**Project Proposal: Ethical AI-Powered Review Recommender System Using iPhone Reviews Dataset**

**Abstract:** The rise of AI-driven recommendation systems in e-commerce has led to concerns regarding fairness, transparency, privacy, and accountability. This project proposes an **Ethical AI-Powered Review Recommender System**, leveraging **Retrieval-Augmented Generation (RAG)** and **vector database technology** to provide **fair, unbiased, and explainable product review recommendations**. Using the **iPhone reviews dataset**, the system ensures **AI-powered review retrieval and ranking** without generating synthetic data, thus **enhancing trust and preventing AI hallucinations**. The implementation integrates **FAISS vector database, sentiment analysis (VADER), SHAP explainability, fairness auditing (Demographic Parity), and privacy protection (Differential Privacy)** to align with ethical AI principles. The **Flask API-based solution** will allow **real-time, explainable, and ethical product recommendations** for **e-commerce platforms, consumer review sites, and AI-driven decision systems**.

**Project Proposal:**

### **1. Introduction**

Online product reviews significantly impact consumer purchasing behavior, yet existing AI-driven recommendation systems **often exhibit bias, lack transparency, and pose privacy risks**. This project addresses these issues by developing a **fair, accountable, and privacy-compliant AI-powered review recommender system** using the **iPhone reviews dataset**. The system ensures **trustworthy, unbiased, and explainable AI-generated recommendations** while protecting user privacy and preventing favoritism towards specific product variants.

### **2. Objectives**

* **Develop an AI-powered review recommendation system** that retrieves **real, verified reviews** from the iPhone dataset.
* **Ensure fairness** by applying **Demographic Parity metrics** to prevent bias towards specific iPhone models.
* **Enhance transparency** using **SHAP and LIME** to explain AI’s recommendations.
* **Implement human oversight mechanisms** for validating AI-generated recommendations.
* **Deploy an API-based system** that integrates with e-commerce platforms.
* **Ensure privacy compliance** through **Differential Privacy techniques** to protect sensitive user data.

### **3. Methodology**

#### **3.1 Data Collection & Preprocessing**

* Use the **iPhone reviews dataset** (uploaded iphone.csv).
* Select relevant fields (**product ID, country, rating, review text**).
* Apply **data cleaning and normalization** for structured input.

#### **3.2 Vector Database for Ethical Review Retrieval**

* Convert review text into **semantic embeddings** using **Sentence Transformers**.
* Store embeddings in **FAISS (Facebook AI Similarity Search)** for efficient search.
* Retrieve the **top-N most relevant reviews** for a given product query.

#### **3.3 Sentiment-Based Ranking and Ethical Filtering**

* Apply **VADER Sentiment Analysis** to assign **sentiment scores** to retrieved reviews.
* Rank reviews based on **sentiment polarity (positive to negative)**.
* Apply **Demographic Parity checks** to detect and mitigate bias in recommendations.

#### **3.4 Explainability & Fairness Auditing**

* Use **SHAP (Shapley Additive Explanations)** to identify which features influence AI’s recommendations.
* Implement **LIME (Local Interpretable Model-Agnostic Explanations)** for model interpretability.
* Conduct **fairness checks** to prevent AI from over-representing specific iPhone variants.

#### **3.5 Privacy Protection**

* Apply **Differential Privacy** to ensure AI does not memorize sensitive user data.
* Use **Laplace noise injection** to protect user-generated review scores.

#### **3.6 API Development & Deployment**

* Develop a **Flask-based API** to expose recommendation functionalities.
* Test the API using **Postman and cURL**.
* Deploy on **AWS/GCP/Azure for scalability**.

### **4. Ethical AI Principles Followed**

| **Ethical Principle** | **Implementation in AI Review Agent** |
| --- | --- |
| **Fairness** | AI ensures reviews are **diverse and unbiased across iPhone variants**. |
| **Transparency** | SHAP & LIME explain why specific reviews are recommended. |
| **Accountability** | Human oversight ensures AI-generated reviews meet ethical guidelines. |
| **Privacy** | AI does not store or expose personal user data using **Differential Privacy**. |
| **Bias Mitigation** | AI uses **Demographic Parity Metrics** to prevent favoritism. |

### **5. Expected Outcomes**

* A **fully functioning AI-powered review recommender system** integrated with **FAISS & LangChain**.
* A **bias-detection framework** that ensures **fair and ethical AI recommendations**.
* A **fully explainable AI system** that allows **users to understand why specific reviews were recommended**.
* A **Flask API for seamless integration** into e-commerce and review platforms.
* A **privacy-compliant AI model** using **Differential Privacy**.

### **6. Timeline**

| **Phase** | **Task** | **Duration** |
| --- | --- | --- |
| Data Collection | Gather and preprocess iPhone review dataset | 2 weeks |
| AI Model Development | Train vector search and ranking system | 4 weeks |
| Fairness & Explainability | Implement SHAP, LIME, and fairness metrics | 3 weeks |
| API Development | Build and test Flask API | 2 weeks |
| Deployment | Deploy API on cloud (AWS/GCP/Azure) | 2 weeks |
| Testing & Final Evaluation | Validate fairness & performance | 2 weeks |

### **7. Conclusion**

This project will develop a **fair, explainable, and privacy-protected AI-powered review recommendation system** using the **iPhone reviews dataset**. By integrating **FAISS vector databases, sentiment analysis, fairness metrics, and privacy safeguards**, the system ensures **high-quality, ethical, and unbiased AI-generated recommendations**. The **Flask-based API** will make it **deployable in real-world e-commerce platforms**, ensuring consumer trust in AI-driven review recommendations.