DATA VISUALIZATION

ASSIGNMENT-1

8/10

23/9

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Subject : Data visualization

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Explain how human perceptual Processing models and Gestalt Principles influence the effectiveness of data Visualizations Discuss with suitable examples how visualization designers can minimize information overload and maximize information clarity using overload concepts such as Gibsonian Affordance theory, data abstraction, and appropriate dataset representation.

Introduction:

Datavisualization is one of the most Powerful tools in modern Communication because it transforms raw data into meaningful, interpretable patterns. It efficientiness depends on how well it aligns with human perception and Cognition.

By applying perceptual principal like Gestalt Principles and Concepts like Gibsonine Affordance theory, data abstraction and proper dataset representation. designers and proper clear, intuitive, and enhance understanding.

Human Perceptual Processing models in Visualization

Human Perceptual Models explain how People quickly interpret visual data by recognizing Patterns, colors, shapes and Contrasts faster than text.

* Pre-attentive Processing: The brain instantly notices features like color, size, or orientation,

Example: a red bar in chart of blue bar draws immediatly attention.

* working memory limits:
Since, human can only procss few chunks of information at once(7 ± 2 rule) visualization should summarize data.

Greatest Principles and Data visualization.
Gestalt Psychology explains how human naturally preceive and grouping design because they help determine how users interacts graphs, charts or dashboards

i) proximity: Elements that are close together are perceived as belonging to the same group

ii) Similarity:
Objects with similar shapes, color or size are seen as part of the same category.

iii) Continuity: The human eye prefers continuous lines and curves. Line chart are effective because viewers naturally follow tends along a smooth path.

iv) Closure:
Humans tend to fill in gaps to perceive a complete shape.

Minimizing Information overload and Maximizing clarity

1) Gibson's Affordance theory

Gibson's Affordance theory suggest that objects have inherer properties that indicate their possible use. In visualization, this translate to intutive design where with on interpet the chart.

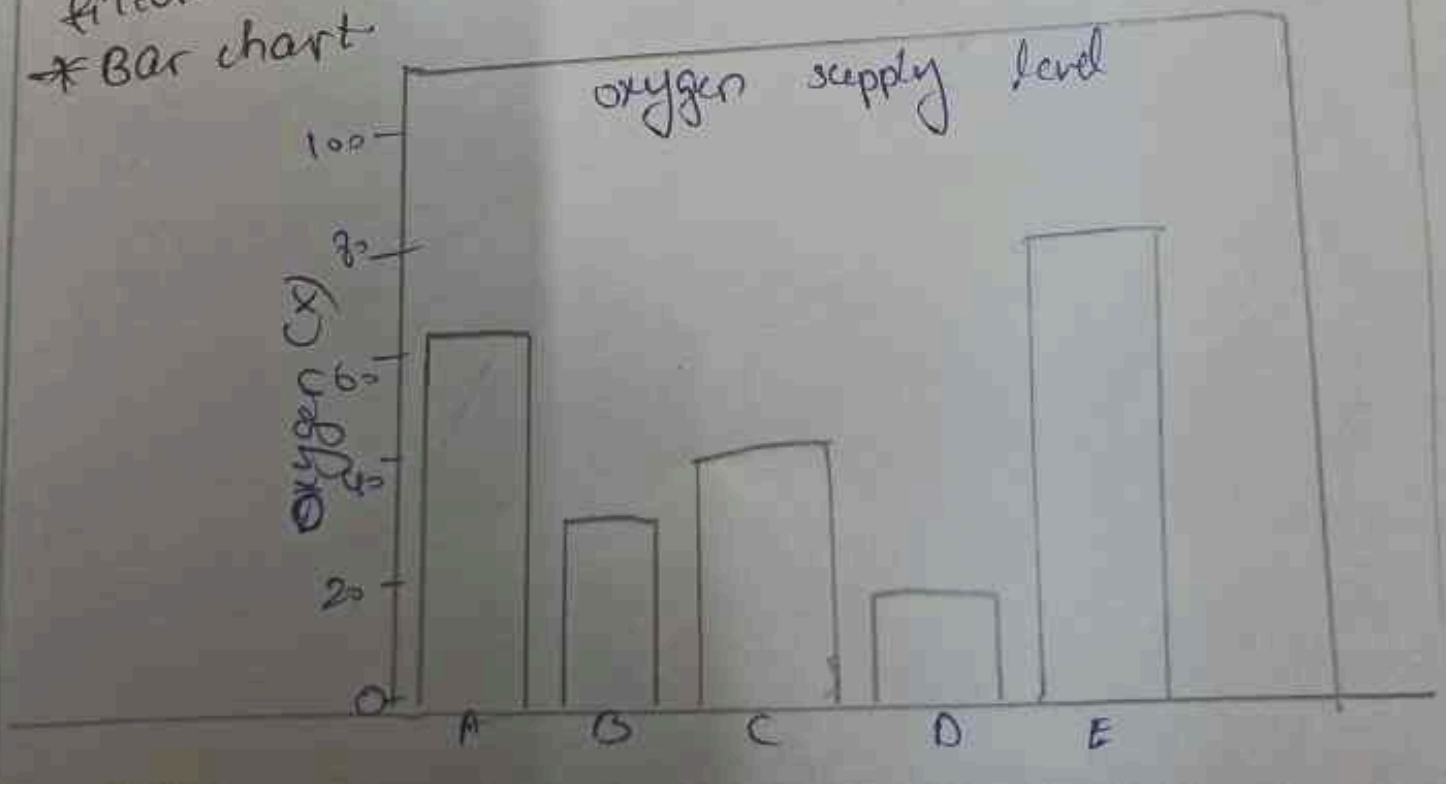
2) Data Abstraction:

Raw data is often to large and complex for direct visualization may confuse the audience, even if the data is accurate.

Practical Example

In a hospital dashboard during a pandemic, using color to highlight low oxygen levels grouping stab by ward, adding interactive filters and make faster decision

* Bar chart



with the help of suitable datasets, Compare and Construct different visualization techniques in univariate, Bivariate and Multivariate analysis.

Introduction :-

Data analysis often categorized into univariate, Bivariate and multivariate analysis depending on the number of variables studied. It depends on :

1. Number of data : categorical vs Continuous
2. Number of variables : one, two or more than two
3. objective of analysis : distribution, Comparision

* Univariate Analysis :
Univariant analysis involves analyzing a single variable at a time to understand it's distribution, central tendency and spread.

Examples:

1) Indian census (male and female categorized by bar chart)
2) Monthly Expenditure.

* Bivariante Analysis : Bivariate Analysis deals with the relationship between two variables. The aim is to identify correlation, trends or difference between them.

* scatterplot with fit line: used for two continuous variables

* side by side box plots:
used one variable is categorical and the other is continuous.

Example:

1) A scatterplot with a regression study hours lead to higher marks.

*Multivariant analysis:
Multivariate analysis involves three or more variables simultaneously to uncover complex relationships.

i) Heatmap: used for showing correlation matrices

ii) Bubble sort: similar to a scatterplot but with a third variable represented by bubble sort

Conclusion: Therefore, univariate, bivariate, multivariate visualization serve different, purposes distributions relationship and complex interactions choosing the right chart type based on data type and helps turn raw data into insights supporting better decisions