Generative AI - AI and Data Science Track

Final Project Proposal

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Personalized Conversational Commerce System **PCCS**

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1 Project Overview

1.1 Objective

The goal of the Personalized Conversational Commerce System (PCCS) is to revolutionize e-commerce by leveraging AI to create a highly engaging and tailored shopping experience. By integrating conversational AI, personalized product recommendations, dynamic pricing, and sales forecasting, we aim to enhance user satisfaction and optimize business performance.

1.2 Key Features

- **Conversational AI Engagement**
  - Utilize large language models (LLMs) like GPT-3 or ChatGPT to provide personalized and context-aware interactions with customers.
  - Implement sentiment analysis to gauge user emotions, allowing the system to adapt responses and enhance user engagement.
  - Develop a chatbot capable of recommending products, answering queries, and assisting with pricing and promotions.
- **Personalized Product Recommendations**
  - Employ collaborative filtering and content-based filtering algorithms to deliver tailored product suggestions based on user behavior and preferences.
  - Leverage LLMs to generate engaging product descriptions and suggest items that align with users' interests and historical data.
- **Dynamic Pricing Engine**
  - Create a pricing model that adjusts in real-time based on demand fluctuations, inventory levels, user behavior, and competitor pricing.
  - Integrate forecasting models to predict customer demand, enabling proactive pricing adjustments.
  - Utilize a multi-agent system to simulate competitor pricing strategies and maintain competitive advantage.
- **Sales and Demand Forecasting**
  - Implement time series forecasting techniques to anticipate customer behavior and inventory requirements.
  - Analyze seasonal trends to optimize pricing and inventory management strategies.
  - Utilize advanced forecasting tools such as Facebook Prophet, ARIMA, LSTM, or XGBoost for accurate predictions.

- **MLOps for Model Management**
  - Establish MLOps practices to automate the deployment, monitoring, and continuous improvement of machine learning models.
  - Create CI/CD pipelines for seamless integration of new model versions and enhancements.
  - Utilize monitoring tools like MLflow to track model performance and ensure optimal functionality over time.
- **Web Application Frameworks**
  - Integrate FastAPI for building high-performance APIs to handle user requests efficiently.
  - Utilize Streamlit to create interactive dashboards for real-time insights into user behavior, product recommendations, and sales forecasts.

2 Implementation Plan

2.1 Phase 1: Data Collection and Preprocessing

Goal: Gather relevant e-commerce datasets (customer interactions, product descriptions, sales data) and preprocess them for machine learning.
Key Activities:

- Collect and clean data for customer interactions and sales.
- Extract relevant features for product recommendations and pricing.
- Set up the development environment and CI/CD pipeline.

2.2 Phase 2: Conversational AI and Recommendation Engine

Goal: Build a chatbot using large language models (LLMs) and integrate a recommendation engine.
Key Activities:

- Fine-tune a conversational AI model (e.g., GPT-3) to respond to customer inquiries.
- Develop personalized recommendations based on collaborative and content-based filtering.
- Create a simple user interface for interaction using Gradio or Streamlit.

2.3 Phase 3: Forecasting and Dynamic Pricing

Goal: Implement demand forecasting and real-time dynamic pricing adjustments.
Key Activities:

- Build time-series forecasting models using tools like Facebook Prophet.
- Implement dynamic pricing strategies based on predicted demand.
- Integrate the forecasting model with the chatbot to provide real-time price updates.

2.4 Phase 4: MLOps, Testing, and Deployment

Goal: Ensure robust system performance and deploy the solution to production.
Key Activities:

- Set up MLOps tools (MLflow) for experiment tracking and model deployment.
- Conduct testing (unit, end-to-end, A/B testing) to validate the models.
- Deploy the system using FastAPI and containerize it with Docker for scalability.

3 Expected Outcomes

- Enhanced customer engagement and satisfaction through personalized experiences.
- Increased sales through effective product recommendations and dynamic pricing strategies.
- Improved inventory management and forecasting accuracy, leading to cost savings and better resource allocation.

4 Conclusion

The Personalized Conversational Commerce System (PCCS) represents a significant advancement in the e-commerce landscape. By harnessing the power of AI and machine learning, this project will create a more personalized, efficient, and engaging shopping experience for users while simultaneously driving business growth and optimizing operational efficiency. We seek support to bring this vision to life and transform the future of online shopping.