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AC Price Analysis using Flipkart Data

Data-Driven Insights on Air Conditioner Pricing
Using Python

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About us

- B.Tech graduates in Electronics and Communication Engineering (ECE) and aspiring data analysts passionate about transforming raw data into meaningful insights.
- This project — “AC Price Analysis using Web Scraping and Pandas” — was developed to study market TRENDS of air conditioners on Flipkart.
- Our goal is to **analyze pricing patterns**, **brand comparisons**, and seasonal trends using data - driven techniques in Python.

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Introduction

- The air conditioner (AC) market is rapidly growing with diverse brands, models, and pricing strategies.
- Understanding pricing patterns helps identify market trends and consumer preferences.
- This project, **“AC Price Analysis using Web Scraping and Pandas,”** focuses on analyzing AC data scraped from **Flipkart** to uncover insights about pricing, brand comparisons, and seasonal variations.
- The analysis is performed using **Python** with tools like **BeautifulSoup** and **Pandas** for data extraction, cleaning, and visualization.

Business Problem

- **Consumers face difficulty** in choosing the right AC due to varying **prices, brands, and features**.
- **Retailers and marketers** need insights into pricing trends to **remain competitive** in the market.
- The **AC market is highly dynamic**, with seasonal fluctuations affecting prices and consumer demand.

Objective

- To **scrape real-time AC data** from **Flipkart** using Python-based web scraping tools.
- To **analyze pricing trends** across different **brands, capacities, and features**

  (e.g., star rating, inverter type).
- To **visualize data insights** through graphs and charts using **Pandas** and **Matplotlib/Seaborn**.
- To derive **data-driven insights** that help understand market behavior and consumer choices.

Tools Used

- **1. Programming & Data Analysis:**
  - **Python** – Main programming language for scraping and analysis
  - **Pandas** – Data manipulation and analysis
  - **NumPy** – Numerical computations
- **2. Web Scraping:**
  - **BeautifulSoup** – Parsing HTML and extracting data
  - **Requests** – Sending HTTP requests to web pages
  - **re (Regex)** – Pattern matching for extracting features
- **3. Data Visualization:**
  - **Matplotlib** – Plotting graphs and charts
  - **Seaborn** – Enhanced statistical visualizations

Data Collection (Web Scraping)

- **Source:** Flipkart website – AC listings including price, brand, model, capacity, star rating, and inverter type.
- **Tools & Libraries:**
  - **Python**
  - **BeautifulSoup** – for parsing HTML pages
  - **Requests** – for sending HTTP requests
  - **Pandas** – for storing and managing the dataset
- **Process:**
  - Send HTTP requests to Flipkart AC pages.
  - Parse HTML to extract product details.
  - Store extracted data in a **structured CSV/Excel dataset**.
- **Challenges:**
  - Dynamic website content & pagination
  - Handling missing or inconsistent data
  - Avoiding IP blocks during scraping

Web-Scrapping Code :

```
price = []
brand = []
model = []
ton = []
star = []
inv = []
units = []
room_size = []
ai = []

for i in range(1,77):
    url = ("https://www.flipkart.com/search?q=air+conditioner&otracker=
    "search&otracker1=search&marketplace=FLIPKART&as-show=on&as=off&page="+str(i))
    print(url)

    a = soup.find_all("div",class_="Nx9bqj _4b5DiR")
    b = soup.find_all("div",class_="KzDlHZ")
    c = soup.find_all("li",class_="J+igdf")

    # Price
    for i in a:
        price.append(i.text)

    #Brand
    for i in b:
        brand.append(re.findall(r"\b^\w+",i.text)[0])

    #model
    for i in b:
        q = re.findall(r"[20]{1}[0-9]{3}",i.text)
        if len(q)>0:
            model.append(q[0])
        else:
            model.append(np.nan)

    #ton
    for i in b:
        ton.append(re.findall(r"(\d+(?:\.\d+)?)\s*Ton",i.text,flags=re.I)[0])

    #star
    for i in b:
        star.append(re.findall(r"(\d+)\s\Star",i.text)[0])
```

```
#Inverter
for i in b:
    a = re.search(r"Split Inverter",i.text,flags=re.I)
    if a:
        inv.append("Yes")
    else:
        inv.append("No")

#units
for i in c:
    x = re.findall(r"(\d+(?:\.\d+)?)\s*(?:Units|kWh)", i.text, flags=re.I)
    if len(x)>0:
        units.append(x[0])

#Room_Size
for i in c:
    x = re.findall(r"Room Size:(.*)",i.text)
    if len(x)>0:
        room_size.append(x[0])

# AI
for i in b:
    a = re.search("AI",i.text)
    if a:
        ai.append("Yes")
    else:
        ai.append("No")
```

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Dataset Overview

- **Number of Records:** ~[1824 * 10]
- **Key Features / Columns:**
  - **Brand** – Manufacturer of the AC
  - **Model** – AC model name/number
  - **Capacity** – Cooling capacity in tons
  - **Star Rating** – Energy efficiency (1★–5★)
  - **Inverter** – Yes/No
  - **Units** – Power Usage per annually
  - **Price** – Listed price in INR

```
df.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 1824 entries, 0 to 1823
Data columns (total 10 columns):
 #   Column     Non-Null Count  Dtype
---  ------     --------------  -----
 0   Brand      1824 non-null   object
 1   Model      1824 non-null   int64
 2   Capacity   1824 non-null   float64
 3   Star       1824 non-null   int64
 4   Inverter   1824 non-null   object
 5   Units      1824 non-null   float64
 6   AI         1824 non-null   object
 7   Size       1824 non-null   object
 8   Price_tag  1824 non-null   object
 9   Price      1824 non-null   int64
dtypes: float64(2), int64(3), object(5)
memory usage: 142.6+ KB
```

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Sample Dataset

	Brand	Model	Capacity	Star	Inverter	Units	AI	Size	Price_tag	Price
0	Voltas	2024	1.00	5	Yes	511.13	No	90 sqft or Below	High price	30620
1	MarQ	2025	0.75	3	Yes	553.16	No	90 sqft or Below	Low price	19490
2	Midea	2025	1.00	3	Yes	685.62	Yes	90 sqft or Below	High price	25990
3	Lloyd	2025	1.50	3	Yes	941.76	No	111 - 150 sqft	High price	29490
4	Samsung	2025	1.50	5	Yes	751.24	Yes	111 - 150 sqft	High price	40990
5	Blue	2025	1.50	5	Yes	783.33	No	111 - 150 sqft	High price	39990
6	Panasonic	2025	1.50	3	Yes	977.16	No	111 - 150 sqft	High price	33490
7	Daikin	2024	1.50	3	Yes	966.47	No	111 - 150 sqft	High price	34490
8	Godrej	2025	1.50	3	Yes	951.91	No	111 - 150 sqft	High price	27990
9	LG	2025	1.50	5	No	744.75	Yes	111 - 150 sqft	High price	41490
10	realme	2025	1.50	5	Yes	781.88	No	111 - 150 sqft	High price	28990
11	IFB	2025	2.00	3	Yes	1252.53	Yes	151 - 200 sqft	High price	40590

Data Cleaning & Preprocessing

1. Handling Missing Values:

- Replaced missing **model names** or **features** with NaN or default values.
- Removed rows with **critical missing data** (e.g., price).

2. Data Type Conversion:

- Converted **Price** and **Capacity** columns to numeric types for analysis.
- Converted **Star Rating** to integer.

3. Removing Duplicates:

- Checked for and removed **duplicate entries** to ensure data quality.

4. Feature Standardization:

- Standardized **brand names** (e.g., “LG” vs “Lg”).
- Standardized **room sizes** and **inverter values** to consistent formats.

5. Final Dataset:

- Clean, structured dataset ready for **analysis and visualization**.
- Columns: Brand, Model, Price, Capacity, Star_Rating, Inverter, Units, Room_Size, AI

Exploratory Data Analysis (EDA)

1. **Statistical Summary:**

   - Calculated **mean, median, and mode** of AC prices.
   - Provides an overview of the **central tendency** and **spread** of the data.

Numerical Data

```
df.describe()
```

	Capacity	Star	Units	Price
count	1824.000000	1824.000000	1824.000000	1824.000000
mean	1.427083	3.833333	831.204167	32599.583333
std	0.318606	0.986284	203.125218	6236.018960
min	0.750000	3.000000	511.130000	19490.000000
25%	1.375000	3.000000	712.185000	28990.000000
50%	1.500000	3.000000	781.880000	32490.000000
75%	1.500000	5.000000	964.692500	36990.000000
max	2.000000	5.000000	1252.530000	42390.000000

Categrorical Data

```
df.describe(include="O")
```

	Brand	Model	Inverter	AI	Size	Price_tag
count	1824	1824	1824	1824	1824	1824
unique	12	2	2	2	3	2
top	Voltas	2025	Yes	No	111 - 150 sqft	High price
freq	304	1444	1748	1216	1140	1748

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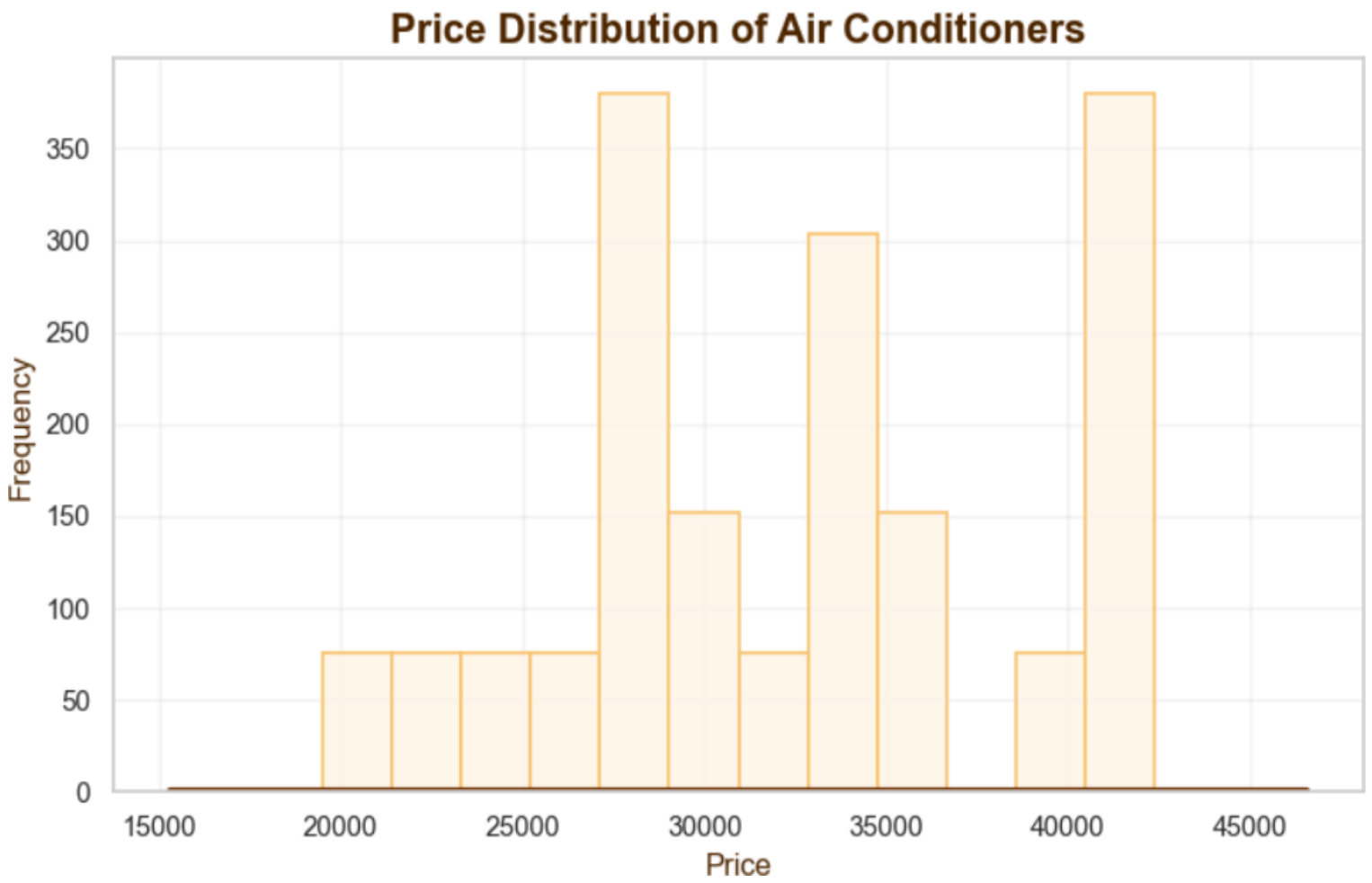
2. **Price Distribution:**
   - Visualized **AC prices** using **bar plot.**
   - Identifying **price ranges.**



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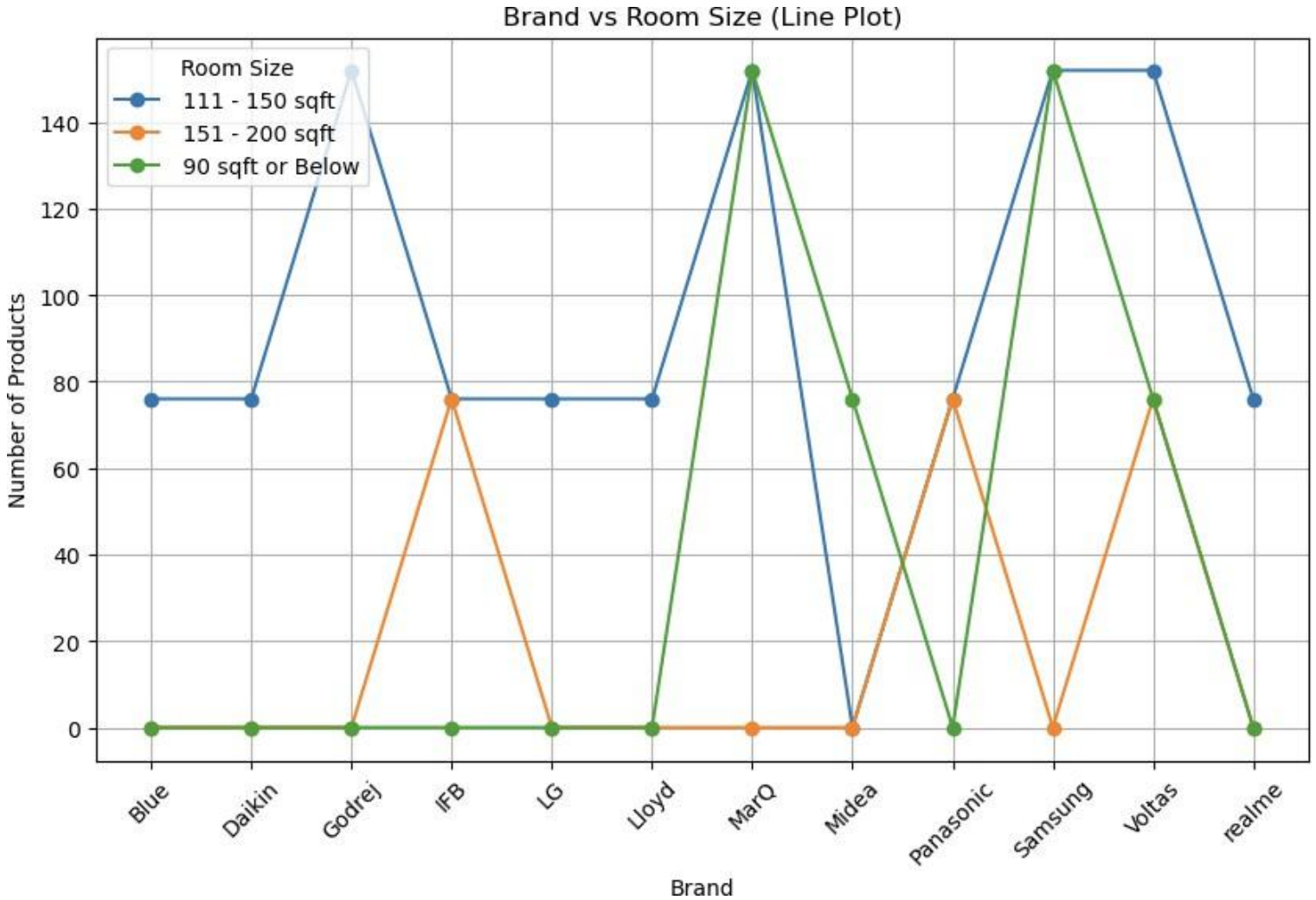
3. Brand Distribution across Area:

- Visualized **AC Brand** using **Line plot.**
- Identifying various **Room Sizes.**



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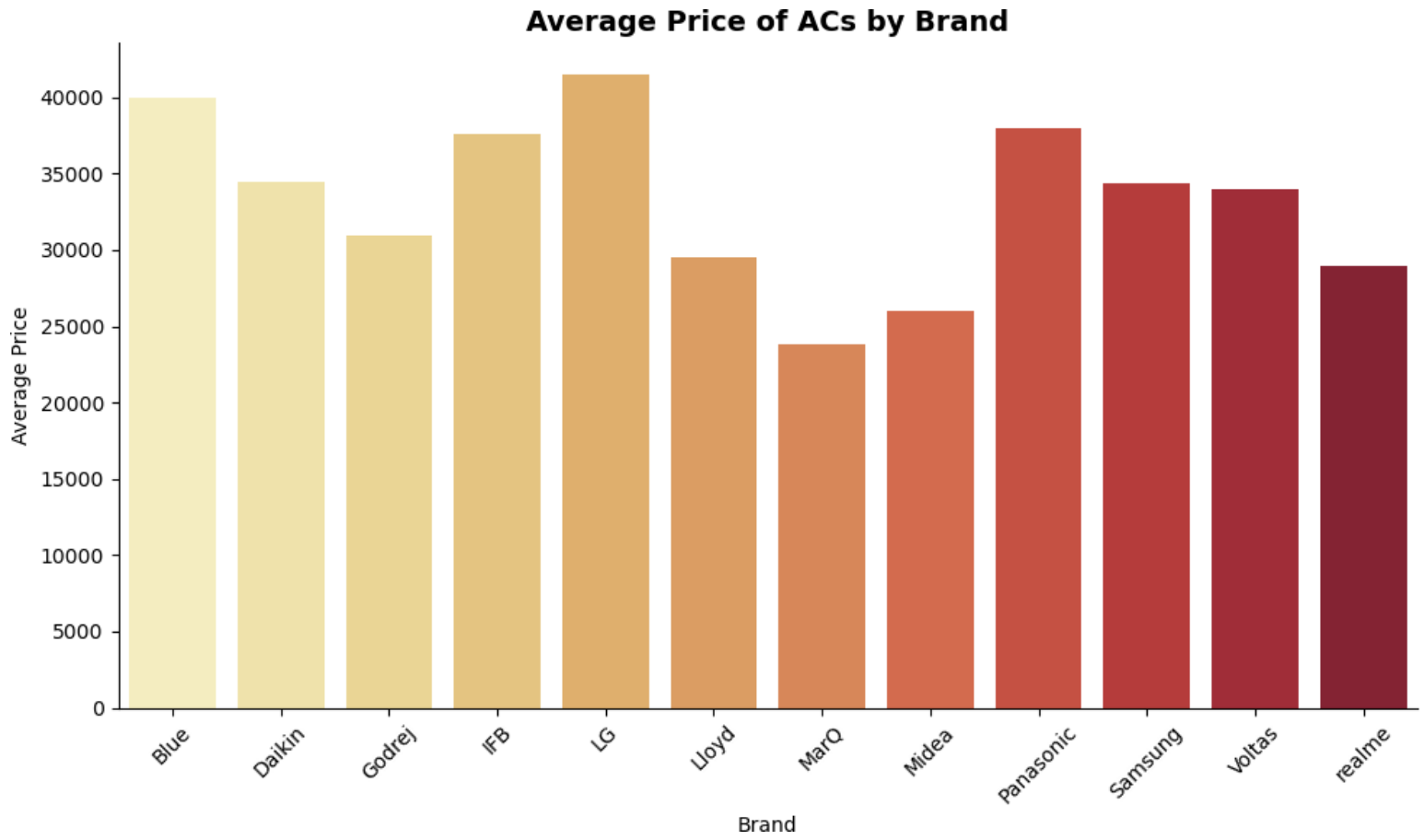
4. Brand-wise Price Comparison:

- Visualized **Average AC prices** using **bar plot** across **Brands.**



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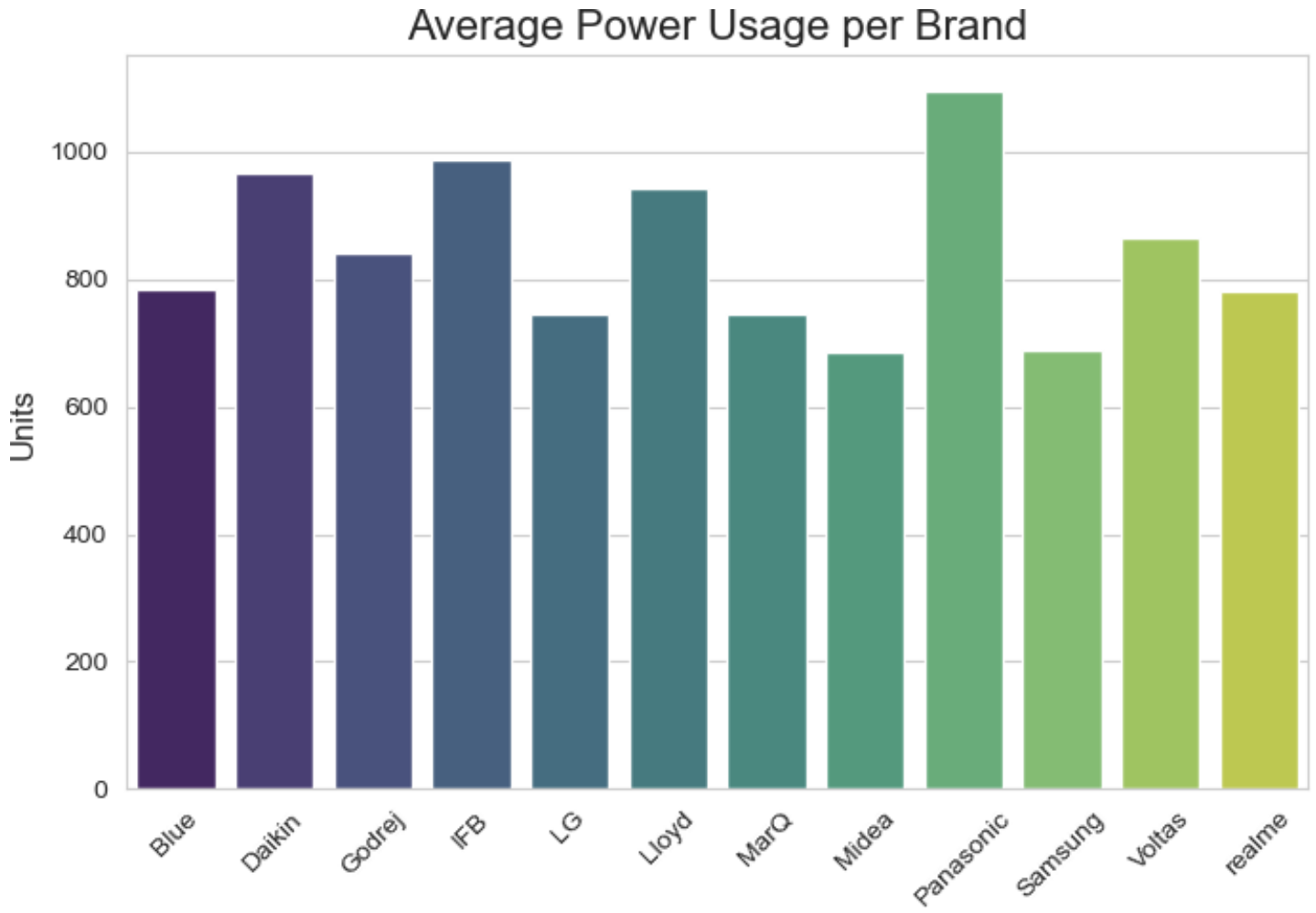
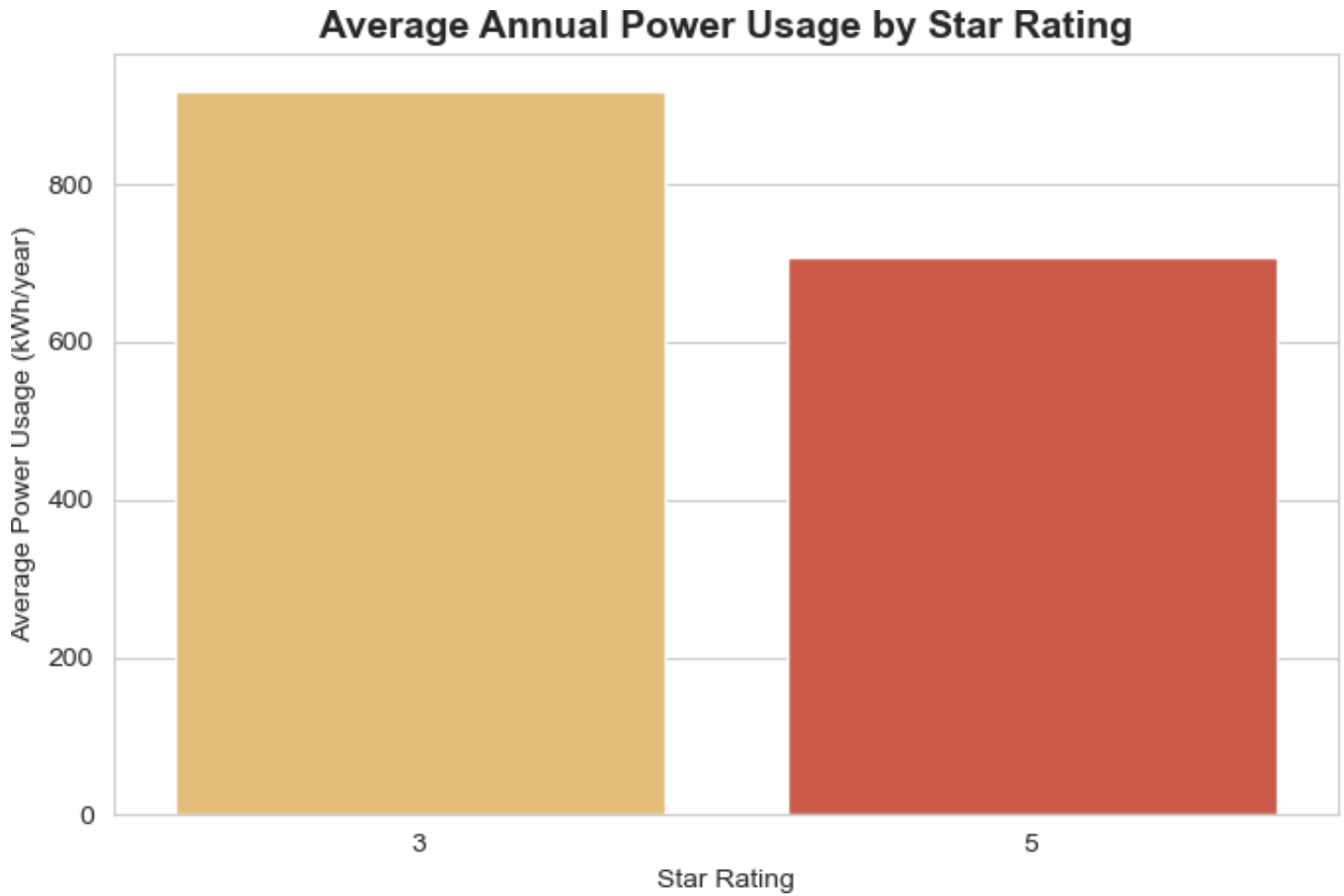
5. **Brand-wise Power Distribution:**
   - Visualized **Average power usage** using **bar plot** across **Brands.**



6. Power Distribution based on Star :

- Visualized **Average power Distribution** using **bar plot** across **Star rating.**



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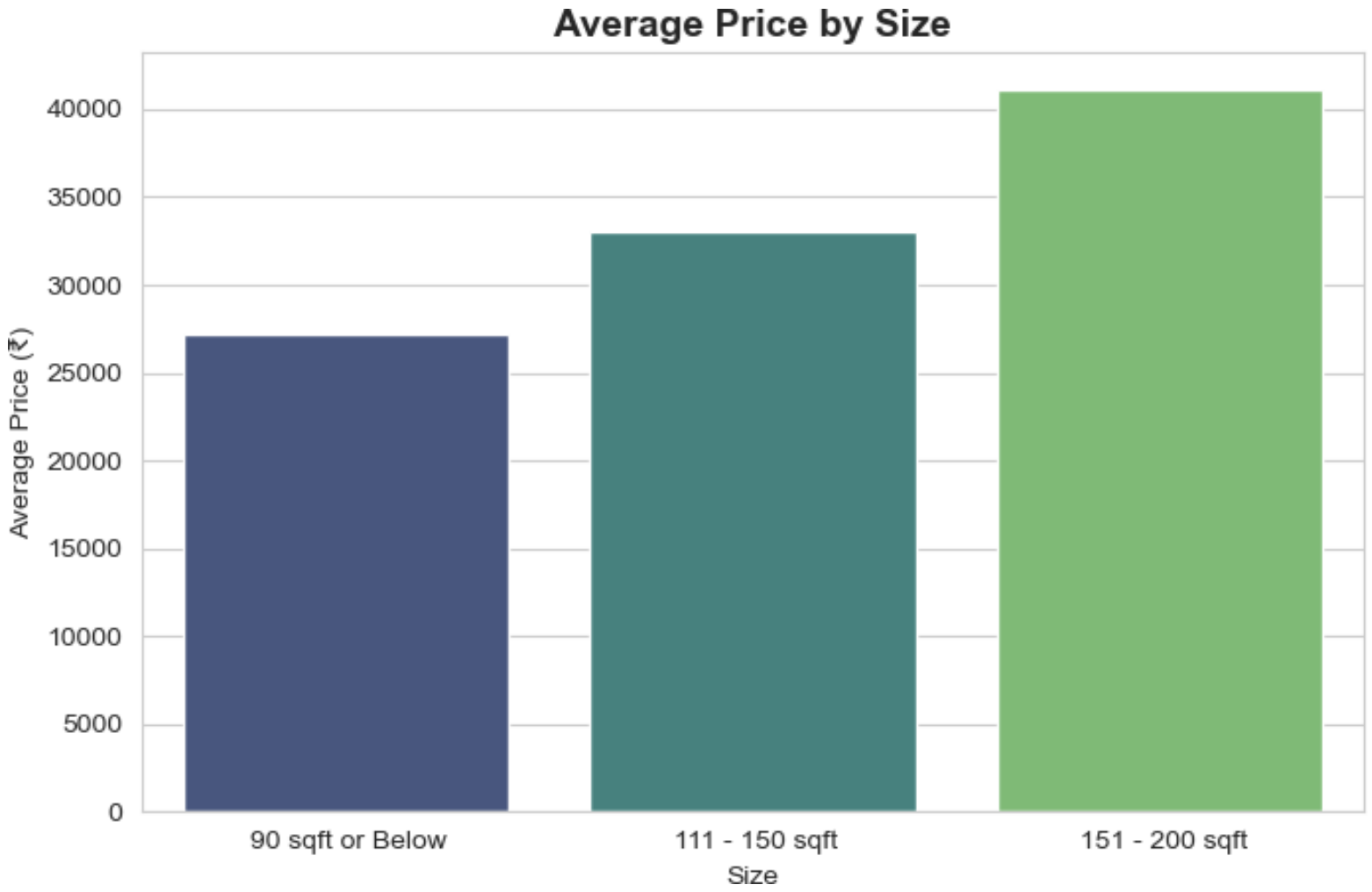
7. **Price comparison based on Area :**
    - Visualized **Average Price Comaprison** using **bar plot** across **Different areas.**



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8. Price comparison based on Brands :

- Visualized **Average Price Comaprison** using **bar plot** across **Different Brands.**

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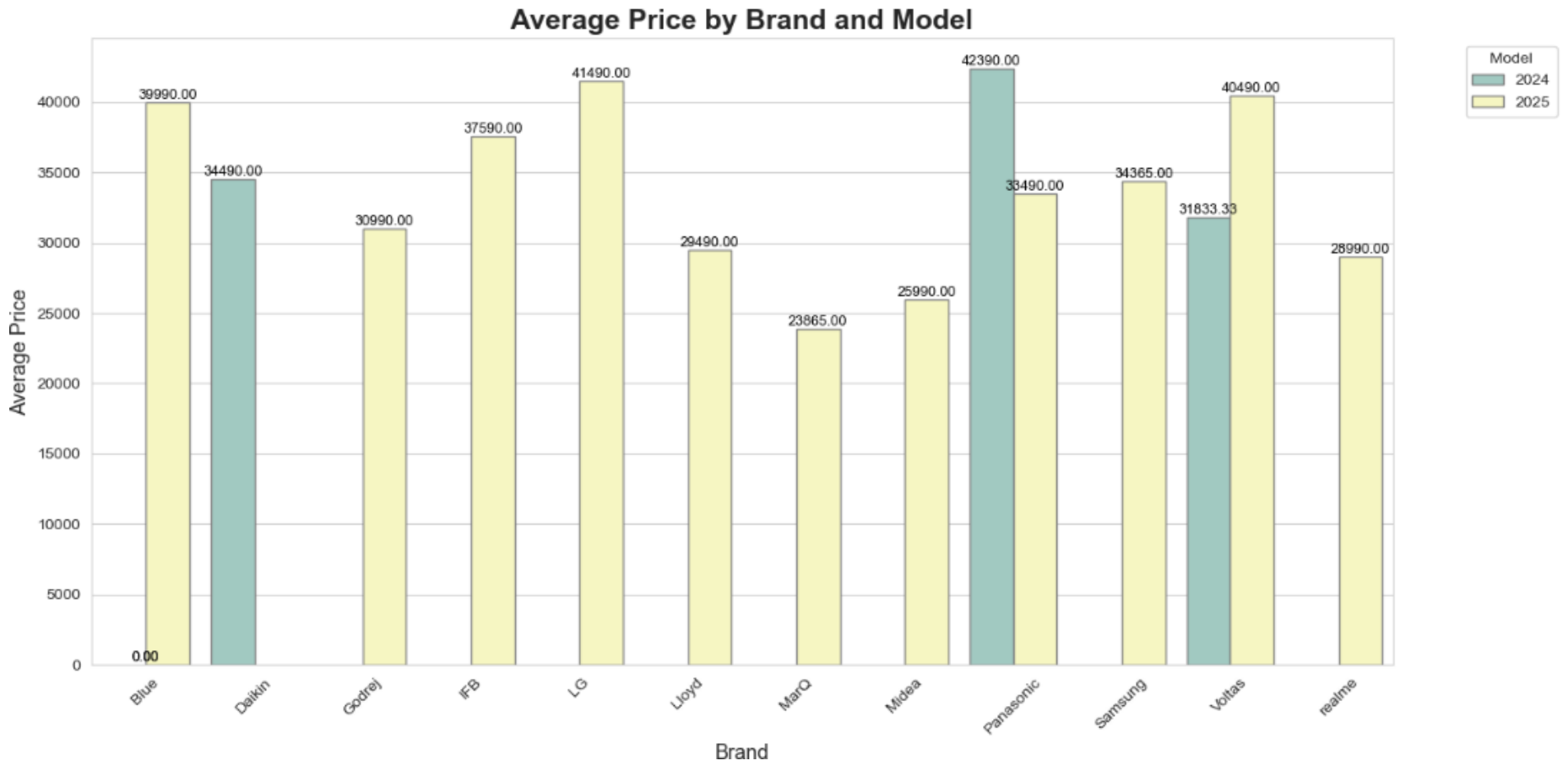
9. Price comparison based on Model :

- Visualized **Average Price Comaprison** using **bar plot** across **Different Models.**



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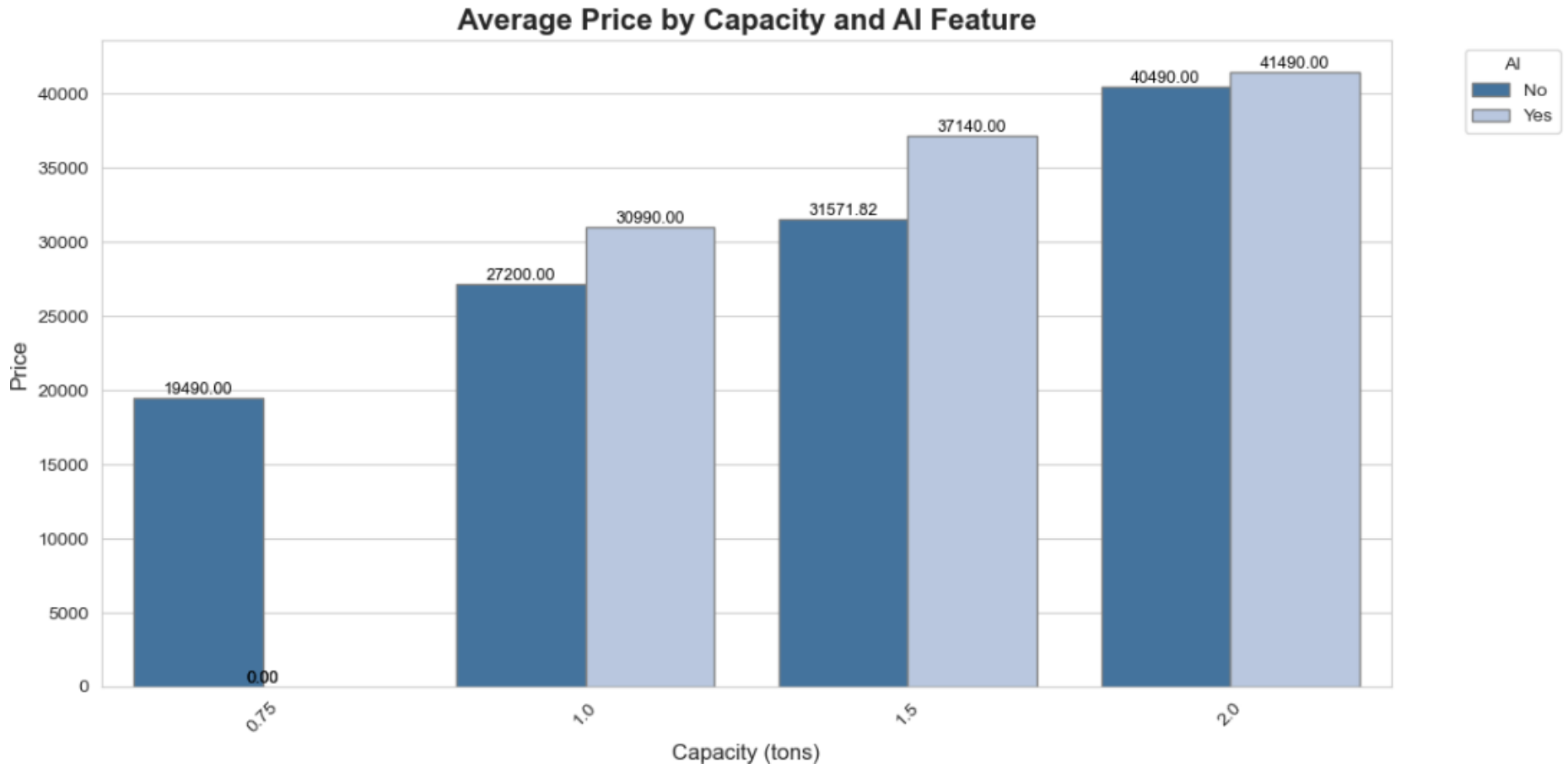
10. Price comparison based on AI :

- Visualized **Average Price Comaprison** using **bar plot** across **AI.**



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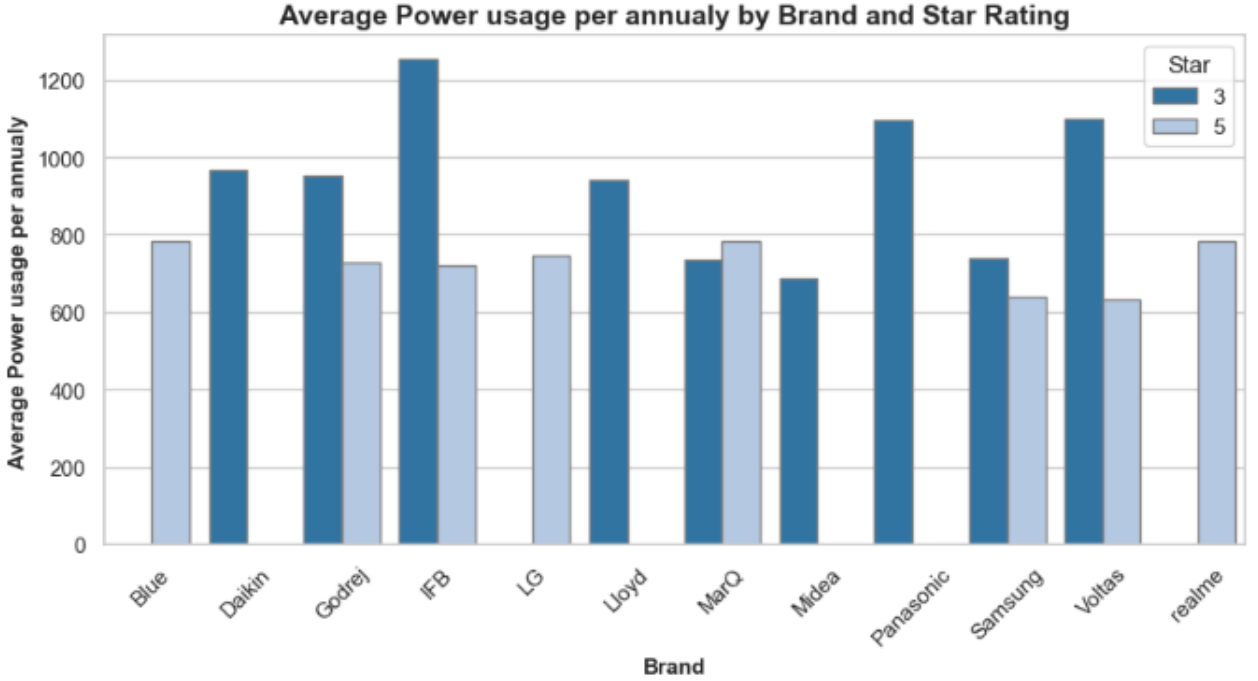
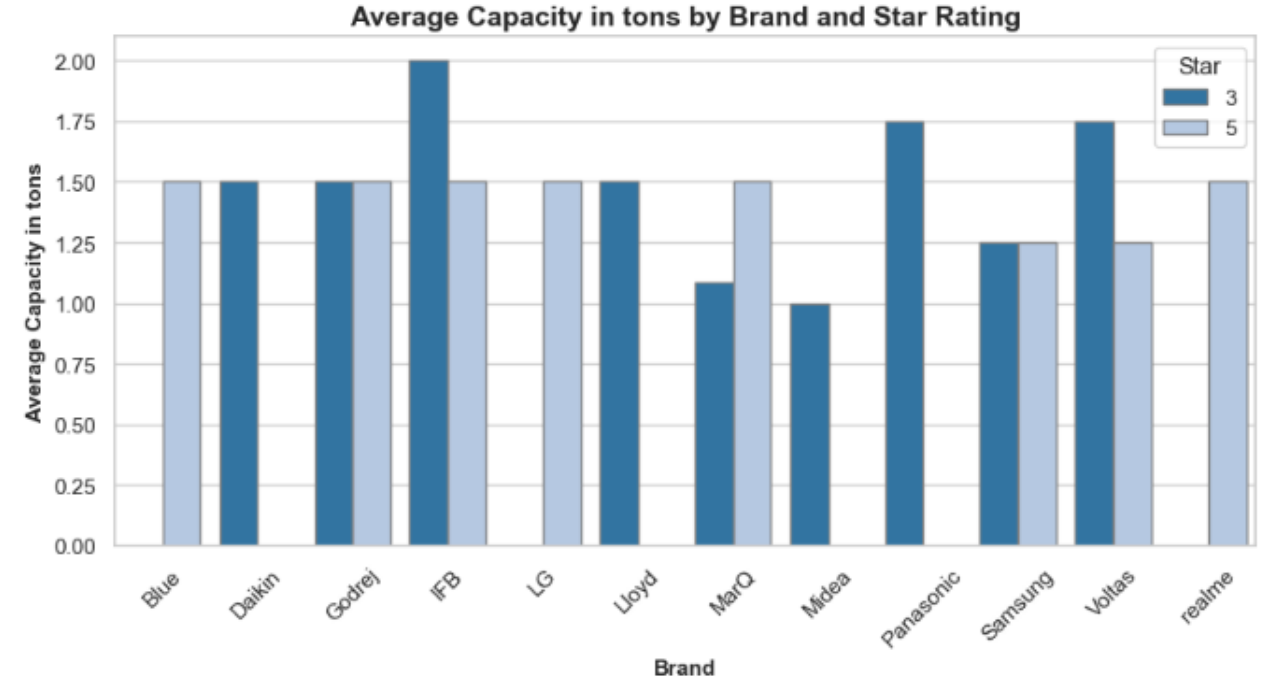
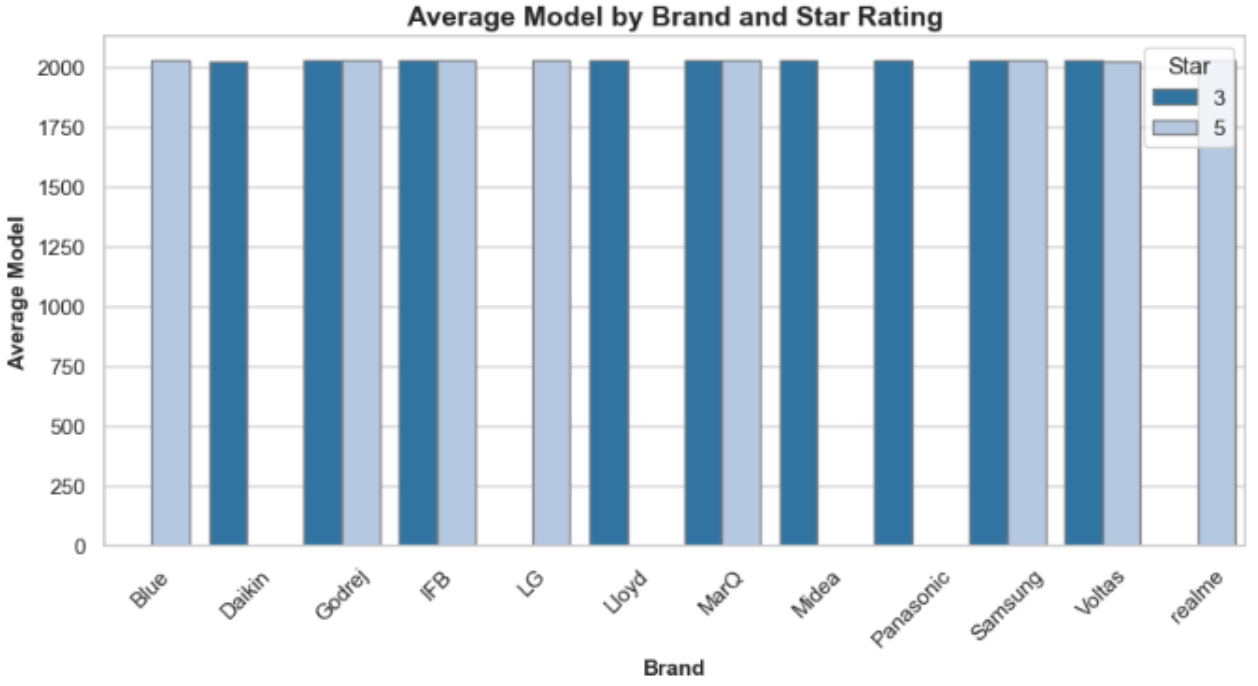
Average Price by Brand and Star Rating
Average Price
Brand
Star
3
5
Blue
Daikin
Godrej
IFB
LG
Lloyd
MarQ
Midea
Panasonic
Samsung
Voltas
realme


Average Power usage per annualy by Brand and Star Rating
Average Power usage per annualy
Brand
Star
3
5
Blue
Daikin
Godrej
IFB
LG
Lloyd
MarQ
Midea
Panasonic
Samsung
Voltas
realme


Average Capacity in tons by Brand and Star Rating
Average Capacity in tons
Brand
Star
3
5
Blue
Daikin
Godrej
IFB
LG
Lloyd
MarQ
Midea
Panasonic
Samsung
Voltas
realme


Average Model by Brand and Star Rating
Average Model
Brand
Star
3
5
Blue
Daikin
Godrej
IFB
LG
Lloyd
MarQ
Midea
Panasonic
Samsung
Voltas
realme

General Data Patterns

Metric	Observation
Average Price	₹27,000 – ₹32,000
Price Range	₹15,000 – ₹60,000
Most Common Capacity	**1.0 Ton** (around 50% of all ACs)
Most Common Star Rating	**3-Star**
Inverter AC Share	~70% of products
AI Feature Share	~30% of products

Interpretation:

Mid-range 1.0-ton, 3-star inverter ACs dominate the market, reflecting consumer preference for energy efficiency and moderate cooling capacity.

Brand Analysis

Brand	Median Price (₹)	Segment
LG	~36,000	Premium
Samsung	~34,000	Premium
Voltas	~29,000	Mid-range
MarQ	~21,000	Budget
Midea	~26,000	Budget-Mid

Insights:

- **Voltas** and **MarQ** dominate the budget segment (<₹25k).
- **LG** and **Samsung** target the premium inverter AC market (>₹32k).
- **Midea** offers competitive pricing with AI and inverter features at mid-level prices.

Capacity vs. Price

Capacity (Ton)	Avg Price (₹)	Trend
0.75	~19,000	Budget compact models
1.0	~27,000	Standard segment
1.5	~32,000	Premium segment
2.0	~38,000	High-end models

Observation:

Price **increases proportionally with capacity**, showing a clear linear trend (correlation ≈ +0.7).

Key Questions:

- Which brands offer the **best value for money**?
- How do features like **capacity, star rating, and inverter technology** impact price?
- What are the **seasonal trends** in AC pricing?

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Any Questions or Comments?

THANK YOU

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