Laptop Price Prediction Analysis

A machine learning project to predict laptop prices based on their features, analyzing a dataset of 1,275 laptops with 23 columns including specifications like RAM, storage, CPU, and display characteristics.

Dataset Overview

1,275

Laptop Records

Complete records with no missing values

23

Features

14 categorical and 9 numerical columns

19

Manufacturers

Dell, Lenovo, and HP are most common

The dataset contains detailed specifications including CPU, GPU, storage, display quality, and other hardware characteristics that influence laptop pricing.

Manufacturer Distribution

Top Manufacturers

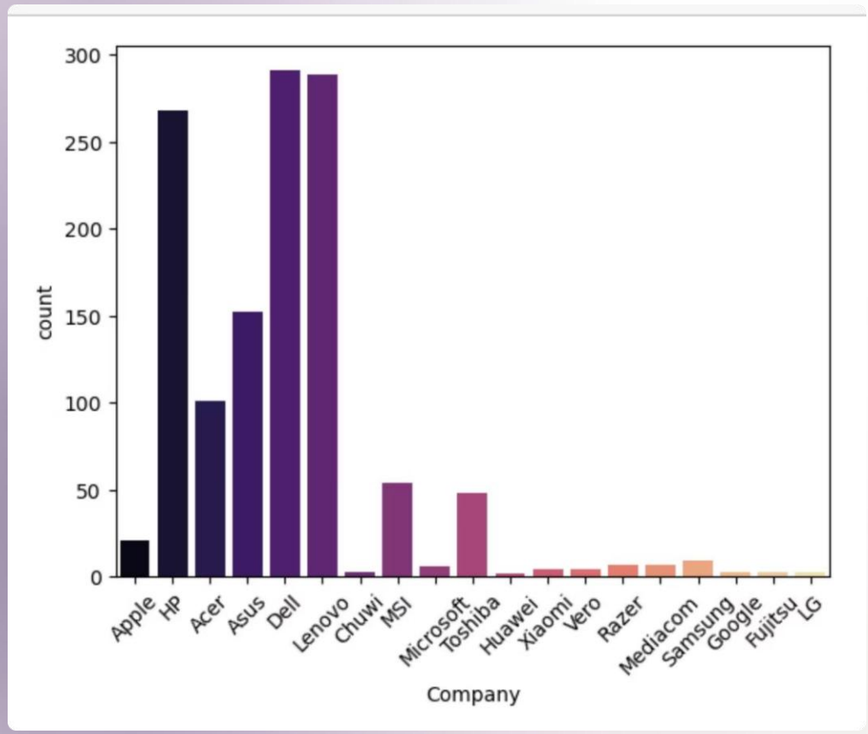
Dell (291), Lenovo (289), and HP (268) dominate the dataset, representing the majority of laptop records.

Mid-Range Brands

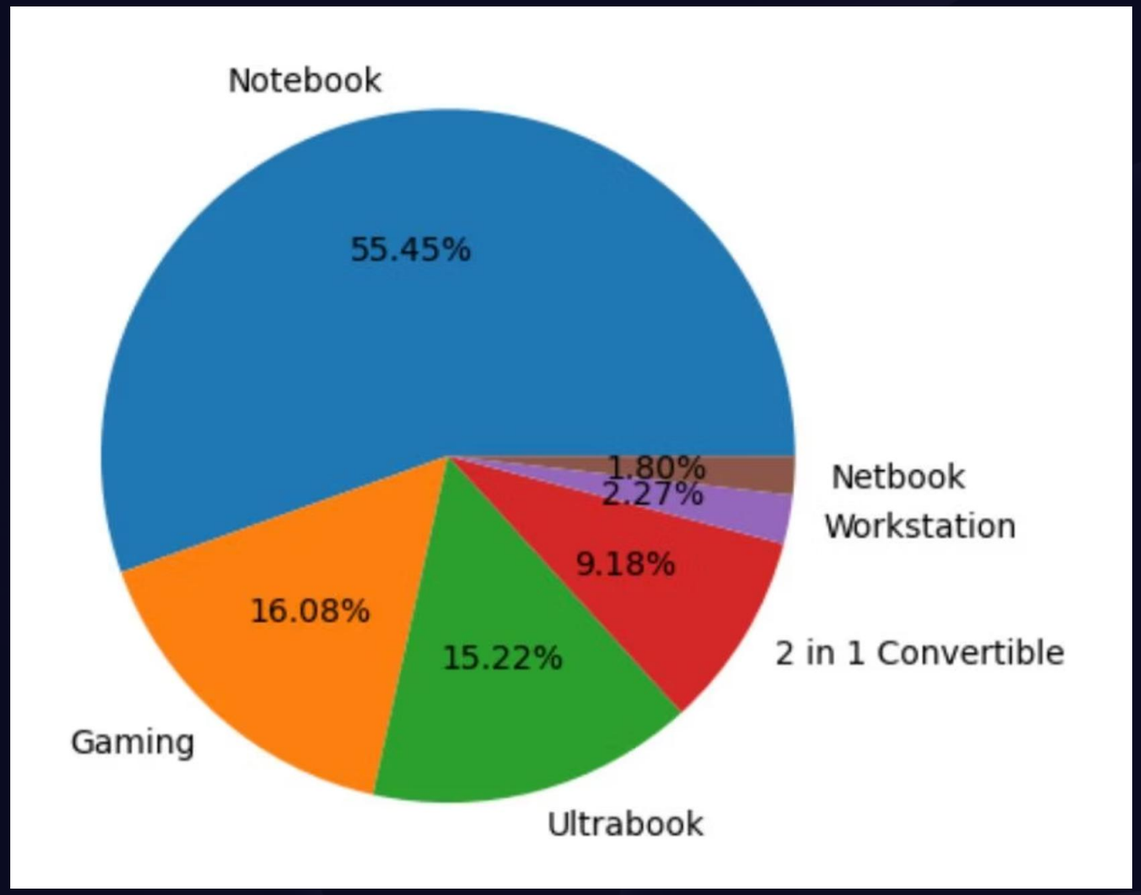
Asus (152), Acer (101), MSI (54), and Toshiba (48) have moderate representation.

Premium/Niche Brands

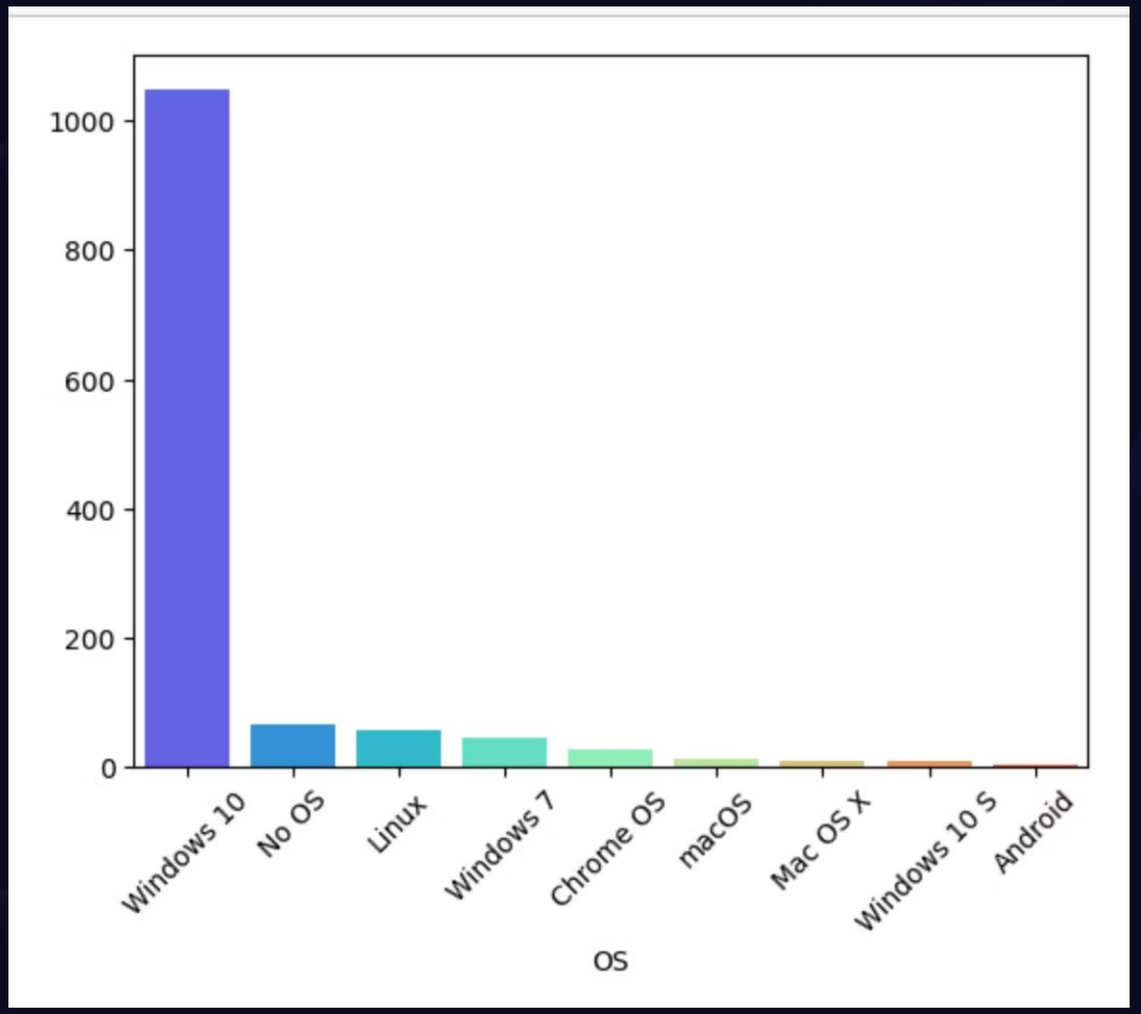
Apple (21), Samsung (9), Razer (7), and others have fewer entries but often represent premium segments.



Laptop Types and Operating Systems



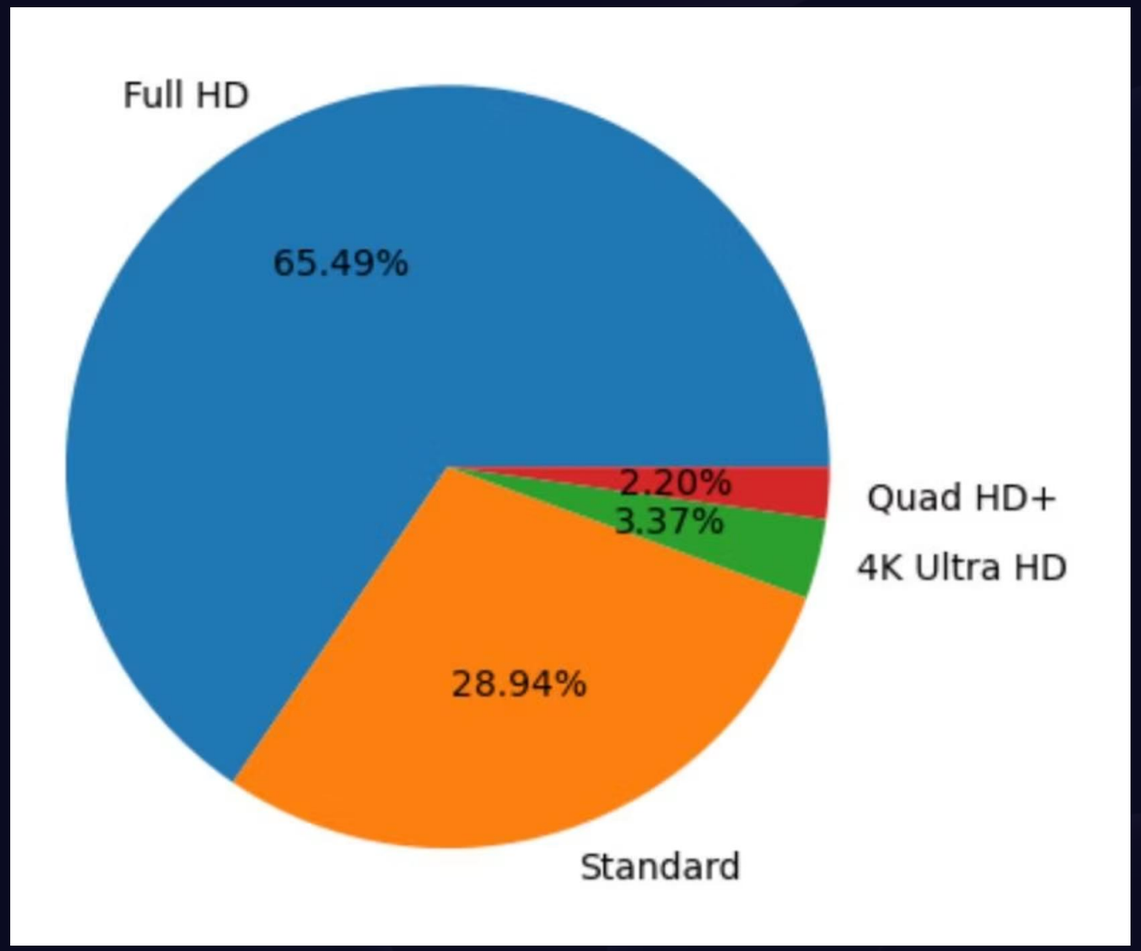
Notebook type laptops are the most common in the dataset, followed by Ultrabooks and Gaming laptops.



Windows 10 is the dominant operating system, with macOS and No OS being distant followers.

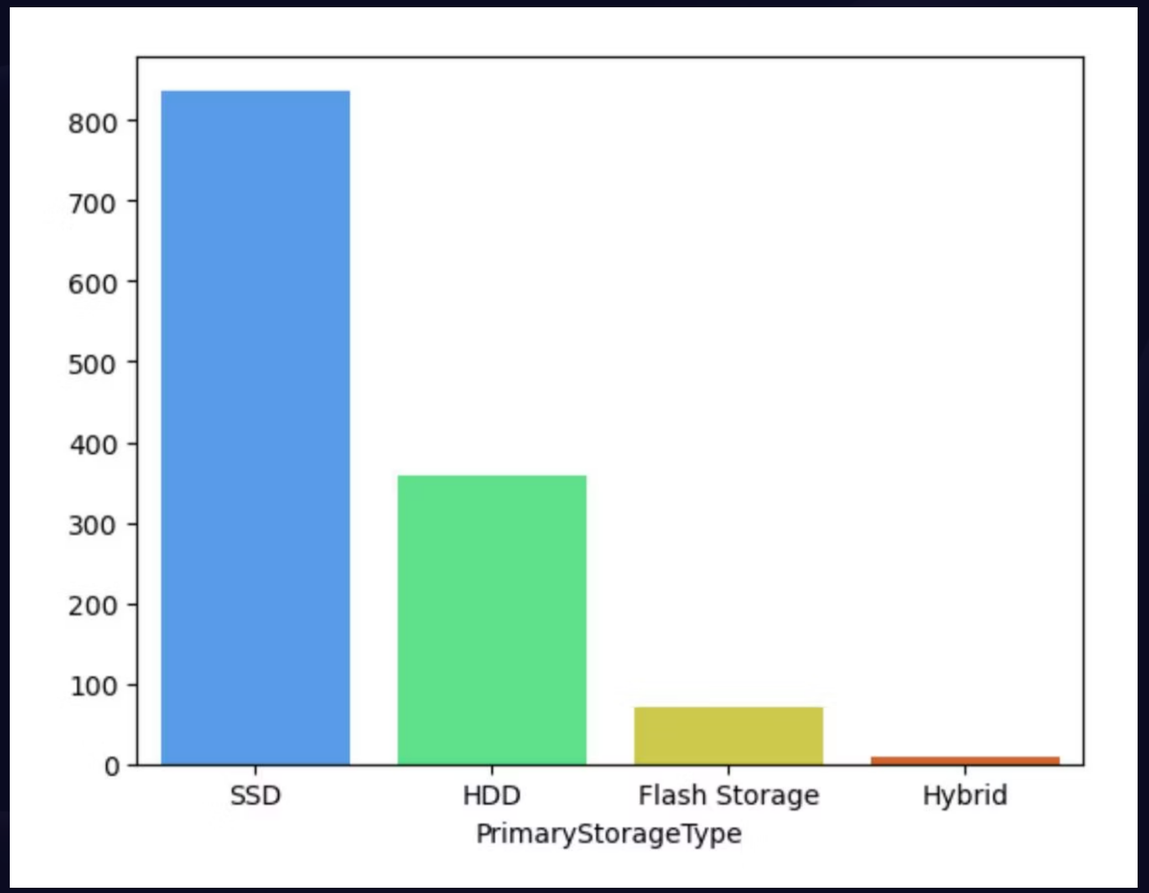
Display and Storage Characteristics

Screen Types



Full HD screens dominate at 65%, with Standard resolution screens being the second most common.

Storage Types



SSD is the most common primary storage type, showing the industry shift toward faster storage solutions.

Price Factors: Hardware Features

RAM

Strongest correlation with price (0.74), indicating RAM is a primary price determinant.

CPU Frequency

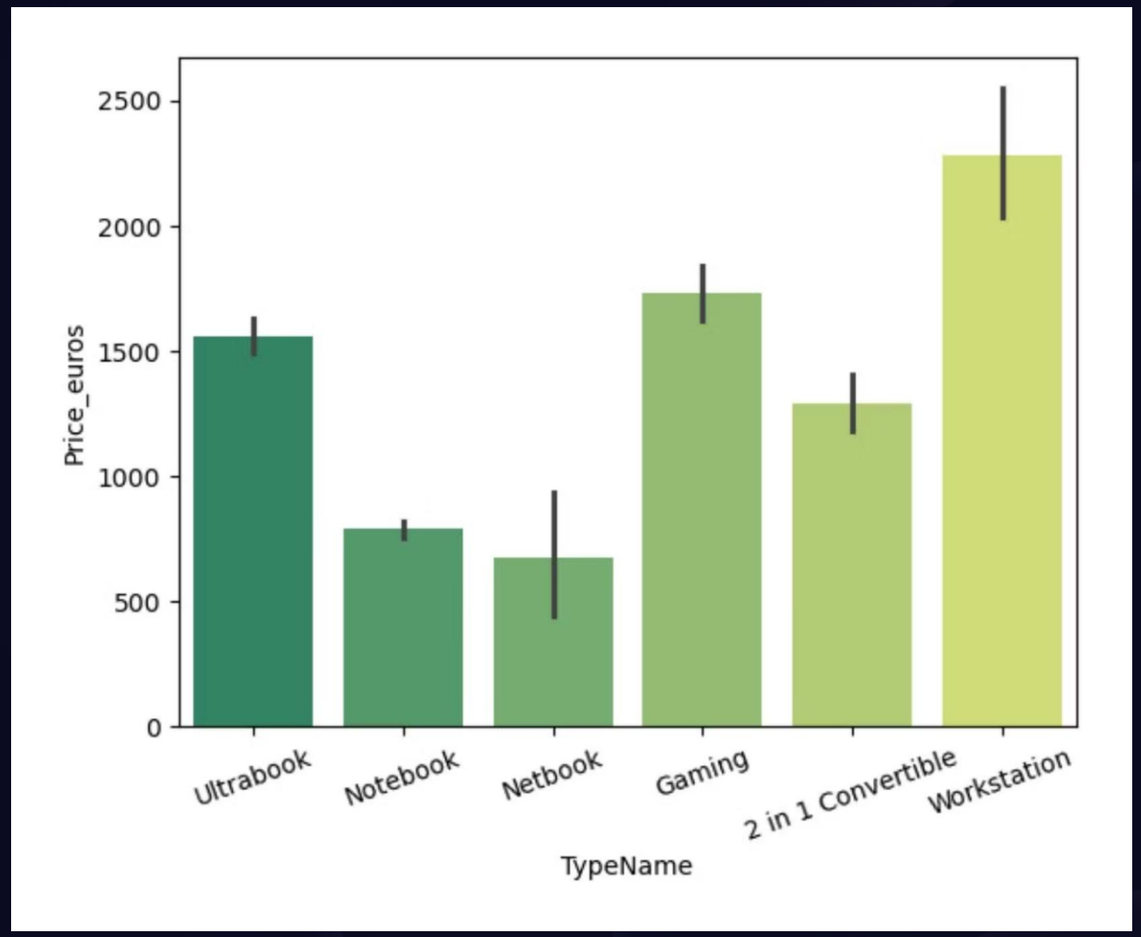
Moderate positive correlation (0.43) with price, showing faster processors command higher prices.

Premium Features

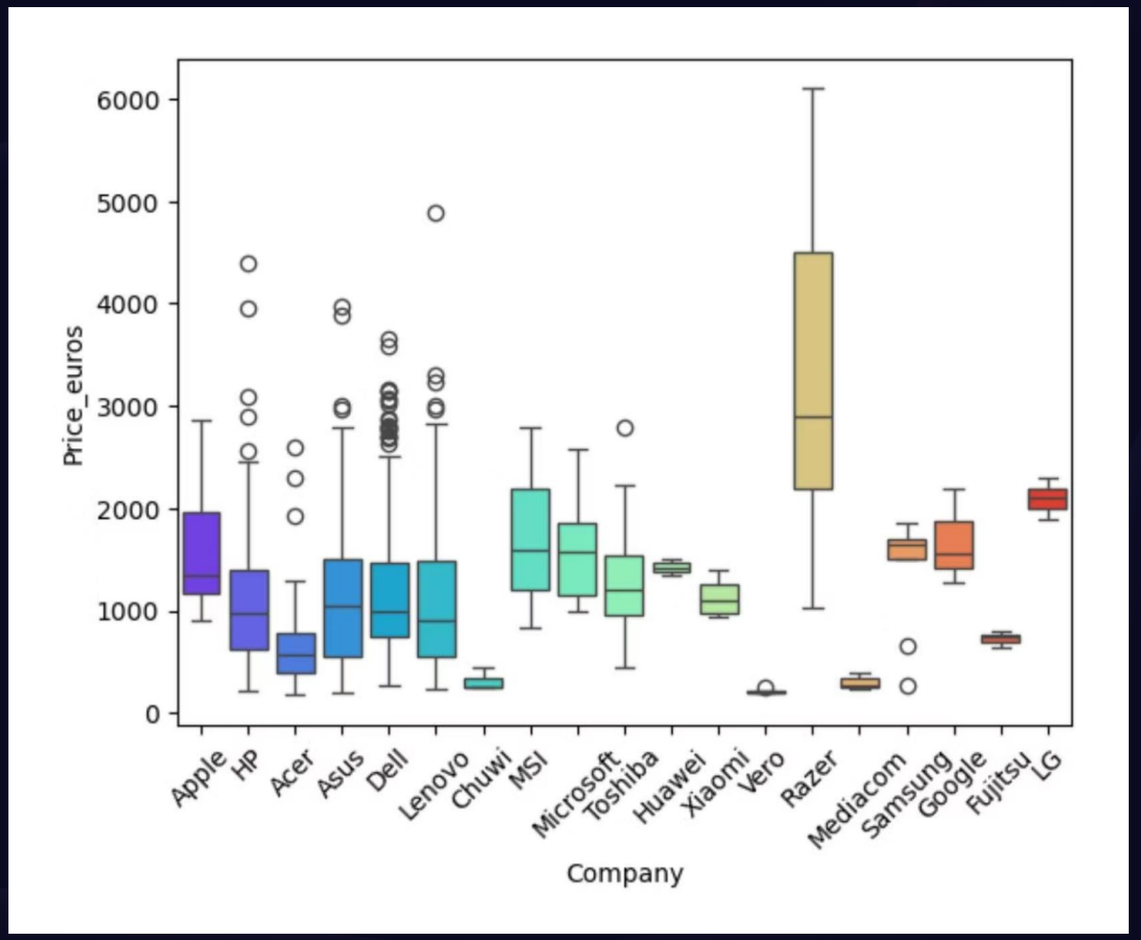
Touchscreens, IPS panels, and Retina displays all significantly increase laptop prices.

The analysis shows that hardware specifications have a direct and measurable impact on laptop pricing.

Price Variations by Type and Brand



Workstations are the most expensive laptop type, while Netbooks are the most affordable. Gaming laptops and Ultrabooks fall in the mid-to-high price range.



Razer has the highest median price, while Apple shows significant price variation. Dell, HP, and Lenovo offer laptops across various price points.

Feature Engineering & Preprocessing

Feature Creation

Created new features: Pixels Per Inch (PPI) from screen dimensions and Total Storage by combining primary and secondary storage.

Binary Encoding

Converted Touchscreen, IPSpanel, and RetinaDisplay to binary values (0/1) for model compatibility.

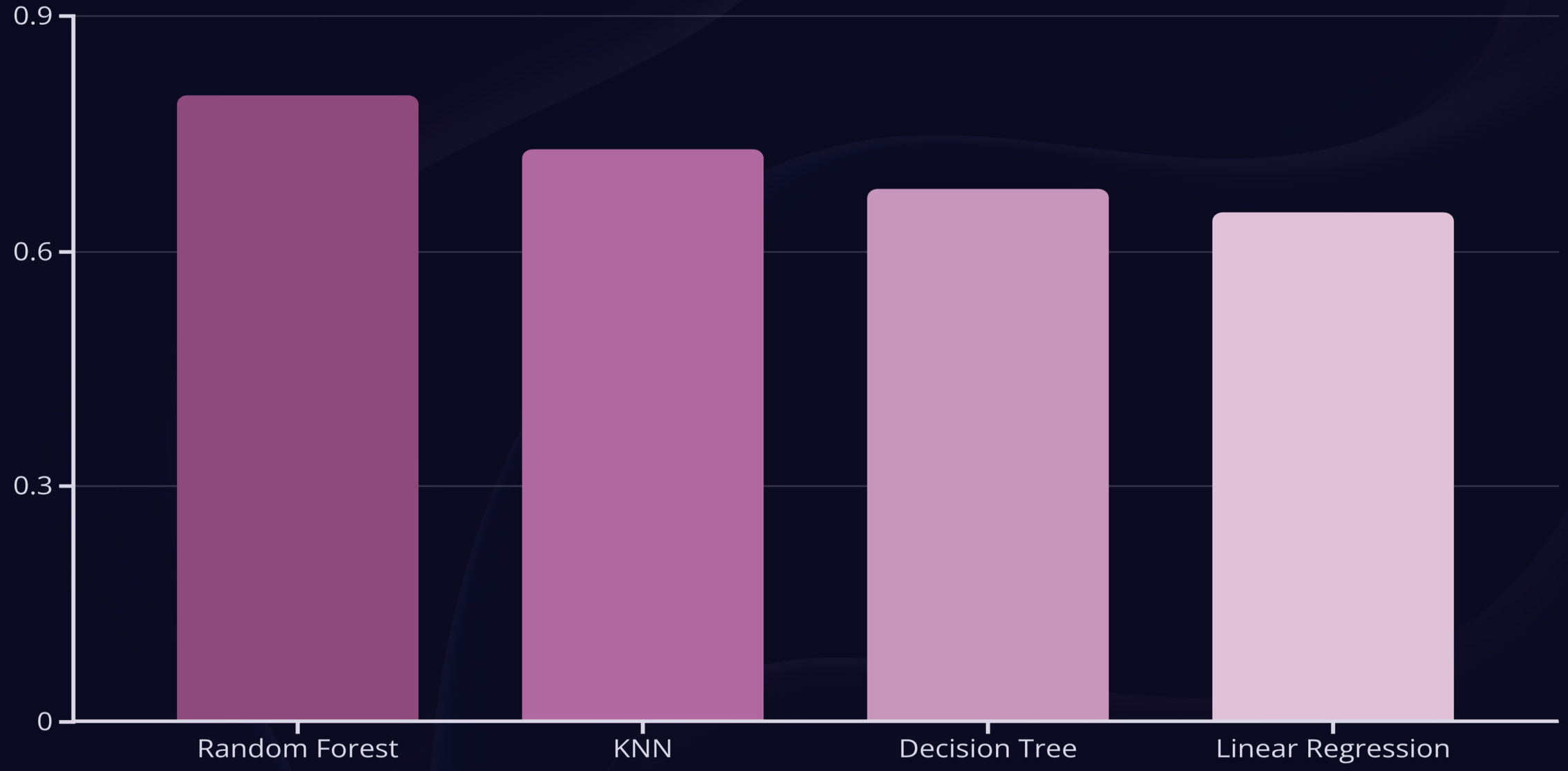
Feature Simplification

Simplified CPU and GPU model names and grouped rare values to reduce dimensionality.

Data Splitting

Split data into training (75%) and testing (25%) sets, with separate handling for categorical and numerical features.

Model Performance Comparison



Conclusions & Key Insights

Best Predictors

RAM, CPU frequency, and premium display features (touchscreen, IPS, Retina) are the strongest price indicators.

Model Performance

Random Forest achieved 80% accuracy in predicting laptop prices, outperforming other algorithms.

Market Insights

Workstations command premium prices, while gaming laptops and ultrabooks occupy the mid-high range. Brand premium exists for manufacturers like Razer and Apple.

This model could be valuable for retailers, manufacturers, and consumers to understand laptop pricing factors and make informed decisions about laptop purchases or pricing strategies.