



OESON GLOBAL INTERNSHIP PROGRAM

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# Business Analysis Report

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**The most influential features  
affecting laptop prices** - A case  
study and analysis

# Meet The Team



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Mechanical Design Engineer with a strong background in design principles and business knowledge. An aspirant Business Analyst and Product Manager looking for new challenges and opportunities.

Currently, a Business Analyst Intern at OESON, India.

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Business Development Lead at The THRIVE Project, a Global Non-Profit Organization based in Australia. Business Analyst at OESON, India.

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Business Analyst at Oeson, Indore, Madhya Pradesh, India

I'm currently pursuing a masters in statistics at Christ Univesity, Bangalore. My main goal is to step into the field of Business Analytics and I wish to improve my skill base in various tools





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# Introduction

The personal computer was meant to die ten years ago, but it has only recently witnessed its first significant increase in a decade. According to market research firm Canalys, PC shipments will reach 297 million units in 2020, up 11% from 2019. IDC estimates 302 million shipments for the year, up 13.1% year over year. Gartner agrees that 2020 will be a major year for PCs, with the most growth since 2010.

Due to the continuing coronavirus outbreak, PC shipments are increasing. Midway through the year, supply shortages made purchasing a new laptop difficult, and demand continued until 2020. "Demand is pushing the PC market forward and all signs indicate this surge still has a way to go," says Ryan Reith of IDC. People are also using PCs and laptops for leisure, in addition to home working and remote study.

At the same time, the number and models of laptops created have differentiated themselves to gain a competitive advantage and get their own space in the market, surviving the fierce competition that has been going on for the past 10 years, trying to produce models with unique characteristic combinations, design and performance for specific targets.

Laptop pricing is subject to a lot of variation: the development of the latest versions of each laptop is based on some fundamental factors present in the models, for which the main brands are known, such as the latest operating system used, the presence of particular graphics cards, the quality of the warranty service, the installation of particular software or packages, the type of ram, the type of storage devices, and so on.

Our aim is to analyse how all these factors are correlated with the price of the laptop today and which is the most influential feature in terms of price.



# Literature Review

## **Game debate, (2021). Why Intel 12th gen is the most expensive?**

Retrieved from:

<https://www.game-debate.com/news/31425/intel-12th-gen-alder-lake-cpus-are-apparently-much-more-expensive-than-11th-gen-rocket-lake#:~:text=The%20main%20reason%20is%20likely,AMD%20core%2Dfor%2Dcore.>

## **Laptop, (2021). Best laptop CPU's in 2021**

Retrieved from:

<https://www.laptopmag.com/articles/cpu-comparison>

## **Crucial, (2021). Why does the price of memory fluctuate?**

Retrieved from:

<https://www.crucial.in/support/articles-faq-memory/store-memory-pricing>

## **Make use of.com, (2021). Why are graphics cards so expensive.**

Retrieved from:

<https://www.makeuseof.com/why-are-graphics-cards-so-expensive/>

## **DRS, (not available). SSDs are increasing in price.**

Retrieved from:

<http://www.datarecoveryspecialists.co.uk/blog/ssds-are-increasing-in-price>

## **We recoverdata.com, (not available). What's better for you 64-bit vs 32-bit?**

Retrieved from:

<https://www.werecoverdata.com/blog/whats-better-64-bit-vs-32-bit/>

## **Kaggle, (2022). Laptop specs and latest prices**

Retrieved from:

<https://www.kaggle.com/datasets/kuchhbhi/latest-laptop-price-list>



# Research Methodology

The research methodology for this hypothesis is a statistical one to derive insights based on laptop pricing. We used the method of correlation analysis to test the hypotheses. The correlation

The tools used were in the following order,

**Excel** - To sort and clean the data

**R** - To conduct the statistical analysis

**Power BI** - The visualizations for the results obtained

## **Analysis followed:**

- Exploratory Descriptive Analysis
- Statistical Analysis
- Hypothesis Analysis

# Exploratory Descriptive Analysis

## DESCRIPTIVE EXPLORATORY ANALYSIS ON DATASET

Range Index: 896 entries, 0 to 895 (made on Pandas)

Data columns (total 23 columns):

```
#   Column                Non-Null Count  Dtype
---  -
0   brand                 896 non-null    object
1   model                 896 non-null    object
2   processor_brand       896 non-null    object
3   processor_name        896 non-null    object
4   processor_gnrtn       896 non-null    object
5   ram_gb                896 non-null    int64
6   ram_type              896 non-null    object
7   ssd_gb                896 non-null    int64
8   hdd_gb                896 non-null    int64
9   os                    896 non-null    object
10  os_bit                896 non-null    object
11  graphic_card_gb       896 non-null    int64
12  weight                896 non-null    object
13  display_size          896 non-null    object
14  warranty               896 non-null    int64
15  Touchscreen           896 non-null    object
16  msoffice               896 non-null    object
17  latest_price          896 non-null    int64
18  old_price              896 non-null    int64
19  discount               896 non-null    int64
20  star_rating           896 non-null    float64
21  ratings                896 non-null    int64
22  reviews               896 non-null    int64

dtypes: float64(1), int64(10), object(12)
```

# Exploratory Descriptive Analysis

## DESCRIPTIVE EXPLORATORY ANALYSIS ON DATASET

### Main Info Dataset

	count	mean	std	min	25%	50%	75%	max
graphic_card_gb	896.0	1.198661	2.057454	0.0	0.0	0.0	2.00	8.0
warranty	896.0	0.691964	0.606282	0.0	0.0	1.0	1.00	3.0
latest_price	896.0	76309.860491	46613.354368	13990.0	45490.0	63494.0	89090.00	441990.0
old_price	896.0	88134.154018	55719.645554	0.0	54940.5	78052.5	111019.50	377798.0
discount	896.0	18.527902	10.508486	0.0	11.0	19.0	26.00	57.0
star_rating	896.0	2.980469	1.965254	0.0	0.0	4.1	4.40	5.0
ratings	896.0	367.391741	1106.309355	0.0	0.0	19.0	179.50	15279.0
reviews	896.0	46.152902	136.079586	0.0	0.0	3.0	23.25	1947.0

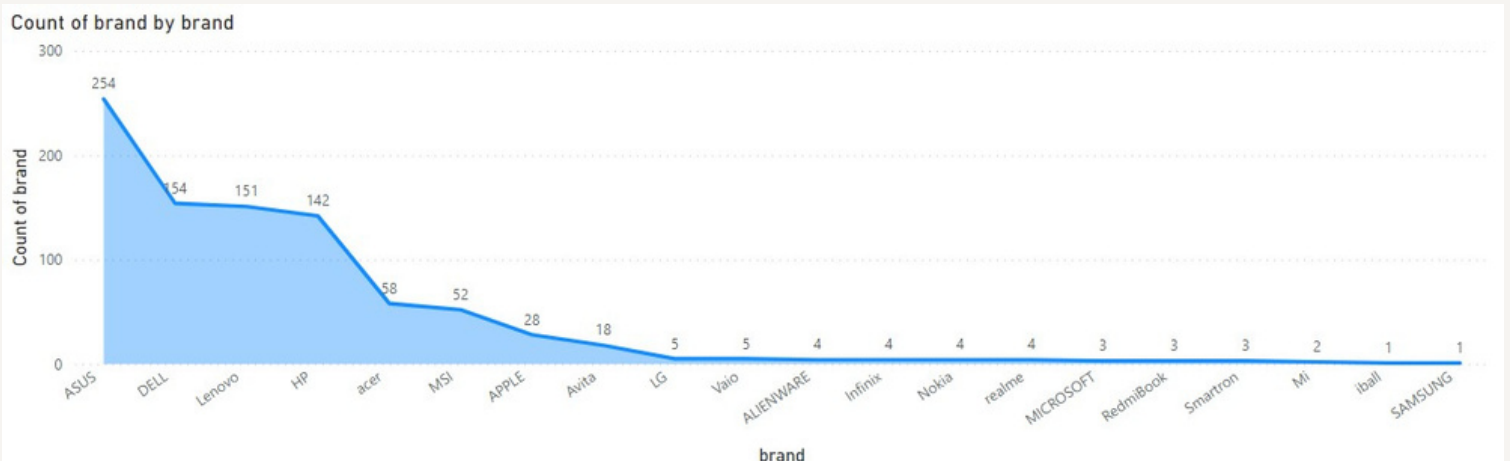


# Exploratory Descriptive Analysis

## DESCRIPTIVE EXPLORATORY ANALYSIS ON DATASET

These are the results obtained from an exploratory analysis on the dataset:

1) Most laptops are manufactured under the ASUS (254), DELL (154), Lenovo (151) and HP (142) brands. Since our data lacks quantitative data on notebook sales, a complete analysis of the market is impossible.

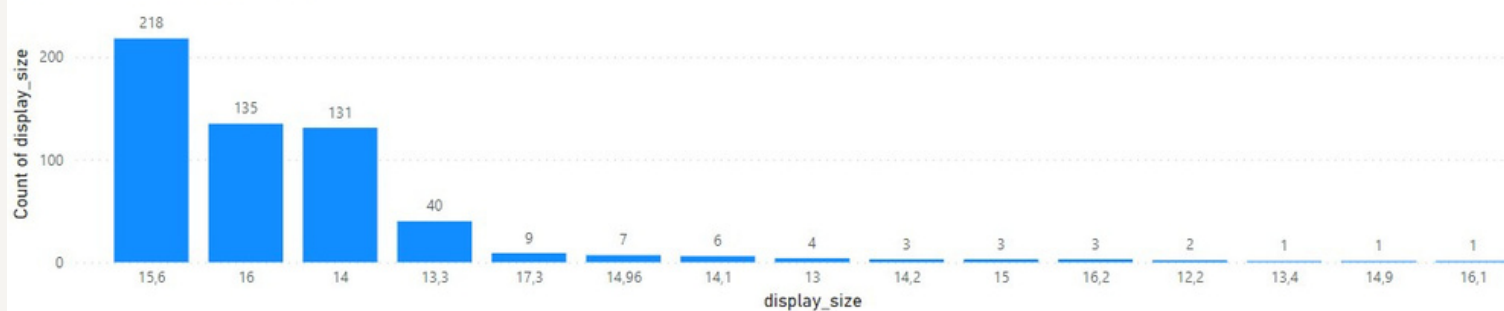


# Exploratory Descriptive Analysis

## DESCRIPTIVE EXPLORATORY ANALYSIS ON DATASET

2) The mode of the variable display size is 15.6 (218), suggesting significant demand from buyers, since these computers are used both at work and at home, this is the case.

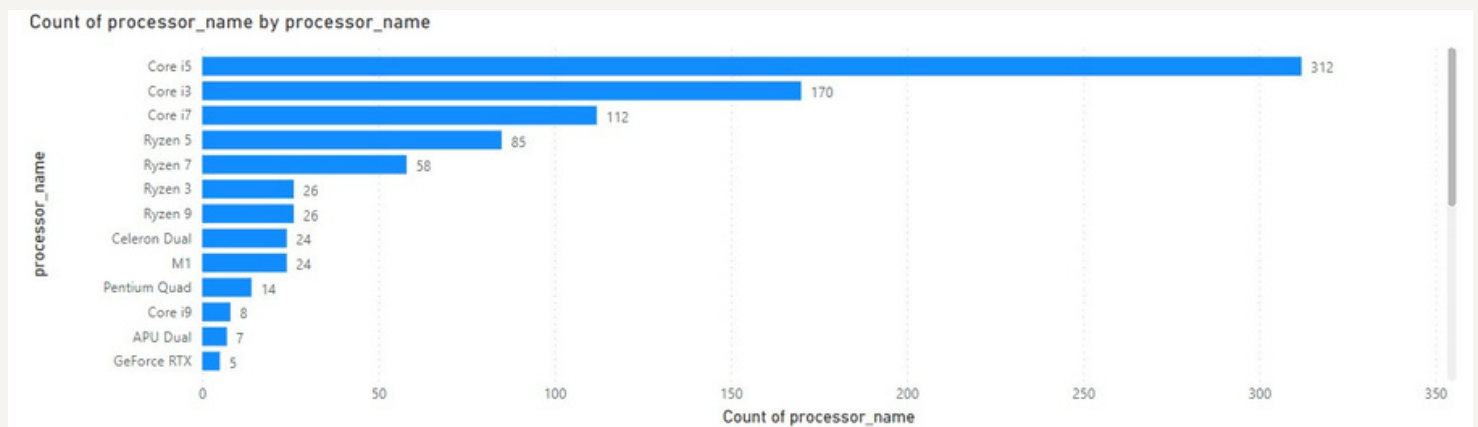
Count of display\_size by display\_size



# Exploratory Descriptive Analysis

## DESCRIPTIVE EXPLORATORY ANALYSIS ON DATASET

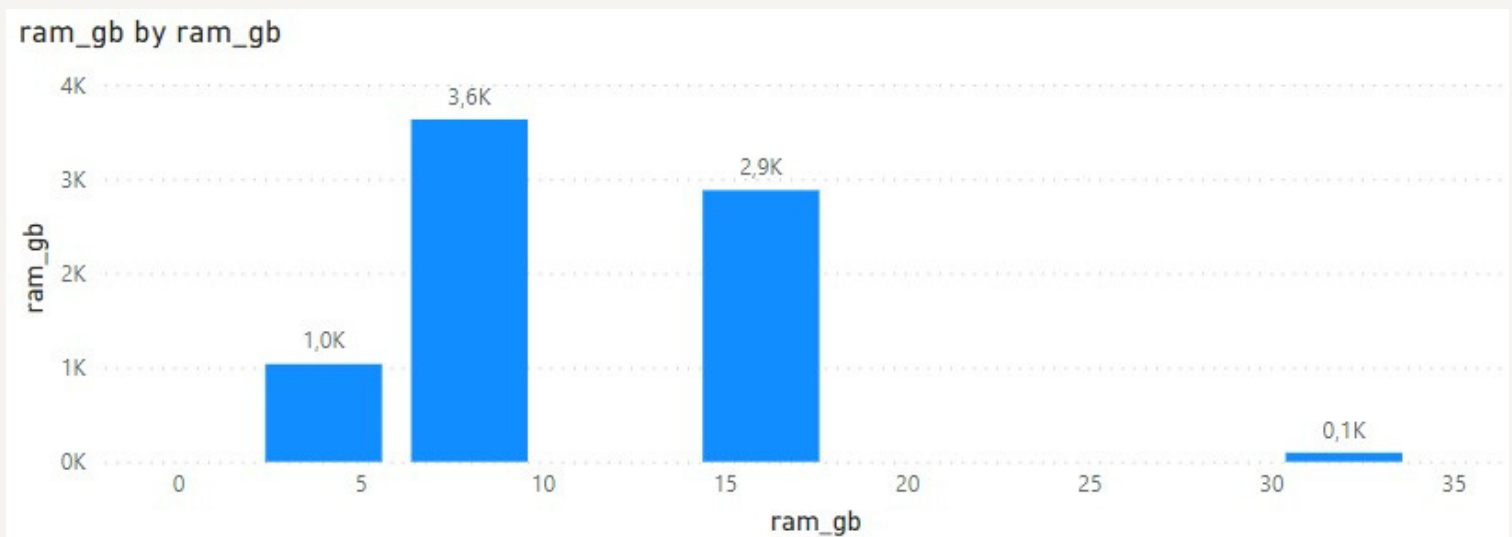
3) Intel processors, particularly Core i5 (312), Core i3 (170) and Core i7 (112), are the most common. The low price and high performance of this phenomenon can be explained.



# Exploratory Descriptive Analysis

## DESCRIPTIVE EXPLORATORY ANALYSIS ON DATASET

4) The mode is set to 8 Gb in the ram gb variable, as shown in the first graph below. This indicates that this amount of RAM will be sufficient for most tasks. This is a demonstration of how supply is created by demand.



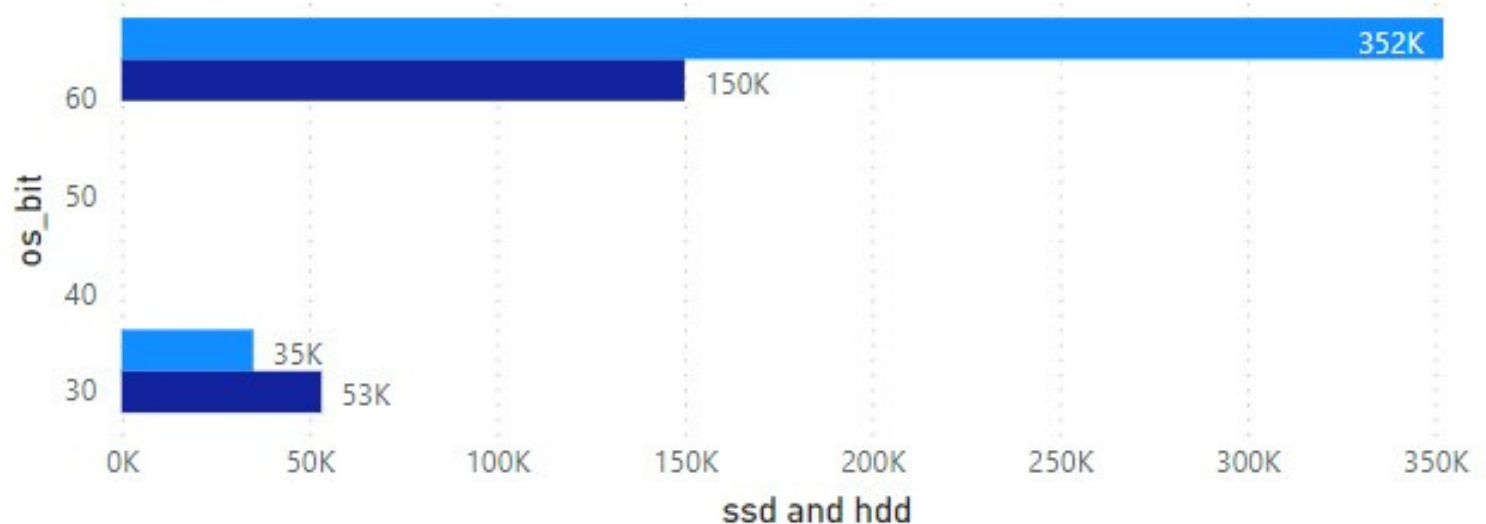
# Exploratory Descriptive Analysis

## DESCRIPTIVE EXPLORATORY ANALYSIS ON DATASET

5) Most laptops come with a solid state drive (SSD). In order to compete, several manufacturers install only one storage device in laptops to save money on additional slots. If you choose a model with a fast SSD, for example, you run the risk of losing your system and personal data. The option of having only an HDD is also not ideal. Today, this type of media has very low data exchange rates. Your system will take a long time to boot up, and the slowness with which applications start and process data will be unpleasant. Consequently, while you select a device, the SSD + HDD dual disk solution should be preferred when selecting a device.

ssd and hdd by os\_bit

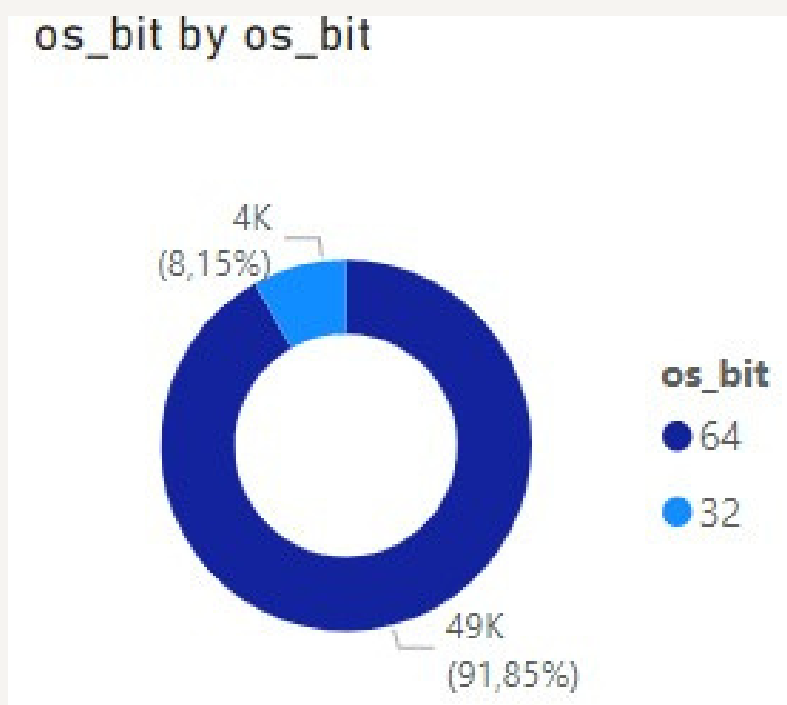
● ssd ● hdd



# Exploratory Descriptive Analysis

## DESCRIPTIVE EXPLORATORY ANALYSIS ON DATASET

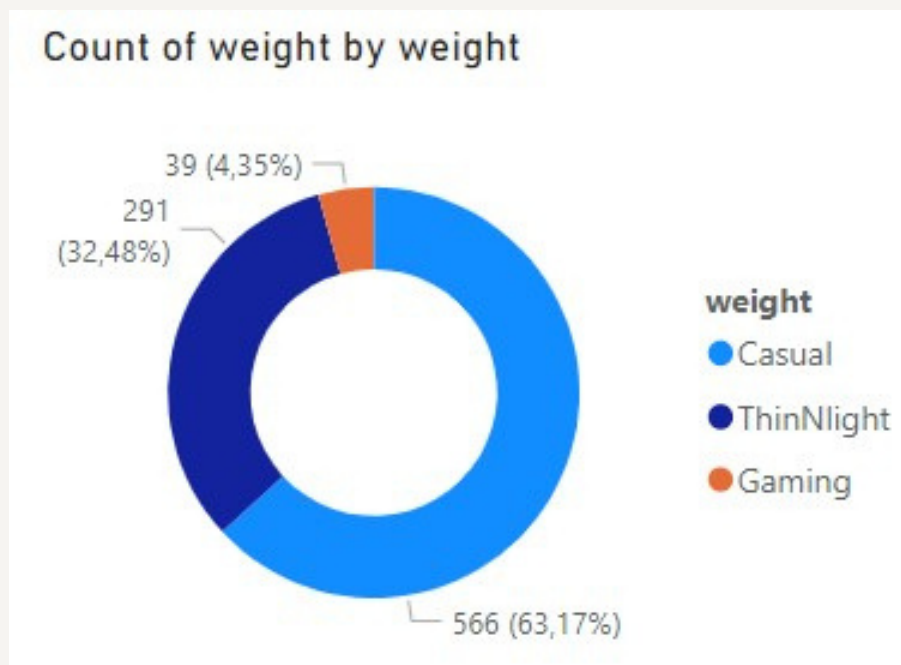
6) Windows 64-bit is the most popular operating system value. This can be explained by the system's ease of use and low cost, as well as a far wider range of programs available.



# Exploratory Descriptive Analysis

## DESCRIPTIVE EXPLORATORY ANALYSIS ON DATASET

7) Gaming laptops aren't very popular because most games are played on stationary computers with far more powerful hardware.



# Statistical Analysis

This is the CORRELATION MATRIX between the variables :

price & os\_bit

price & warranty

price & processor\_name

price & msoffice

price & graphic card

price & sdd

price & processor type

price & processor generation

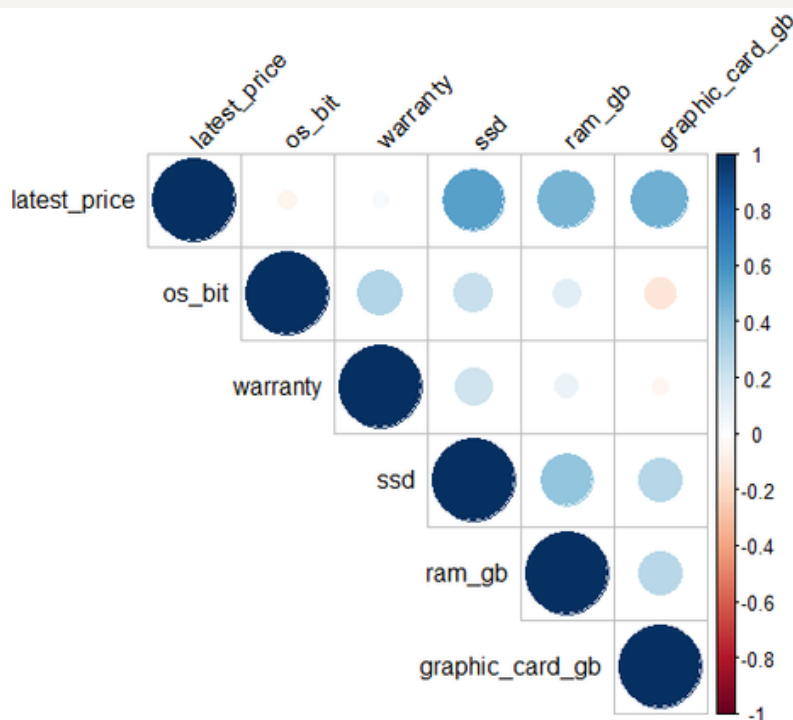
	row	column	cor	p
1	latest_price	os_bit	-0.05838920	8.066688e-02
2	latest_price	warranty	0.03976668	2.343787e-01
3	os_bit	warranty	0.29047222	0.000000e+00
4	latest_price	ssd	0.54506450	0.000000e+00
5	os_bit	ssd	0.22968458	3.430589e-12
6	warranty	ssd	0.20292731	8.805516e-10
7	latest_price	ram_gb	0.46848241	0.000000e+00
8	os_bit	ram_gb	0.12249495	2.374734e-04
9	warranty	ram_gb	0.08701665	9.160634e-03
10	ssd	ram_gb	0.39640666	0.000000e+00
11	latest_price	graphic_card_gb	0.48780894	0.000000e+00
12	os_bit	graphic_card_gb	-0.13986006	2.653999e-05
13	warranty	graphic_card_gb	-0.04225079	2.064086e-01
14	ssd	graphic_card_gb	0.28531998	0.000000e+00
15	ram_gb	graphic_card_gb	0.27567552	0.000000e+00



# Statistical Analysis

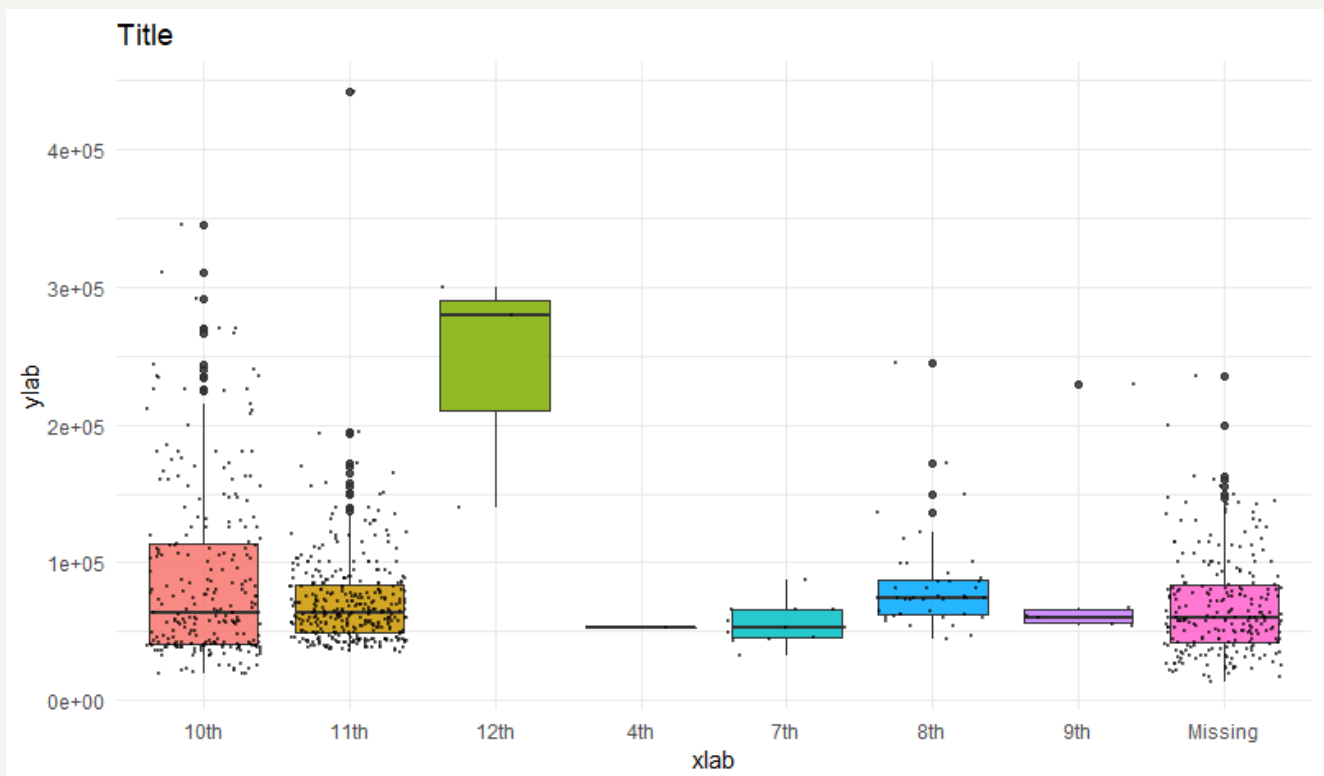
From the CORRELATION MATRIX and the CORRELATION TABLE below we can notice that the latest price is positively highly correlated with the variables `ssd`, `ram_gb` and `graphic_card_gb` (see the first line), while latest price is positively low correlated with `os_bit` and `warranty`.

From the following CORRELATION TABLE, we can notice that, against our expectations, the presence or not of warranty doesn't affect the latest variable in a significative way, the correlation is slightly positive but very low.



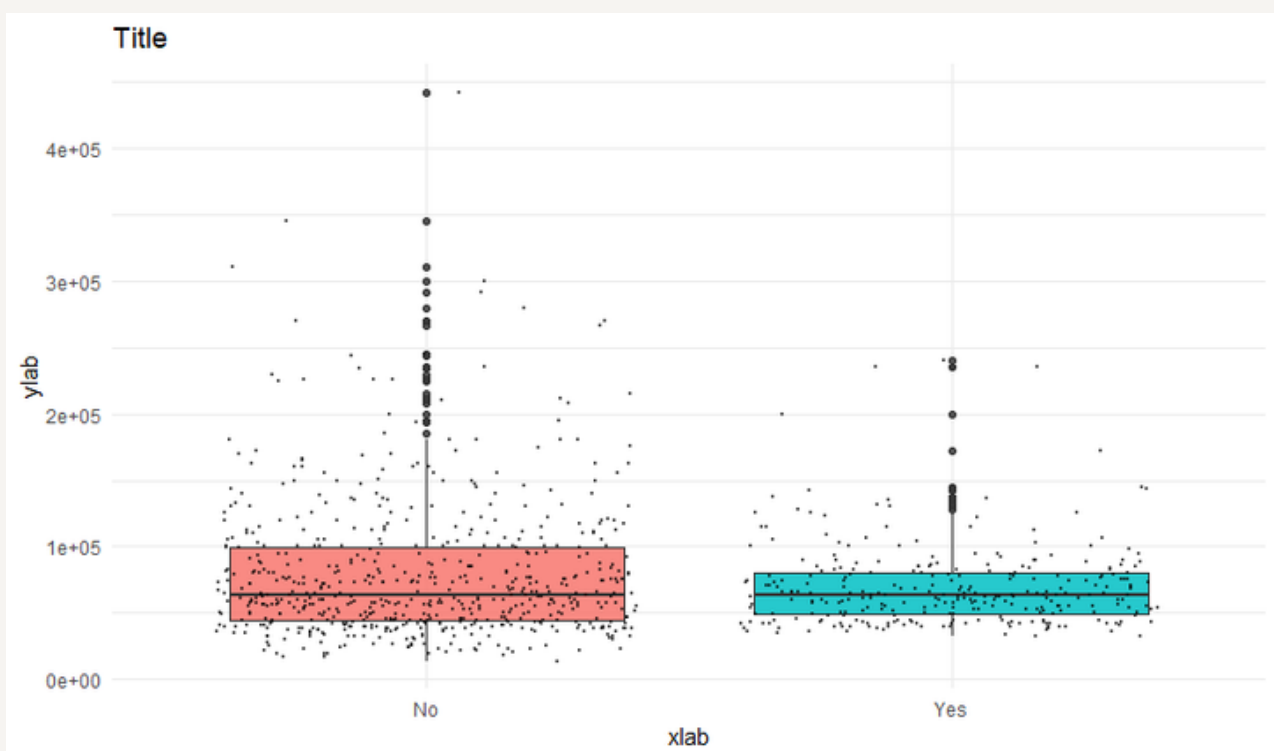
# Statistical Analysis

From the CORRELATION MATRIX and the CORRELATION table, against our expectations, for almost all processor generations, the price is comparable and is almost the same. The only exception is given of the 12th generation one, which saw a dramatic increase in the median price!



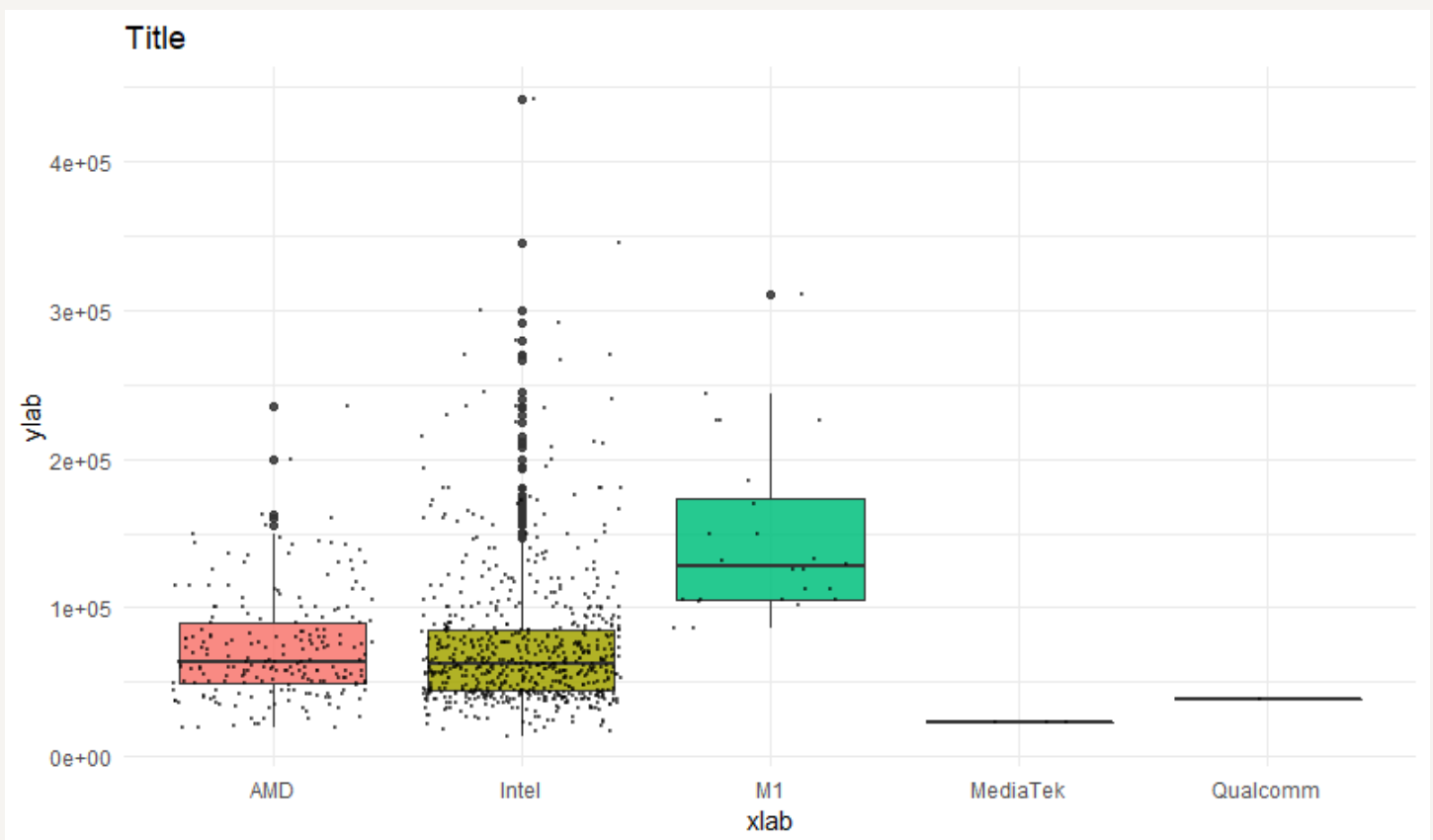
# Statistical Analysis

The following Box Plot, still against our expectations, show how the presence of msoffice in the laptops doesn't affect the latest\_price at all: in fact, the median price without msoffice is almost the same as if msoffice is installed in the laptops of the given dataset.



# Statistical Analysis

From the following Box Plots, it can be noted how there is almost no difference between the two most popular processor\_brand, i.e. Intel and AMD, while M1 median price is dramatically higher with respect to the last ones.





# Hypothesis Testing

Lead Hypothesis	Hypothesis	Statistical Tools
How do different features in the laptop lead to variation in prices ?	Variations in laptop's latest prices because of the presence of the feature, processor generation.	Correlation
	Variations in laptop's latest prices because of the presence of the feature, ram gb	Correlation
	Variations in laptop's latest prices because of the presence of the feature, ssd	Correlation
	Variations in laptop's latest prices because of the presence of the feature, hdd	Correlation
	Variations in laptop's latest prices because of the presence of the feature, os bit	Correlation
	Variations in laptop's latest prices because of the presence of the feature, graphic card gb	Correlation
	Variations in laptop's latest prices because of the presence of the feature, display size	Correlation
	Variations in laptop's latest prices because of the presence of the feature, warranty	Correlation
	Variations in laptop's latest prices because of the presence of the feature, ms office	Correlation

# Results & Discussions

1. p value is greater than 0.05
2. p value is greater than 0.05
3. p value is equal to zero
4. p value is equal to zero
5. p value is lesser than 0.05
6. p value is lesser than 0.05
7. p value is equal to zero
8. p value is lesser than 0.05
9. p value is lesser than 0.05
10. p value is equal to zero
11. p value is equal to zero
12. p value is lesser than .0.05
13. p value is greater than 0.05
14. p value is equal to zero,
15. p value is equal to zero.

If the p value is lesser than 0.05, then we have to reject the null hypothesis.

If the p value is not lesser than 0.05, then we fail to reject the null hypothesis.

# Results & Discussions

Therefore from the above observation,

- We fail to reject the null hypothesis in the first case.
- In the second case, we fail to reject the null hypothesis.
- In the third case, we reject the null hypothesis.
- In the fourth case, we reject the null hypothesis.
- In the fifth case, we reject the null hypothesis.
- In the sixth case, we reject the null hypothesis.
- In the seventh case, we reject the null hypothesis.
- In the eighth case, we reject the null hypothesis.
- In the ninth case, we reject the null hypothesis.
- In the tenth case, we reject the null hypothesis.
- In the eleventh case, we reject the null hypothesis.
- In the twelfth case, we reject the null hypothesis.
- In the thirteenth case, we fail to reject the null hypothesis.
- In the fourteenth case, we reject the null hypothesis.
- In the fifteenth case, we reject the null hypothesis.





# Summary

As we started with the report, we took into consideration the variation in the laptop prices based on the different features such as graphics card, os-bit, SSD, ram-gb, processor-type etc.

Exploratory Descriptive Analysis, Statistical Analysis and Hypothesis Analysis was what we followed during the course of our project, from which we were able to derive the results in terms of correlation between laptop prices and features.

It was observed that the latest price is positively highly correlated with the variables `ssd`, `ram_gb` and `graphic card`, while latest price is positively low correlated with `os_bit` and `warranty`.

In conclusion from the above analyses performed, Asus was the most purchased laptop, Intel processor\_core I5 (312) was the most commonly used processor, the most used memory is 8GB under RAM, 64-bit OS and `ssd` were the most preferred feature while choosing a device.

# References

- <https://www.game-debate.com/news/31425/intel-12th-gen-alder-lake-cpus-are-apparently-much-more-expensive-than-11th-gen-rocket-lake#:~:text=The%20main%20reason%20is%20likely,AMD%20core%2Dfor%2Dcore.>
- <https://www.laptopmag.com/articles/cpu-comparison>
- <https://www.crucial.in/support/articles-faq-memory/store-memory-pricing>
- <https://www.makeuseof.com/why-are-graphics-cards-so-expensive/>
- <http://www.datarecoveryspecialists.co.uk/blog/ssds-are-increasing-in-price>
- <https://www.werecoverdata.com/blog/whats-better-64-bit-vs-32-bit/>
- <https://www.kaggle.com/datasets/kuchhbhi/latest-laptop-price-list>



# Thank You

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