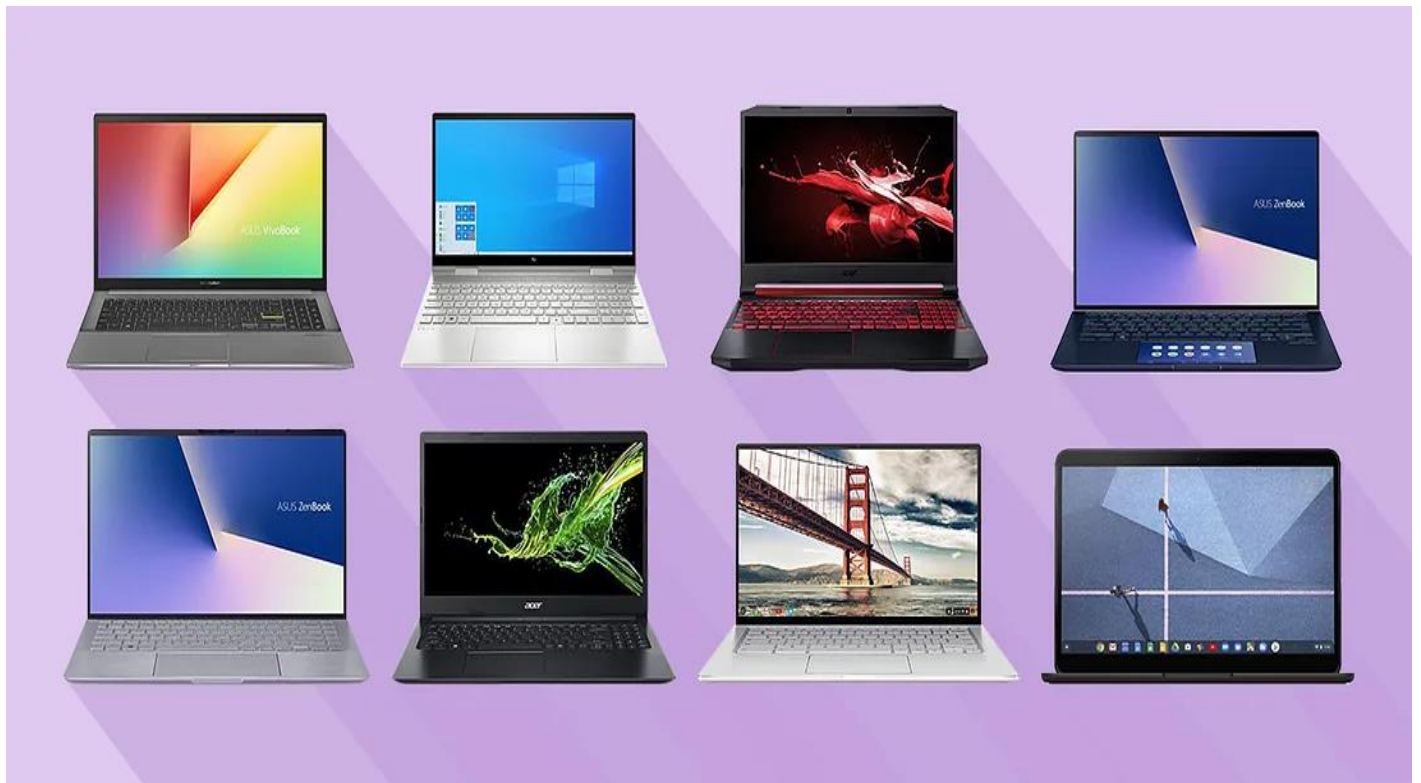


Fynn Labs: Project3

Link: [GitHub](#)

Laptop Price Prediction System

Date: 25th May, 2024



Laptop Price Prediction System

Step 1: Prototype Selection

Problem Statement

Laptops, first invented in 1980 and launched in 1982 by the Japanese company Seiko Epson, have become an integral part of the lives of human beings. Today, these technical devices serve a multitude of purposes — calling, video calls, texts, internet, mailing, playing games, taking pictures, shopping etc. Due to these very purposes, the buyers often take many parameters into consideration such as brand, processor, memory size (internal & external), camera among others. However, one parameter that is generally not considered is the **price**. As such, the main objective of this report is to introduce a system to cross-validate the price of a laptop based on its features.

Market/Customer/Business Need Assessment

Price is the most important side of shopping. Customers are very often interested in knowing the price of the item they wish to buy. Likewise, they are also interested in knowing whether the item is worth the price or not given its features. Hence, the type of service proposed here will enable the common man to have an estimate of the price of a laptop before making a purchase.

Target Specifications

The service will be essential for almost everyone in predicting the mobile price by means of:

- a. Company
- b. TypeName
- c. RAM
- d. Internal Memory (ROM)
- e. OpSys
- f. CPU
- g. Inches
- h. Screen Resolution
- i. Weight
- j. Gpu

External Search

- [Dataset](#)
- [Linear Regression](#)
- [Lasso and Ridge Regression](#)

Let's import the dataset and have a look at it!

▼ Import Modules

```
[1]: import numpy as np
import pandas as pd
import matplotlib.pyplot as plt
from sklearn.model_selection import train_test_split
from sklearn.linear_model import LinearRegression, Ridge, Lasso
from sklearn.metrics import mean_absolute_error
```

Loading the dataset

```
[2]: df = pd.read_csv('laptop_data.csv')
df.head()
```

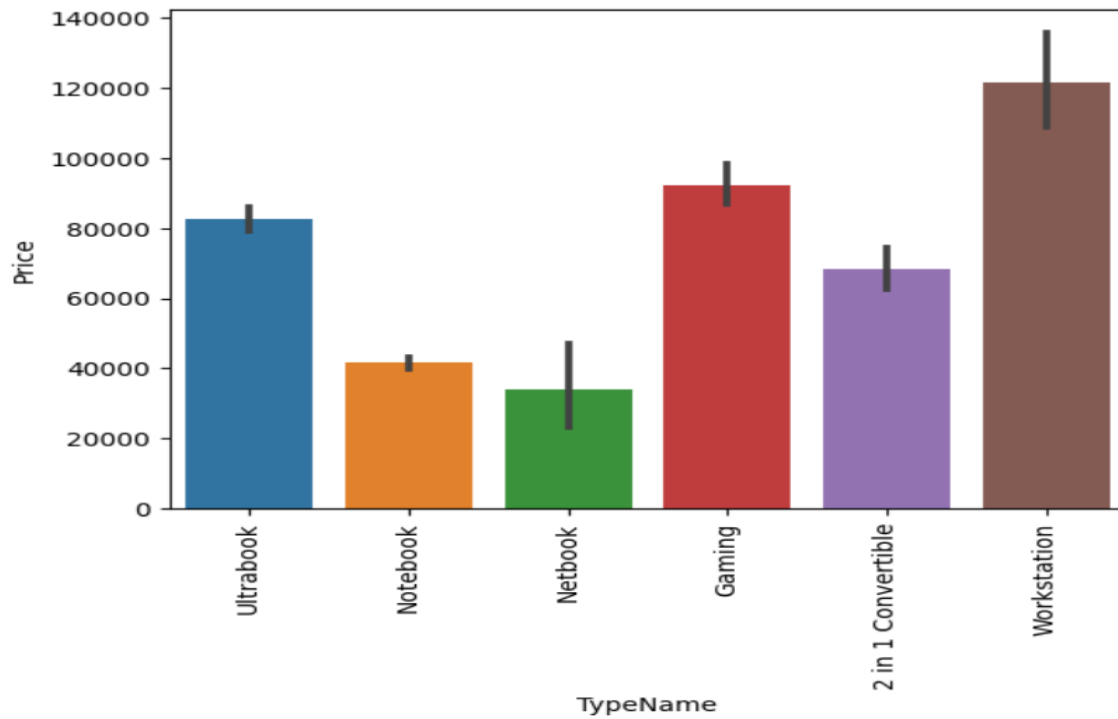
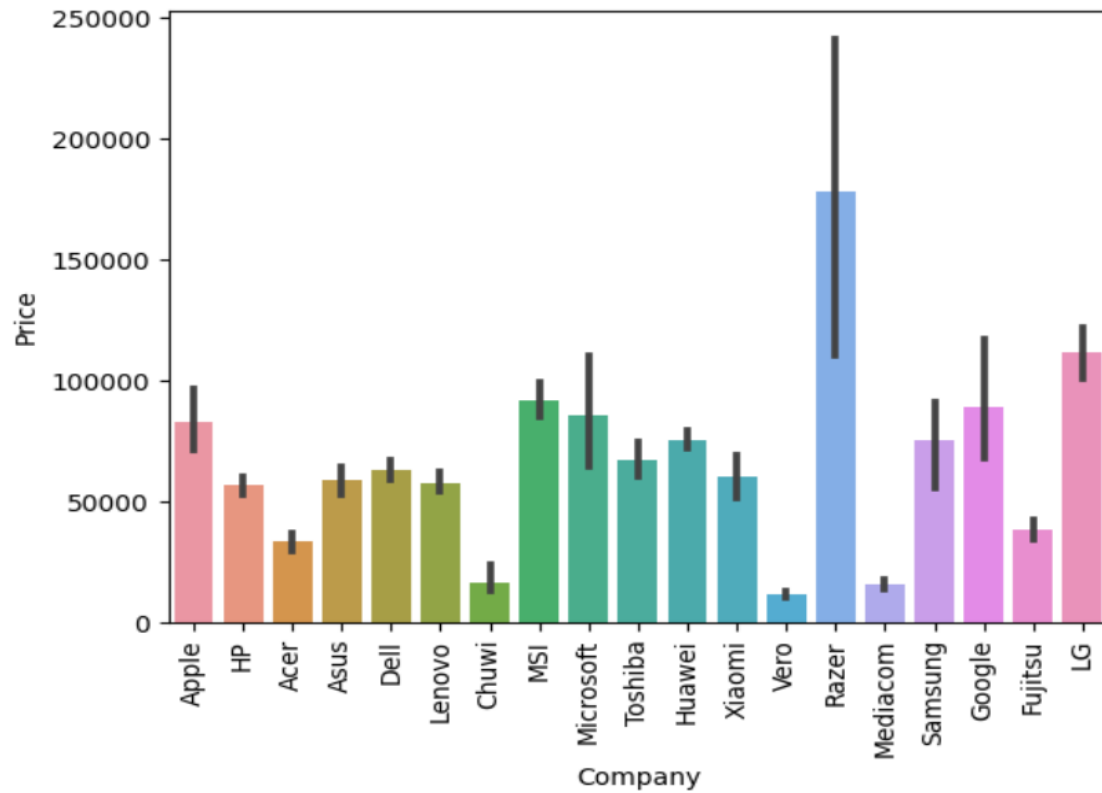
	Unnamed: 0	Company	Type	Name	Inches	ScreenResolution	Cpu	Ram	Memory	Gpu	OpSys	Weight	Price
0	0	Apple	Ultrabook		13.3	IPS Panel Retina Display 2560x1600	Intel Core i5 2.3GHz	8GB	128GB SSD	Intel Iris Plus Graphics 640	macOS	1.37kg	71378.6832
1	1	Apple	Ultrabook		13.3	1440x900	Intel Core i5 1.8GHz	8GB	128GB Flash Storage	Intel HD Graphics 6000	macOS	1.34kg	47895.5232
2	2	HP	Notebook		15.6	Full HD 1920x1080	Intel Core i5 7200U 2.5GHz	8GB	256GB SSD	Intel HD Graphics 620	No OS	1.86kg	30636.0000
3	3	Apple	Ultrabook		15.4	IPS Panel Retina Display 2880x1800	Intel Core i7 2.7GHz	16GB	512GB SSD	AMD Radeon Pro 455	macOS	1.83kg	135195.3360
4	4	Apple	Ultrabook		13.3	IPS Panel Retina Display 2560x1600	Intel Core i5 3.1GHz	8GB	256GB SSD	Intel Iris Plus Graphics 650	macOS	1.37kg	96095.8080

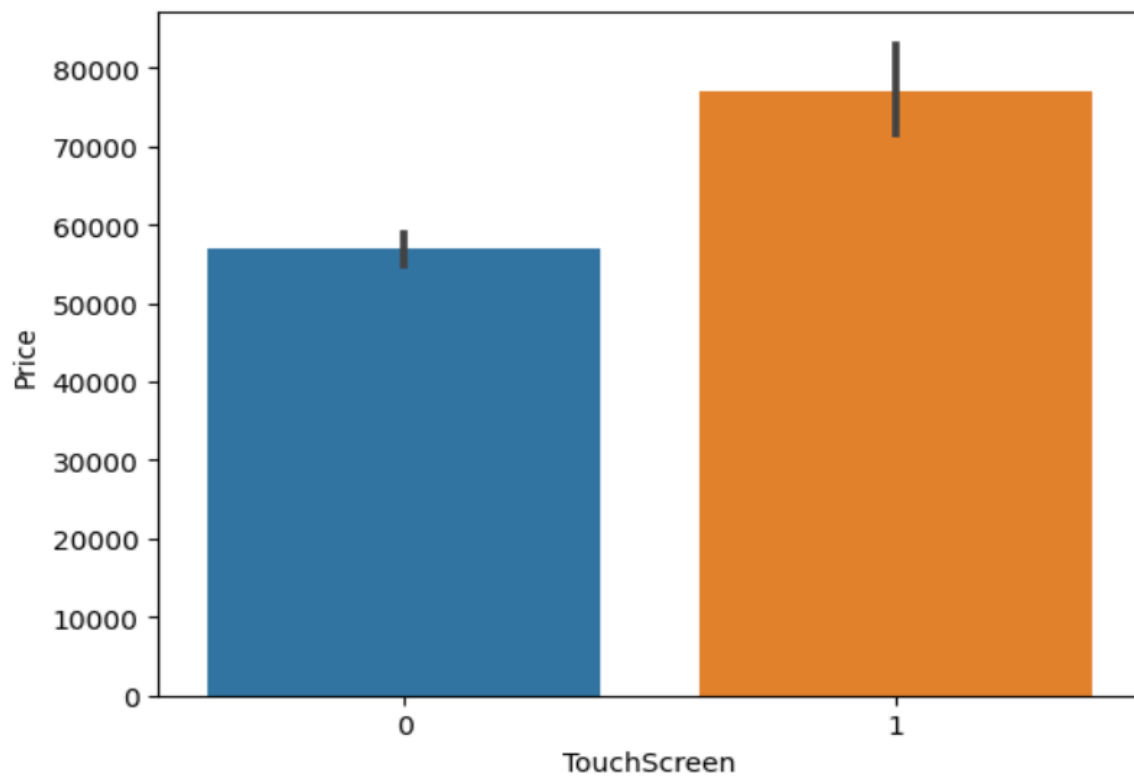
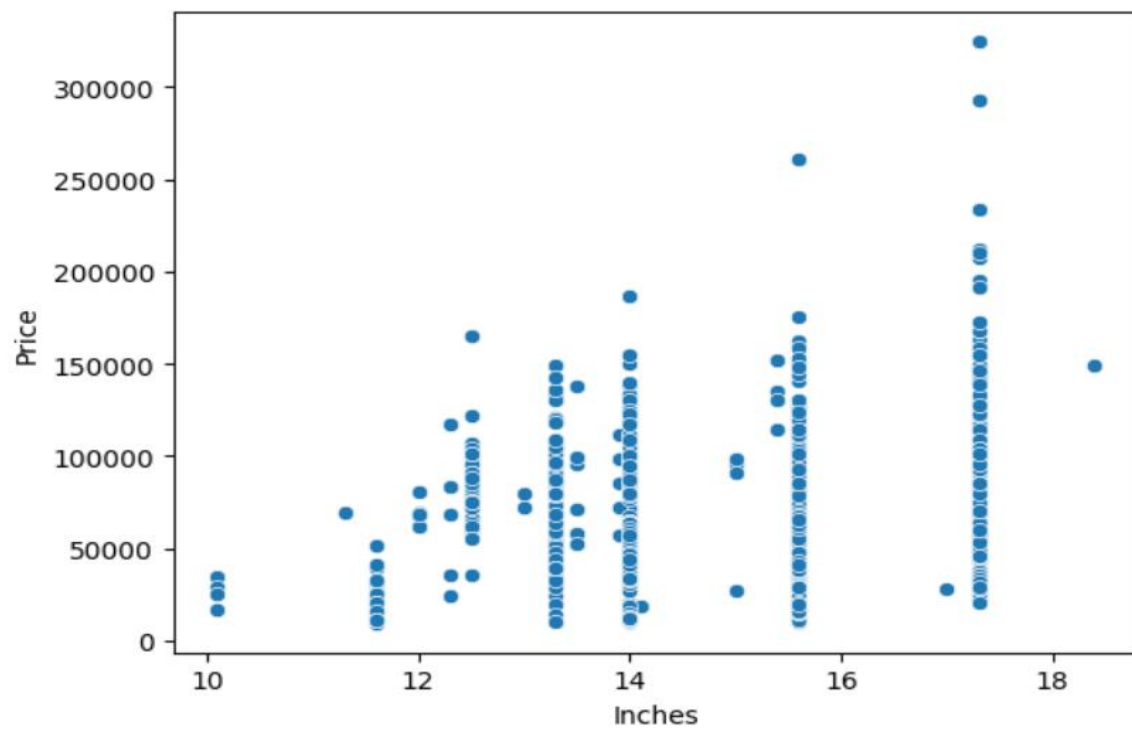
Getting info of the dataset

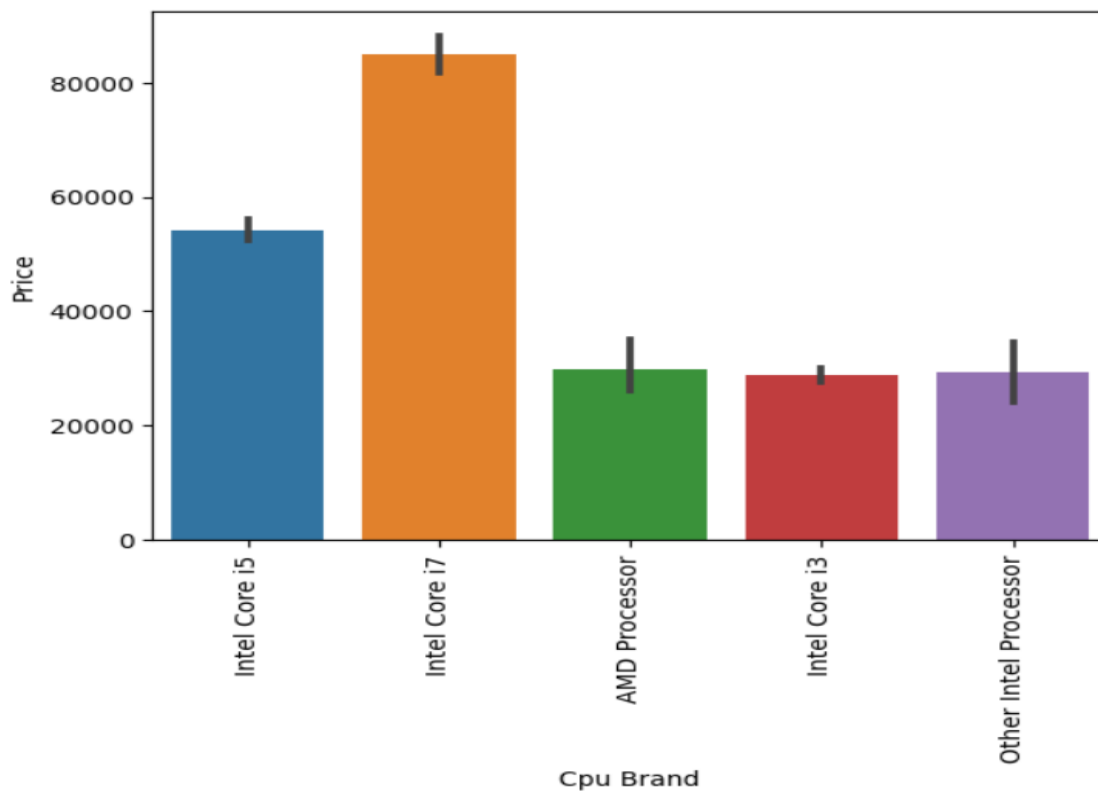
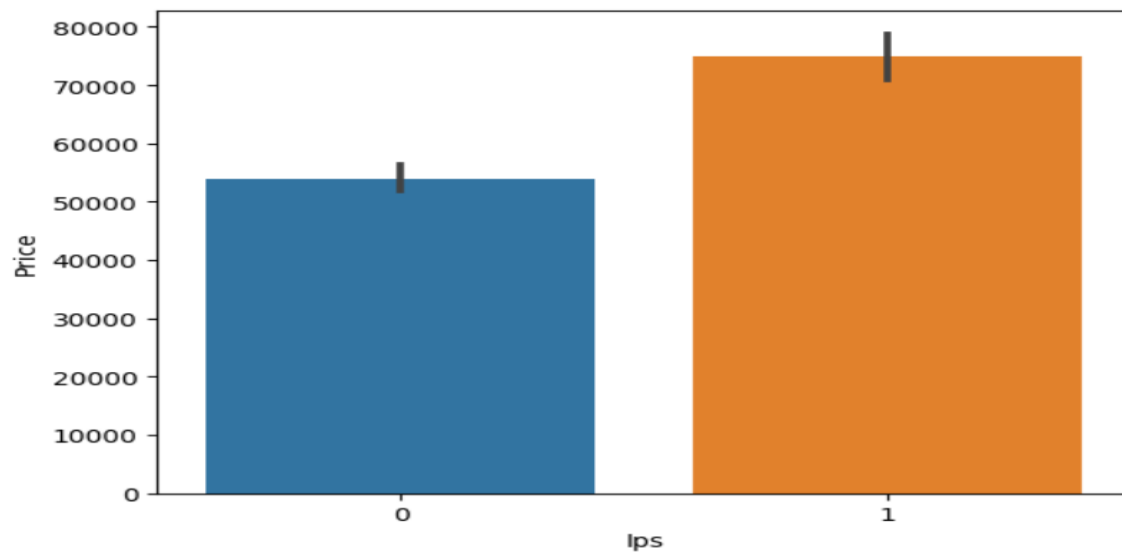
```
[3]: df.info()

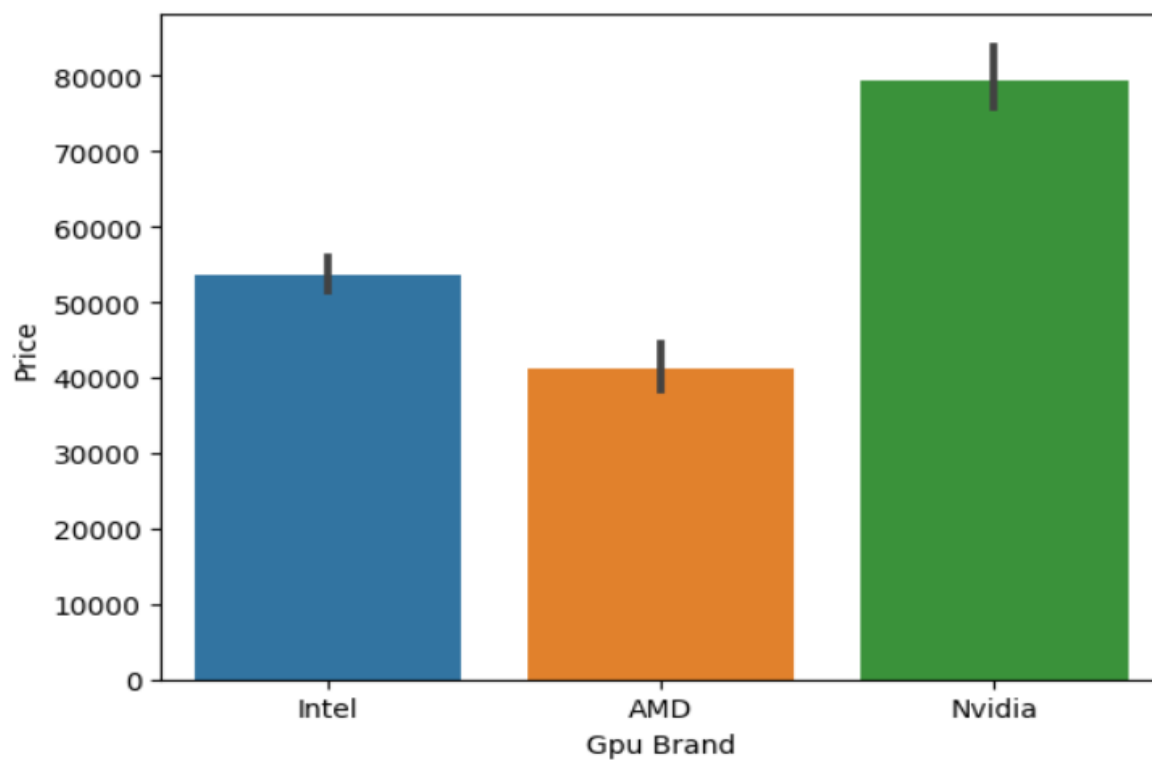
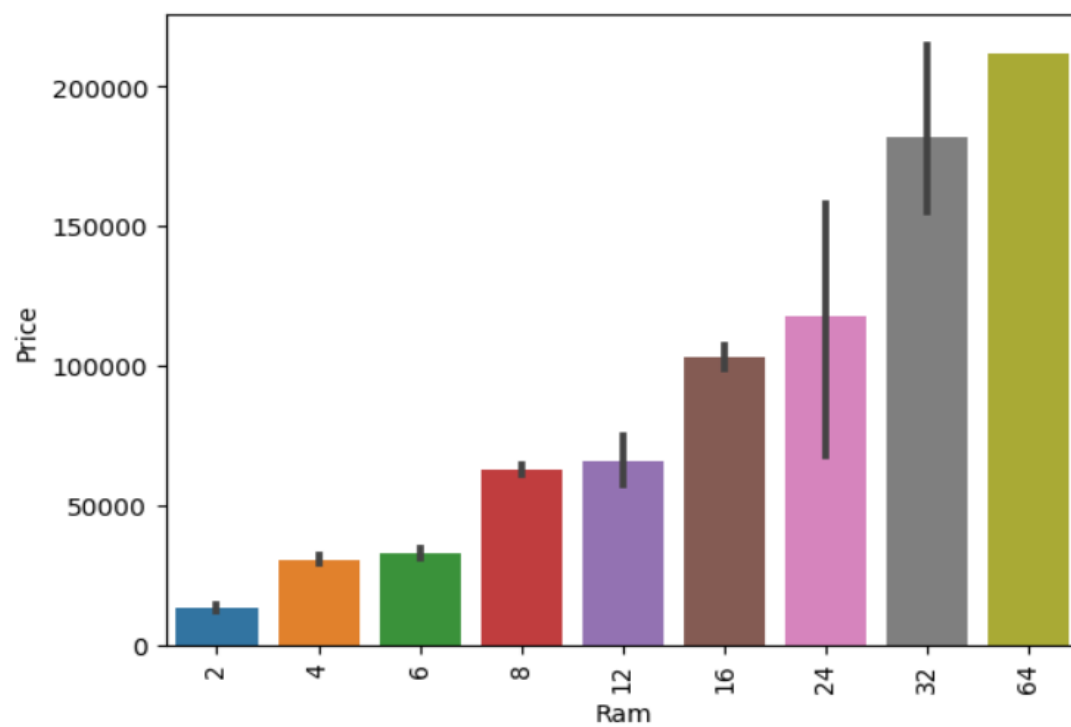
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 1303 entries, 0 to 1302
Data columns (total 12 columns):
#   Column          Non-Null Count  Dtype
---  ---
0   Unnamed: 0      1303 non-null  int64
1   Company         1303 non-null  object
2   TypeName        1303 non-null  object
3   Inches          1303 non-null  float64
4   ScreenResolution 1303 non-null  object
5   Cpu             1303 non-null  object
6   Ram             1303 non-null  object
7   Memory          1303 non-null  object
8   Gpu             1303 non-null  object
9   OpSys           1303 non-null  object
10  Weight          1303 non-null  object
11  Price           1303 non-null  float64
dtypes: float64(2), int64(1), object(9)
memory usage: 122.3+ KB
```

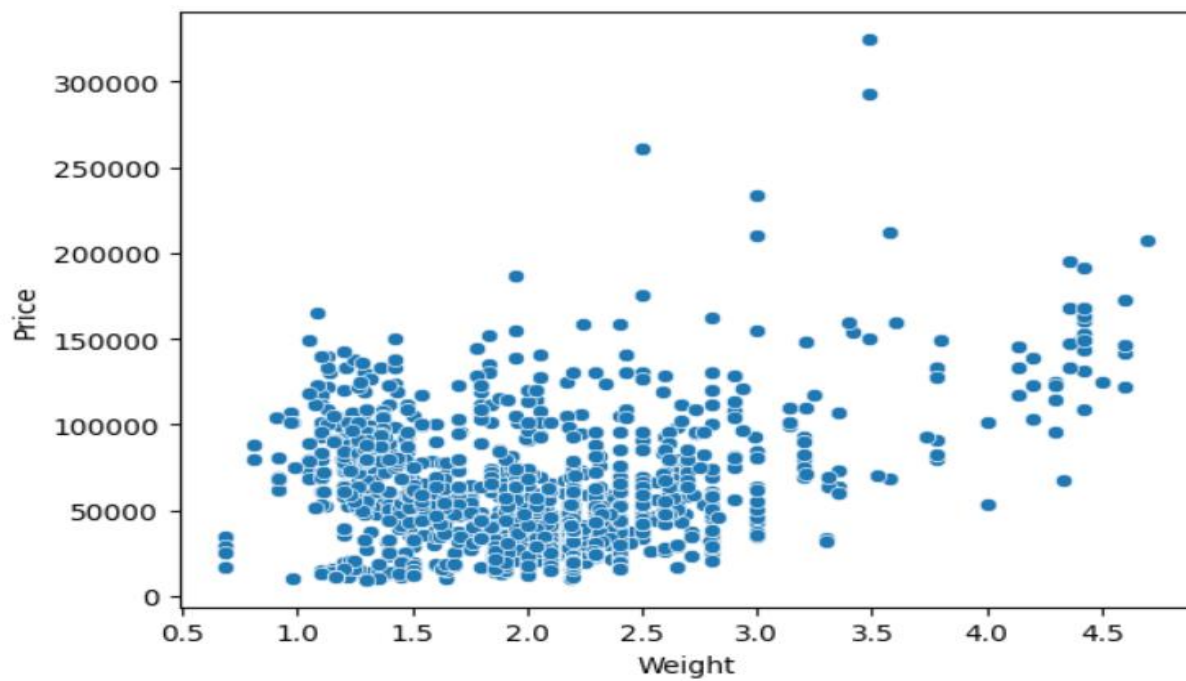
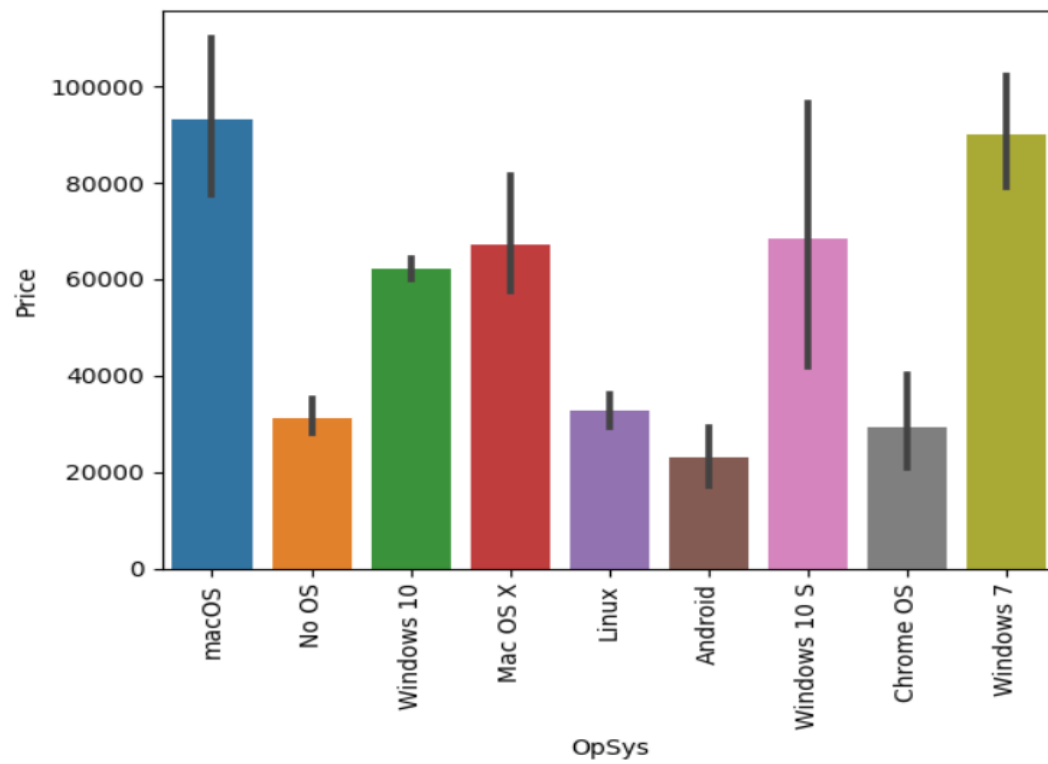
Exploratory Data Analysis (EDA)

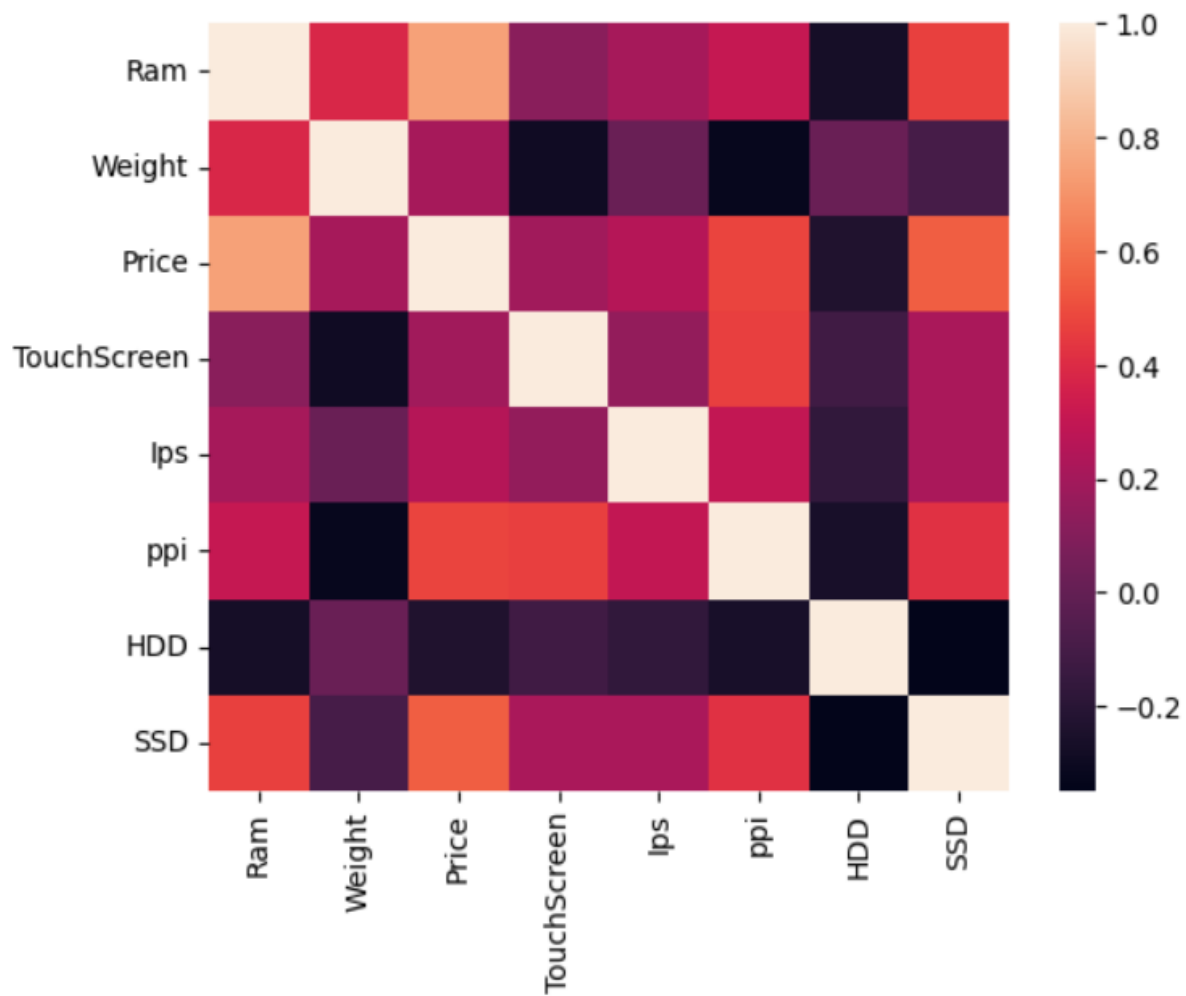












Applicable Regulations

Many laptops manufacturing companies don't allow to scrap data from its official websites which could be a possible hindrance in data collection.

Applicable Constraints

Since the laptop sales market is always changing, continuous data collection and its updation is extremely necessary as lack of quality data is likely to reduce the accuracy of the model.

Business Opportunity

This way of predicting the price of phones has been floating around the internet but there seem NO service in place to achieve the same. Therefore, there is a greater chance of the service being useful to not only the customers but also the sellers as the service will allow the sellers to assess what the customers are looking for.

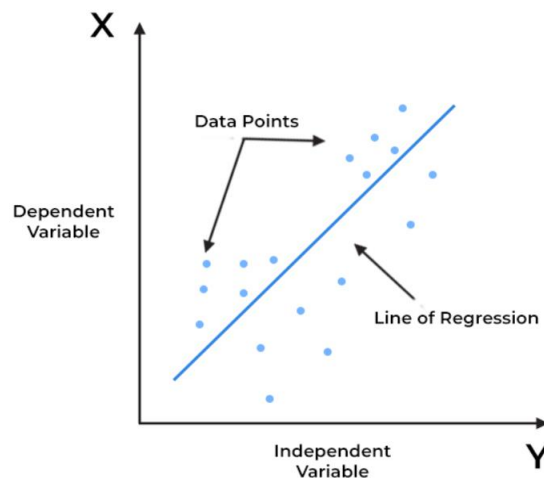
Concept Generation

For successful implementation, the proposed service will require the following algorithms, tools and experts.

Algorithms:

Linear Regression

Linear regression is one of the easiest and most popular Machine Learning algorithms. It is a statistical method that is used for predictive analysis. It makes predictions for continuous/numeric variables such as sales, salary, price, etc.



Lasso and Ridge Regression

Lasso and Ridge regressions, aka L1 and L2 regularization respectively, are some of the simple techniques often used to tackle what is known as ‘overfitting’ (model complexity) which may result from linear regression. Although they both work towards a common goal by penalizing the magnitude of coefficients of features along with minimizing the error (difference between actual and predicted values), there is a slight difference between the penalties they add to the cost function. Lasso adds penalty equal to absolute value of the magnitude of coefficients while Ridge adds penalty equal to square of the magnitude of coefficients.

Tools:

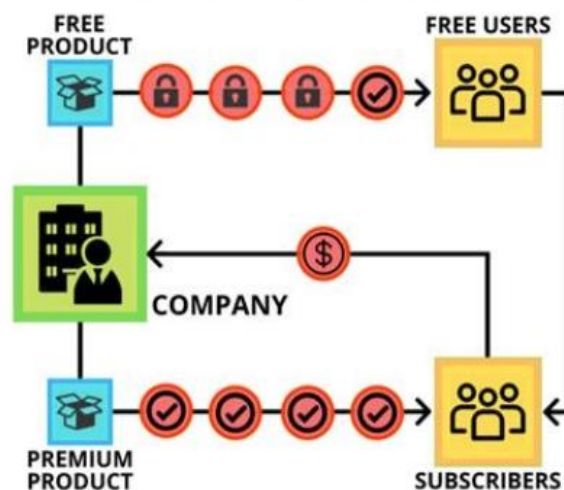
- [Python](#): It's a programming language that will be used for building the service.
- [Pandas](#): Pandas is a library mainly used for handling, manipulating and transforming data.
- [Scikit-learn](#): It is the gold standard library for machine learning which comes with plenty of algorithms to perform different tasks such as regression, classification etc.
- [Matplotlib](#) and [Seaborn](#): Both of these libraries are used for visualization purposes.

Business Model

There are many applications of the Laptop Price Predictor, but the major ones lie in helping manufacturer sales and ensuring customers' value for money. This product can make use of several business models, but the one we shall be using is:

- Subscription Business Model

SUBSCRIPTION BUSINESS MODEL



Instead of selling products, laptop price predictor system will operate on a tiered subscription model designed to cater to a wide range of users, from casual shoppers to tech enthusiasts and small businesses.

The service will offer a Free Tier with basic price predictions and limited access to historical data. For more comprehensive features, users can subscribe to the Basic Plan at a moderate monthly fee, which includes unlimited predictions, basic price drop alerts, and an expanded historical data set.

The Premium Plan, at a higher monthly fee, will provide advanced alerts, personalized recommendations, detailed comparison tools, and priority support. Businesses can opt for a customizable Business Plan, which includes all Premium features, bulk predictions, API access, and a dedicated account manager.

This model ensures that users receive valuable insights and timely alerts to make informed purchasing decisions while generating consistent revenue through recurring subscriptions.

The subscription model is used because of its pricing structure, in which a business will charge customers a recurring fee to access their product or service.

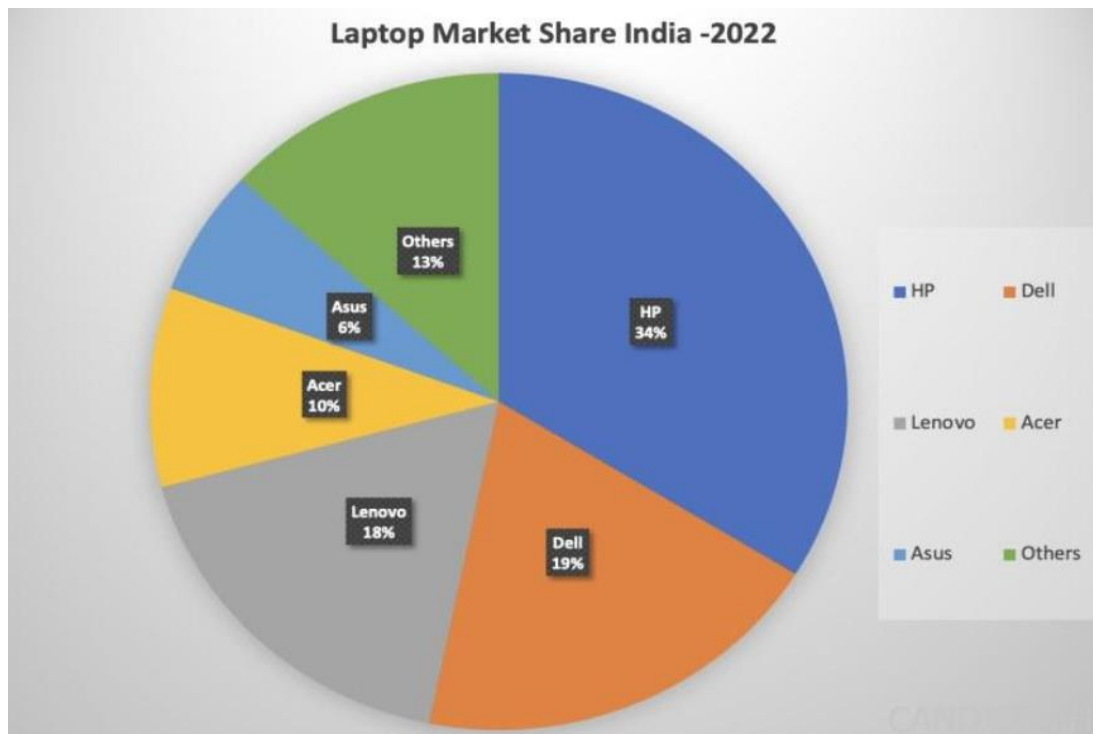
Operational Procedure

Our operating plan consists of several steps targeting manufacturers and customers alike to successfully deploy the Price Predictor in the service market. We also plan to employ different marketing strategies to reach out to mobile phone manufacturers and customers. Charged at a certain rate for each use of the Price Predictor, manufacturers will be allowed to use our product and receive a suggested pricing of their laptops. Depending on the sales of the manufacturer after pricing their based on our Predictor, they may reach out to us for further use of our product. As for customers, we aim to rely on their feedback of our product to improve the algorithm used for prediction since the market constantly changes and we may need to tweak our product from time to time. For this reason, our product shall be made available as a web-based online application since the product would need to be updated every now and then. This is easier than following a downloadable offline form of our product, since that would require users to download different versions of our product from time to time. We plan to make our service available for purchase in different forms. This includes purchase for one time use, purchase by subscription (monthly or annually), and purchase for infinite usage. Rates would differ for the different modes of purchase.

People who use the prediction

- This kind of prediction will help companies estimate price of mobiles to give tough competition to other mobile manufacturer
- Also, it will be useful for Consumers to verify that they are paying best price for a mobile.

Statistics of smartphone market in India



- There were 2.8 million units shipped in Q2 2020 Vs. 4.2 Mn in Q1 2022.
- HP is the largest laptop brand in India and has a 33.8% share, followed by Dell, with a 19.4% share.
- Lenovo is a close third with a 17.6% share, and Acer and Asus are at number 4 and 5.
- Asus has a 6.2% share in the Indian market and has tremendous demand for gaming laptops.
- Apple also grows strongly in the Indian market thanks to better pricing and incredible products.

Let's quickly look at the top brands' shipments and market share in 2022

Brand	Market Share	Total Shipments (1000s)
HP	33.8%	1449
Dell	19.4%	830
Lenovo	17.6%	752
Acer	9.8%	421
Asus	6.2%	267
Others	13.2%	563
Total	100%	4,282

Financial Equation

The above diagram indicates how the laptop companies in India have been growing in 2022. Even with the impact of COVID, the industry has continued to grow.

To create financial equations based on the above data, we can use the market share and total shipments to derive some key metrics. Below are a few financial equations that can be used to understand the distribution and impact of each brand within the market:

Total Shipments for each Brand:

$$\text{Total Shipments} = \text{Market Share} \times \text{Total Market Shipments}$$

Market Share for each Brand:

$$\text{Market Share} = \frac{\text{Total Shipments}}{\text{Total Market Shipments}}$$

Example:

Summary of Financial Equation for HP Laptops: -

$$\text{Total Shipments} = 0.338 \times 4,282 = 1,449 \text{ (thousands)}$$