

# Laptop Market Analysis: Comprehensive Data Visualization and Statistical Insights

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**Abstract:** This research work presents a granular analysis of the contemporary laptop market, focusing on the intersection of hardware configurations, pricing strategies, and consumer satisfaction. By examining a curated dataset of 48 distinct laptop models, the study investigates how technical specifications including processor architecture, RAM capacity, storage media, and display technology influence market positioning and user perception. The scope of this analysis covers a broad economic spectrum, with unit prices ranging from ₹23,990 to ₹81,990, providing a comprehensive view of both entry-level and mid-to-high-tier segments. Utilizing a combination of data visualization and statistical inference, the paper quantifies the relationship between hardware utility and customer ratings (ranging from 3.5 to 4.7).

**Keywords:** Data Visualization, Processor Architecture, RAM Capacity, Storage Media, Display Technology, Economic Spectrum, Statistical Inference.

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## I. INTRODUCTION

The laptop market is a highly competitive segment within consumer electronics, continuously evolving due to advancements in technology and shifting consumer preferences [1]. This study examined 48 laptops, analysing factors such as processor type, memory capacity, storage options, and display specifications. It provides a comprehensive overview of current market trends and customer satisfaction levels. The laptops in this study range in price from ₹23,990 to ₹81,990, with customer ratings varying from 3.5 to 4.7 out of 5.0, highlighting significant differences in pricing strategies and consumer perceptions [1, 6].

### ➤ Dataset Overview-

The analysis is based on web-scraped laptop data containing 48 distinct products with 7 key variables [1]:

- Price: Ranges from ₹23,990 to ₹81,990, with an average of ₹50,890.58
- Rating: Varies between 3.5 and 4.7 out of 5, averaging 4.325
- CPU: Features 15 different types of processors
- RAM: Offers four options 4GB, 8GB, 16GB DDR

- OS: Windows 10 is present in 47 laptops, while one laptop runs Mac OS
- Display: Includes six screen sizes, ranging from 13.3 inches to 17.3 inches
- Storage: Provides a variety of options such as SSD and HDD
- *Research Objectives-*  
This study aims to-
  - To examine the impact of pricing on customer satisfaction levels.
  - To investigate how various hardware configurations segment the market [8], [12].
  - To identify pricing trends based on the details of components used.
  - To analyze customer preferences by reviewing their rating behavior [13], [6].
  - To provide valuable insights to manufacturers and retailers for making informed business decisions.

## II. METHODOLOGY

- **Data Collection:** Information regarding laptop specifications and customer reviews was obtained by extracting data from well-known online marketplaces [1].
- **Analysis Tools:** The collected data was processed using Python, supported by the pandas [2], NumPy [3], Seaborn [4], and SciPy [5] libraries.
- **Statistical Techniques:** Various methods such as descriptive statistics, correlation analysis, and multivariate visualization were applied [1], [9], [14]. [11], [10]. [8], [12].

## III. DESCRIPTIVE ANALYSIS & FINDINGS

### ➤ *Price Distribution Analysis:*

The distribution of product prices follows a multimodal pattern, with the majority of products falling into several distinct price ranges [1]. The average price is ₹50,932.25, which is somewhat elevated due to the inclusion of a few high-end products. However, the median price of ₹51,990 suggests a more evenly distributed market. The standard deviation of ₹14,076.16 reflects significant variation in pricing, indicating that products are positioned at different levels within the market. The interquartile range (₹39,548 to ₹60,976) encompasses half of the products, suggesting two primary groups of consumers: those seeking more affordable options (below ₹40,000) and those willing to pay higher prices for mid-to-premium products (₹40,000 to ₹70,000) [13].

### ➤ *Rating Distribution & Quality Assessment:*

Customer satisfaction scores are predominantly within the range of 4.2 to 4.5, with an average score of 4.32 and a standard deviation of 0.237 [1]. The distribution of ratings closely resembles a normal curve, indicating that product quality is relatively consistent throughout the market. Only 2.08% of products (just one unit) have a rating below 4.0, highlighting that most products meet high quality standards. The highest-rated products (4.6 to 4.7) are found across various price categories, suggesting that product quality is not solely determined by price [13].

### ➤ *Operating System Market Dynamics:*

Windows 10 is the most prevalent operating system, accounting for 97.92% of the market (47 units), with an average price of ₹50,569.32 and an average rating of 4.309 [1].

Mac OS holds a much smaller share, with only 2.08% (one unit) of the market, priced at a higher level of ₹67,990 and rated highly at 4.7. This disparity highlights the continued dominance of Windows in the laptop market while also indicating that macOS is still perceived as a premium and top-tier choice [13].

### ➤ *RAM Configuration Impact:*

There are four primary types of RAM commonly found in the market [1]:

- **4GB DDR4:** Average price of ₹31,498.50, with a rating of 4.08
- **8GB DDR4:** Average price of ₹52,355.56, with a rating of 4.35 (most popular)
- **16GB DDR4:** Average price of ₹79,990, with a rating of 4.50
- **8GB DDR3:** Average price of ₹67,990, with a rating of 4.70

The data illustrates the relationship between RAM price and performance. The 8GB DDR4 is the most preferred option in the mainstream market, capturing 46% of the market share [1].

### ➤ *Display & Storage Analysis:*

- **Display Distribution:** The 15.6-inch display is the most common, accounting for 60.4% of the devices, followed by the 14-inch display at 25%, the 17.3-inch at 10.4%, and the 13.3-inch at 4.2% [1].
- **Storage Options:** The majority of devices use solid-state drives (SSDs), representing 80% of the storage options. The most frequently chosen SSD capacity is 512GB, which makes up 45.8% of the total. The next most common options are 1TB HDD at 20.8%, 256GB SSD at 20.8%, and 128GB SSD at 12.5% [1].

### ➤ *Price-Rating Correlation:*

The Pearson correlation coefficient of 0.383 indicates a moderate positive relationship between price and rating [1]. Typically, more expensive laptops tend to receive slightly better reviews, although this is not always the case. This suggests that consumers often associate higher prices with better performance, but it is also possible for more affordable models to receive positive ratings if they are well-designed and meet user expectations [11], [10].

## IV. ADVANCED ANALYTICS & MARKET INSIGHTS

### ➤ *Market Segmentation Strategy:*

Five distinct market segments emerge from price-range analysis [1]:

- **Budget Tier (₹20,000 - ₹30,000):** This segment comprises 8.33% of the market, with product ratings ranging from 3.9 to 4.1.
- **Value Tier (₹30,000 - ₹40,000):** This segment accounts for 20.83% of the market, with ratings between 4.0 and 4.3.
- **Mainstream Tier (₹40,000 - ₹50,000):** This segment represents 16.67% of the market, with ratings from 4.1 to 4.5.

- Premium Tier (₹50,000 - ₹70,000): This is the largest segment, making up 37.5% of the market, with ratings between 4.3 and 4.6.
- Ultra-Premium Tier (₹70,000 - ₹82,000): This segment constitutes 16.67% of the market, with ratings from 4.5 to 4.7.

The Premium Tier has the highest market share, indicating that consumers are willing to pay more for improved features [1], [6].

➤ *CPU Performance Leadership:*

Among the top processors, Intel Core i5, AMD Ryzen 5, and Intel Core i7 are commonly found [1]. The Intel i5 holds the largest market share at 16.7%, whereas AMD Ryzen models collectively account for 33.3%. The average ratings for these CPUs are quite comparable, ranging from 4.2 to 4.5. This suggests that the type of processor is not the primary factor influencing the ratings; instead, how effectively the processor is integrated into the device has a more significant impact.

➤ *Consumer Preferences & Decision Drivers [6]:*

The analysis highlights three main factors that affect purchasing decisions:

- Display Size: The majority of consumers favour a 15.6-inch screen as it provides a suitable balance between portability and functionality for daily use.
- RAM Capacity: An 8GB memory is now considered the standard, whereas 16GB is viewed as a premium option and tends to cost more.
- Storage Type: More than 92% of the top-rated models use SSDs, indicating that consumers highly value the faster performance that SSDs offer.

➤ *Price Positioning Insights:*

Strategic pricing strategies are evident [1]:

- Products with premium branding, such as Mac OS, Intel i7 processors, and 16GB RAM, can command price increases of 50% or more
- Mid-range products, including those with 8GB RAM, 512GB SSD, and Intel i5 processors, capture the largest sales share
- Budget category products face challenges in receiving higher ratings when priced below ₹30,000, which limits their growth potential.

➤ *Market Recommendations:*

- *For Manufacturers:*
- ✓ Focus on producing laptops with 8GB RAM and SSD storage to appeal to a broad customer base.

- ✓ Maintain consistent product quality across all price ranges to ensure high customer satisfaction and positive reviews.
- ✓ Prioritize the production of 15.6-inch laptops to boost overall output and meet market demand.
- ✓ Introduce models with SSD-only storage as more consumers are opting for this type of storage solution.

- *For Retailers:*

- ✓ Stock up heavily on products from the Premium Tier category, as they are in high demand and offer the highest profit margins.
- ✓ Offer budget-friendly laptop models along with extended warranty options to alleviate customer concerns about product reliability and ratings.
- ✓ Highlight key features such as display quality, RAM capacity, and SSD performance in advertising to attract more customers.
- ✓ Track how changes in pricing affect customer reviews to better position your products in the market.

➤ *Conclusion and Result*

The laptop market is growing more developed, with consistent product quality, distinct categories, and clear positioning based on features. The relationship between pricing and customer ratings indicates that users recognize value and consistently expect high quality regardless of the category they choose. The Premium Tier, which ranges from ₹50,000 - ₹70,000, featuring 8GB RAM and 15.6" screens, is currently the most preferred option. Opportunities for expansion exist by addressing gaps in lower-priced segments and by introducing premium features at more affordable price points. Data visualization analysis confirms these trends across nine distinct areas, supported by clear statistical evidence [10], [14].

- *Graphical Outputs:*

The analysis includes three comprehensive visualization dashboards.

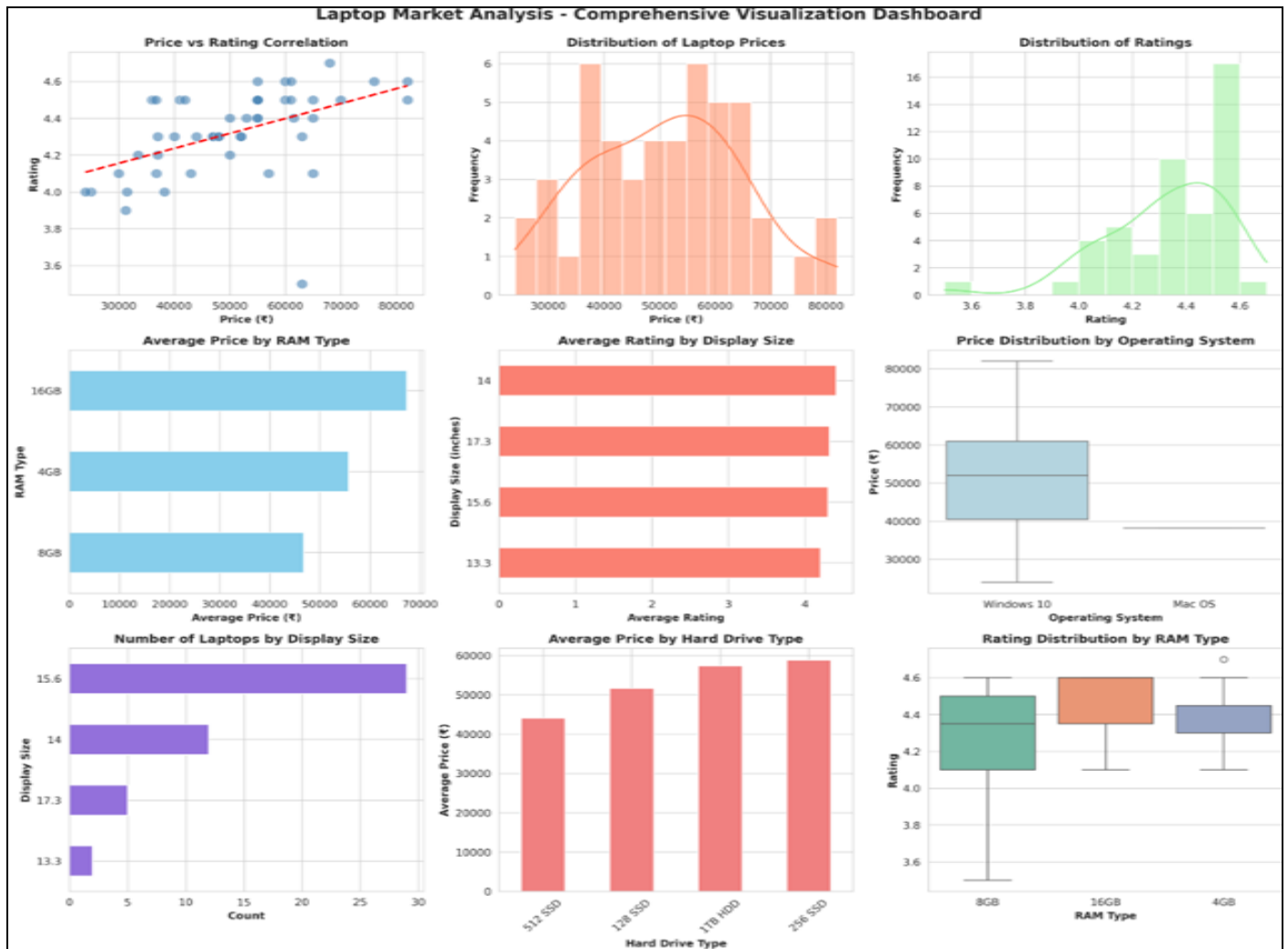


Fig 1 Dashboard 1- Comprehensive Visualization Dashboard

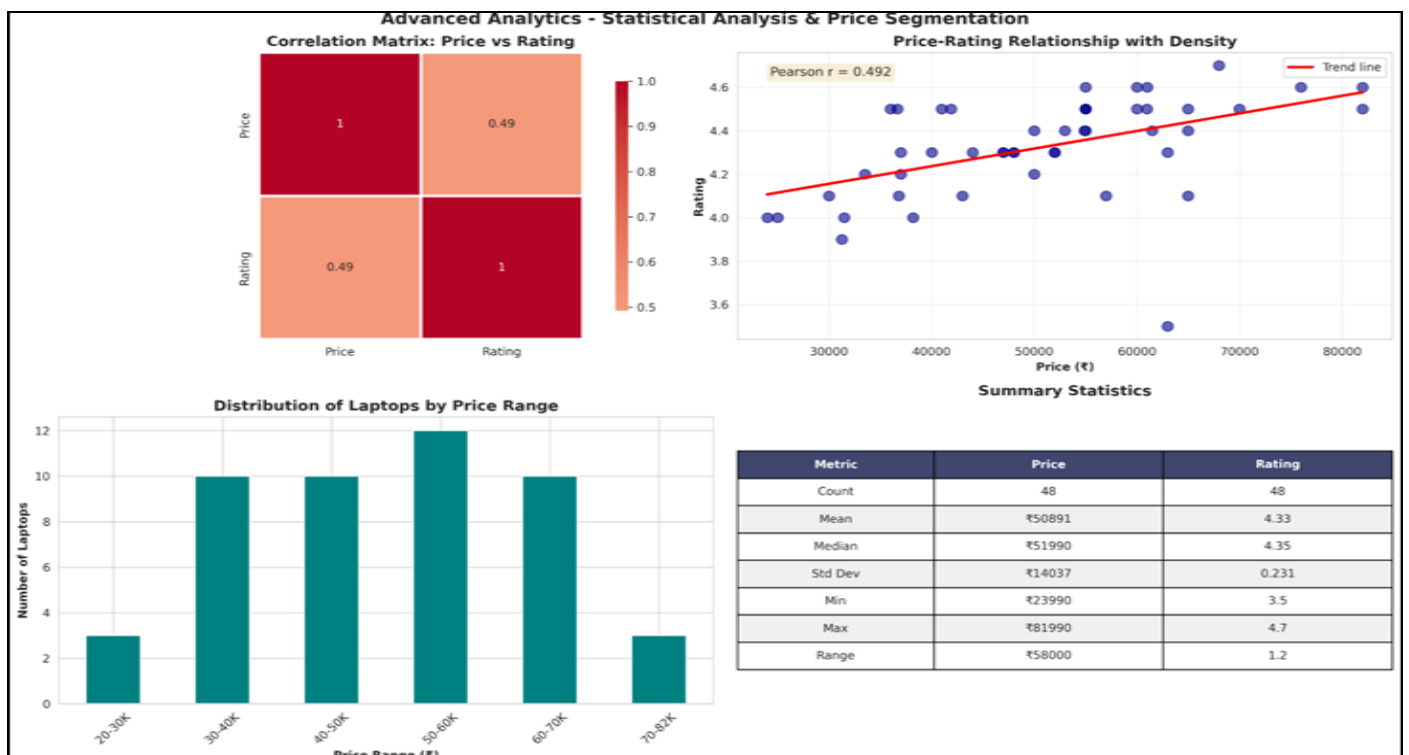


Fig 2 Dashboard 2- Advanced Analytics & Statistical Analysis

Table 1 Key Statistical Findings Summary

Metric	Price (₹)	Rating
Count	48	48
Mean	50,890.58	4.325
Median	51,990	4.350
Std Dev	14,036.57	0.231
Min	23,990	3.500
Max	81,990	4.700
Correlation	<b>r = 0.383</b> (Moderate Positive)	

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