**Information Visualization – Project 3: Programming with D3.js**

Introduction :  
Businesses must analyze consumer purchase behavior in order to comprehend their target market and adjust their marketing tactics. Using a dataset comprising demographic and purchase data, the goal of this project is to create a prototype visualization system that combines several visualizations to study customer purchasing patterns.   
  
Overview of the Dataset :  
Along with purchasing information like Purchase Amount, Chain, and Payment Method, the dataset includes demographic factors like Age, Gender, Income, Occupation, and Family Size. It is appropriate for in-depth study because it provides a thorough understanding of consumer behavior and has  entries.

Identify at least three visualization tasks for the dataset:

Tasks for Visualization   
Three essential visualization tasks have been determined in order to examine the dataset's insights:   
  
Task 1: Gender-specific Average Purchase   
Bar chart is the visual representation.   
The purpose of this job is to compare the average purchase amounts made by different genders in order to gain insight into their purchasing patterns.   
Interaction: Data filtering for more exploration is triggered by clicking on a bar.

Task 2: Average Purchases by Family Size and Gender   
Graphical Display: A multi-line diagram   
This work provides deeper insights into spending patterns by visualizing how purchase quantities fluctuate with family size for different women.   
Interaction: To facilitate comparative analysis, the line chart dynamically updates based on the gender selected in the bar chart.

Task 3: Distribution of Payment Methods   
Pie chart as the visual representation   
It is possible to gain insight into consumers' preferred payment options by analyzing the distribution of payment methods they use.   
Interaction: In-depth details about each payment option are displayed when the mouse is over the corresponding pie chart segment.

Visualization Design :

To accurately depict the data and assist with the designated objectives, each style of visualization has been carefully selected.   
  
Bar Chart: Perfect for comparing numerical data (average purchase amounts) across several categories (gender, for example).   
Multi-line chart: Used to show patterns and connections between several variables (e.g., gender, size of family, amount of purchase) across an extended range.   
Pie Chart: Appropriate for visually appealingly portraying distributions and proportions (payment method distribution).

Designer Interactions :

Users are more engaged and data discovery is made easier with interactive elements.   
  
Bar Chart Interaction: Pie and multi-line charts can be updated by clicking on a bar, which allows users to concentrate on particular gender portions.   
Interaction of Multiple Lines Chart: When you hover over data points, tooltips providing comprehensive details on typical purchase amounts appear, which helps you understand the data.   
Pie Chart Interaction: User's comprehension of payment preferences is improved by the mouseover action, which shows consumers the percentage and comprehensive details of each payment option.

Execution

The D3.js package is used to construct the web-based data visualization system. Important aspects of the implementation are:   
Accessibility: Web browsers may access the system, guaranteeing its general usefulness.   
Functionality: A flawless user experience is offered by all fully functional visualization and interaction features.   
Coordination: Through interactions, several visualizations are synchronized, enabling users to examine data from various angles.

Outputs:

So, we have used these 3 representations : Bar graph, scatter plot , pie chart .This shows the insights average purchase by gender , average purchase by family size and gender .

In the bar graph and scatter plot yellow represents female and blue represents male.

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This is interactive when we hover the mouse over the images , the plots shows up gender and average purchase .

These visualizations interact within themselves also. For example , when we click on one bar in the bar graph, besides hovering on the bar the scatter plot and the pie chart get brushed up accordingly.

If we click on the bar showcasing the male percentage ,accordingly the scatter plot shows the values of the male . same thing goes with the pie chart , it shows the percentage of various payment methods of males .

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Conclusion :

The visualization system prototype that was built provides a useful tool for studying customer purchasing patterns. Through the integration of various interactive elements and infographics, users can obtain significant insights into spending trends, payment preferences, and demographic trends.