A

Project Report

On

**Laptop Price Calculator WebApp**

Submitted in partial fulfillment of the requirement for the IV semester

**Bachelor of Computer Science**

By

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**2024- 2025**

**STUDENT’S DECLARATION**

We, **Ayush Budhlakoti and Deepanshu Suyal** here by declare the work, which is being presented in the project, entitled “**Laptop Price Calculator**” in partial fulfillment of the requirement for the award of the degree **B.Tech** in the session **2024-2025**, is an authentic record of my own work carried out under the supervision of “**Mrs. Senam Pandey”,** Assistant Professor, Department of CSE, Graphic Era Hill University, Bhimtal.

The matter embodied in this project has not been submitted by us for the award of any other degree.

Date: 12/12/2024

Ayush Budhlakoti

Deepanshu Suyal

**CERTIFICATE**

The project report entitled “**Laptop Price Calculator**” being submitted by Ayush Budhlakoti and Deepanshu Suyal to Graphic Era Hill University Bhimtal Campus for the award of bonafide work carried out by them. They have worked under my guidance and supervision and fulfilled the requirement for the submission of report.

Mrs. Senam Pandey Dr. Ankur Bisht

(Project Guide) (HOD, CSE Dept.)

**ACKNOWLEDGEMENT**

We take immense pleasure in thanking Honorable **“Mrs. Senam Pandey”** (**Assistant** **Professor,** **CSE, GEHU Bhimtal Campus**) to permit me and carry out this project work with his excellent and optimistic supervision. This has all been possible due to his novel inspiration, able guidance and useful suggestions that helped me to develop as a creative researcher and complete the research work, in time.

Words are inadequate in offering my thanks to GOD for providing me everything that we need. We again want to extend thanks to our President **“Prof. (Dr.) Kamal Ghanshala”** for providing us all infrastructure and facilities to work in need without which this work could not be possible.

Many thanks to the Director sir of Gehu, Bhimtal,other faculties for their insightful comments, constructive suggestions, valuable advice, and time in reviewing this thesis.

Finally, yet importantly, we would like to express my heartiest thanks to our beloved parents,

for their moral support, affection and blessings. We would also like to pay our sincere thanks to all our friends and well-wishers for their help and wishes for the successful completion of this research.

**Ayush Budhlakoti**

**Deepanshu Suyal**

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**INTRODUCTION**

In today's digital world, the demand for laptops has grown significantly, with numerous models and configurations available in the market. Choosing the right laptop can be overwhelming due to the wide variety of options and price ranges. Traditional methods, such as comparing specifications manually or relying on store recommendations, often fail to provide a clear understanding of what factors influence laptop prices.

A Laptop Price Prediction system addresses this issue by leveraging advanced algorithms and machine learning techniques to analyze key factors such as specifications, brand value, and market trends. This project aims to develop an efficient and accurate system that helps users predict laptop prices based on their preferences and requirements, making the buying process simpler and more informed.

### Key Motivations

1. **User Confusion**: The wide variety of laptops and price points can confuse buyers, making it difficult to select the most suitable option.
2. **Informed Decisions**: A price prediction system can assist users in making better purchasing decisions by providing insights into price variations based on specifications and other factors.
3. **Market Awareness**: By understanding price trends and patterns, both users and sellers can benefit from more transparent and competitive pricing.

**PROBLEM STATEMENT**

The laptop market has experienced tremendous growth, offering users a vast selection of models with varying specifications and price ranges. While this diversity is beneficial, it also creates challenges for buyers who struggle to predict laptop prices and make informed purchasing decisions. Traditional methods, such as manually comparing specifications or relying on general advice, often fall short in providing accurate and personalized insights.

The main challenges can be outlined as follows:

1. **Overwhelming Options**: Buyers face a wide range of laptop models and configurations, making it hard to identify the best choice within their budget.
2. **Lack of Price Insights**: Without a clear understanding of price determinants, buyers may struggle to gauge whether a laptop offers good value for money.
3. **Market Trends**: Rapid changes in technology and market demand can make it difficult to predict how laptop prices fluctuate over time.

* **Inconsistent Price Estimates**: Existing price estimators may fail to provide accurate predictions due to incomplete or outdated data.
* **Data Integration**: Combining diverse data sources, such as specifications, brand reputation, and market trends, is complex but essential for accurate price predictions.
* **Model Efficiency**: Ensuring the prediction model is both accurate and computationally efficient is crucial for a smooth user experience.
* **Dynamic Adjustments**: The system must adapt to evolving trends and user requirements, requiring ongoing learning and updates.
* **Develop an Accurate Price Prediction System**: Build a model that predicts laptop prices based on detailed specifications and market data.
* **Utilize Advanced Algorithms**: Apply machine learning techniques such as regression models, decision trees, and ensemble methods to enhance prediction accuracy.
* **Ensure User-Friendly Performance**: Design the system to provide fast and reliable price predictions for seamless user interaction.
* **Incorporate Feedback Mechanisms**: Enable the system to improve over time by learning from user inputs and market updates.

By addressing these challenges and achieving the outlined goals, the **Laptop Price Prediction System** aims to simplify the decision-making process for buyers, providing them with accurate price estimates and valuable insights into the market.

**Data Preprocessing**

Data preprocessing is a critical step in developing an effective Laptop Price Prediction system. It involves cleaning, transforming, and preparing the raw data to make it suitable for analysis and machine learning model training. Below is an outline of the key steps involved in data preprocessing for this project:

#### 1. **Data Collection**

* **Laptop Specifications**:
  + Collect data on specifications such as processor type, RAM, storage capacity, screen size, graphics card, and operating system.
  + Gather additional details like brand, model, and release year.
* **Price Data**:
  + Obtain historical and current pricing information for various laptop models from online retail websites or manufacturers.
* **Market Trends**:
  + Include data on seasonal discounts, new releases, and user demand trends if available.

#### 2. **Data Cleaning**

* **Handle Missing Values**:
  + Identify missing data in fields like specifications or prices and apply suitable strategies (e.g., mean imputation or removing incomplete rows).
* **Remove Duplicates**:
  + Check for and remove duplicate laptop entries to maintain data quality.
* **Correct Errors**:
  + Fix inconsistencies or errors in specification data, such as typos or misclassified categories.

#### 3. **Feature Engineering**

* **Specification Encoding**:
  + Encode categorical features like brand, operating system, and processor type using techniques such as one-hot encoding or label encoding.
* **Price Categories**:
  + Create price range categories (e.g., budget, mid-range, premium) for better analysis.
* **Date Features**:
  + Extract useful features from release year, such as age of the laptop.
* **Composite Features**:
  + Generate composite features like performance score by combining processor speed, RAM, and storage capacity.

#### 4. **Data Transformation**

* **Normalization/Standardization**:
  + Scale numerical features like RAM, storage, and screen size to ensure comparability.

**\**

**Model Training**

Model training is a crucial phase in developing a **Laptop Price Prediction** system. This step involves selecting appropriate machine learning algorithms, training models on the preprocessed data, evaluating their performance, and fine-tuning them for better accuracy. Below are the key steps involved in the model training process:

#### 1. **Selecting Algorithms**

The choice of algorithms depends on the complexity of the data and the desired prediction accuracy. Commonly used algorithms include:

* **Linear Regression**: Simple and interpretable, useful for understanding the impact of features on laptop prices.
* **Decision Trees**: Suitable for capturing non-linear relationships between features and prices.
* **Random Forests**: An ensemble method that improves prediction accuracy by combining multiple decision trees.
* **Gradient Boosting Algorithms**: Advanced techniques like XGBoost or LightGBM, which excel in handling complex datasets with high predictive performance.

#### 2. **Data Preparation for Training**

* **Feature Matrix Creation**: Construct a feature matrix where each row represents a laptop and columns represent its features (e.g., processor type, RAM, brand, etc.).
* **Target Variable**: Define the target variable as the laptop price for supervised learning models.
* **Handling Categorical Features**: Use encoding techniques like one-hot encoding for categorical features such as brand and operating system.
* **Normalization**: Normalize numerical features (e.g., RAM, storage) to ensure they are on a comparable scale and improve model convergence.

By following these steps, we can ensure that the data is optimally structured for training, and the selected models can effectively learn the relationships between laptop features and their prices. This process is key to building a robust and accurate prediction system

**Front-End using Streamlit**

Streamlit is a powerful tool for quickly building interactive web applications. Here's a guide to setting up a front end for your **Laptop Price Prediction** system using Streamlit.

#### 1. **Setting Up Streamlit**

First, install Streamlit using pip:

pip install streamlit

#### 2. **Creating the Streamlit App**

Create a new Python file, app.py, to serve as the main application for your Streamlit front end.

#### 3. **Designing the User Interface**

The UI should have sections for user input, displaying predicted prices, and visualizing additional insights.

#### 4. **Key Components of the App**

* **User Input**:
  + Sidebar input fields for specifying laptop features such as brand, processor, RAM, storage, screen size, and graphics card.
* **Price Prediction**:
  + Main section to display the predicted price based on user input.
* **Additional Features**:
  + Options to show related insights like similar laptops within the predicted price range, brand comparisons, or market trends.

#### 5. **Running the Streamlit App**

Run your app using the following command:

streamlit run app.py

#### 6. **Enhancements**

* **Search Bar**: Allow users to look up laptops by model or specifications.
* **User Authentication**: Include registration and login to personalize the experience.
* **Visualization**: Add charts and graphs showing price trends, feature comparisons, and market analytics.
* **Recommendation System**: Suggest alternative laptops based on user preferences and budget.

#### 7. **Deployment**

Deploy the app using platforms like Heroku, Streamlit Sharing, or any cloud service that supports Python-based web applications.

With Streamlit, you can create an intuitive and visually appealing interface that simplifies interaction with the **Laptop Price Prediction** system, making it user-friendly and accessible.

**CONCLUSION**

In conclusion, the development of a **Laptop Price Prediction** system demonstrates significant potential to simplify decision-making for consumers in the competitive laptop market. By addressing the challenges of overwhelming choices, inconsistent pricing information, and lack of insights, this project aims to provide accurate and reliable price predictions, empowering users to make informed purchasing decisions.

**Data Analysis and Feature Engineering**:  
 The system effectively gathers and processes data on laptop specifications, brands, and market trends to extract meaningful features that influence pricing.

**Model Development and Comparison**:  
Multiple algorithms, including linear regression, decision trees, and ensemble models like Random Forests and XGBoost, have been implemented and evaluated to identify the most accurate approach for price prediction.

**Model Training and Evaluation**:  
Prediction models have been trained and evaluated using metrics such as Mean Absolute Error (MAE) and Root Mean Squared Error (RMSE), ensuring that the system delivers precise and dependable results.

**System Integration and User Interface**:  
A user-friendly interface has been developed using tools like Streamlit, allowing users to input specifications and receive real-time price predictions seamlessly.

**Scalability and Adaptability**:  
The system includes mechanisms to integrate new data and learn from market trends, ensuring its predictions remain relevant and up to date.

The project utilizes a range of resources and technologies, including diverse datasets, machine learning frameworks, development tools, and deployment platforms, to build a robust and scalable Laptop Price Prediction system.