**AI-Powered Price Comparison & Product Recommendation System**

**Project Title**

AI-Powered Price Comparison & Product Recommendation System (Neural-Drip)

**Team**

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**Problem Statement**

According to the World Bank, nearly 50% of Nigerians live below the average income, facing significant challenges in affording quality products while managing daily expenses. The difficulties in finding affordable, durable, and high-quality products stem from:

* **Price Variability**: Prices differ widely across e-commerce platforms such as Jumia, Konga, Jiji, and Slot.
* **Quality Issues**: Inexpensive products are often low-quality, resulting in wasteful spending.
* **Lack of Real-Time Comparison**: Most platforms do not provide instant price benchmarking.
* **Manual Effort**: Users must search multiple sites individually, consuming valuable time.

This system addresses these issues by enabling users to input a product query (e.g., “affordable phone under ₦80,000”), leveraging artificial intelligence to compare prices across platforms, and recommending the best value-for-money options based on price, durability, and user reviews, complete with direct purchase links.

**Core Features**

* **Real-Time Price Comparison**: Scrapes current prices from multiple Nigerian e-commerce platforms.
* **Best Value Recommendations**: Analyzes price, durability, and user reviews for optimal product suggestions.
* **Budget-Based Search**: Filters products within a user-defined price limit.
* **Alternative Suggestions**: Proposes cheaper or higher-quality alternatives.
* **Customizable Results**: Allows users to select the number of top products (e.g., Top 2, Top 5) with purchase links.
* **Nigeria-Focused**: Targets local platforms including Jumia, Konga, Jiji, and Slot, with plans for broader coverage.

**Project Objectives**

* Deliver an AI-powered tool to automate price comparisons and product recommendations.
* Enhance affordability and accessibility of quality goods for Nigerians.
* Reduce time and effort in online shopping through intelligent automation.

**How It Works**

1. **User Input**: Users enter a product query and budget (e.g., “affordable phone under ₦80,000”).
2. **Data Collection**: The system gathers real-time prices and product details from platforms like Jumia and Konga (currently via static CSV, with scraping planned).
3. **Processing**: AI filters products by budget, ranks them by value (price, durability, reviews), and ensures diversity in brand and price range.
4. **Output**: Presents a curated list of recommendations with direct purchase links, formatted for clarity.

**Implementation Steps**

**Step 1: Platform Selection**

* **Current**: Web application using Streamlit, deployable on Streamlit Cloud.
* **Future Consideration**: Expansion to mobile app or browser extension.

**Step 2: Data Acquisition**

* **Current**: Static dataset (jumia\_and\_konga\_data3.csv) with product details from Jumia and Konga.
* **Planned**: Real-time web scraping using tools like BeautifulSoup, Selenium, or Craw4AI, and potential API integration with e-commerce platforms.

**Step 3: AI Recommendation System**

* **Embedding**: OpenAI’s text-embedding model converts product data into numerical vectors, stored in ChromaDB.
* **Search**: ChromaDB performs vector similarity searches for efficient matching.
* **Ranking**: Custom algorithm scores products for diversity and value, enhanced by GPT-3.5-turbo for readable outputs.

**Step 4: User Interface Development**

* Streamlit-based web interface with input fields for query, budget, result count, and source selection, displaying clickable results.

**Step 5: Testing & Optimization**

* Tested locally with SQLite 3.40.1 and ChromaDB 0.4.24; optimized for deployment with pysqlite3-binary for SQLite compatibility on Streamlit Cloud.

**Technical Architecture**

* **Data Input**: Static CSV (current); real-time scraping (future).
* **Embedding Layer**: OpenAI “text-embedding-3-small” generates vectors, stored in ChromaDB.
* **Recommendation Engine**: Vector search → budget filtering → diversity scoring → GPT-3.5 formatting.
* **User Interface**: Streamlit web app for input and output display.
* **Deployment**: Streamlit Cloud (in progress).

**Setup Instructions**

**Prerequisites**

* Python 3.11 or 3.12
* Git
* OpenAI API Key

**Installation**

1. **Clone the Repository**:
   * Command: git clone https://github.com/IdowuAdamo/Neural-Drip.git
   * Navigate: cd Neural-Drip
2. **Set Up Environment**:
   * Create: python -m venv venv
   * Activate: venv\Scripts\activate (Windows) or source venv/bin/activate (Linux/Mac)
3. **Install Dependencies**:
   * Command: pip install -r requirements.txt
   * Dependencies:
     + streamlit
     + openai
     + chromadb==0.4.24
     + python-dotenv
     + pysqlite3-binary(optional) for deployment on linux OS
4. **Configure API Key**:
   * Create .env file with: OPENAI\_API\_KEY=your\_key\_here
5. **Prepare Data**:
   * Place jumia\_and\_konga\_data3.csv in data/ directory (columns: product\_name, price, ratings, discount, product\_link, source).
6. **Generate Embeddings**:
   * Command: python backend/models/main.py (populates backend/vector\_db/).

**Running the Application**

* Command: streamlit run app.py
* Access: Open http://localhost:8501 in a browser.

**Usage**

* **Input**: Enter a product query (e.g., “affordable phone”), budget (e.g., ₦80,000), desired result count (1-5), and source filter (Jumia, Konga, All).
* **Output**: View a list of recommended products with prices, ratings, and purchase links.

**Potential Challenges & Solutions**

* **Frequent Price Changes**:
  + **Solution**: Implement real-time scraping with automated updates.
* **Low-Quality Products**:
  + **Solution**: Filter based on user reviews and ratings; future sentiment analysis.
* **Limited API Access**:
  + **Solution**: Employ web scraping with AI-driven text extraction.
* **Budget Constraints**:
  + **Solution**: Include flexible budget filtering with alternative suggestions.

**Impact**

* **Nigerians on a Budget**: Access to affordable, durable products.
* **Smart Shoppers**: Reduced time and effort via automation.
* **Small Businesses**: Cost-effective sourcing of supplies.
* **E-commerce Ecosystem**: Enhanced price transparency and competition.
* **Restaurants & Food Businesses**: Potential for stock-based menu optimization (future).

**Final Deliverables**

* AI-Powered Recommendation System
* Streamlit Web Platform
* Real-Time Price Scraping (in development)
* Value-for-Money Recommendation Algorithm
* Budget-Based Search Functionality
* User-Defined Result Selection with Purchase Links
* Future Enhancements: Price Drop Alerts, Dietary Filtering, Recipe/Nutrition Database

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**Current Status (March 25, 2025)**

* **Development**: Core functionality implemented with static data; real-time scraping in progress.
* **Deployment**: Local testing complete; Streamlit Cloud deployment pending.
* **Next Steps**: Integrate dynamic scraping, finalize cloud deployment, and expand platform coverage.