

CONVERSE ANALYTICS: AI CHATBOT FOR RETAIL PERFORMANCE



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AI SOLUTIONS

AI Solutions use machine learning and smart algorithms to automate tasks, solve problems, and power intelligent chatbots for natural, efficient user interactions.

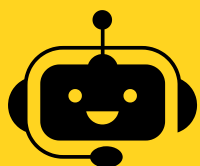
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EXECUTIVE SUMMARY

A leading global apparel retailer seeks to empower business stakeholders across Sales, Marketing, Inventory and Finance with on-demand, natural-language access to critical performance metrics, in-depth diagnostics and forward-looking forecasts. By integrating Snowflake's enterprise-grade data warehouse with a bespoke LLM-driven "Data Warehouse Agent," we propose an AI-powered Retail Analytics Chatbot that will:

- Interpret business-centric queries in plain English
- Translate questions into optimized, cost-efficient SQL for Snowflake
- Auto-correct and execute queries in real time
- Present interactive charts and tabular reports
- Generate retail-specific insights (ABC/XYZ segmentation, vendor scoring, top movers)
- Deliver time-series forecasting (seasonality adjustments, promotion impact)
- Export consolidated reports to Excel or PDF

This solution aligns seamlessly with your corporate data ecosystem, leverages an MCP AI framework for modular extensibility, and upholds enterprise standards for security, governance and scalability.



Chat AI



1. BUSINESS CONTEXT & OBJECTIVES

1.1 CHALLENGE

Business users currently rely on static BI dashboards or ad-hoc requests to IT, leading to long lead times and limited self-service flexibility.

1.2 GOAL

Democratize data-driven decision-making by enabling non-technical colleagues to ask unstructured questions such as “Which SKUs are understocked in Region West?” and receive instant, actionable insights.

1.3 DESIRED OUTCOMES

- Reduce report-generation cycle from days to minutes.
- Alleviate BI team workload on ad-hoc requests.
- Enhance inventory turnover, promotion effectiveness and vendor performance.

2. TARGET CASE STUDY

2.1. CLIENT PROFILE

- A global apparel retailer operating both brick-and-mortar and e-commerce channels.

2.2. DATA LANDSCAPE

- Snowflake houses 10+ schemas covering POS orders, inventory movements, product catalogs, vendor data, promotions and web analytics.
- Daily ETL pipelines ingest ERP, online sales, in-store transactions and third-party data.

2.3. PILOT SCOPE

- Domains: Sales & Inventory.
- Volume: ~100 tables, ~500 million rows of historical data.

3. SOLUTION OVERVIEW

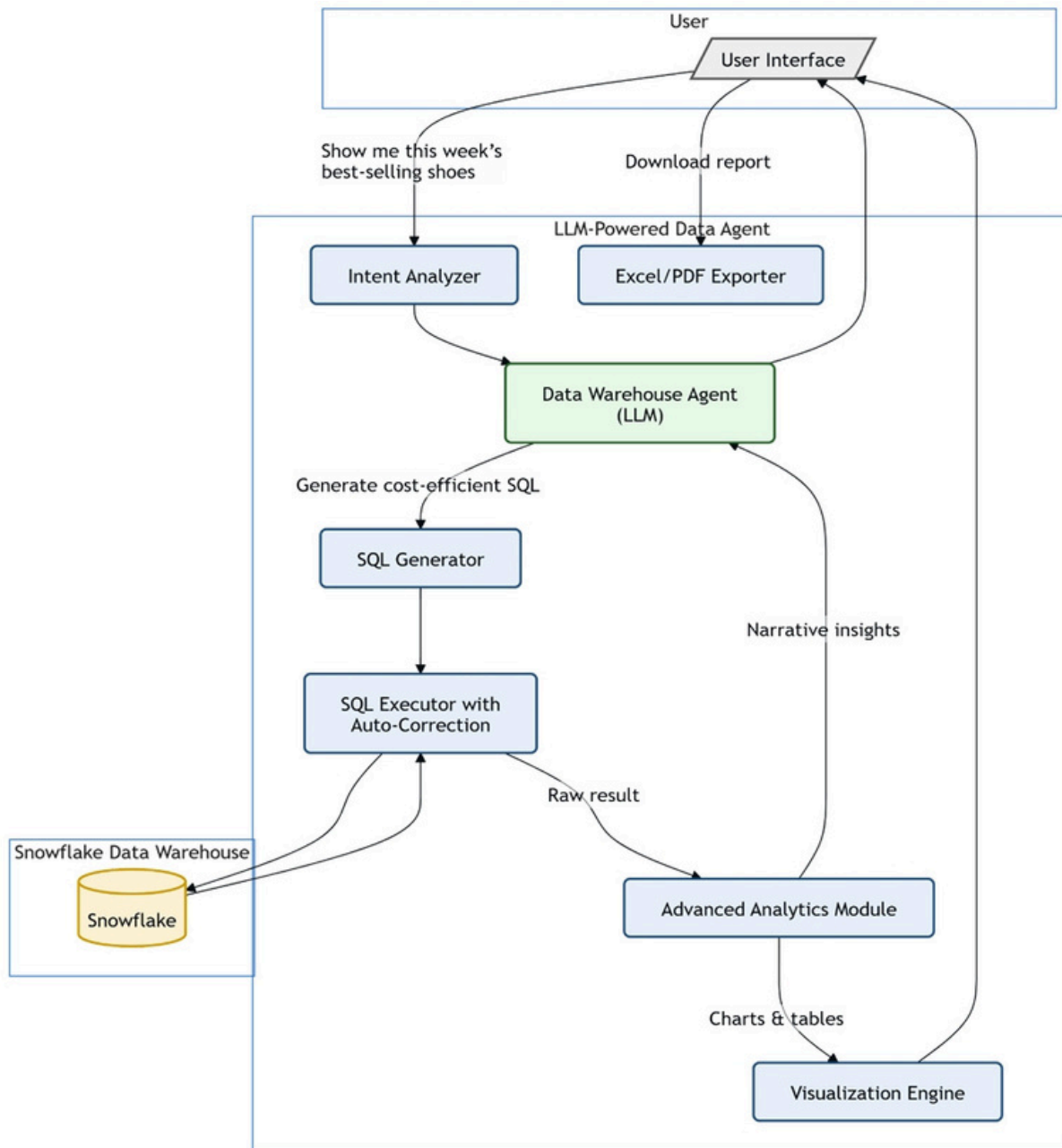


FIG: AI SYSTEM ARCHITECTURE

3.1. USER INTERFACE

- Web-based chat interface (React + Tailwind).
- Conversational flow with follow-up context support.

3.2. INTENT & ENTITY ANALYZER

- Hybrid approach: fine-tuned transformer classifier (e.g. BERT) plus rule-based extraction.
- Detects query type (report, inventory analysis, forecasting, ABC/XYZ) and key entities (dates, SKUs, regions).

3.3. DATA WAREHOUSE AGENT (LLM)

- Contextual prompt construction including schema metadata and conversation history.
- Hosted in a secure VPC, leveraging OpenAI's GPT-style model.

3.4. SQL GENERATOR & AUTO-CORRECTION

- Generates parameterized, Snowflake-specific SQL following best practices (CTEs, cost hints).
- Executes queries via Snowflake connector; captures errors and iteratively refines SQL.

3.5. ADVANCED ANALYTICS MODULE

- ABC/XYZ Analysis: Revenue-based product segmentation (A/B/C) combined with demand variability (X/Y/Z).
- Forecasting: On-demand Prophet or ARIMA pipelines for sales and inventory trends.

3.6. VISUALIZATION ENGINE

- Interactive Plotly charts: time series, heatmaps, bar/column charts
- Responsive dashboards embedded within chat interface.

3.7. INSIGHT NARRATOR

- LLM-generated plain-language summaries (e.g. “Product X experienced 25% month-over-month growth driven by Region North.”).

3.8. EXPORTER

- One-click export of reports and visuals to Excel (.xlsx) or PDF using Apache POI / ReportLab

3.9. MCP AI ORCHESTRATOR

- Connector framework to integrate additional data sources (CRM, web analytics)
- Centralized feature store, caching and logging

4. WORKFLOW

1. QUESTION SUBMISSION

- User inputs free-form query in chat UI.

2. INTENT & ENTITY EXTRACTION

- System classifies query and extracts relevant parameters.

3. PROMPT & SQL COMPOSITION

- Example prompt:
“You are a Snowflake SQL expert. Available tables: orders, order_lines, products, inventory.
Question: ‘Which SKUs are understocked as of 2025-07-28 in Region West?’
Please provide optimized SQL.”

4. SQL EXECUTION & AUTO-CORRECTION

- Query sent to Snowflake; on error, feedback loop to LLM for correction.

5. DATA RETRIEVAL

- Results fetched (up to 10,000 rows by default).

6. ANALYTICS & VISUALIZATION

- If requested, run ABC/XYZ segmentation or forecasting pipelines.
- Render interactive charts; assemble narrative.

7. RESPONSE DELIVERY

- Display combined chart, table and narrative.
- Offer download options for CSV, Excel and PDF.

8. SESSION CONTINUITY

- Preserve context to support follow-up questions (e.g. “Compare to last month.”).

5. SECURITY, GOVERNANCE & SCALABILITY

- **Authentication & Authorization**
 - SSO via SAML/OAuth2; fine-grained role-based access control; dynamic data masking.
- **Audit & Compliance**
 - Comprehensive logging of user queries, generated SQL and results.
- **Scalability**
 - Kubernetes-based deployment with horizontal autoscaling for UI and LLM agents.
 - Snowflake handles compute elasticity for query processing.
- **Cost Governance**
 - Query cost estimation and policy-driven limits to prevent runaway scans or expensive joins.

CONCLUSION

By harnessing Snowflake's robust data platform and cutting-edge LLM technology within an MCP AI framework, this Retail Analytics Chatbot will revolutionize how business users interact with data turning complex analytics into a simple conversation and driving measurable ROI across the organisation.