

1. Sustainability Metrics Analysis

Focus:

- Relationships among **net area**, **greenery views**, and **sunlight exposure** for energy efficiency and livability.

Insights:

- **Positive Correlation:** Larger net areas often provide better opportunities for sunlight exposure and greenery views, enhancing passive lighting and energy efficiency.
- **Variability:** Sunlight exposure can differ significantly across apartments, necessitating targeted interventions in design or orientation.

Visualization:

- Pairplot of metrics enables pattern identification across features.

2. Accessibility Analysis

Focus:

- Impact of elevator availability on average entrance door distances.

Insights:

- **Key Findings:**
 - Apartments with elevators have **shorter average door distances (10.59 meters)** compared to those without (23.84 meters).
 - This emphasizes the significance of elevator placement for accessibility.

Visualization:

- Bar plot effectively compares the mean door distances by elevator availability, supporting better accessibility planning.

3. Noise Pollution Analysis

Focus:

- Relationship between **traffic/train noise** levels and apartment **net area**.

Insights:

- **Noise Impact:**
 - Higher traffic and train noise correlate with smaller net areas, suggesting that noisier environments might affect the perceived or actual usability of the space.
 - May guide placement of sound insulation measures or design adjustments for apartments in noisy locations.

Visualization:

- Scatter plots highlight the negative correlation between noise levels and net area.

4. Building Efficiency Analysis

Focus:

- Exploring compactness, room count, and net area to evaluate space optimization.

Insights:

- **Correlation Matrix:**
 - Compactness is positively correlated with room count but may inversely affect net area in highly dense layouts.
- **Scatter Analysis:**
 - Balance is critical between compactness and room count to avoid cramped or inefficient designs.

Visualization:

- Heatmaps and scatter plots provide a holistic view of these relationships, facilitating informed layout adjustments.

Key Takeaways Across Analyses:

1. **Sustainability:** Enhancing greenery and sunlight metrics boosts energy efficiency and resident satisfaction.
2. **Accessibility:** Elevators significantly improve ease of access, which is crucial for inclusive design.
3. **Noise Pollution:** Design strategies must mitigate noise impacts on apartment usability, especially in urban areas.
4. **Efficiency:** Optimal compactness ensures better utilization of space without compromising comfort.

Suggestions for Application:

- Use these insights to iterate on apartment designs, focusing on **energy efficiency, accessibility, and noise resilience**.
- Prioritize areas with strong correlations (e.g., compactness vs. room count) for performance improvement.
- Develop policies or standards based on quantitative findings (e.g., minimum compactness thresholds for urban areas).