NYU STERN

Panasonic

Panasonic

Re-Entering the European Laptop Market

Data Science for Business: Technical

Group 12

Shivam Dheer, Justine Guan, Lynn Lin, Spandan Rout

Disclaimer: This analysis is an academic exercise using publicly available data. The authors are not affiliated with Panasonic Corporation, and the views expressed do not represent the company

Data-Driven Product Strategy

Business Problem: How can Panasonic make informed, data-backed decisions in reentering the European market?

- **Company Perspective:** To succeed as a new entrant, we cannot make any assumptions about the current market, we have to be sure
- **Consumer Perspective:** What features matter to them today, how features affect price expectations

Most Importantly...

Overall Sustainability: Informed decisions reduce risk and increase adaptability in a dynamic market.

Target Outcomes

- Leverage Data to Understand Pricing Decisions
- Launch a New Laptop Line
- Re-establish Panasonic's Presence in the European PC Market
- Achieve Competitive Pricing
- Establish Long-Term Market Competitive Edge

Prediction, Actions, & Decisions

Prediction: **Market pricing of laptops based on key features including RAM, SSD storage, and laptop type.**

Specific business actions/decisions:

- ➔ **Market positioning:** understand our target customer segments' price tolerance and feature preferences for laptops.
- ➔ **Pricing Strategy:** Set competitive price ranges for Panasonic laptops based on predicted MSRP.
- ➔ **Product Design :** Adjust configs (e.g., RAM, storage) to hit our target price range and attract target customers. Further, apply competitive benchmarking of SKUs.

How will we use the model to make decisions:

- ❖ Run a specific laptop configuration (with designed key features) through the model to predict its potential MSRP.
- ❖ Further, modify the configuration based on our target price point to make the new laptop line more attractive to target customers.

Data and EDA Overview

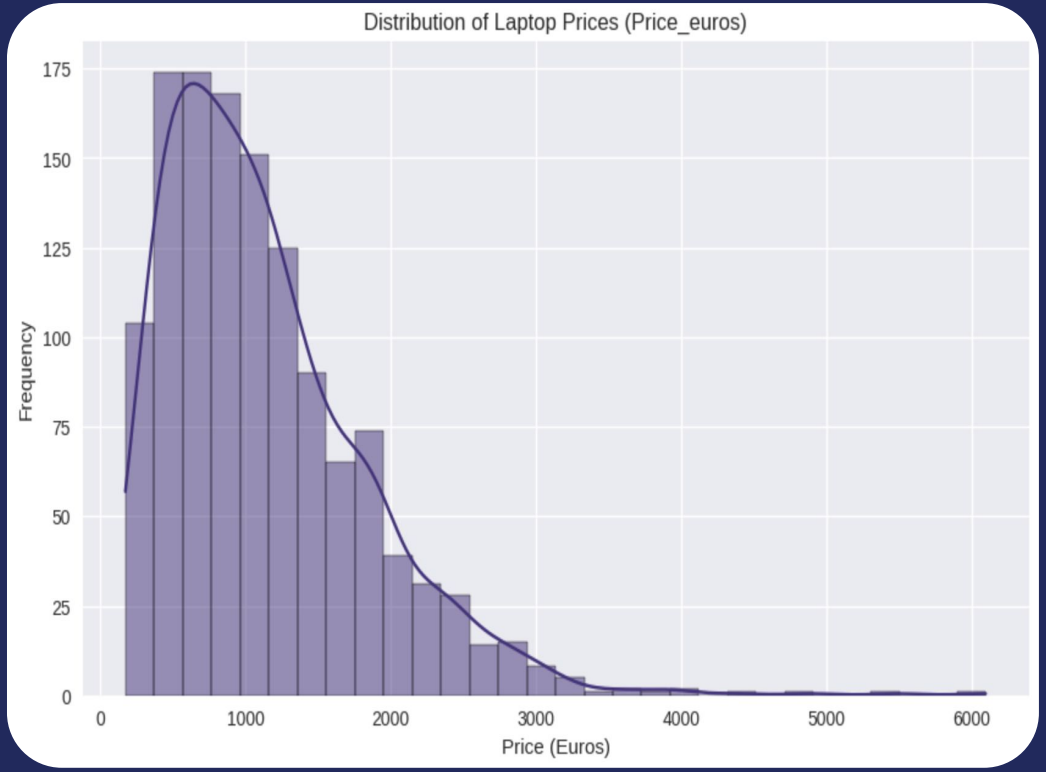
The Data: Laptops Galore!

Dataset: 1000+ laptops with features like RAM, CPU, storage, and price

Target: Price in euros

Let’s see how these specs stack up!

Laptop Prices: Budget or Bank-Breaker?



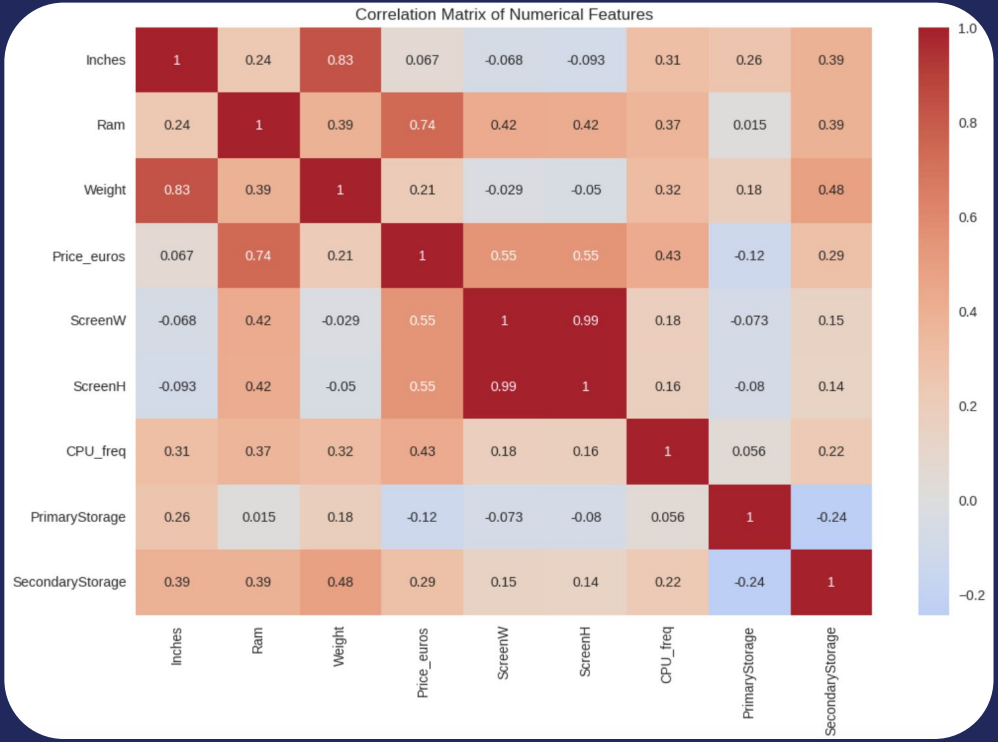
Distribution of Laptop Prices

Most laptops are budget-friendly, peaking at 1000-1500 euros.

But there's a long tail - some laptops hit 6000 euros!

This skewness (1.51) led us to log-transform the prices for better modeling.

What's Driving the Price?



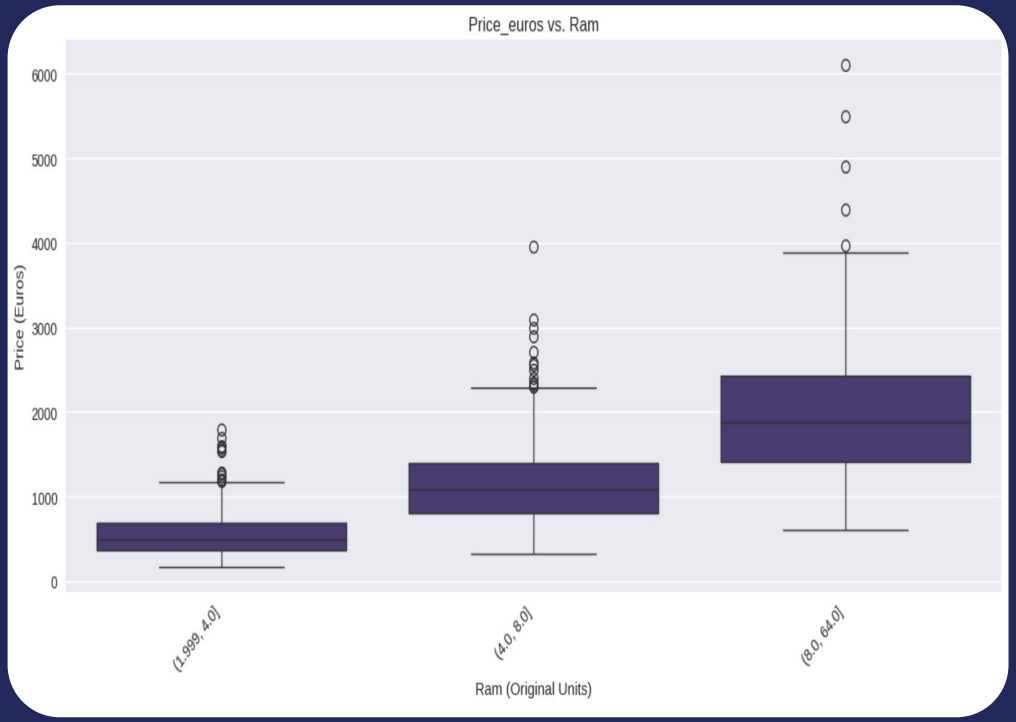
Correlation Matrix of Numerical Features

RAM and price have a strong correlation (0.74)- more RAM, more money!

Screen size and weight also play a role (0.83 correlation).

Some features, like storage, have weaker links - surprising, right?

RAM: The Pricey Superhero of Laptops



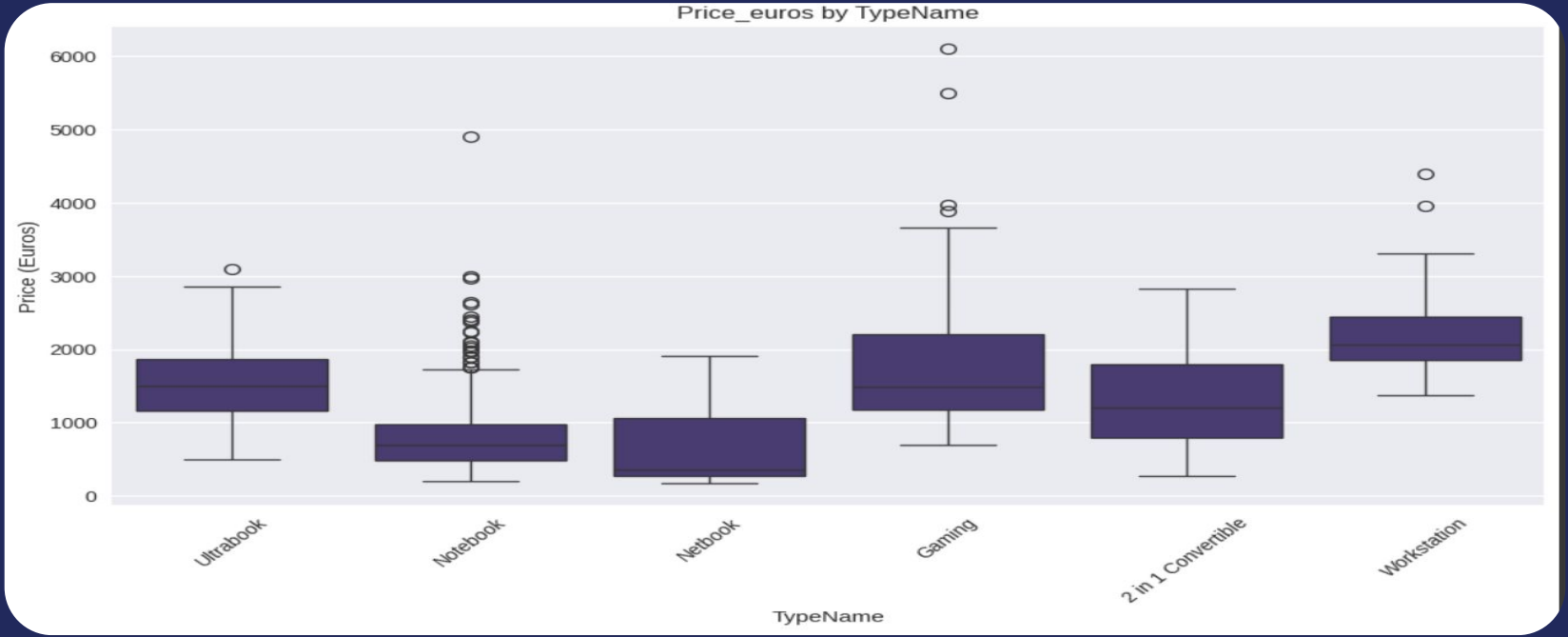
Price_euros vs. Ram Boxplot

Higher RAM means higher prices - medians jump from 1000€ (4GB) to 2500€ (64GB).

Outliers show premium laptops can hit 6000€ with high RAM.

RAM is our top predictor, no surprise there!

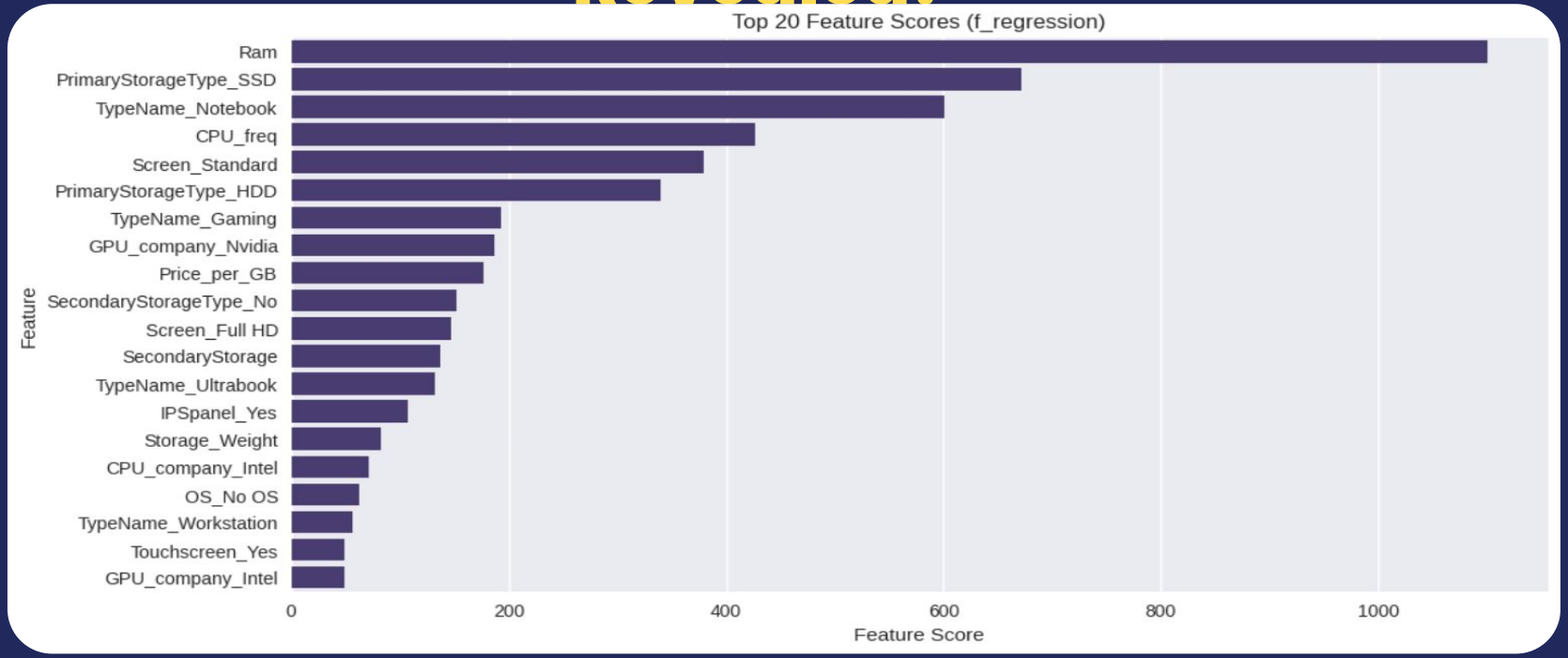
Gaming Laptops: Pay to Play!



Price_euros by TypeName

Gaming and Workstation laptops lead the pack at ~2500€.
Notebooks are the budget champs at ~500€.

Who's the MVP? Feature Importance Revealed!



Top 20 Feature Scores (f_regression)

RAM tops the charts, followed by SSD storage and laptop type.
These features drive our price predictions

Modeling and Performance

Model Testing (Cross-Validation)

Linear Regression

Mean CV RMSE
0.30 ± 0.03

Random Forest

Mean CV RMSE
0.06 ± 0.02

XGBoost

Mean CV RMSE
0.05 ± 0.01

Test Performance (Winner)

Model	RMSE (Euros)	MAE (Euros)	R^2
Linear Regression	371.74	252.43	0.72
Random Forest	176.21	27.90	0.94
XGBoost	**114.79**	28.40	**0.97**

Metric Choice: RMSE chosen for pricing accuracy, penalizes large errors in euros, critical for high-priced laptops

XGBoost takes the crown with the lowest RMSE!

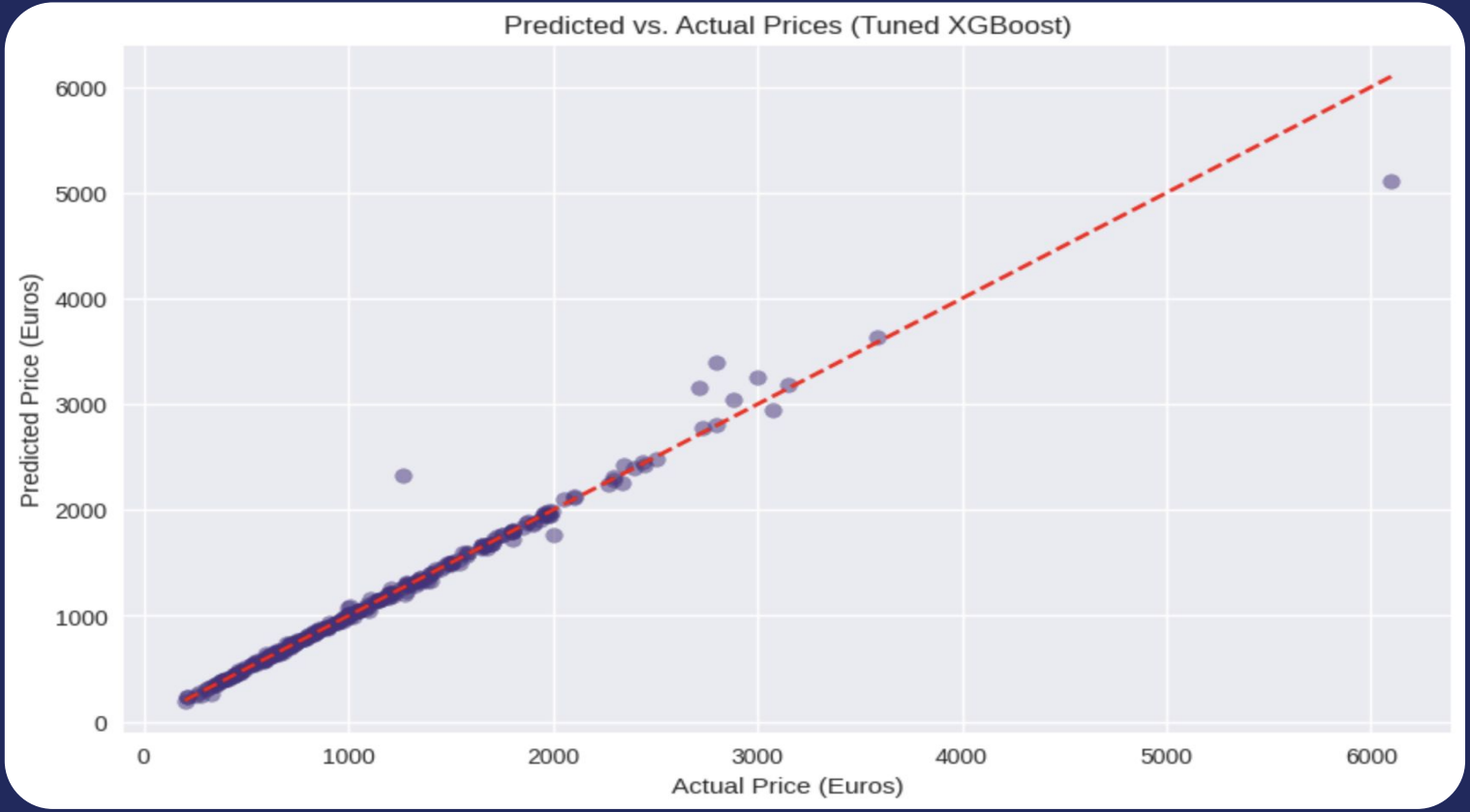
Tuned XGBoost: Even Better!

Model	RMSE (Euros)	MAE (Euros)	R^2
XGBoost	114.79	28.40	0.97
Tuned XGBoost	**107.12**	28.74	**0.98**

Tuned Parameters: Learning rate, max depth, n_estimators, subsample, - optimized for lower RMSE and better generalization.

Tuning made XGBoost even sharper, with an R^2 of 0.98!

Nailed It! (Mostly) - Tuned XGBoost Results

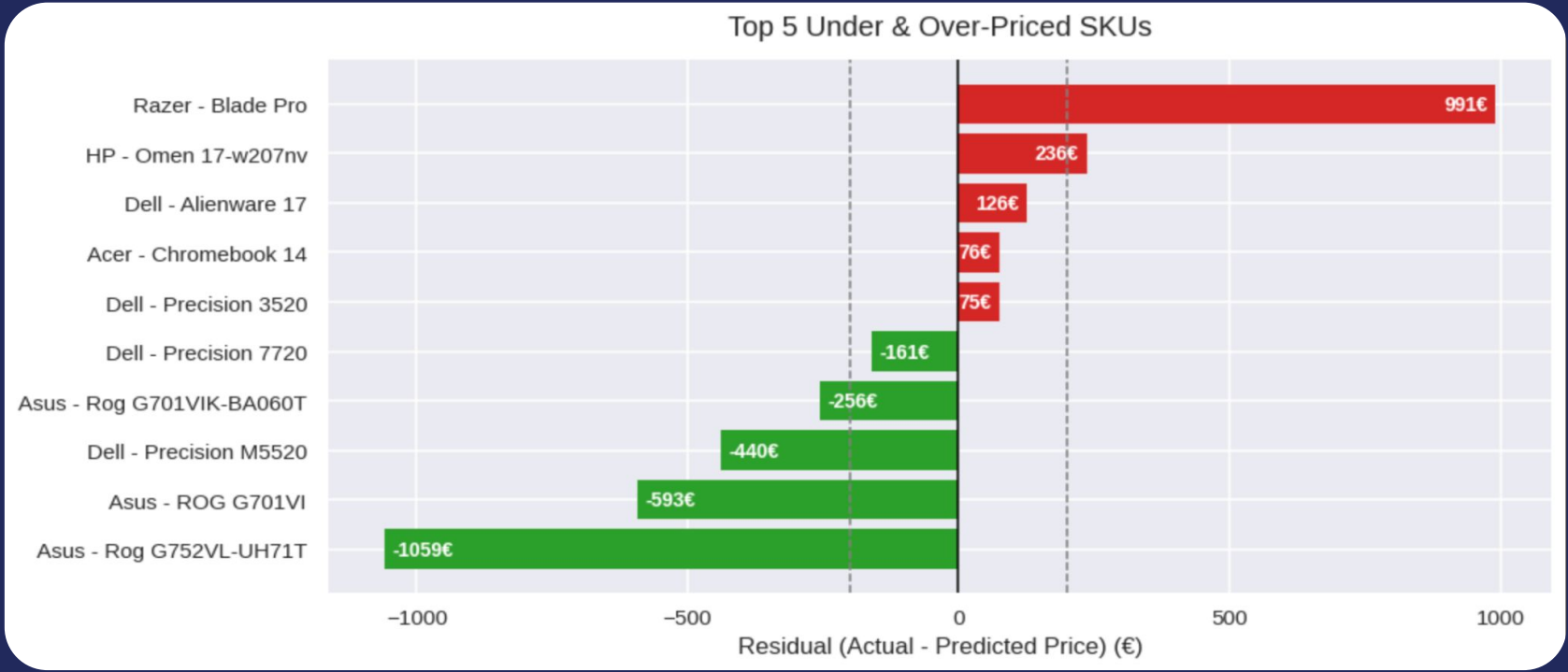


Predicted vs. Actual Prices (Tuned XGBoost)

Model Performance

- Tuned XGBoost predicts prices with an RMSE of 107.12 euros and MAE of 28.74 euros.
- R^2 of 0.98, near-perfect predictions across all price ranges!
- Even high-end laptops (5000€+) are now much closer to the mark.

Pricing Smarts: Spotting Over & Under-Priced Laptops!



Our Tuned XGBoost model flags pricing anomalies in the market

Deployment and Bias of Model

Input New Spec → **Model Server** → **Pricing Team Dashboard**

Brand Drift

Panasonic doesn't appear in the dataset, meaning the model has no pricing reference for the brand. As its reputation grows, the model may underpredict prices.

Mitigation: leave-one-out encoding with rolling window

Tech Drift

Missing ARM, M-series, and AI chips, risking price bias for modern laptops.

Mitigation: Add "architecture" and "release year" features; retrain quarterly to capture new tech trends.

Future Directions

What’s Next for Panasonic’s Pricing Game?

Track Demand Trends

Add sales volumes, stock-turn data, and online review counts/ratings to gauge customer willingness to pay.

Add Cost & Margin Insights

Include component costs (RAM, CPU, display) and Bill-of-Materials to compute margins accurately.

Monitor Competitor Promotions

Use web-scraped promo / discount data (e.g., Amazon, Idealo) and event-based flags to stay competitive.

Include Lifecycle Data

Track product launch dates, generation tags, and deprecation notices to adjust pricing curves.

Use Performance Metrics

Incorporate third-party CPU / GPU PassMark scores, battery life, and display quality ratings for better feature valuation.

Thank you!

Questions?