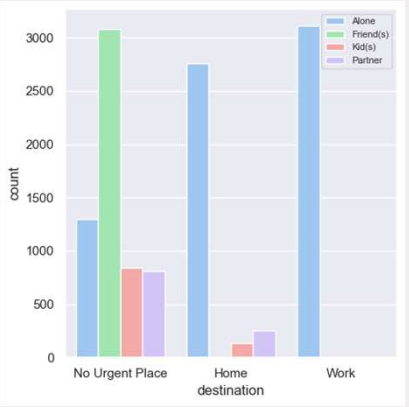


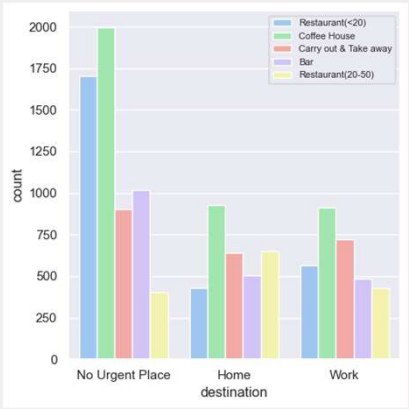


Understanding User Behavior (Contd.)

- For “1d” expiration users are mostly accepting “coffee house” and “Bar” coupon.
- When the user’s destination is “No Urgent Work”, then higher chance of accepting the coupon.
- When the destination is “No Urgent Work”, users are traveling with friends. When their destination is “home” and “work” they are traveling alone.
- User prefer to visit coupon platforms in the “opposite direction” of their destination.

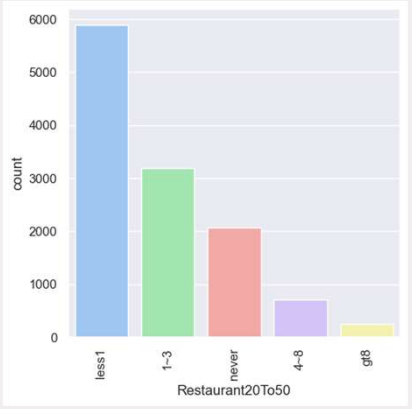


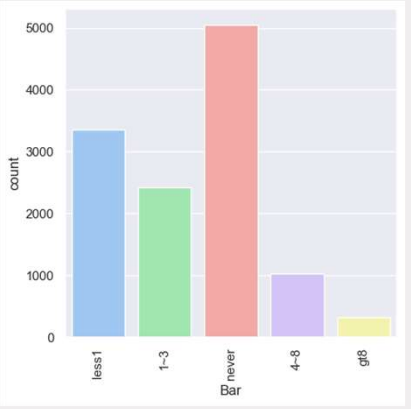


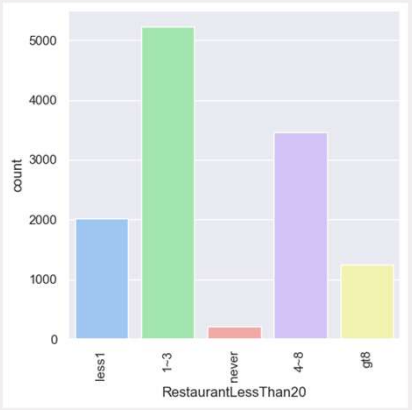


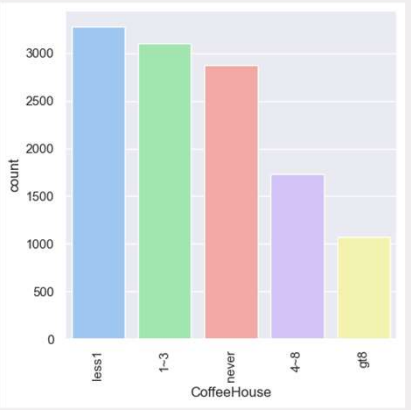
Understanding User Behavior (Contd.)

- The user count for not visiting the bar at all is high.
- The coffee house is something most users visit.
- Users frequently visit restaurants with an average expense per person of less than $20 every month.
- Users rarely visit restaurants with an average expense per person of $20 to $50 every month.



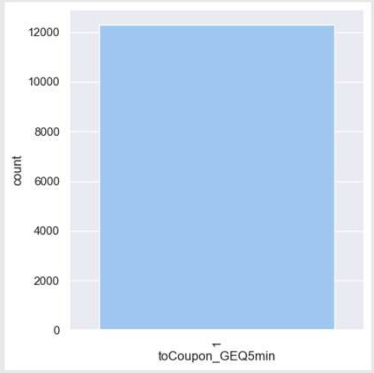


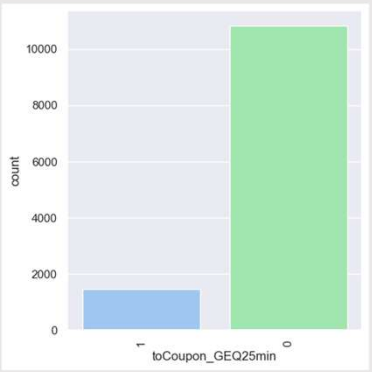


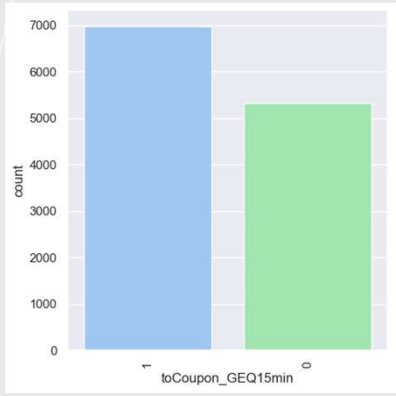


Understanding User Behavior (Contd.)

- Every users visits to driving distance to the restaurant/cafe/bar for using the coupon is greater than 5 minutes.
- Frequently visits driving distance to the restaurant/cafe/bar for using the coupon is greater than 15 minutes
- Rarely visits driving distance to the restaurant/cafe/bar for using the coupon is greater than 25 minutes

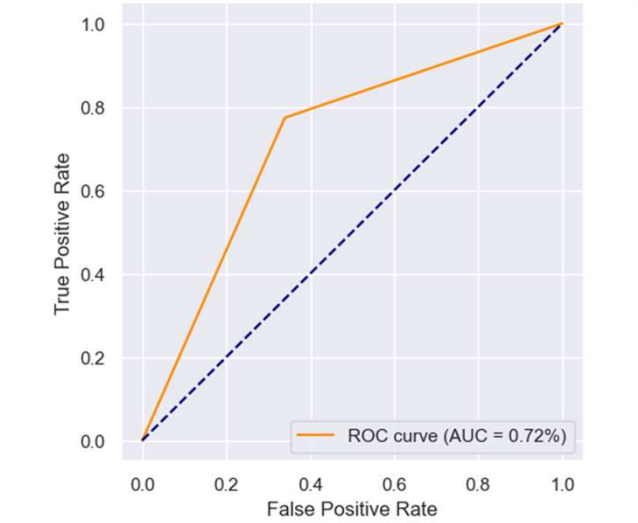


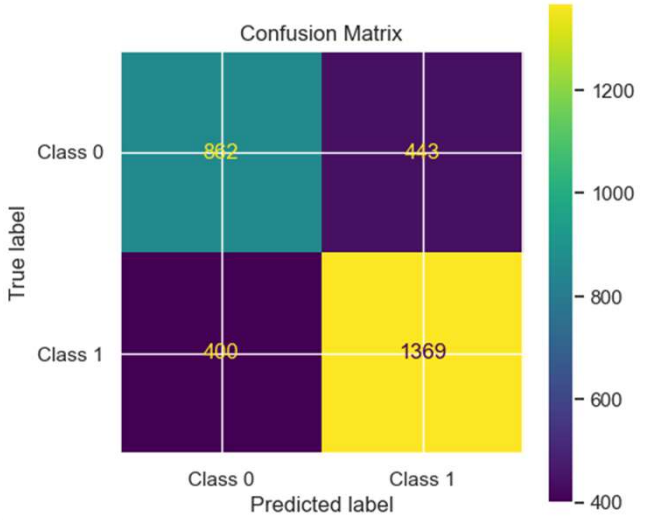




Model Evaluation

- The XGBoost model has been constructed for this dataset.
- Cross-validation has been performed on the model with 10 folds.
- Hyperparameter tuning has been conducted for the model using the following parameters: n_estimators = 800, random_state = 345, max_depth = 3, reg_alpha = 0.1, and learning_rate = 0.1.
- The train accuracy with cross-validation is approximately 78%, and the test accuracy with cross-validation is around 72%.





Conclusion

- The XGBoost model, constructed for this dataset, underwent cross-validation with 10 folds to ensure robustness and reliability. Hyperparameter tuning was meticulously performed, optimizing parameters such as n_estimators, random_state, max_depth, reg_alpha, and learning_rate. As a result, the XGBoost model achieved a train accuracy of approximately 78% and a test accuracy of around 72% with cross-validation.
- **Weather Impact:** Sunny weather significantly increases the likelihood of users accepting coupons, particularly for the "Coffee House" offer.
- **Coupon Expiration:** Coupons with shorter expiration times, such as 2 hours, are more likely to be accepted, especially for coffee house deals. For longer expiration periods, users tend to favor coffee house and bar coupons.
- **Destination and Travel Companions:** Users are more inclined to accept coupons when their destination involves no urgent work. Additionally, when traveling to destinations like home or work, users are typically alone, while they travel with friends when the destination is "No Urgent Work."
- **User Preferences:** Users tend to visit coupon platforms in the opposite direction of their destination, indicating a willingness to explore new venues.
- **Establishment Visitation:** A significant portion of users does not visit bars at all, while coffee houses are popular destinations. Users frequently visit restaurants with lower average expenses per person, but they rarely visit establishments with higher average expenses.
- **Travel Distance:** Users generally travel distances of more than 5 minutes to reach restaurants, cafes, or bars for coupon usage. For frequent visits, the travel time exceeds 15 minutes, while for rare visits, it surpasses 25 minutes.