Screen Sense: Kids' Screentime Visualization

Milestone 2: Visual Exploration and Topic Trends

OBJECTIVE: The objective of Milestone 2 is to analyze the Indian Kids Screen Time dataset using detailed visual exploration techniques. Week 3 focuses on understanding distributions of screen time, age bands, and device usage, and comparing these patterns across gender, age groups, and location types through bar charts, histograms, boxplots, and line plots. Week 4 aims to examine device and activity preferences across demographics and study weekday–weekend variations to identify behavioral differences and usage peaks. These analyses help uncover high-screen-time cohorts, interpret early trends, and build a strong foundation for further modeling and insights.

Week 3: Univariate and Bivariate Visual Analysis

1. **Analyze the distributions** of key variables such as:

1.1 Histogram of Average Daily Screen Time

A histogram was plotted to examine how many children fall into different screen-time ranges (e.g., 0–2 hrs, 3–5 hrs, etc.).
This helps reveal whether children generally spend low, moderate, or high hours on digital devices.

Key Observations

The distribution is **right-skewed**, meaning a significant number of children spend **high screen-time hours** (4–7 hours/day).

Only a small portion of children fall within the recommended screen-time range (below 2 hours/day).

The most common range appears to be **4–6 hours/day**, indicating excessive digital exposure among kids.

A few outliers exist with more than 7–8 hours/day, which may indicate gaming addiction or heavy usage.

1.2: Distribution of Age Bands

The age bands (e.g., Child, Pre-Teen, Teen) were analyzed through a bar chart to understand how the dataset is distributed across different age groups.

What the graph shows

- A count of how many children belong to each age category.
- Examples:
    - **Children (5–9 years)**
    - **Pre-Teens (10–12 years)**
    - **Teens (13–18 years)**

Key Observations

- Teens represent the **largest portion** of the dataset, suggesting they are the most frequent digital users.
- Pre-teens form the second largest group.
- Young children form a smaller percentage, but still significant.

1.3: Count of Primary Device Usage

A count plot was used to analyze what primary device children mostly use for daily activities. Devices may include:

- Mobile phones
- Tablets
- Laptops
- Smart TVs
- Gaming consoles

Key Observations

- **Mobile phones dominate** as the most-used device across all age groups.
- Tablets and laptops rank second and third, depending on age and region.

- Smart TVs and gaming consoles are used less frequently, indicating usage is more individual than shared.
- Urban children show more device variety, while rural children are more mobile-dependent.

2. Comparison of Screen Time Across Demographics

A major part of visual exploration involves comparing how screen time differs across demographic variables. This helps identify which groups spend more or less time on digital devices and whether certain categories show consistent behavioral patterns.

2.1 Screen Time by Gender

A **boxplot or bar chart** was used to compare average daily screen time between boys and girls.

Detailed Observations

- The median screen time for both genders is almost the same, showing **no major gender gap**.
- The spread (interquartile range) is also similar, meaning both boys and girls follow similar screen-time habits.
- A few outliers exist for both genders, suggesting extreme usage due to gaming or entertainment.
- Overall, gender does **not significantly influence** screen time.

Interpretation

This indicates equal access to digital devices for both boys and girls in modern households.

2.2 Screen Time by Age Band

The dataset was divided into age bands (Child, Pre-Teen, Teen), and bar charts/boxplots were used to compare screen usage.

Detailed Observations

- **Teens (13–18 years)** exhibit the **highest screen-time** values.
- Pre-teens show moderate usage, while young children have relatively lower screen time.
- Teens also show higher variation, with many values ranging between 4–7 hours/day.
- Pre-teens and children show more stable, predictable patterns.

Interpretation

Age strongly influences screen behavior —
-older children have more access
-more independence
-more online learning and social media usage
-more recreational content consumptio

2.3 Screen Time by Urban vs Rural Location

Location was used to compare digital exposure based on households in cities vs villages.

Detailed Observations

- **Urban children** record significantly **higher screen time** than rural children.
- Urban distributions are wider, showing more device diversity and varied activities.
- Rural children show lower but more consistent usage patterns.
- Internet availability and device access are key factors.

Interpretation

Urban lifestyle encourages:
-more device access
-more educational and recreational content
-longer daily screen engagement

3. Visualizations Used

To fully understand the variable behaviors, a combination of visual techniques was applied:

3.1 Bar Charts

- Used for comparing counts of categories such as gender, location, and device usage.
- Helpful for examining group-based differences in screen time.

3.2 Histograms

- Used for analyzing the distribution of continuous variables such as screen time.
- Help identify skewness, peaks, and outliers.

3.3 Boxplots

- Used to compare screen-time distributions across demographics (e.g., gender, age band, location).
- Shows medians, interquartile ranges, and outliers.

3.4 Line Plots

- Used to analyze trends over time (weekdays vs weekends).
- Helpful for spotting increasing or decreasing patterns.

3.5 Scatter Plots

- Used to analyze relationships between variables, such as:
    - Screen time vs educational-to-recreational ratio
    - Screen time vs age
- Helps identify correlations, clusters, and patterns.

4. Early Trends and Correlations Identified

Early trend identification is essential before moving into advanced modeling.
Based on Week 3 analysis, the following trends were observed:

4.1 Influence of Age on Screen Time

Trend

- Screen time **increases with age**.
- Teens record the highest values, followed by pre-teens, then children.

Reason

- More independence
- Social media usage
- Gaming & entertainment
- Increased educational content
- Greater device access

4.2 Gender Influence on Device Usage

Trend Observed

- No large differences in total screen time.
- But in some cases:
    - Boys tend to use mobile devices slightly more for gaming
    - Girls show slightly higher usage for educational content
      (This may vary dataset to dataset)

Interpretation

Gender is **not a strong predictor** of screen-time duration in this dataset.

4.3 Urban vs Rural Differences in Screen Exposure

Trend

- Urban children spend more time using screens compared to rural children.
- Urban children use multiple devices (mobile, laptop, tablet), whereas rural children rely mostly on mobiles.

Reason

- Greater internet availability
- More online classes
- Higher exposure to technology
- Lifestyle differences

Summary of Week 3 Analysis

- Demographic comparisons show strong differences based on **age** and **location**, but not **gender**.
- Teens and urban students form the **highest screen-time groups**.
- Key visualizations (bar charts, histograms, boxplots, scatter plots) effectively show how variables interact.
- Early correlations reveal the foundation for future prediction models.

4. Week 4: Device/Activity and Weekday–Weekend Analysis

Purpose of Week 4

Week 4 focuses on understanding how screen usage patterns change across demographics, device types, and days of the week. The aim is to analyze behavioral shifts such as weekend spikes and identify high-usage cohorts.

4.1 Device Mix Across Demographics (Detailed Explanation)

Understanding how different demographic groups use different devices helps reveal behavioral patterns, accessibility, and preferences among children. Visualizations such as bar charts and grouped bar plots were used to compare device usage across gender, age band, and location.

Device Usage by Gender

A bar chart was created to compare the primary device used by boys and girls.

Detailed Observations

- Both boys and girls show a strong preference for **mobile phones**, making them the most commonly used device for all activities.
- Boys slightly prefer mobiles for gaming and entertainment.
- Girls show a more balanced usage between mobiles and laptops (possibly for schoolwork or online classes).
- Tablet usage is similar for both genders and remains moderate.

Interpretation

Gender does not drastically affect the choice of device; however, subtle differences in activity purpose (gaming vs learning) exist.

Device Usage by Age Band

A grouped bar chart was used to compare device preferences across different age groups (Children, Pre-Teens, Teens).

Detailed Observations

- **Children (5–9 years):** More likely to use tablets or shared devices like smart TVs.
- **Pre-Teens (10–12 years):** Increasing mobile usage, moderate laptop usage.
- **Teens (13–18 years):** Dominant mobile users and the highest laptop users among all groups.

Interpretation

Older children have greater independence and more personal devices, leading to higher mobile and laptop usage. Younger children depend on shared or controlled devices.

Device Usage by Urban vs Rural Location

The primary device usage was compared between urban and rural students.

Detailed Observations

- **Urban children:** Use a wider variety of devices including mobiles, laptops, tablets, and sometimes smart TVs.
- **Rural children:** Primarily rely on **mobile phones** due to availability and affordability.
- Laptop and tablet usage is noticeably higher in urban regions.

Interpretation

Urban regions provide more digital resources, leading to better device access, whereas rural usage is restricted mostly to mobile phones.

4.2 Educational vs Recreational Activity (Detailed Explanation)

Understanding how much time children spend on educational vs recreational activities helps measure the quality of screen usage. Visualizations such as scatter plots and grouped bar charts were used here.

Scatter Plot: Average Screen Time vs Educational Ratio

A scatter plot was used to examine how the proportion of educational activity relates to total screen time.

Detailed Observations

- Children with **higher educational-to-recreational ratios** tend to have **lower overall screen time**.
- Children with lower educational ratios (more entertainment) show **higher screen time**, especially teens.
- A downward sloping trend indicates a **negative correlation** between educational activity ratio and screen duration.

Interpretation

Students spending more time on educational content naturally limit entertainment-based screen exposure.

Grouped Bar Graph: Activity Ratio by Age Band

A grouped bar chart was used to compare how activity ratios differ across age categories.

Detailed Observations

- **Children:** Show higher educational ratios, likely due to parental control.
- **Pre-Teens:** Balanced ratio between educational and recreational activities.
- **Teens:** Higher recreational activity, especially gaming, social media, and video streaming.

Interpretation

Recreational activity grows with age, leading to higher screen time among teens.

Gender-wise Educational vs Recreational Patterns

A comparison was made to examine if boys and girls differ in how they use their screen time.

Detailed Observations

- Girls show slightly higher engagement in **educational activities**, especially online classes.
- Boys show a higher tendency toward **recreational activities**, particularly gaming and streaming.
- However, the differences are not extremely large; both genders engage in both activity types.

Interpretation

Cultural and behavioral trends influence recreational vs educational usage, but gender differences are moderate.

Summary of Week 4 Analysis

- Mobile is the most preferred device across all demographics.
- Urban children show the most device diversity, indicating more digital access.
- Teens are the dominant users of mobiles and laptops.
- Higher educational ratios are linked to lower screen-time duration.
- Recreational activity increases significantly with age, especially during weekends.

Overall Milestone 2 Conclusion

- Milestone 2 provided a comprehensive visual understanding of the screen-time behavior of Indian children through detailed univariate, bivariate, and demographic-based analyses. The exploration revealed clear patterns showing that **teens and urban children exhibit the highest screen-time levels**, driven largely by increased access to mobile devices and recreational content. While device usage is dominated by mobile phones across all groups, urban children demonstrated greater device diversity, highlighting disparities in digital accessibility.
- The analysis also showed that **gender has minimal impact** on screen-time duration, whereas **age and location significantly influence** usage behavior. Weekday–weekend comparisons confirmed a strong spike in recreational screen time during weekends, and the educational-to-recreational activity ratio indicated a **negative correlation** with total screen hours.
- Overall, Milestone 2 successfully identified peak usage cohorts, highlighted key behavioral trends, and established the foundational insights required for advanced modeling in the subsequent milestones. These findings will guide predictive analysis, risk assessment, and targeted digital wellness strategies moving forward.

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