



SNS COLLEGE OF ENGINEERING

Kurumbapalayam (po), Coimbatore – 641 107

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DEPARTMENT OF ARTIFICIAL INTELLIGENCE AND DATA SCIENCE

19AD504 – DATA VISUALIZATION

Pre attentive attributes

What are Preattentive Attributes?

Preattentive attributes are the visual features that our brain notices *instantly* and *without effort*. These features help people quickly understand what's important in a chart or graph. When used well, they make it easy to find patterns and important information at a glance.

Main Preattentive Attributes:

- 1. Color:**
 - **What it does:** Different colors make things stand out.
 - **Example:** Use a bright color for key data points to draw attention to them.
- 2. Size:**
 - **What it does:** Bigger objects look more important.
 - **Example:** A large circle can show that a value is bigger than the smaller ones.
- 3. Shape:**
 - **What it does:** Different shapes help show different groups.
 - **Example:** Using triangles for one group and squares for another in a scatter plot helps tell them apart.
- 4. Position:**
 - **What it does:** Where things are placed tells you if they're similar or different.
 - **Example:** In a bar chart, bars next to each other are easy to compare.
- 5. Length:**
 - **What it does:** Longer bars or lines show bigger values.
 - **Example:** A taller bar means a bigger value in a bar chart.
- 6. Grouping (Spatial Proximity):**
 - **What it does:** Things close together are seen as part of a group.
 - **Example:** Points close together in a scatter plot show they're similar.

Why It Matters: Preattentive attributes let people understand data without thinking too hard. By using color, size, or position smartly, you can make the most important parts of your data stand out right away.

Preattentive Attributes-Sight and Memory

Preattentive attributes are closely tied to both **sight** and **memory** in data visualization. Here's a simplified breakdown of how they relate:

Preattentive Attributes and Sight

- **Instant Perception:** Our brain can quickly spot certain visual features (like color, size, and shape) without needing to focus or analyze. This happens almost immediately, within a few hundred milliseconds.
- **Examples:**
 - You instantly notice a red dot among many blue ones.
 - A larger bar in a chart catches your eye immediately compared to smaller bars.

This makes **sight** a key part of preattentive attributes because these features stand out at a glance, even if the viewer isn't actively looking for them.

Preattentive Attributes and Memory

- **Working Memory:** Humans have limited working memory, which means we can only hold a few pieces of information in our minds at once. Preattentive attributes help reduce the cognitive load by making important information more obvious, so we don't need to rely on memory as much.
- **Memory Efficiency:** By using preattentive attributes like color or size to highlight key data points, we reduce the need for viewers to remember specific details—they can "see" the important information instead of trying to recall it.

How Sight and Memory Work Together in Data Visualization:

- **Sight** picks up on preattentive attributes quickly, allowing us to grasp key insights without much effort.
- **Memory** is supported by this because the need to mentally process or remember a lot of information is reduced. Instead, viewers rely on their instant visual understanding of the chart.

Example: In a line graph showing sales over time, if one point is highlighted in bright red (color) and is also larger (size), viewers will immediately notice that point without needing to remember the details of the whole graph. Their sight processes it quickly, and their memory is freed up to focus on other insights.