## Project Proposal

# Title: Ecommerce-product-recommendation-system

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**Introduction:**

The Product Recommendation System is a machine learning project designed to enhance the shopping experience for users and drive sales for e-commerce businesses. By leveraging cutting-edge collaborative filtering and content-based filtering algorithms, the system analyzes user browsing and purchase history to generate personalized product recommendations. Through the careful examination of user behavior, the system ensures that recommendations are not only relevant but also tailored to individual preferences. Ultimately, the project aims to optimize user engagement, increase customer satisfaction, and boost revenue for e-commerce platforms.

**Objective:**

The objective is to address two key challenges in product recommendation and customer targeting: recommending products with the highest number of ratings and targeting new customers with the most popular products while solving the Cold Start Problem. By recommending products with high ratings, businesses aim to capitalize on their established trustworthiness and appeal to customers seeking reliable options. Concurrently, targeting new customers with popular products leverages existing customer preferences to attract newcomers, mitigating uncertainties associated with new customer interactions. To overcome the Cold Start Problem, businesses use these popular products as a starting point, providing relevant recommendations even in the absence of individual customer data, thus facilitating initial engagement and enhancing customer satisfaction.

**Dataset:**

https://www.kaggle.com/datasets/vibivij/amazon-electronics-rating-datasetrecommendation/download?datasetVersionNumber=1

**Implementation Plan:**

- **Rank-Based Product Recommendation**

  *Objective:* Recommend popular products based on the highest number of ratings, targeting new customers and addressing the cold start problem.

  *Outputs:* Recommends the top 5 products with a specified minimum number of ratings/interactions.

  *Approach:* Calculates average rating and total number of ratings for each product, sorts by average, and selects top products meeting the specified criteria.

- **Similarity-Based Collaborative Filtering**
  *Objective:* Provide personalized recommendations by identifying similar users and their interactions.
  *Outputs:* Recommends top 5 products based on interactions of similar users.
  *Approach:* Utilizes cosine similarity to find similar users, recommends products based on similar users' interactions while excluding those already interacted with by the target user.

- **Model-Based Collaborative Filtering**
  *Objective:* Offer personalized recommendations considering user behavior and preferences, overcoming sparsity and scalability challenges.
  *Outputs:* Recommends top 5 products for a particular user.
  *Approach:* Utilizes Singular Value Decomposition (SVD) to reduce dimensionality, predicts ratings for all users, and recommends products based on predicted ratings.

- **Evaluation**
  Calculates the Root Mean Squared Error (RMSE) of the SVD model to assess its accuracy in predicting user ratings.

**Deliverables**:

- The Python notebook with the source code of the model.
- Training and testing data.

**References:**


1. "An overview of Machine Learning Technologies and their use in E-learning" : https://ieeexplore.ieee.org/document/9151758
2. "A Survey on Machine Learning Approaches and Its Techniques": https://ieeexplore.ieee.org/document/9087123
3. "Multimodal Representation Learning: Advances, Trends and Challenges": https://ieeexplore.ieee.org/document/8949228
4. "Similarity Based Collaborative Filtering Model for Movie Recommendation Systems":https://ieeexplore.ieee.org/document/9432354
5. "Product Rank Based Search Engine for E-Commerce":https://ieeexplore.ieee.org/document/8529503
6. "Research on Personalized Learning Route Model Based on Improved Collaborative Filtering Algorithm": https://ieeexplore.ieee.org/document/9696131