Product Recommendation System

📌 Background

E-commerce platforms like **Amazon, Netflix, and Spotify** succeed largely because of their recommendation engines. Customers expect **personalized experiences** without them, users feel overwhelmed by choices and businesses lose sales opportunities.

This project explores **Recommendation Systems** that use **Collaborative Filtering (CF)**, **Content-Based Filtering (CBF)**, and a **Hybrid Approach** to suggest products tailored to each user.

❓ Problem Statement

- Customers face **choice overload** when browsing online.
- Businesses lose revenue when they cannot effectively **recommend the right products**.
- Standard search engines don't always capture **personal preferences**.

🎯 Objectives

1. **Personalization**: Suggest products relevant to each individual user.
2. **Scalability**: Handle multiple users and batch recommendations.
3. **Accuracy**: Improve predictions by combining **CF** and **CBF**.
4. **Usability**: Provide a **Streamlit-based interactive app** for easy use.

⚙️ Methodology (Simplified)

1. **Data Collection** – A dataset of users, product IDs, names, categories, and ratings (`product_recs.csv`).
2. **Collaborative Filtering** – Recommends products based on **similar users** and their preferences.
3. **Content-Based Filtering** – Uses **TF-IDF (Text Similarity)** on product names + categories to suggest similar products.
4. **Hybrid Model** – Blends CF and CBF for better accuracy.
5. **Streamlit App** – Users can interact with the system, get single-user or batch recommendations, and visualize results.

✅ Features

- 🧑‍🚀 **Single User Recommendations** – Enter a User ID and see top product suggestions.
- 📂 **Batch Predictions** – Upload a CSV of multiple users to generate recommendations at once.
- 📊 **Visualization** – Popular recommended products displayed in charts.
- 🧩 **Hybrid Model** – Combines CF & CBF for better accuracy.
- 🎨 **Interactive UI** – Built with **Streamlit** for ease of use.

🛠️ Tech Stack

- **Python 3.13** 🐍
- **Pandas / NumPy** – Data handling
- **Scikit-learn** – Cosine similarity, TF-IDF vectorization
- **Matplotlib / Seaborn** – Visualization
- **Streamlit** – Web app frontend

🧩 Project Structure

Product-Recommendation-System/

|

├── product_recs.csv   # Dataset (user_id, product_id, product_name, category, rating)

├── app.py   # Streamlit web app

├── model_test.py   # Local testing (CF, CB, Hybrid)

├── requirements.txt   # Dependencies

└── README.md   # Documentation

🚀 Installation

1. Clone the repo:
git clone https://github.com/<your-username>/Product-Recommendation-System.git
cd Product-Recommendation-System

2. Install dependencies:
   pip install -r requirements.txt

📊 Results

- **Collaborative Filtering**: Works well when users have many ratings.
- **Content-Based Filtering**: Suggests similar products even for new users.
- **Hybrid**: Balances personalization + product similarity, improving accuracy.

🔒 Disclaimer

This project is for **educational and demonstration purposes only**.
It does not use real customer data.

🔮 Future Work

- Integrate with **real e-commerce datasets**.
- Add **deep learning recommendation models**.
- Improve scalability for **large datasets**.

👨‍💻 About the Developer

Sherriff Abdul-Hamid – AI Engineer | Data Scientist | Economist