
AI-Powered Price Prediction
Intelligent Product Pricing with Google Gemini
Tech Innovations Group
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# What is AI-Powered Price Prediction?

Oursystem combinesmachine learning withtheGoogle GeminiAPI to offeracomprehensivesolution for real-time product price prediction, anomalydetection, andclear explanations.It's designed for dynamicmarkets,helpingbusinesses make data-driven pricing decisions.

### ML Regression

Estimates product prices based on various features.

### Gemini Anomaly Detection

Identifies unusual pricing patterns.

### Intelligent Explanations

Gemini-powered insights into price predictions and anomalies.

# Key Features

### Automated Data Collection

ScrapesproductdatafromFakeStoreAPI, ensuring fresh insights.

### Comprehensive ML Pipeline

Robusttrainingwithmultipleregression algorithms for accuracy.

### Real-Time Price Estimation

Instantpricepredictionsbasedonproduct attributes.

### AI-Powered Analysis

Geminiprovidesanomalydetection and explanatory insights.

### Intuitive Web Interface

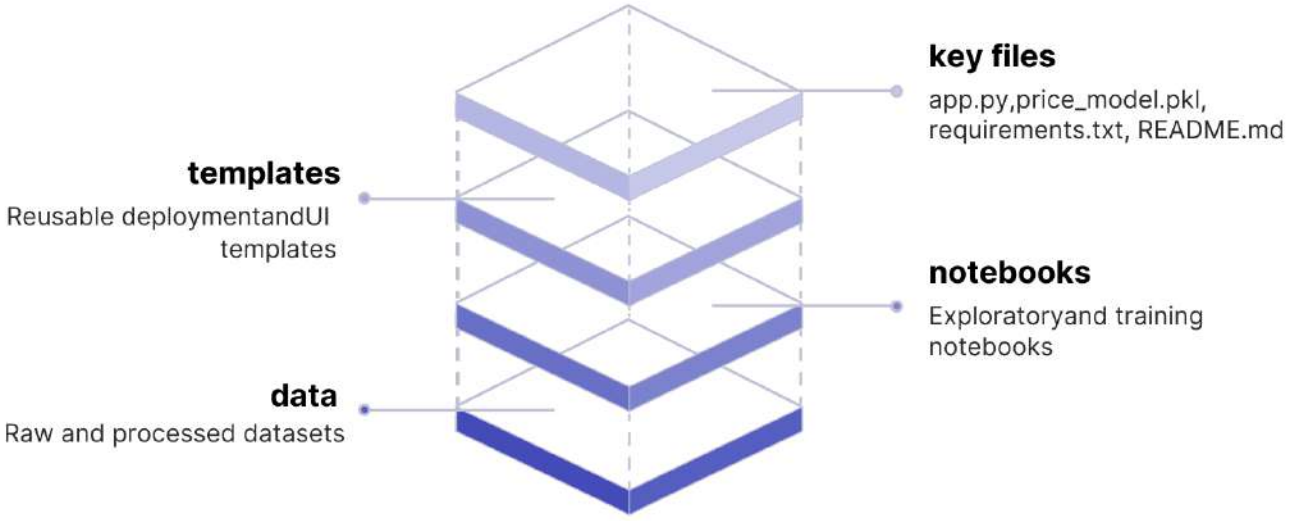
Modern,responsiveUIforseamless interaction.

### Model Persistence

Saveandloadtrainedmodels for continuous improvement.

# Architecture Overview

Thesystemismodular,ensuringscalabilityandeaseofmaintenance, with distinct components for data, models, and presentation.




This structured approach allows for independent development and deployment of each component.


# Technology Stack

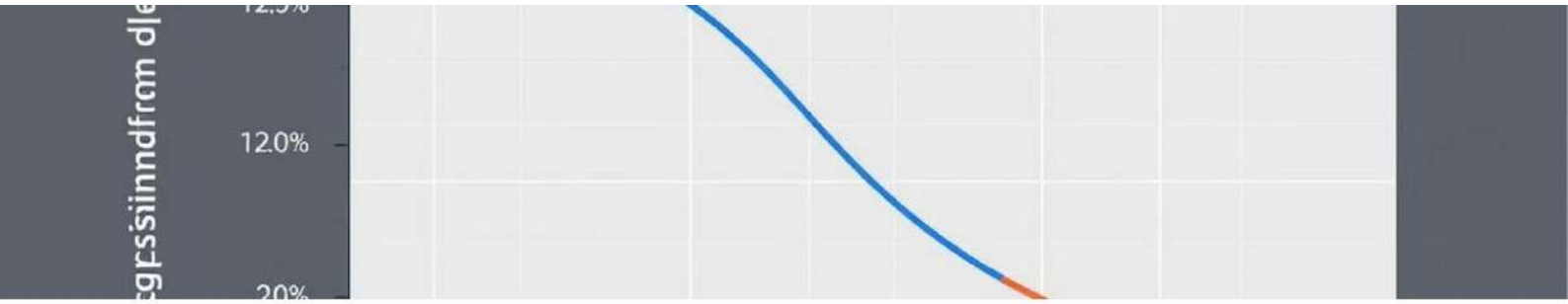
Builtonwidely-adoptedopen-sourcetechnologies, ensuring robustness, flexibility, and community support.

### Core Technologies

- **Python 3.10+:** Main programming language
- **scikit-learn, pandas, numpy:** For Machine Learning
- **Flask:** Web framework
- **Google Gemini API:** For AI integration

### Supporting Tools

- **matplotlib, seaborn:** Data visualization
- **joblib:** Model persistence
- **Bootstrap 5, HTML5, CSS3, JS:** Frontend development
- **Git:** Version control




# Model Training & Evaluation

Thesystememploysrigorousmodelselectiontoensurehighpredictiveaccuracy and provides clear performance metrics.

### Features Used

- **rating_count:** Number of product ratings
- **rating_rate:** Average rating (0-5 stars)
- **title_length:** Length of product title
- **description_length:** Length of description
- **category_encoded:** Encoded product category

### Algorithms Tested

- Linear Regression
- Ridge Regression
- Lasso Regression
- Random Forest
- Gradient Boosting

### Model Selection

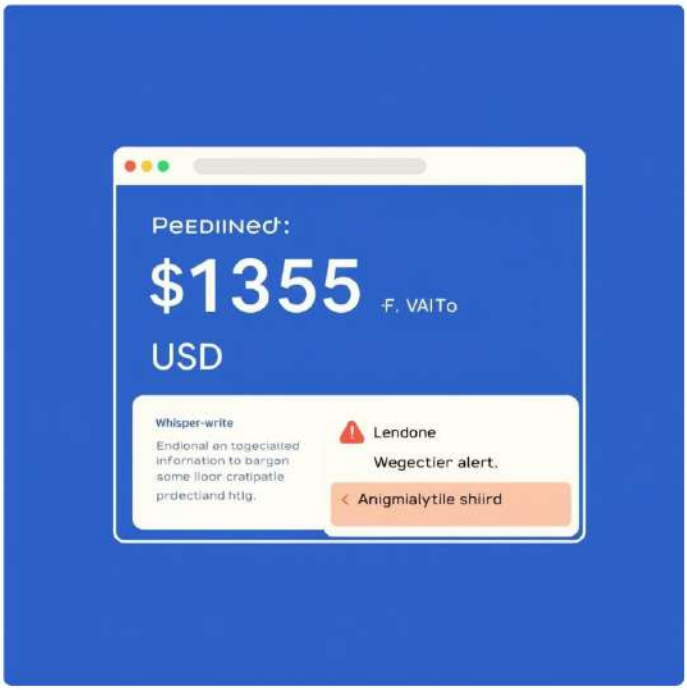
- Best model selected based on **RMSE**
- Comprehensive performance metrics provided
- Feature importance analysis for insights

# Web Application Usage

Theintuitivewebinterfaceallowsuserstoinputproductspecifications and receive real-time predictions and AI-powered insights.


### 1. Input Product Specifications

Enter details such as rating count, rating rate, title length, description length, and product category.




### 2. Get Predictions & Analysis

Receive ML-powered price predictions, Gemini-powered explanations, and anomaly detection results instantly.

# Future Enhancements & Call to Action

**Roadmap**

- Support for more product APIs
- Advanced feature engineering
- Model versioning and A/B testing
- Real-time model retraining
- Docker containerization & Cloud deployment