Laptop Price Analysis Using Python

Introduction :

Laptops have become an essential part of modern life, serving purposes ranging from personal entertainment to professional work and gaming.
The laptop market is highly diverse, with numerous brands offering a variety of models that differ in specifications, performance, and price.

Understanding the features that influence consumer choices is crucial for both buyers and manufacturers.
This dataset contains detailed information about laptops from various companies, including their brand, product type, screen size, RAM, storage,
CPU and GPU specifications, operating system, weight, and display features, along with the price in euros.

Objective :

This dataset offers an excellent opportunity to explore patterns and relationships between laptop features and pricing. By performing Exploratory Data Analysis (EDA), we can understand trends in laptop specifications, identify popular configurations, detect outliers in pricing, and examine how different factors such as brand, performance, and display features influence cost.
The analysis will provide insights into consumer preferences, market trends, and help in making informed decisions for manufacturers, retailers, and potential buyers.

Exploratory Data Analysis:

The dataset has 1275 rows and 23 columns.

1.Descriptive Analysis:

1. Top 10 best selling laptop brands:

Dell leads the market with 291 units sold closely followed by Lenovo with 289 units and Hp also maintains a strong presence with 268 units:

This data indicates that dell , lenovo and hp dominate the market potentially due to the brand reputation , product availability and consumer preferences.

2.Most Selling Product per Company:

The Dell XPS 13 leads sales, followed by the HP 250 G6, with Lenovo Legion Y520-15IKBN and Toshiba Satellite Pro showing solid performance. Its success comes from premium build, excellent display, strong battery life, and balanced performance, backed by brand trust and positive user reviews.

3.Most Popular product Type by Company:

Notebooks are the most sold laptop type, followed by Ultrabooks and Gaming laptops.

1.HP, Lenovo, and Dell lead in Notebook sales, Apple dominates the Ultrabook segment, and MSI leads in Gaming laptops.
2. Notebooks top sales due to their affordability, versatility, and balanced performance, making them ideal for both personal and professional use.

4.Most Frequently used Ram Configuration

8 GB RAM is the most common configuration, making it the standard for general users, followed by 4 GB in budget models.16 GB RAM is preferred by professionals, while higher capacities like 32 GB, 64 GB, and 24 GB are rare, showing limited high-end options.2 GB RAM appears only in older or low-end laptops.

5.Distribution of Operating System Across Companies

The most commonly used operating system among companies is Windows 10 (1,048), followed by systems with No OS, while the least used operating system is Android (2).

6.GPU Company Market Distribution:

Intel dominates the GPU market with a 55.2% share, followed by NVIDIA (31.1%) and AMD (13.6%), while ARM holds only 0.1%. This shows Intel's strong lead and widespread integration in most laptop models.

7.Top Laptop Manufacturer By Screen Type.

Lenovo leads in both Full HD and Standard displays, showing wide market coverage, while Dell focuses on high-resolution screens like 4K and Quad HD+, targeting premium users.

8.Distribution of CPU Manufacturer.

Intel dominates the laptop CPU market with 95.2%, while AMD holds 4.7% and Samsung has a minimal 0.1% share.

9.Distribution of Primary Storage Types:

SSD dominates with 837 laptops, followed by HDDs (359) for budget storage. Flash storage (71) is used in lightweight models, while hybrid setups (8) are rare.

10. Distribution of Secondary Storage Types

Most laptops (1,067) lack secondary storage, showing a shift toward single SSD setups. HDDs (202) are the main secondary option for added space, while secondary SSDs and hybrid drives are rare and limited to high-end models.

11. Most Common GPU Models by Company.

Intel HD Graphics 620 is the most common GPU, followed by HD 520 and UHD 620, showing dominance of integrated graphics. NVIDIA GTX 1050 and GTX 1060 lead among dedicated GPUs for gaming and high-performance laptops.

2. Comparative and Ranking Analysis:

1.Top 10 most expensive Laptop Overall.

The Razer Blade Pro is the most expensive laptop in the dataset, followed by the Lenovo ThinkPad P51 and the HP ZBook 17.

2. Top 10 least expensive Laptop Overall.

C740-C9QX (Intel 3205U/2GB/32GB/Chrome) is the least expensive laptop at $174, built for basic tasks with low RAM, minimal storage, and Chrome OS — ideal for budget or educational use.

3.Most Premium Laptop per Company.

4.Least Expensive Laptop per Company.

5.Top 5 Companies Generating the Highest Revenue
Dell leads in revenue (€349,974.50), followed by **Lenovo** (€316,126.19) and **HP** (€289,524.34).

3.Distribution & Category-Wise Analysis

1.Average Laptop Price Across CPU Frequency Ranges.
Laptops with 2–3 GHz CPUs have the highest average price, followed by 3–4 GHz and 1–2 GHz. However, pricing also depends on factors like RAM, storage type, GPU, display quality, and brand reputation.

2.Median Laptop Price by Weight Category.
Heavier laptops have the highest median price (€1,408), followed by lightweight ones (€1,379), while medium-weight models are the least expensive.

3.Average Laptop Price by RAM Capacity.

Laptops with higher RAM have higher prices. 64 GB models are the most expensive (~€3,975), while 32–24 GB fall in the premium range (>€2,200). 8–16 GB offers the best mid-range value (€1,180–€1,940), and 2–4 GB models are entry-level (<€600)

4.Average Laptop Price by Operating System.

macOS and Windows 7 laptops are the most expensive (>€1,600), Windows 10 models are mid-range, while Linux, Chrome OS, No OS, and Android laptops are budget options, with Android being the cheapest (~€434).

5.Average Laptop Price by GPU Manufacturer

NVIDIA GPUs have the highest average price (€1,496) for gaming laptops, Intel GPUs are mid-range (€1,020), AMD GPUs are budget-friendly (€778), and ARM GPUs are the cheapest (€659).

6.Average Laptop Price by Screen Type.

4K Ultra HD laptops are the most expensive ($2,424.76), followed by Quad HD+ ($1,616.96). Full HD offers the best balance ($1,231.20), while Standard displays are the cheapest ($730.33).

7.Average Laptop Price by CPU Manufacturer

Intel laptops have the highest average price (€1,163.73), Samsung are mid-range (€659), and AMD offers the most budget-friendly options (€560.99).

8.Laptop Price Trends by Primary Storage Capacity.

Laptops with ≤500 GB storage cover all price ranges, while those with >1000 GB are rarer and mostly premium. Price isn't driven by storage alone — brand, performance, and features also matter. The most common storage sizes are 256 GB, 1024 GB, and 128 GB, while 16–240 GB options are rare.

9.Laptop Price Trends by Secondary Storage Capacity.

Secondary storage has little effect on laptop prices — models with 0–1000 GB span all

price ranges, showing CPU, GPU, and brand matter more. Most laptops (1,067) lack secondary storage, while 187 have 1 TB and very few use smaller capacities (256–512 GB).

10.Average Laptop Price by Primary Storage Size.

SSDs have the highest average price (€1,391.90), followed by hybrid drives (€875.93). HDDs are budget options (€658.40), while flash storage is the cheapest (€544.99).

Other Key Insight:

All laptops in the dataset are touchscreen, feature IPS panels, and include Retina displays, offering high-quality visuals and responsive performance.

3.Correlation Insights:

There's a strong positive correlation (0.74) between RAM size and price — laptops with more RAM tend to be significantly more expensive.

4.User Segment Analysis:

Students dominate laptop usage at 98.5%, followed by professionals (1.4%) and gamers (0.1%).

Conclusion:

This analysis reveals that laptop pricing is largely determined by performance-oriented features such as CPU type, RAM capacity, GPU power, and storage type, along with brand reputation and display quality.

1.Performance Components Drive Price: High-end CPUs, NVIDIA GPUs, SSD storage, and larger RAM (correlation = 0.74) significantly increase laptop prices.

2.Storage Preference: SSDs dominate for their speed and reliability, replacing traditional HDDs.

3.Display & Design Impact: 4K/Retina displays and premium, lightweight designs further elevate prices.

4.Brand Leadership: Dell, Lenovo, and HP lead in sales, while Apple commands premium pricing due to its design and ecosystem.

5.User Segments: Students (98.5%) dominate the market, preferring mid-range laptops (8–16 GB RAM, SSD, Intel i5/i7), while professionals and creators choose high-end models with advanced specs.

Recommendations:

1.Focus on Mid-Range Models: Prioritize laptops with 8–16 GB RAM, SSDs, and Intel i5/i7 CPUs — the most demanded configuration among students and professionals.

2. Promote SSD-Only Options: Gradually phase out HDDs and highlight SSD speed advantages; offer hybrid drives for high-storage users.

3.Segment Products by Audience:

- *Students:* Affordable notebooks with balanced specs.

- *Professionals:* Lightweight ultrabooks with long battery life.

- *Gamers/Creators:* High-end laptops with NVIDIA GPUs and 4K displays.

4.Enhance Display & Design: Use IPS, Full HD/4K screens, and premium builds even in mid-range devices.

5.Adopt Data-Driven Pricing: Use demand analytics for smart pricing, bundling, and inventory control.

6.Expand GPU-Focused Models: Target gamers, designers, and AI professionals with NVIDIA/AMD GPUs.

7.Leverage Brand Trust: Promote reliability and user satisfaction through strong branding and reviews.

8.Grow Premium Segment: Develop high-performance laptops (32–64 GB RAM, 4K display) for professionals as long-term investments.