Python for Data Science : Austo Automobiles

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1 BUSINESS PROBLEM

1.1 CONTEXT

Austo Motor Company is a leading auto manufacturer that specializes in SUV, Sedan and Hatchback models. In its recent board meeting, members expressed concern about the efficiency of the marketing campaign currently being used. The board decides to hire an analytics professional to improve the existing campaign.

1.2 OBJECTIVE

Analyze the data to get a fair idea of the demand of customers which will help them in enhancing their customer experience.Key Questions to be answered :

1. Do men tend to prefer SUVs more compared to women?
2. What is the likelihood that a salaried person will buy a sedan?
3. What evidence or data supports Sheldon Cooper's claim that a salaried male is an easier target for a SUV sale over a sedan sale?
4. How does the amount spent on purchasing automobiles vary by gender?
5. How much money was spent on purchasing automobiles by people who took a personal loan?
6. How does having a working partner influence the purchase of higher-priced cars?

1.3 DATA OVERVIEW

- The data set has 1581 rows and 14 columns.
- No duplicate records were found
- Missing Data: Gender : 53 records had missing gender information
- Missing Data: Partner Salary: 106 records had missing partner salary values
- Incorrect entries 'Femal' and 'Femle' were standardized to 'Female'
- All missing values in the Gender column were filled with 'Male', based on overall distribution and business statistics
- In cases where the partner salary was missing, it was computed as: Partner Salary = Total Salary - individual salary

- Created Age Category : a categorical column for age-based segmentation
- Created Total Family Members : column estimates the size of a customer's household. It assumes the customer is one member, then adds the number of dependents, and includes one additional member if the customer is married.

Field Name	Description
Age	The age of the individual in years
Gender	The gender of the individual, categorized as male or female
Profession	The occupation or profession of the individual
Marital_status	The marital status of the individual, such as married, single
Education	The educational qualification of the individual, Graduate and Post Graduate
No_of_Dependents	The number of dependents (e.g., children, elderly parents) that the individual supports financially
Personal_loan	A binary variable indicating whether the individual has taken a personal loan ”Yes” or ”No”
House_loan	A binary variable indicating whether the individual has taken a housing loan ”Yes” or ”No”
Partner_working	A binary variable indicating whether the individual's partner is employed ”Yes” or ”No”
Salary	The individual's salary or income
Partner_salary	The salary or income of the individual's partner, if applicable
Total_salary	The total combined salary of the individual and their partner (if applicable)
Price	The price of a product or service
Make	The type of automobile

TABLE 1: DATA DESCRIPTION

2 BUSINESS INSIGHTS: UNIVARIATE ANALYSIS

2.1 COMPANY PRODUCTS AND MARKET CONDITION

- The company specializes in Sedan, Hatchback and SUV models
- Sedan model accounts for (~44%) of the cars purchased, followed by Hatchback model (~36%).SUVs are the least popular car model among the customers

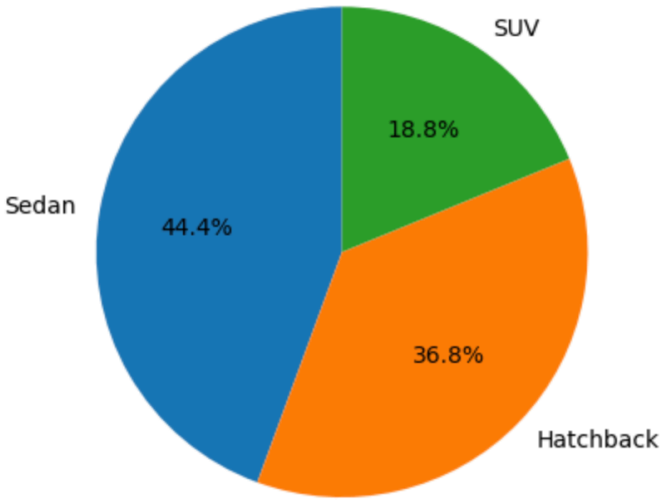

FIGURE 1: DISTRIBUTION OF CAR MAKE TYPES PURCHASED

- 75% of the customers purchased cars in the lower to mid-price ranges $18000 - $47000
- Few customers have bought expensive cars, causing the average price of car purchased to be greater than the median price of the purchased cars

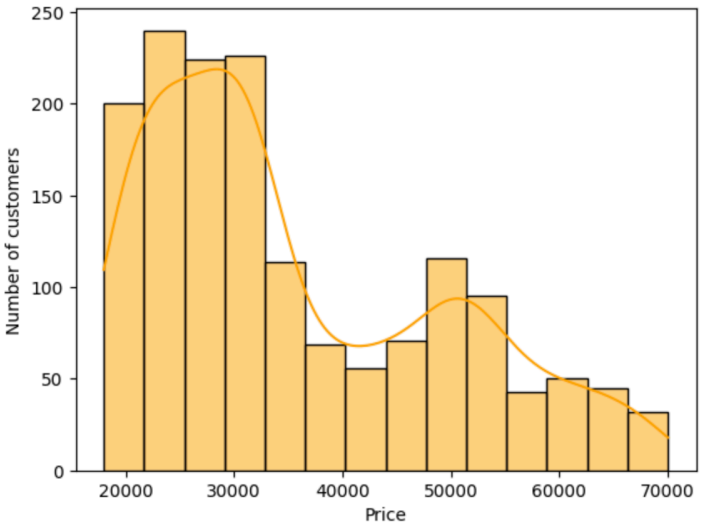

FIGURE 2: DISTRIBUTION OF CAR PRICE

2.2 CUSTOMER BASE

- 95% of the customers include young and middle-aged, ages ranging from 25 years - 38 years
- A few customers have high ages causing the average age of customers to be greater than the median age of the customers

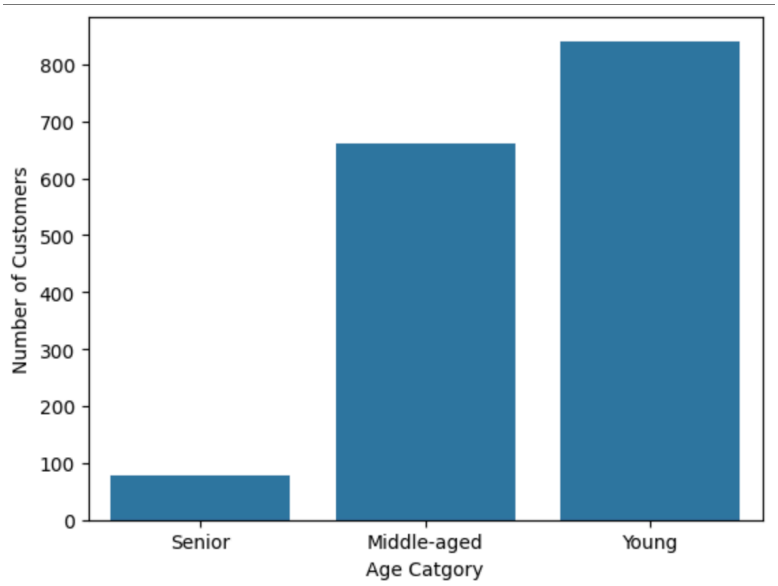

FIGURE 3: CUSTOMER AGE SEGMENT

- 91% of the customers are married and from among them 54% of them have working partners, indicating dual-income households.

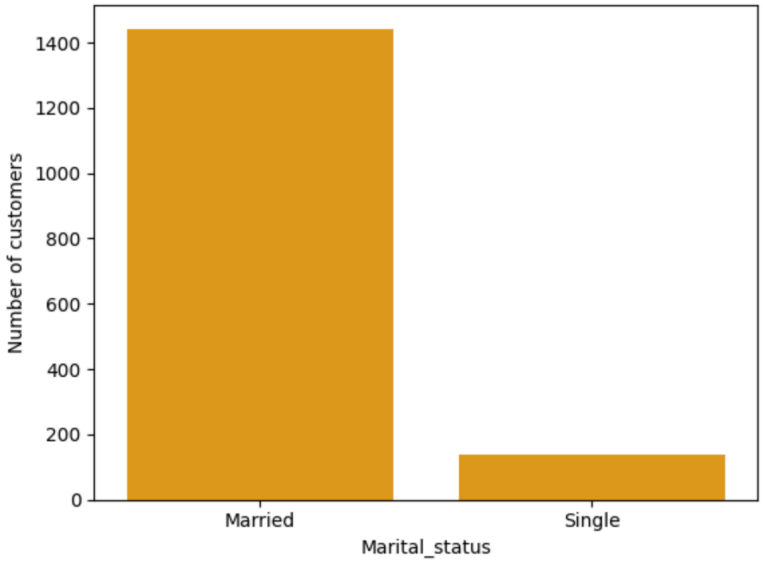

FIGURE 4: CUSTOMER MARITAL STATUS

- 71% of the customers are males.

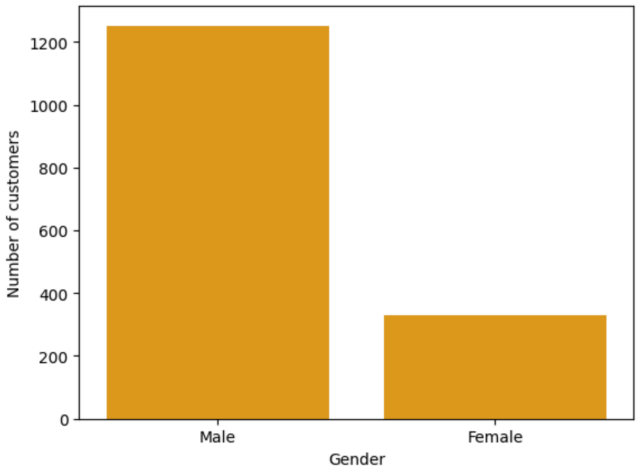

FIGURE 5: CUSTOMER GENDER

- Personal Loan : Customers are evenly split(50%) have personal loans, other 50% don't
- Home Loan : 66% of customers don't have home loan

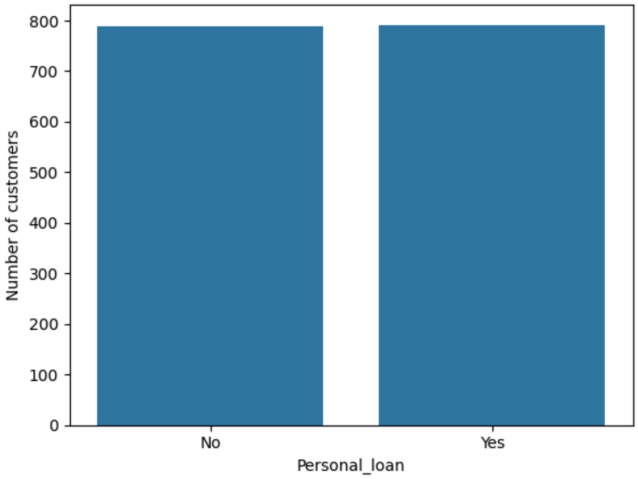

FIGURE 6: PERSONAL LOAN

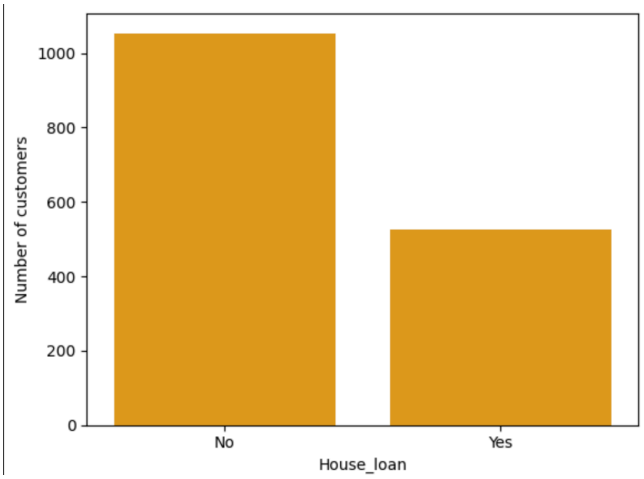

FIGURE 7: HOME LOAN

- 50% of customers have incomes in the median salary range $60000 - $100000
- Few customers have very high total salary, causing outliers, thus the average total salary becomes greater than the median of the customer total salaries

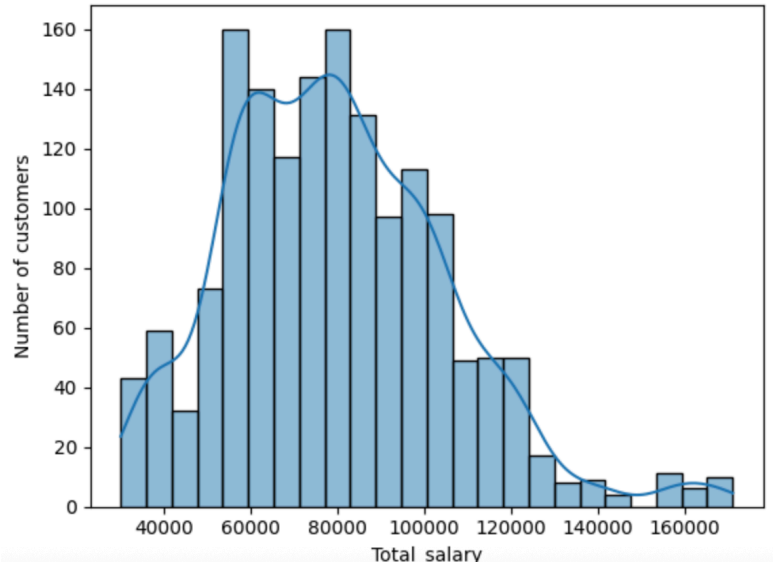

FIGURE 8: DISTRIBUTION OF TOTAL SALARY

- Customers are graduates or postgraduates, and either salaried or business professionals.

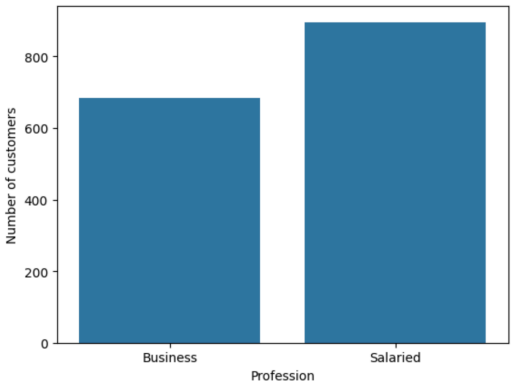

FIGURE 9: PROFESSION

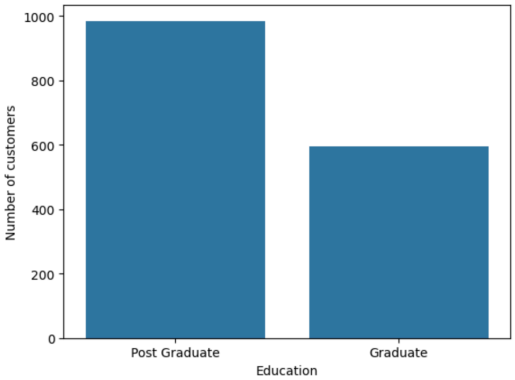

FIGURE 10: EDUCATION

3 DEMAND INSIGHTS : BIVARIATE ANALYSIS

3.1 MARKET CONDITION : CAR MAKE VS PRICE

The price range of each car model:

Car Make	Min Price	Max Price	Median Price
Sedan	$18,000	$55,000	$33,000
Hatchback	$18,000	$33,000	$27,000
SUV	$18,000	$70,000	$57,000

TABLE 2: PRICE RANGE AND MEDIAN PRICE OF DIFFERENT CARS

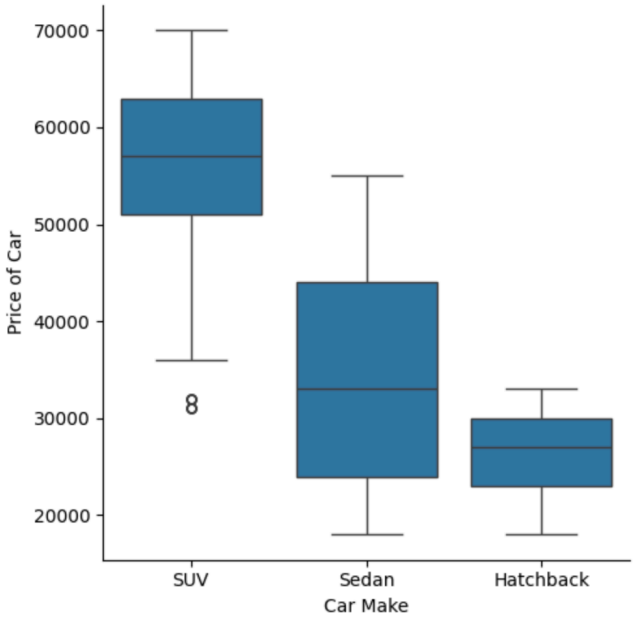

FIGURE 11: CAR MAKE VS PRICE

3.2 BASED ON CAR PRICE

3.2.1 TOTAL SALARY

- Price of the car purchased has a linear relation with the Total Salary
- 50% of the car purchased are in the price range $18000 - $35000, mostly around the median price of $31000.0 and as outliers, Customers with high total salary have purchased expensive cars causing the mean price to be greater than the median price range

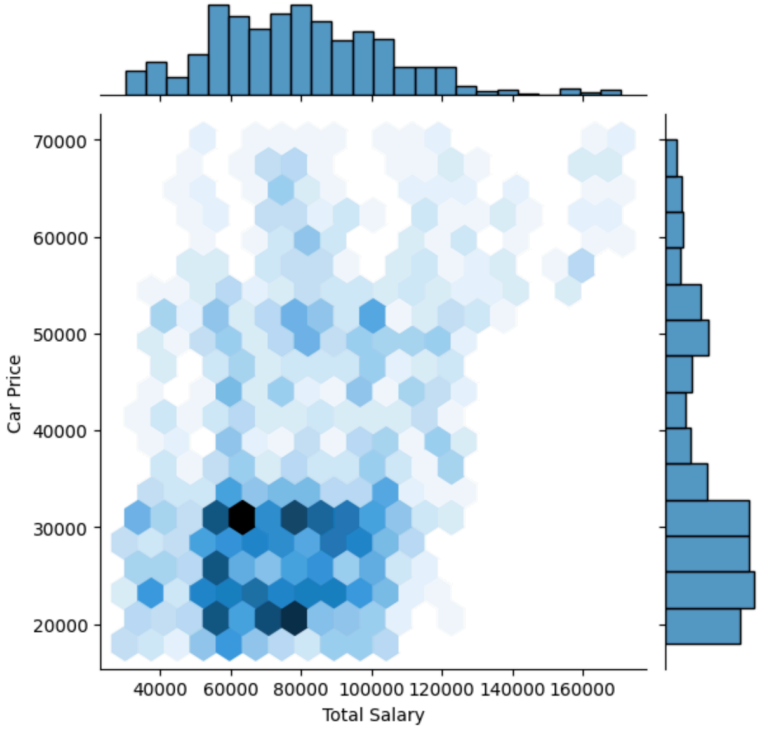

FIGURE 12: TOTAL SALARY VS PRICE

- Since, Total Salary = Salary + Partner salary, the columns Salary and Partner salary, these columns also have positive linear co-relation to the car price
- Customers who are either single or whose partner is not earning, these kind of customers also buy cars within the median price range $20000 - $35000

3.2.2 PERSONAL OR HOME LOAN

- The majority of customers, whether or not they have taken home or personal loans, tend to buy cars in the median price range
- Range of car price also is higher for customers with no personal loan, 50% of price range between $25000 - $49000, while for customers with loan the 50% of the price range between $24000 - $45000

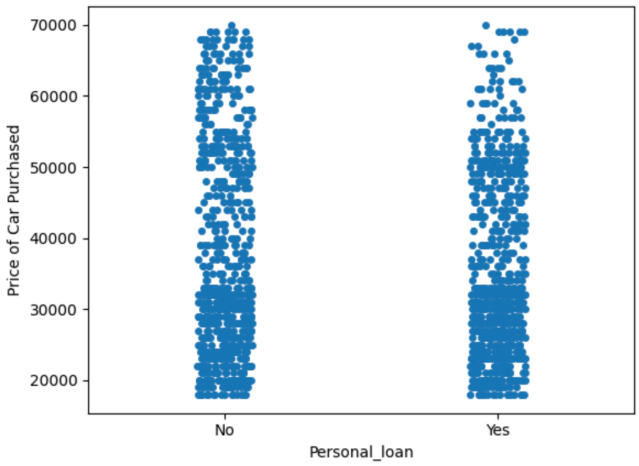

FIGURE 13: PERSONAL LOAN VS CAR PRICE

- The range of car price is also higher for customers without house loan, 50% of the price range between $25000 - $51000, while for customers with loan the 50% of the price range between $24000 - $36000

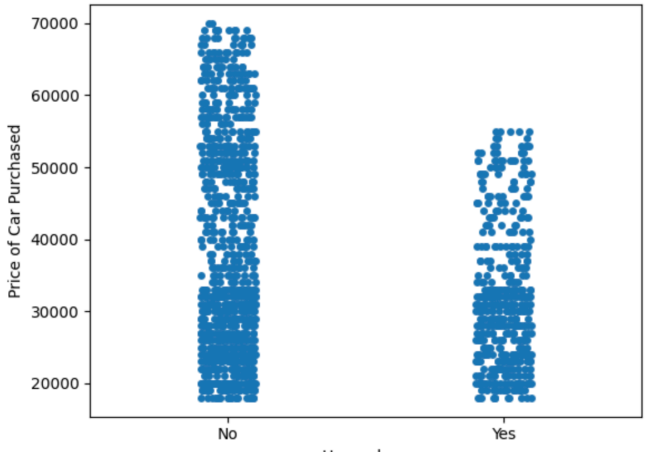

FIGURE 14: HOME LOAN VS PRICE OF CAR

3.2.3 MARITAL STATUS AND FAMILY SIZE

- Most customers irrespective of their marriage status purchase cars in the medium price range $14000 - $40000
- The price is right-skewed for married customers indicating that the married customers purchase higher priced cars

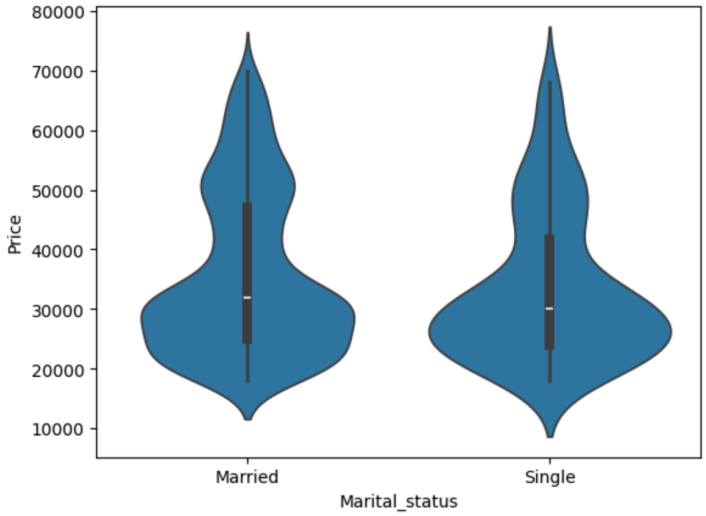

FIGURE 15: MARITAL STATUS VS CAR PRICE

- Majority of families with 1-6 members buy cars in medium price range, as the median Prices of the Cars purchased lie between $20000 - $50000

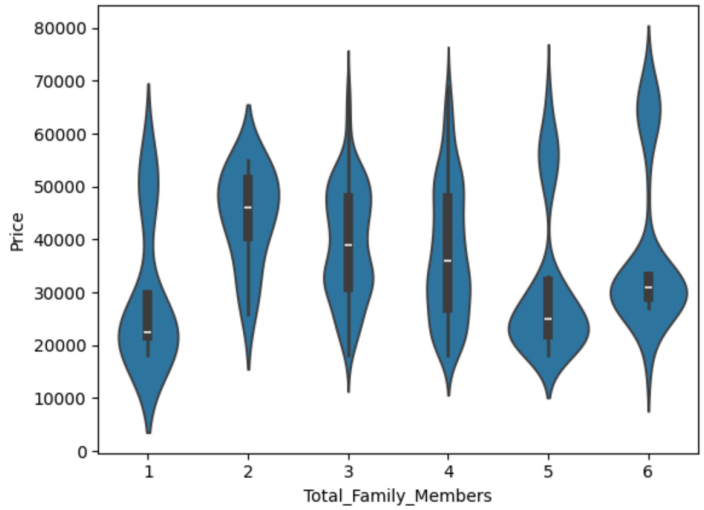

FIGURE 16: FAMILY SIZE VS CAR PRICE

3.2.4 GENDER

- 50% of male customers mostly buy cars in the medium price range $25000 - $38000.Some male customers buy cars of extremely high price causing right skewness
- 75% of Female customers buy cars of higher prices ranging between $39000 - $55000

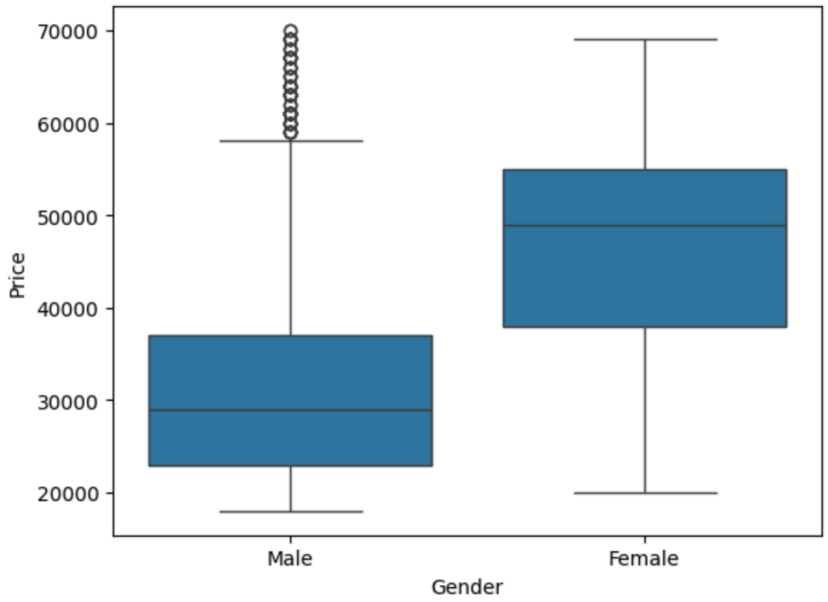

FIGURE 17: GENDER VS CAR PRICE

3.2.5 AGE

- 50% of Young customers purchase car in price range $22000 - $30000, however, some buy expensive cars causing many outliers
- Middle-aged customers exhibit greater variability in the price of car, nevertheless 50% of them buy cars in the price range $35000 - $53000
- Senior customers always purchase expensive cars only, so price ranges from $54000 - $62000

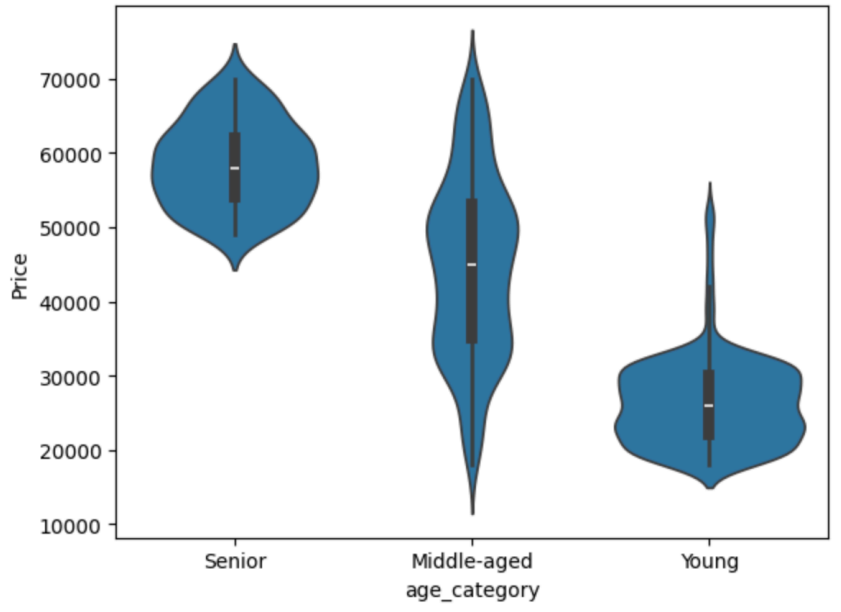

FIGURE 18: AGE VS CAR PRICE

3.3 BASED ON CAR MAKE

3.3.1 CUSTOMER EDUCATION AND PROFESSION

- Customer education or customer profession does not influence car make choice
  The common preference is : Sedan > Hatchback > SUV

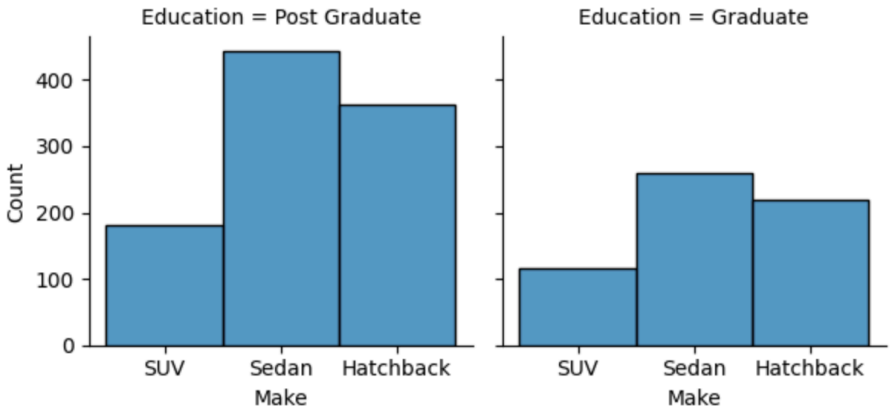

FIGURE 19: CUSTOMER EDUCATION - CAR MAKE

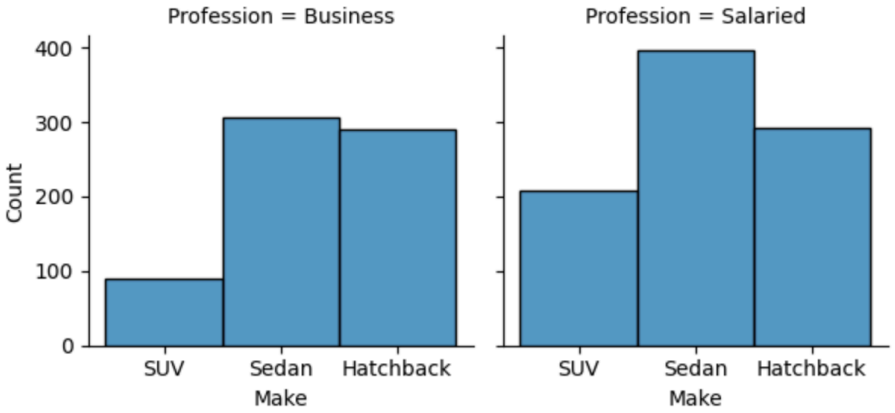

FIGURE 20: CUSTOMER PROFESSION - CAR MAKE

3.3.2 CUSTOMER GENDER AND FAMILY SIZE

- Male customers prefer Hatchbacks, then Sedans. SUVs are least popular
- Female customers opt for SUVs and Sedans, with lower preference for Hatchbacks

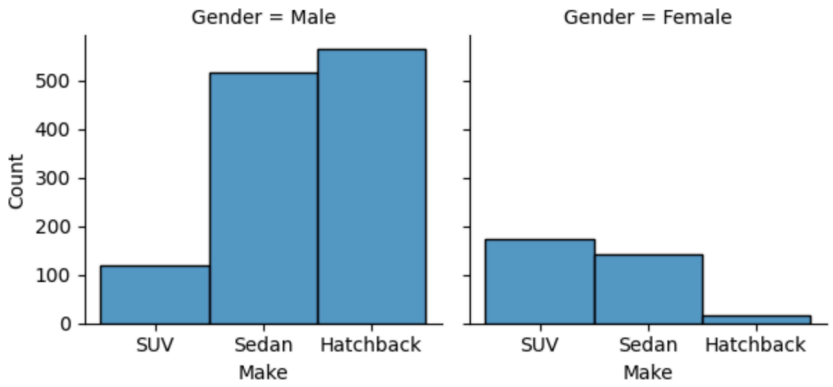

FIGURE 21: GENDER - CAR MAKE

- Salaried Male customers have car make preference in the order : Sedan > Hatchback > SUV

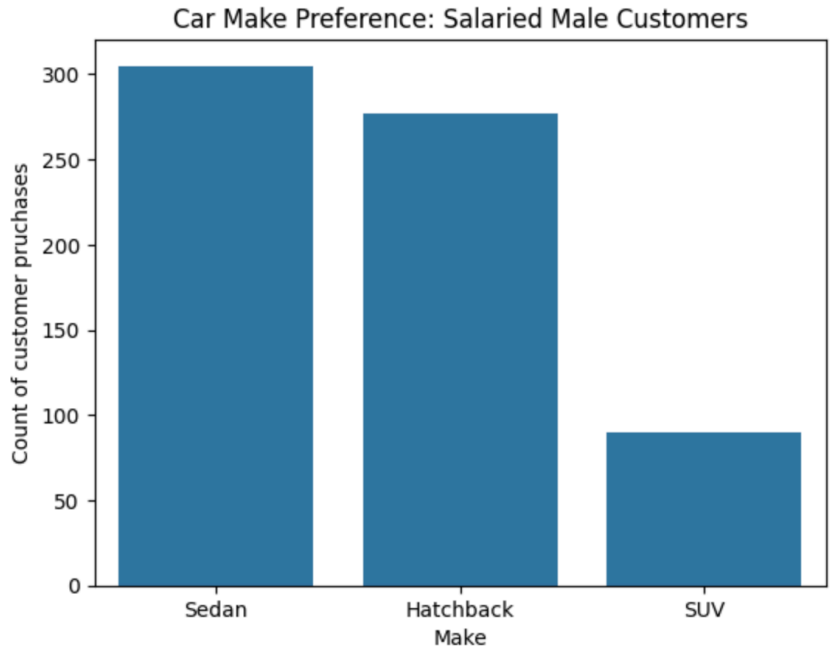

FIGURE 22: SALARIED MALES - CAR MAKE

- Families with 3-5 members prefer Sedan as first choice, then Hatchbacks. SUVs are rarely opted, even by 6 member families

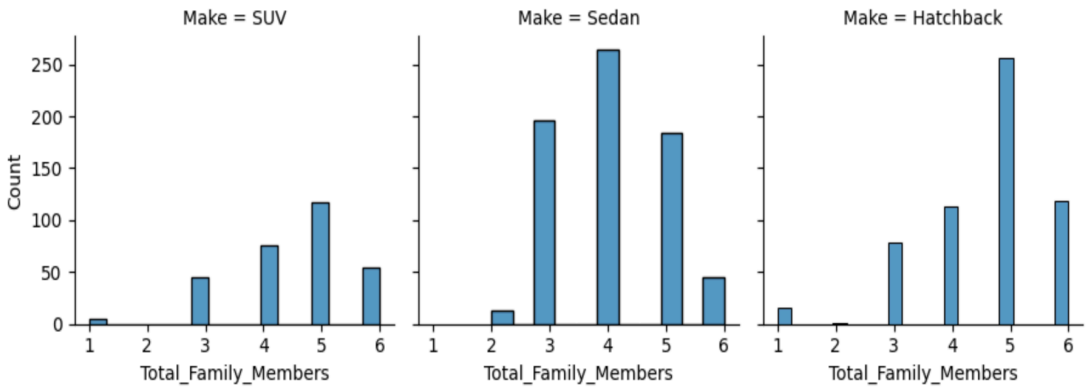

FIGURE 23: FAMILY SIZE - CAR MAKE

3.3.3 AGE GROUPS

- Young customers mostly prefer Hatchbacks followed by Sedan and SUV
- Middle-aged customers mostly prefer Sedan followed by SUV and Hatchback
- Senior customers only opt for SUVs

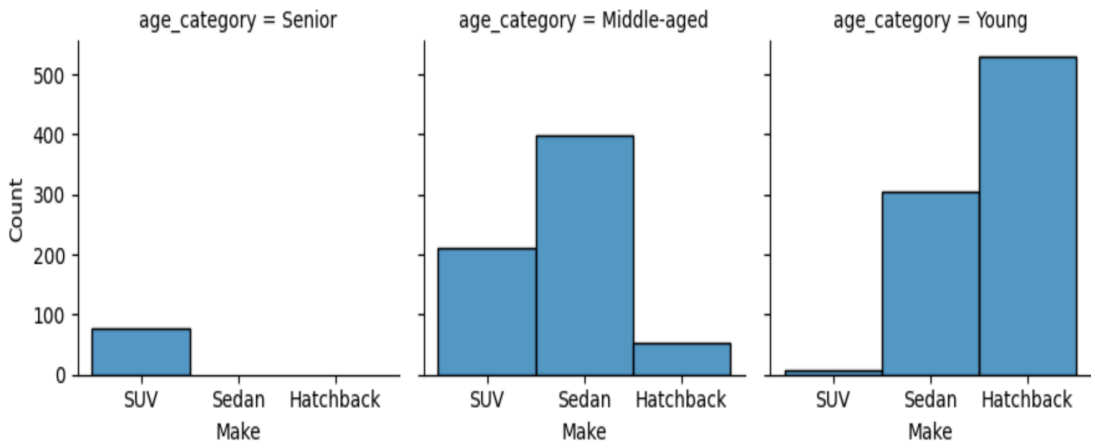

FIGURE 24: AGE - CAR MAKE

4 KEY QUESTIONS

1. **Do men tend to prefer SUVs more compared to women?**
   No, male customers in general preference order : Hatchback > Sedan > SUV.
   Female customers prefer SUV over rest of the models
2. **What is the likelihood that a salaried person will buy a sedan?**
   The probability of a customer purchasing the Sedan is ~44%
3. **What evidence or data supports Sheldon Cooper's claim that a salaried male is an easier target for a SUV sale over a sedan sale?**
   The claim is invalid as salaried males prefer Sedan over Hatchback and SUVs
4. **How does the amount spent on purchasing automobiles vary by gender?**
   - 50% of male customers mostly buy cars in the medium price range $25000 - $38000
   - Some male customers buy cars of extremely high price causing right skewness
   - 75% of Female customers buy cars of higher prices ranging between $39000 - $55000
5. **How much money was spent on purchasing automobiles by people who took a personal loan?**
   - The majority of customers, whether or not they have taken home or personal loans, tend to buy cars in the median price range

- The range of car price also is higher for customers with no personal loan, 50% of price range between $25000 - $49000, while for customers with loan the 50% of the price range between $24000 - $45000

6. **How does having a working partner influence the purchase of higher-priced cars?**

    - Price of the car purchased has a linear relation with the Total Salary
    - Since, Total Salary = Salary + Partner salary, the columns Salary and Partner salary also have positive linear co-relation to the car price
    - 54% of customers have working partners indicating dual-income households, thus higher total salary increases the purchasing power of the family to buy higher-priced cars

5 ACTIONABLE INSIGHTS & RECOMMENDATIONS

- Young, single people under 30 usually have less money to spend. This group, especially young men, can be targeted with Hatchbacks that are shown as affordable, easy to use, and good for city travel. These cars would be perfect for those working in IT or starting their careers. Special discounts or easy payment plans can be offered to attract them
- Salaried men, married couples and big families (with 6 or more members) often prefer higher priced Sedans are a strong target for SUV sales because they offer more space and comfort. Promotions for this group should focus on features like roomy interiors, family-friendly design, and good fuel efficiency.
- People from dual-income households (where both the person and their partner earn) usually have more money to spend. They can be good targets for higher-priced Sedans and SUVs. The focus should be on features like good performance, comfort, and long-lasting value in the promotions.
- People who don't have personal or home loans usually are more financially stable and are more likely to buy expensive cars, especially SUVs. This group should be given priority for premium models