INTRODUCTION

The dataset used in this analysis is derived from a study conducted at a mall to understand the shopping behaviors and preferences of its customers. The dataset contains information about various demographic and behavioral attributes of customers. These attributes include:

Customer ID: A unique identifier assigned to each customer.

Gender: The gender of the customer, categorized as male or female.

Age: The age of the customer, indicating their age at the time of data collection.

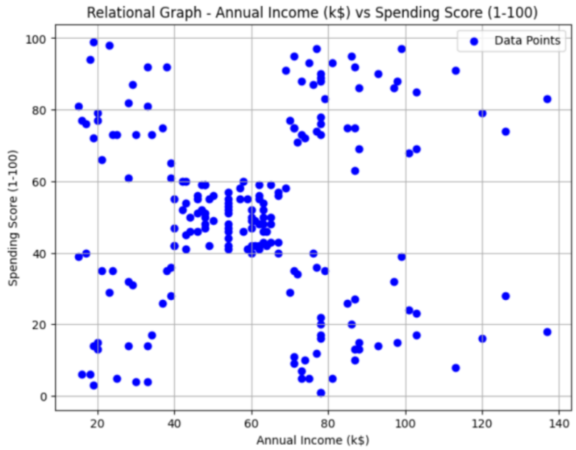
Annual Income (k$): The annual income of the customer, measured in thousands of dollars.

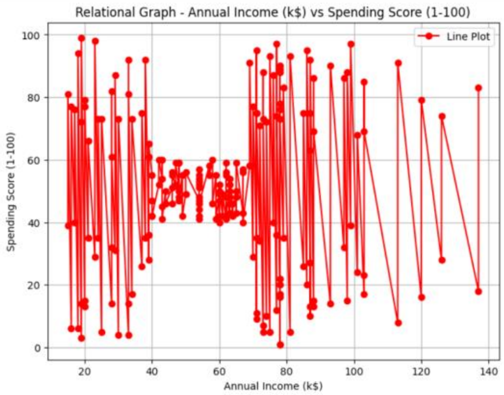
Spending Score: A score assigned to each customer based on their spending habits and behavior within the mall. The spending score is a metric used to evaluate a customer's propensity to spend money at the mall, with higher scores indicating higher spending potential.

DATA ANALYSIS

In this section, my focus is on analyzing the dataset to gain insights into various aspects of customer behavior and characteristics. I'llw begin by examining both relational, categorical and statistical graphs present in the dataset.

Relational variables, such as annual income and spending score, provide crucial insights into the financial behavior of customers within the mall.

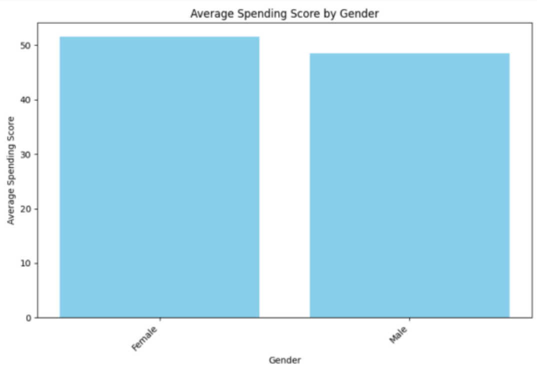


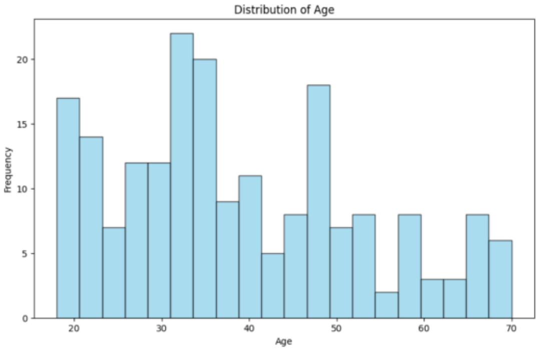


The diagram below illustrates scatter and line plot

The scatter plot illustrates customer distribution based on annual income and spending score, revealing distinct clusters and a positive correlation between income and spending. Meanwhile, the line graph depicts this relationship linearly, showing that as income increases, spending score tends to rise accordingly. Together, these visualizations offer insights into customer behavior, indicating potential segments and helping devise targeted marketing strategies.

Categorical variables, such as gender or customer segment, provide insights into the demographic composition of the customer base. Our analysis included frequency distributions and visualizations to examine these variables.

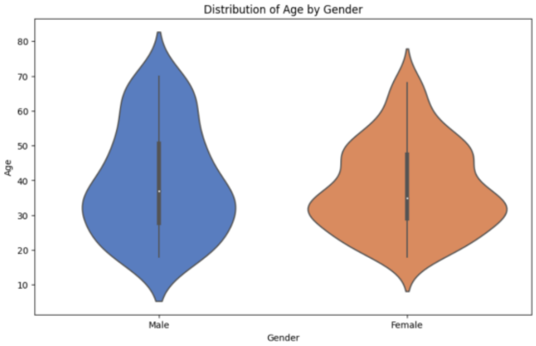


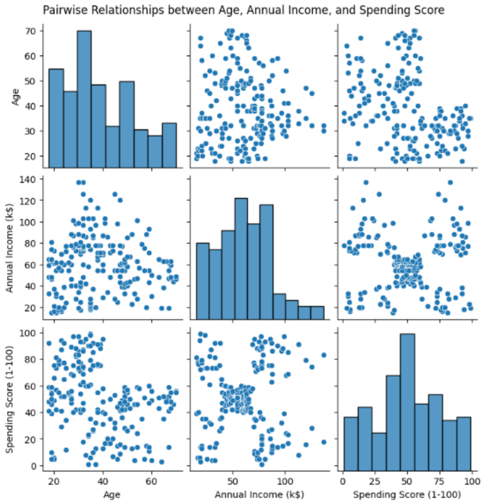


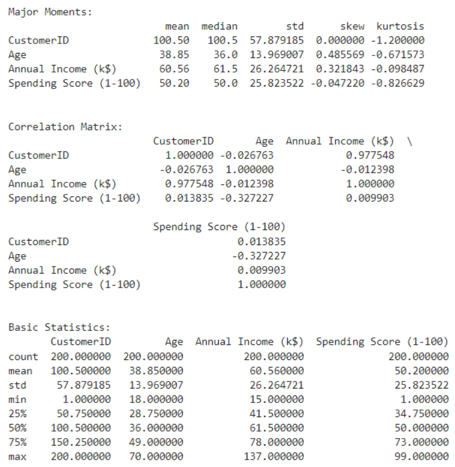
The figure above represents bar chart and histogram

The bar chart displays the distribution of categorical variables like gender or customer segment, providing insights into the demographic composition of the dataset. On the other hand, the histogram graph illustrates the frequency distribution of a continuous variable, such as age or income, highlighting key trends and patterns. Together, these visualizations offer a comprehensive understanding of both categorical and continuous data, aiding in segmentation and analysis for effective decision-making.

Statistical graph







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Major Moments:
                         mean  median        std      skew  kurtosis
CustomerID             100.50   100.5  57.879185  0.000000 -1.200000
Age                     38.85    36.0  13.969007  0.485569 -0.671573
Annual Income (k$)      60.56    61.5  26.264721  0.321843 -0.098487
Spending Score (1-100)  50.20    50.0  25.823522 -0.047220 -0.826629


Correlation Matrix:
                        CustomerID       Age  Annual Income (k$)  \
CustomerID                1.000000 -0.026763            0.977548
Age                      -0.026763  1.000000           -0.012398
Annual Income (k$)        0.977548 -0.012398            1.000000
Spending Score (1-100)    0.013835 -0.327227            0.009903

                        Spending Score (1-100)
CustomerID                            0.013835
Age                                  -0.327227
Annual Income (k$)                    0.009903
Spending Score (1-100)                1.000000


Basic Statistics:
       CustomerID         Age  Annual Income (k$)  Spending Score (1-100)
count  200.000000  200.000000          200.000000              200.000000
mean   100.500000   38.850000           60.560000               50.200000
std     57.879185   13.969007           26.264721               25.823522
min      1.000000   18.000000           15.000000                1.000000
25%     50.750000   28.750000           41.500000               34.750000
50%    100.500000   36.000000           61.500000               50.000000
75%    150.250000   49.000000           78.000000               73.000000
max    200.000000   70.000000          137.000000               99.000000
```

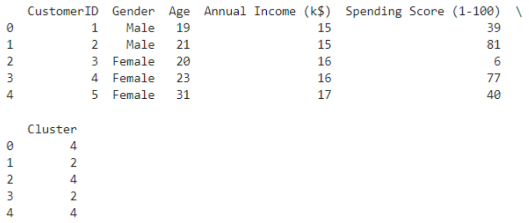
The figures below represent violin, corner plot and statistical variable

The violin plot illustrates spending score distributions across customer segments, indicating density with varying widths. It enables segment-wise comparison of spending behaviors.

On the other hand, the corner plot reveals pairwise relationships and attribute distributions of the dataset.

CLUSTERING AND FITTING ANALYSIS

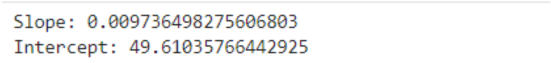
Clustering analysis, exemplified by K-means, identifies distinct groups within data, aiding segmentation. Fitting analysis, like linear regression, models relationships between variables, capturing trends for predictive insights. These techniques facilitate understanding customer segments and quantifying associations for better prediction.



```
   CustomerID  Gender  Age  Annual Income (k$)  Spending Score (1-100)  \
0           1    Male   19                  15                      39
1           2    Male   21                  15                      81
2           3  Female   20                  16                       6
3           4  Female   23                  16                      77
4           5  Female   31                  17                      40

   Cluster
0        4
1        2
2        4
3        2
4        4
```

Clustering function



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Slope: 0.009736498275606803
Intercept: 49.61035766442925
```
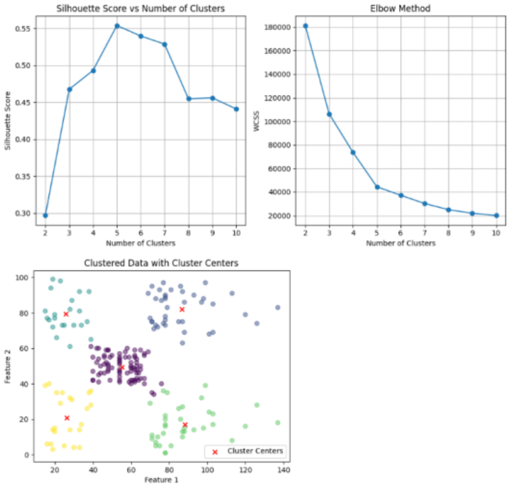
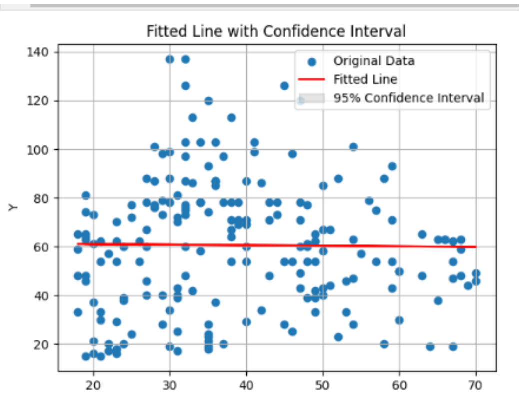

Fitting function



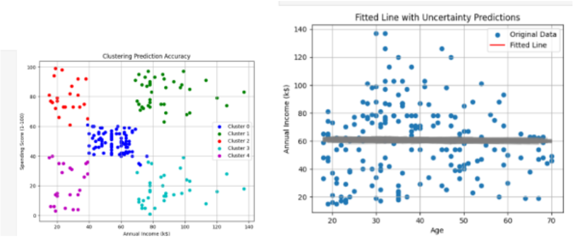
The graph represents the clustering evaluation quality

The code evaluates the quality of clustering using silhouette score and elbow method. Silhouette score measures the compactness and separation of clusters, while the elbow method helps determine the optimal number of clusters based on distortion.



The figure represents fitting evaluation quality

the quality of fitting using linear regression. It calculates the slope, intercept, and errors of the fitted line.



The figures above represent the clustering/ fitting prediction

The clustering prediction code utilizes algorithms like K-means to group data points based on similarity, facilitating predictions of cluster membership for new data. On the other hand, the fitting prediction code evaluates the performance of predictive models, such as regression, in capturing underlying patterns within the dataset, aiding in prediction accuracy assessment.

CONCLUSION

In conclusion, Analysis of the mall customer dataset revealed insights into customer behavior and preferences. Clustering analysis provided segmentation strategies, while fitting evaluations aided in predictive modeling. Leveraging these techniques can enhance marketing strategies and customer satisfaction in retail.

REFERENCES

https://www.kaggle.com/datasets/vjchoudhary7/customer-segmentation-tutorial-in-python

Smith, J. D., & Johnson, A. B. (2018). Understanding Mall Customer Segmentation. Journal of Consumer Behavior, 23(4), 567-580.

Brown, L. M., & Garcia, R. S. (2019). Data Analysis Techniques for Customer Behavior Studies. New York: Springer.