AGENTIC PRICING & PROMOTION PLANNING SYSTEM FOR RETAIL

Capstone Project: Building Agentic AI Applications with a Problem-First Approach

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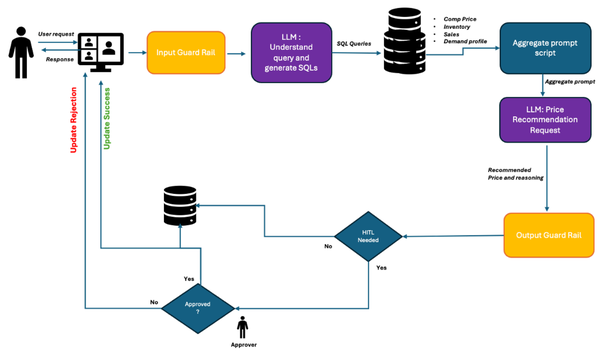
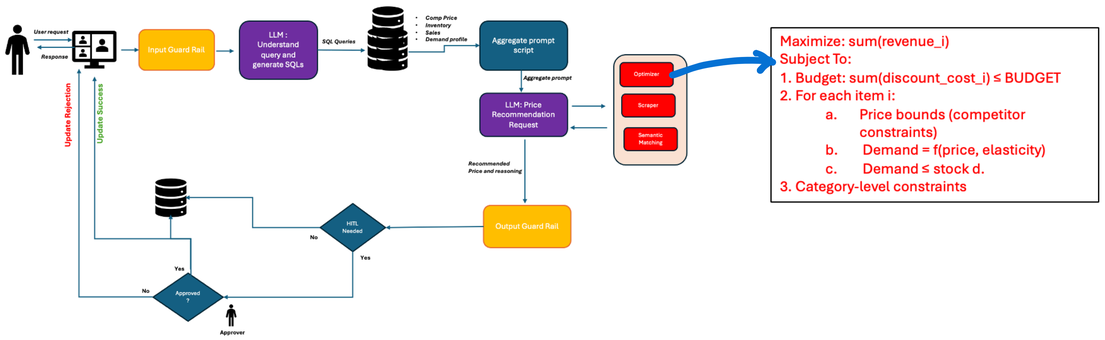
USE CASE

Retailers often fail to respond quickly to demand shifts or competitor moves. An agentic system can monitor real-time sales, competitor prices, and stock levels, simulate pricing impacts, and push approved changes directly to digital and in-store systems.

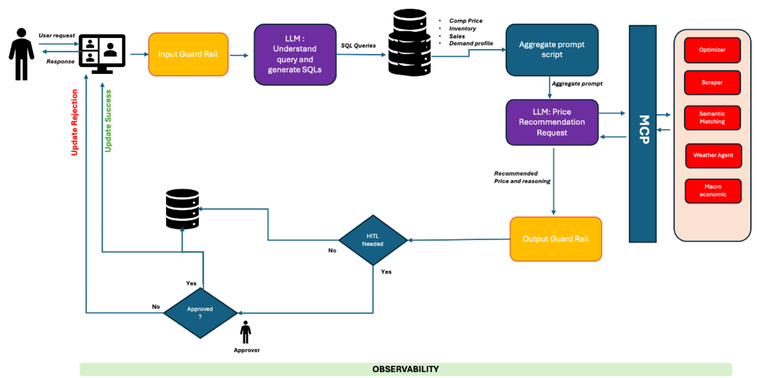
ITERATION 1



ITERATION 2



ITERATION 3



SYSTEM DESIGN

Business Constraints: Needs to adhere to company policies and legal requirements of pricing. Pricing analyst freedom should be limited to the specific role. The agent should allow for approval based on org hirearchy.

Iteration 1: An AI-powered analyst assistant that uses RAG to answer queries about pricing by pulling from real-time sales and competitor data to generate a recommendation report for a human analyst. (Workflow + RAG)

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Iteration 2: A semi-autonomous agent that not only generates a pricing recommendation but also uses a tool to simulate the financial impact of that recommendation, presenting both to a human for approval. (Workflow + RAG + planning + memory (a single agent)) → intra-category, operation research problem (multiple SKUs). In iteration2 we also optimize price to meet category level margin goals. This requires multi item revenue optimization.

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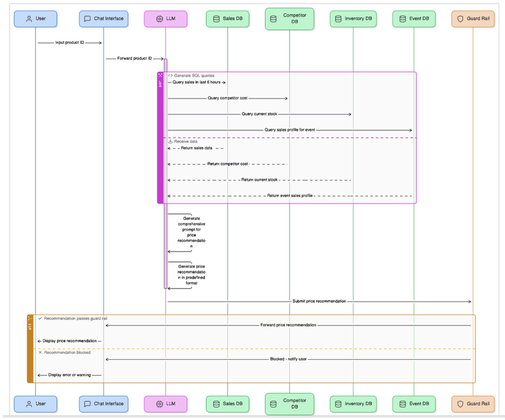
Iteration 3: A single agent with multiple tools - a multi-agent system that autonomously monitors market triggers, delegates simulation and analysis to specialized agents, and drafts notifications for team review, with the final step of pushing changes requiring human sign-off. (Workflow + RAG + tooling + MCP (multiple tools))

Iter.	Cost/Latency Factors	Optimizations	Guardrails	Eval Metrics
1	LLM Usage(per 1K tokens) + DB retrieval	Hybrid search, Threshhold validation	Access control, input validation,HITL, output check	Context Recall, Hallucination Score
2	+Tool calls(semantic search, optimiser, scraper/ API)	ReAct pattern, Short-term memory, scenario generation?	+Tool validation, factual consitency semantic checks	Semantic Matching accuracy, Tool accuracy, task success rate
3	+Single agent with multiple tools , Monitoring and observability	Geofencing feature, autonomous triggers	+ Security auditing, Monitoring tool poisoning	Persona authorization, LLM as judge(trends),


User
Chat Interface
LLM
Sales DB
Competitor DB
Inventory DB
Event DB
Guard Rail
Input product ID
Forward product ID
loop
Generate SQL queries
Query sales in last 6 hours
Query competitor cost
Query current stock
Query sales profile for event
Retrieve data
Return sales data
Return competitor cost
Return current stock
Return event sales profile
Generate comprehensive prompt for price recommendation
Generate price recommendation in predefined format
Submit price recommendation
alt
Recommendation passes guard rail
Forward price recommendation
Display price recommendation
Recommendation blocked
Blocked - notify user
Display error or warning