AI-Driven Personalized Financial Product Recommendation System

Challenge Statement

Modern customers expect highly personalized experiences that cater to their unique preferences. In this hackathon, participants will develop a Generative-AI driven solution that enhances hyper personalisation by analysing customer profiles, social media activity, purchase history, sentiment data and demographic details. The challenge is to design a system that generates personalised recommendations for products, services or content while also providing actionable insights for businesses to optimise customer engagement.

Introduction

With the exponential growth of financial products, consumers face difficulty in choosing the most suitable card for their lifestyle, spending habits, and financial goals. Traditional recommendation systems rely on static and rule-based criteria, which often fail to capture the complexities of individual preferences.

Consumers then turn to social media platforms for recommendations which often lead to confusion because of the overwhelming amount of information and contradictory advice. Consumers are exposed to various opinions from influencers, brands, and other users, making it difficult to identify unbiased suggestions. Many influencers promote products based on sponsorships, which may not align with an individual's financial needs. Additionally, most social media content highlights attractive perks like cashback and rewards but overlooks critical details such as fees and interest rates. This lack of personalization and context, combined with the fear of missing out (FOMO) created by enticing promotions, can lead consumers to make impulsive decisions that may not suit their financial goals. Without thoroughly understanding the fine print or considering their spending habits, consumers risk choosing a product that offers short-term excitement but may not be beneficial in the long run.

To address this, **AI-driven personalized financial product recommendation systems** leverage machine learning (ML), natural language processing (NLP), and data analytics to provide highly accurate and tailored suggestions to users. This system analyzes a user's financial profile, spending behavior, and preferences to recommend the most relevant financial products, improving customer satisfaction and financial management.

Key Objectives of the System

The key objectives of an AI-driven personalized financial products recommendation system include:

- Providing personalized recommendations based on user profiles and interests.
- Enhancing customer satisfaction by matching users with relevant benefits.
- Catch user's attention with catchy and interesting messages to prompt user engagement.
- Minimizing the time and effort required for users to search and compare products.
- Reducing the risk of mismatches that may lead to dissatisfaction or default.
- Increasing revenue for financial institutions by boosting customer acquisition and retention.

Components of the System

1. Data Preparation/Data Collection

A financial services organisation like Wells Fargo can collect user data to recommend suitable credit cards by leveraging consumers' transaction and spending patterns, website and app activity, behavioural and demographic data as well as social media and public data. However, it is very important to ensure privacy and compliance. To protect user privacy, organizations must comply with regulations, obtain explicit consent for data collection, and ensure data security. Transparent communication about how data is used builds trust and encourages users to share relevant information.

Since access to all these types of data is not publicly available, We generated synthetic data using **Python Faker library.**

2. Data Preprocessing

Data collected from various sources often requires cleaning and transformation to ensure consistency. This step involves:

- Handling missing or inconsistent data.
- Normalizing and standardizing spending patterns.
- Encoding categorical variables (e.g., transaction types, card preferences).

3. User Profiling and Segmentation

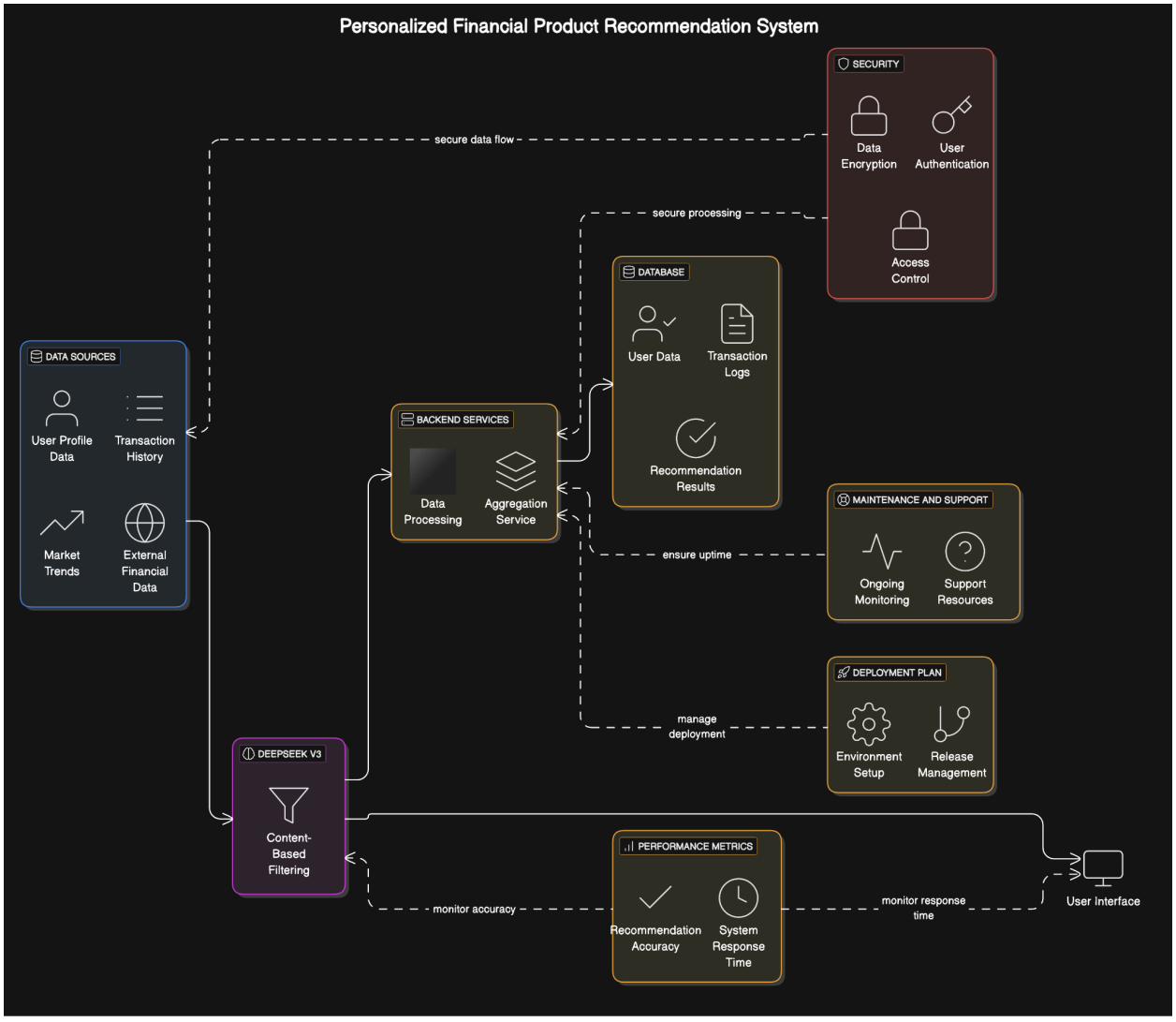
User profiling and segmentation enhance personalization by categorizing users based on:

- **Financial Behavior:** High spenders, budget-conscious users, frequent investors, etc.
- **Risk Appetite:** Conservative, moderate, or aggressive investors.
- **Life Stage and Goals:** Young professionals, families, retirees, etc.

4. Generate hyper-personalized recommendations via DeepSeek-v3-324 model

Leveraging advanced natural language processing (NLP) and deep learning techniques, this model analyzes diverse data points such as transaction history, spending habits, credit scores, investment preferences, and even sentiment derived from user interactions. Through a combination of **collaborative filtering, content-based filtering, and reinforcement learning**, DeepSeek-V3-0324 continuously adapts to evolving user behavior, ensuring that recommendations are dynamically aligned with changing financial goals and preferences.

Architecture Diagram



Types of Products Recommended

The system can recommend a diverse range of financial products, including:

- **Credit Cards:** Personalized based on spending patterns and reward preferences.
- **Loans and Mortgages:** Suggested based on income, credit score, and repayment ability.
- **Investment Products:** Mutual funds, stocks, ETFs, and fixed deposits aligned with risk appetite.
- **Insurance Policies:** Health, life, and auto insurance products based on life stage and risk coverage needs.

Benefits of AI-Driven Recommendation System

- **Higher Personalization:** Delivers highly customized recommendations based on real-time data.
- **Improved Financial Literacy:** Guides users towards better financial decisions.
- **Time and Effort Savings:** Reduces the time required to compare and select financial products.
- **Increased Revenue for Institutions:** Enhances cross-selling and up-selling opportunities.
- **Reduced Risk and Defaults:** Identifies potential defaulters and offers preemptive solutions.

Challenges and Limitations

- **Data Privacy and Security:** Ensuring compliance with regulations such as GDPR and PCI-DSS
- **Cold Start Problem:** Difficulty in recommending products to new users with limited data.
- **Model Bias and Fairness:** Ensuring fairness across diverse user groups.
- **Dynamic Market Conditions:** Adapting to rapidly changing financial environments and offers.

Business Strategy Recommendation

AI-driven financial products recommendation systems can revolutionize the way consumers select credit cards, loans, and other financial products by providing **personalized, data-driven recommendations**. To develop, launch and scale such a solution, we need to answer a few questions:

Who will be our target audience?

The market for AI-powered financial advisors is rapidly expanding, driven by increasing digital adoption and a growing preference for personalized financial services. Key target audiences include

- **Young professionals** seeking credit cards with rewards or travel perks
- **Small business owners** interested in business credit cards and loans
- **High-Net-Worth individuals** exploring premium financial products, and
- **Credit builders** looking for secured cards and financial literacy guidance.

Is there any competition in the market?

The competitive landscape features established players like

- NerdWallet,
- Credit Karma,
- Bankrate, and
- Fintech apps offering financial comparisons.

What core values are we proposing?

- **Personalized Financial Product Matching** - AI-driven algorithms match users with the most suitable credit cards, loans, or savings products based on their spending habits, credit score, and financial goals.
- **Catchy and Interesting push notifications** - Utilizing consumer's interest to tailor catchy and relevant messages to increase user engagement.
- **Real-time Updates and Dynamic Recommendations** - Continuously update product recommendations based on changing financial behaviors and market trends and send timely notifications for promotional offers and better-suited products.
- **Financial Literacy and Guidance** - Offer personalized tips and educational content to help users improve credit scores and manage finances better.
- **Secure and Compliant Platform** - Ensure data security and compliance with **GDPR, CCPA**, and other regulatory standards to build trust.

How can we tackle the Cold Start Problem?

We can offer free trials to early adopters who consent to provide data and insights for the system. Their insights can be used in a feedback loop to enhance the model through reinforcement learning. A/B testing can be done for recommendation effectiveness.

Is there a way to monetise this solution?

Although the solution can be integrated with Wells Fargo's banking applications, a **freemium model** can be used that can provide basic recommendations for free, and provide advanced analytics, detailed financial reports and early access to new financial products via a premium subscription.

How can we make this solution compliant with regulations?

- Implement robust encryption, data anonymization, and secure data storage.
- Comply with **GDPR, CCPA, and PCI-DSS** standards.
- Offer transparent opt-in/opt-out options for data sharing.

Future Scope and Improvements

- **Real-Time Recommendations:** Integrating real-time transactions and spending data to provide adaptive recommendations.
- **Incorporating Explainable AI (XAI):** Enhancing transparency and trust by explaining why a product was recommended.
- **Voice Assistants and Chatbots:** Integrating AI-powered virtual assistants to guide users through financial product selection.
- **Integration with Open Banking APIs:** Leveraging open banking frameworks to access real-time financial data.
- **Financial Health Score Tracking:** Monitoring user financial health and suggesting products to improve it.