Stock Analysis Dashboard - LLM Prototype Documentation

Utility of the Prototype

Link: Recording-20250331_233813.webm

The Stock Analysis Dashboard provides comprehensive financial analysis and insights for investors by leveraging Cohere's LLMs and financial models to interpret complex market data. Its primary utilities are:

1. **Automated Financial Insights**: Transforms raw financial data into actionable investment insights without requiring deep financial expertise.
2. **Time Efficiency**: Reduces research time by automatically processing and analyzing financial metrics that would take hours manually.
3. **Decision Support**: Helps investors make more informed decisions by highlighting key metrics and offering AI-powered recommendations.
4. **Comprehensive Analysis**: Provides a holistic view of stocks through multiple lenses: technical analysis, sentiment analysis, forecasting, and portfolio optimization.
5. **Accessibility**: Makes sophisticated financial analysis accessible to both novice and experienced investors through an intuitive interface.

Main Design Decisions

1. **Multi-Module Architecture**: Divided functionality into specialized modules (Research Center, Predictive Insights, Portfolio Analyzer) to provide comprehensive analysis while maintaining clear navigation.
2. **LLM & API Integration Strategy**:
   - Used Cohere's Command and Command-Light models for financial interpretation and insight generation
   - Integrated multiple financial data sources: yfinance for stock data, Alpha Vantage for news sentiment, PRAW for Reddit discussions
   - Implemented Prophet for time-series forecasting and FinBERT for financial sentiment analysis
   - Combined structured financial data with LLM-generated narratives
3. **Interactive Data Visualization**: Prioritized interactive visualizations with drill-down capabilities to make complex financial data more accessible.
4. **Prompt Engineering Focus**: Crafted domain-specific prompts for financial analysis that guide the LLM to produce reliable, actionable insights.

Main Difficulties Found

1. **Multiple API Integration**: Coordinating multiple APIs (yfinance, Alpha Vantage, PRAW, Cohere) presented challenges with rate limiting, authentication management, response handling, and maintaining data consistency across different sources.
2. **Context Management**: Managing the context window effectively to include relevant financial metrics while still leaving room for LLM analysis required careful optimization.
3. **Performance Optimization**: Balancing the need for real-time financial data with the latency of multiple API calls (Cohere, Prophet forecasting, FinBERT sentiment analysis) required strategic caching mechanisms and optimization of data processing workflows.

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