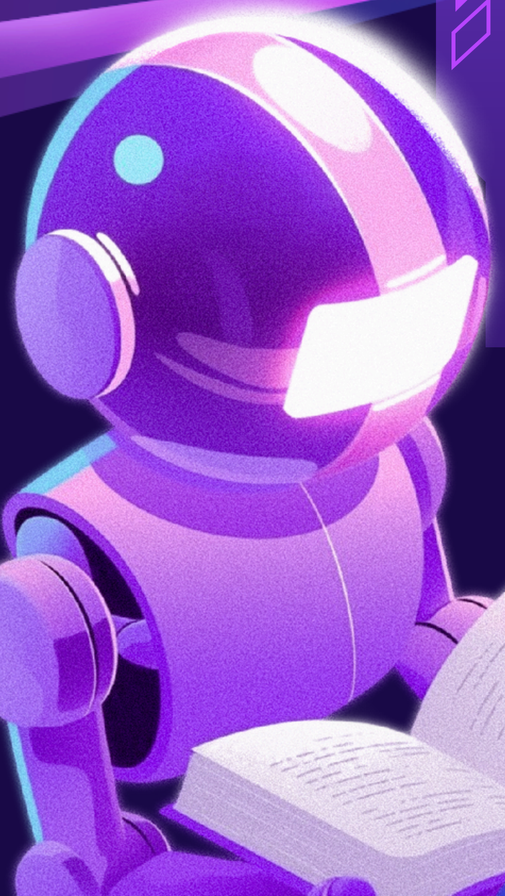
INTEGRATING AI-POWERED CHATBOT WITH PREDICTIVE INVENTORY MANAGEMENT AND DEMAND FORECASTING

STUDIO SHODWE



CONTENTS

INTRODUCTION

- Efficient inventory management leads to good customer experience and optimize operational efficiency.
- Eliminating traditional methods relied on manual data processing and lead to errors.
- Companies recognize the significance of modernization and are turning to AI-powered solutions to address challenges.
- AI powered chatbots streamline departmental communication.
- This leads to agile decision-making and proactive adjustments to inventory strategies,

OBJECTIVES

01

INVENTORY UPDATES

- Real Time inventory updates.
- Across all locations.
- Notifies about stock levels .

02

FORECASTING SALES

- Analyzes historical sales data.
- Provides sales forecasting.

03

RISK MANAGEMENT

- Analyze market trends.
- Helps to avoid Stock outs and Surplus stock.

04

DECISION MAKING

- Does predictive analysis.
- Helps in decision making.

LITERATURE REVIEW

AUTHORS	TOPIC	METHOD	STRENGTH	WEAKNESS
ManishVerma	“Integration of AI-Based Chatbot(ChatGPT) And Supply Chain Management Solution To Enhance Tracking And Queries Response”	Integration ofChatGPT 3.5 an AI-basedchatbot into supply chainoperations	Innovative Integrationspecifically ChatGPT	Data privacy concerns, No real-world applicability and outcomes
Mohd Javaida, Abid Haleema, Ravi PratapSingh	“A study on ChatGPT for Industry 4.0: Background, potentials, challenges, andeventualities”	NLP Algorithms, Machine Learning Techniques, and AI-Driven Analytics	ChatGPT boosts industrial efficiency and safety with data analysis.	ChatGPT's effectiveness in clear decision-making impacts risk and compliance scenarios.
Mariusz Kmiecik	“ChatGPT in third-party logistics – The game-changer or a step into the unknown? ”	Survey Analysis and Case studies	Chatgpt combines both the methods. Utilizes Open-Source andProprietary Versions ofChatGPT.	Selection is based on bias to experts. Limited number of expert participation.
Harikumar Pallathadka, Edwin Hernan Ramirez-Asis	“Applications of artificial intelligencein business management,ecommerce and finance”	Data Analysisand literature review	Covers customer, supply, finance clearly for broad audience.	Skims AI methods, overlooks specifics and challengesin business use.

PROJECT TIMELINE

Week 1
Defining scope, objective and deliverables

Week 2
Research on AI powered Chatbots

Week 3,4
Data gathering and training Chatbot

Week 5
Designing MYSQL database schema

Week 6
Developing API's for integration

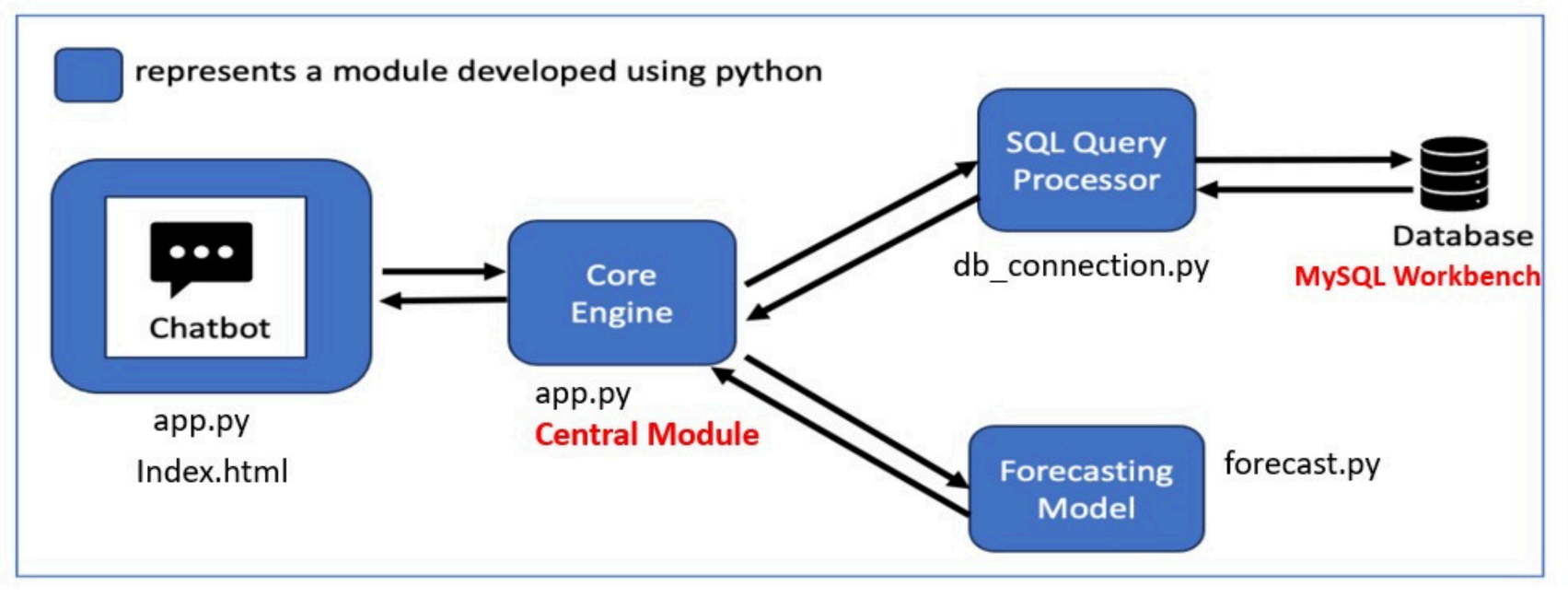
Week 7
Selecting appropriate Forecasting method

Week
Develop and train Forecasting model

Week 9
Developing user friendly web application and integration

Week 10
Testing and debugging

PROJECT WORKFLOW



METHODOLOGIES

CHATBOT

PYTHON USING HUGGING FACE LIBRABRY

GPT 3.5 API's

CORE ENGINE

NATURAL CONVERSATIONAL TEXTS

PYTHON- IDE Jupyter Notebook

SQL QUERY PROCESSOR

MYSQL - WORKBENCH

INVENTORY MANAGEMENT

FORECASTING MODEL

TIME SERIES REGRESSION

Scikit- LEARN LIBRARY

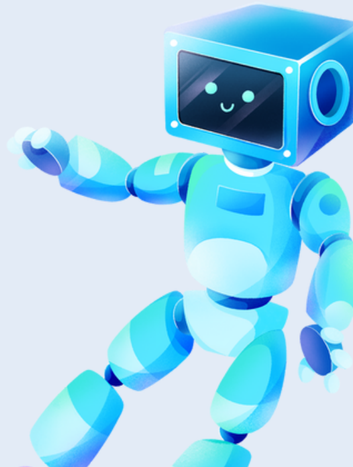
FLASK

AMAZON DATASET: PRE & POST PROCESSING FOR SALES REPORT

- **SKU & ASIN Retention:** KeptSKUswithdataon50+datesandtheirASINs.
- **Date Handling:** Converted dates to a weekly 'Date-counter'.
- **Quantity Management:** Removed SKUs with less than 70 total quantities and filled missing values with 0.
- **Categorization:** Organized SKUs into main categories like Jeans and Ethnic Dress, and sub-categories.
- **SKU Information:** Derived SKU sizes from the 3rd token in the SKU code.

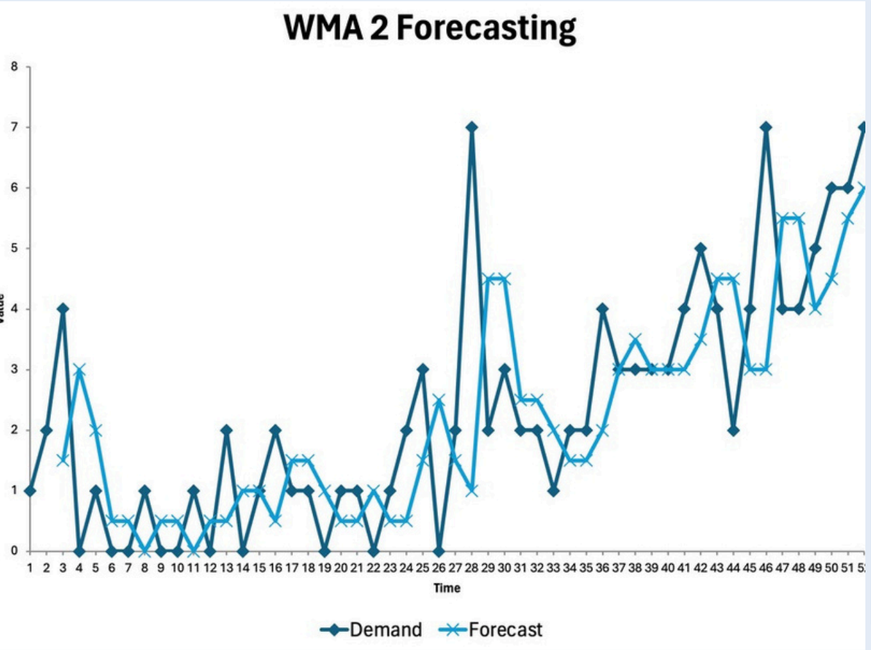
This approach ensures uniform data for analysis and visualization.

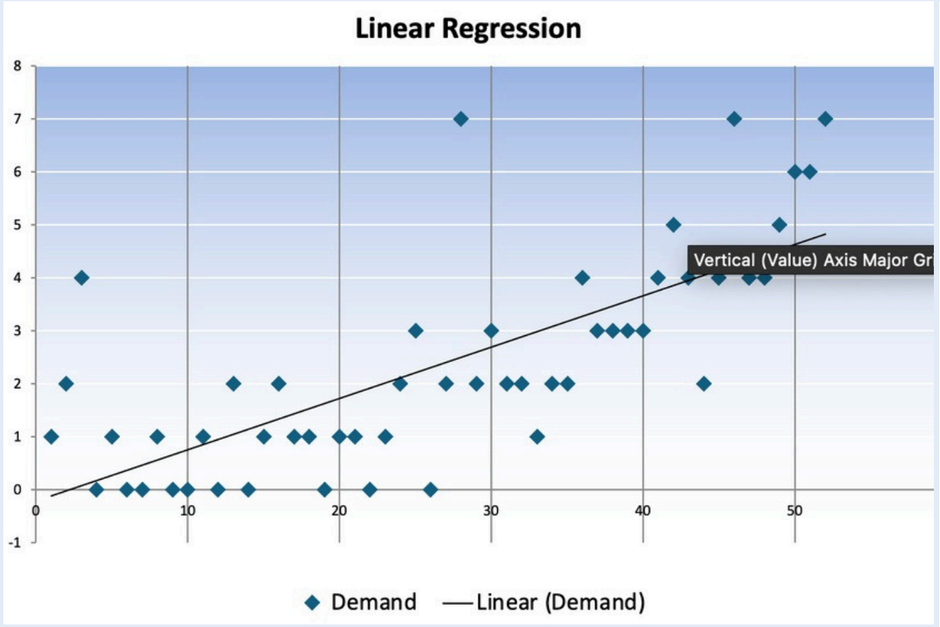
	SKU	ASIN	Qty	Amount	date_counter	Category
1768	J0006-SET-M	B0894WV6S6	2	2348.0	1	Ethnic Dress
1769	J0006-SET-M	B0894WV6S6	0	0.0	2	Ethnic Dress
1770	J0006-SET-M	B0894WV6S6	0	0.0	3	Ethnic Dress
1771	J0006-SET-M	B0894WV6S6	0	0.0	4	Ethnic Dress

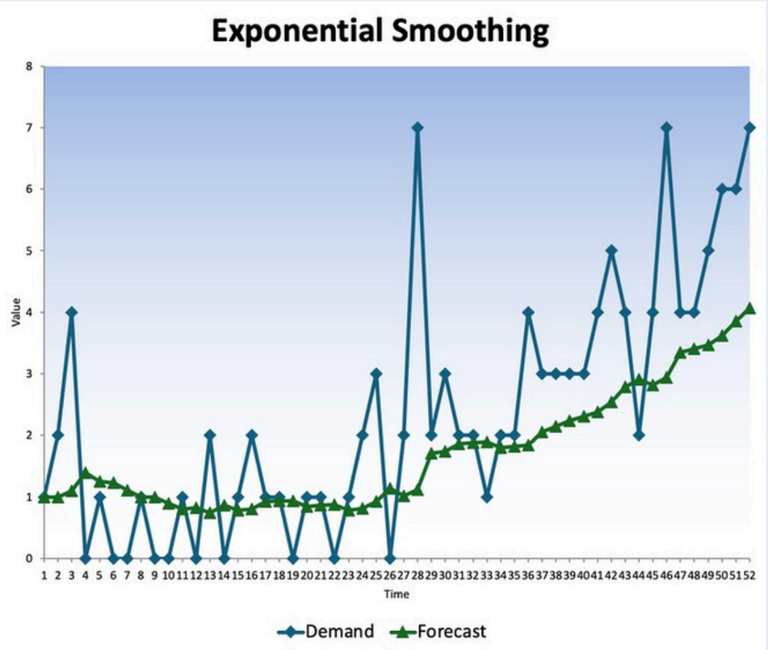


FORECASTING METHODS

Utilized Excel's Quantitative MethodsAnalysisfor52-weekhistoricaldatatoforecast the next 18 weeks.







- **Applied Weighted Moving Average for 2 periods with emphasis on recent data to refine forecast accuracy.**
- **Explored the linear relationship between time (in weeks) and demand.**
- **Established time as an independent variable to predict demand, with close data point alignment to the trend line suggesting high accuracy.**
- **Implemented a smoothing curve emphasizing recent trends for forecasting.**
- **The graphical output showed adjustments for trends, aiding future demand projections.**

FORECASTING METHODS RESULTS

WEIGHTED MOVING AVERAGE -2						
PERIOD	**ACTUAL AVERAGE**	**FORECASTED AVERAGE**	**ERROR**	**MAD**	**MSE**	**SE**
53- 70	0.192586912	6.660493851	-6.467906939	1.17	2.515	1.618577
LINEAR REGRESSION						
PERIOD	**ACTUAL AVERAGE**	**FORECASTED AVERAGE**	**ERROR**	**MAD**	**MSE**	**SE**
53- 70	0.192586912	5.737684624	-5.545097712	**0.997889**	**1.8035**	**1.369575**
EXPONENTIAL SMOOTHING						
PERIOD	**ACTUAL AVERAGE**	**FORECASTED AVERAGE**	**ERROR**	**MAD**	**MSE**	**SE**
53- 70	0.192586912	5.756010643	-5.563423732	1.119956	2.413797	1.584408

Using a Linear regression model for future size requirements will align closely with actual demand along with exploring linear relationship between Weeks (independent variable) and Demand (dependent variable).

CHATBOT FEATURES

- For now four main functionalities have been added in the Chatbot.
- **Query Processing**: When a user submits a query, the system identifies and categorizes it into a specific request type.
- **Function Execution:** It then executes the appropriate function based on the identified request type.
- **Chatbot Training:** The chatbot undergoes two rounds of training for each query. Initially, it is prompted with example-based queries.
- **Human-like Response Training:** Subsequently, it is trained on how to respond in a more human-like manner.

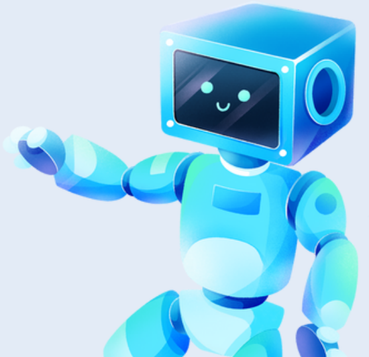
1. **Sales:** Integration with chatbot to manage and analyze sales data.
2. **Inventory:** Capability to track and report inventory levels.
3. **Forecast:** Feature to predict future sales and inventory needs.
4. **Unrelated:** Handles queries that do not fit into the other three categories.

Example 1:

Current date is March 06, 2024.

User: How many dresses were sold last month?

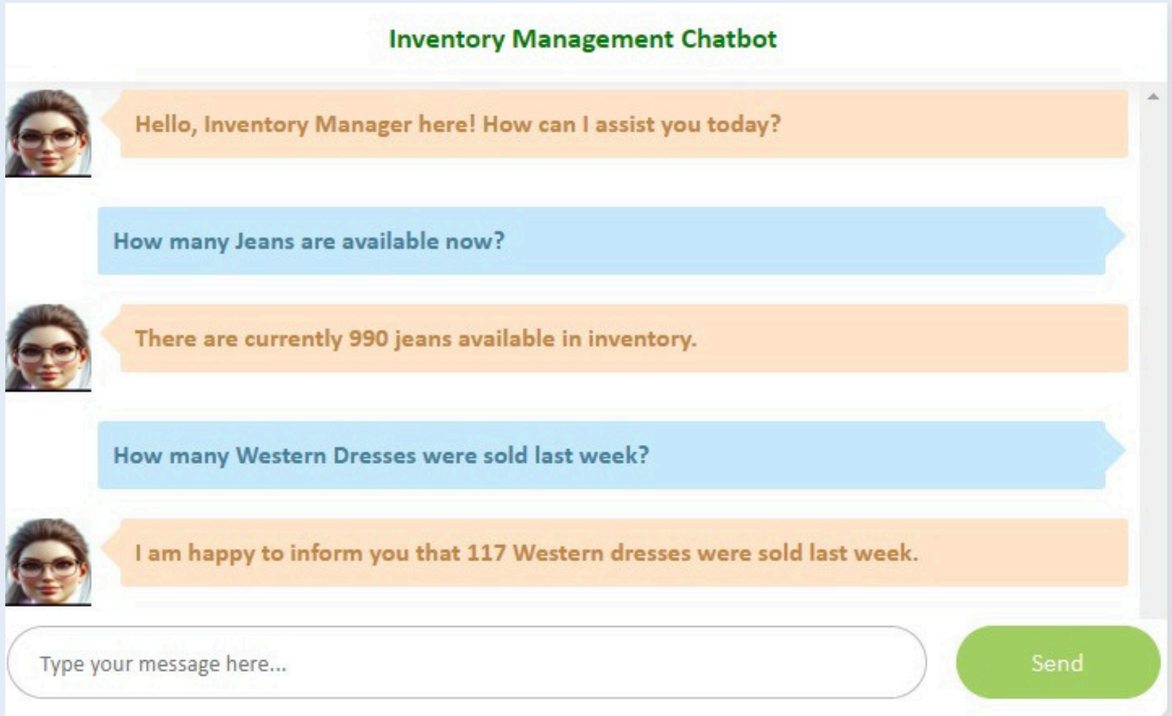
Response: {'type': 'SALES', 'category': 'dress','week':'NA','month': '02', 'year': 2024}

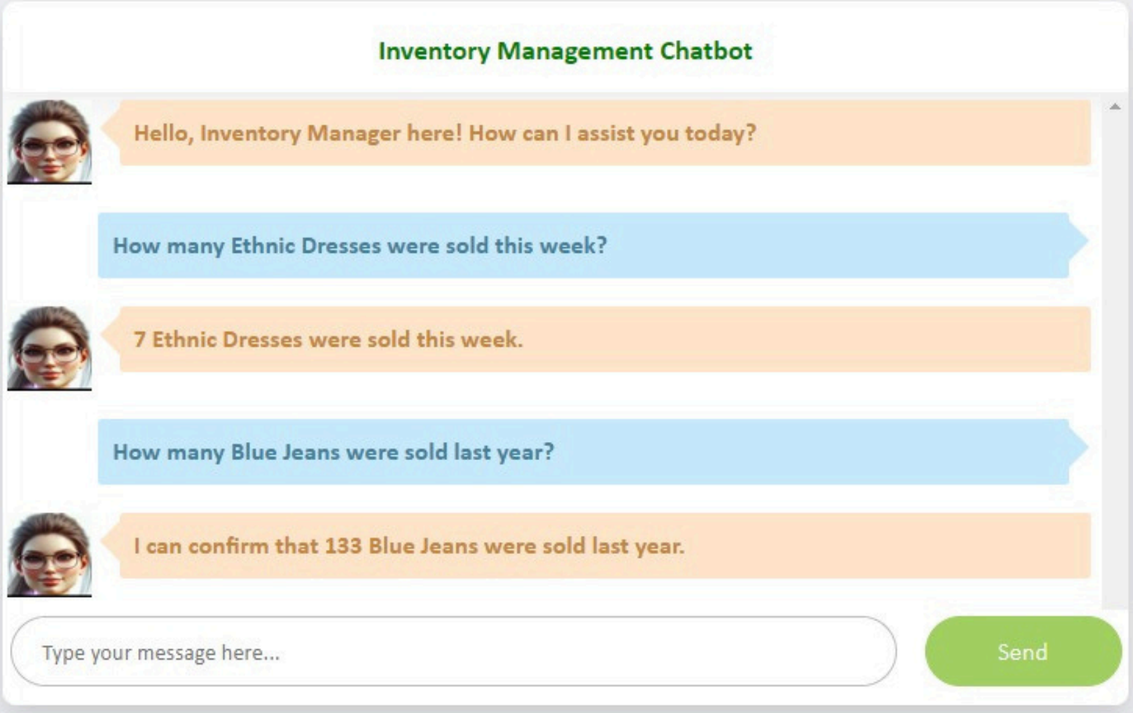


CHATBOT FEATURES

The queries that are being supported by theChatbotcurrentlyare

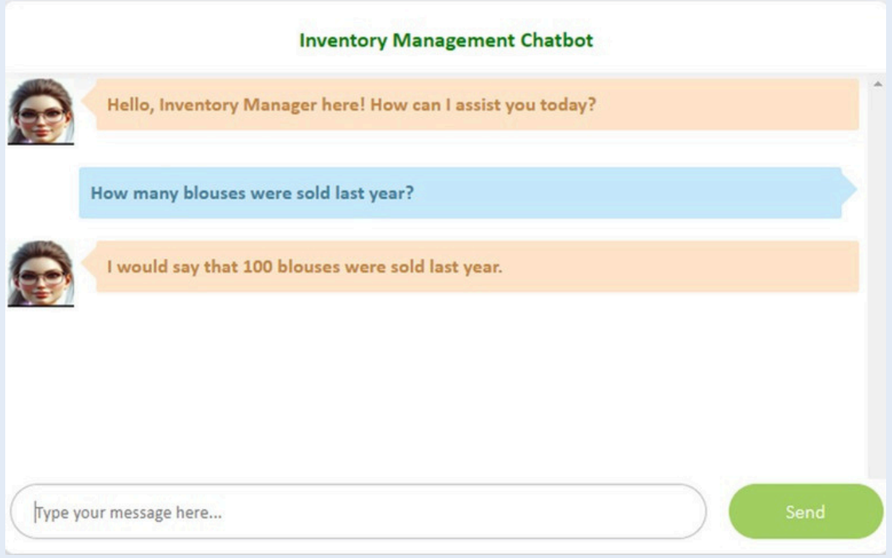
- **How many Jeans are available in the inventory right now?**
- **How many Western Dresses were sold last week?**
- **How many Ethnic Dresses were sold this week?**
- **How many Blue Jeans were sold last year?**
- **How many Jeans were sold last month?**
- **How many Distressed Jeans are expected to be sold next week?**
- **How many Distressed Jeans are expected to be sold next to next week?**

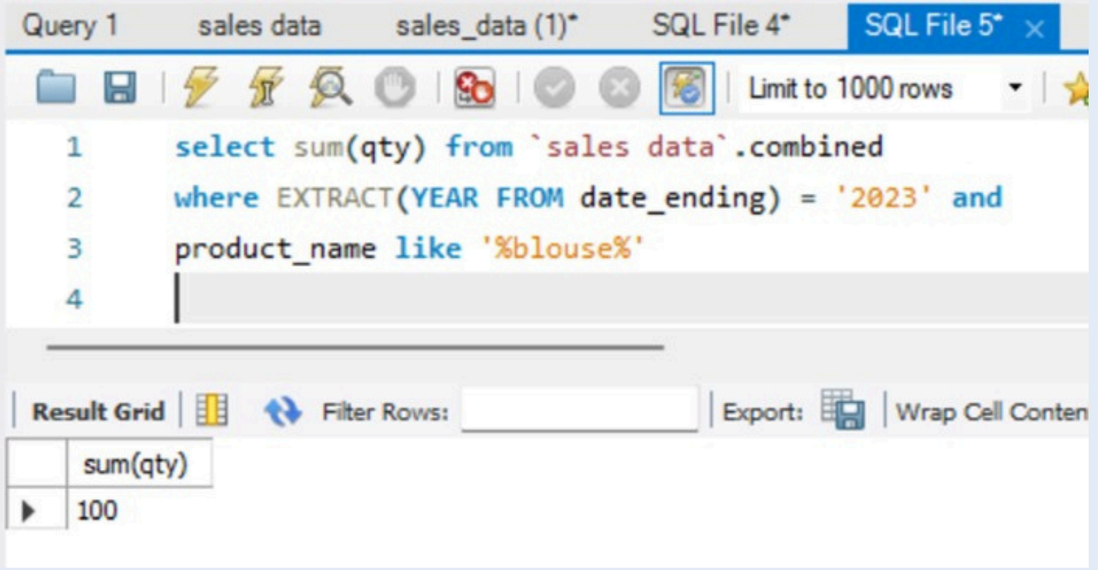


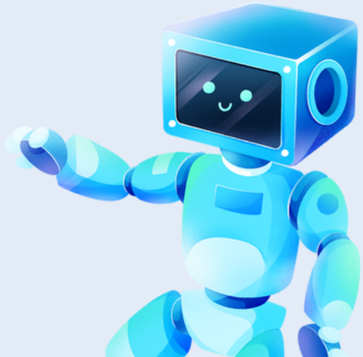


SQL-DATABASE

- Utilize a combined view merging the item and order tables to access necessary information at runtime.
- When a user queries the database, records are fetched, leveraging data from respective tables.
- For sales data, retrieve information from the order table, determining the quantity of items sold for a specific item or category within a given month or year.
- Access inventory details directly from the item table, providing real-time availability information.
- Forecasting utilizes data from the order table, analyzing quantities sold in the previous week to predict future sales.



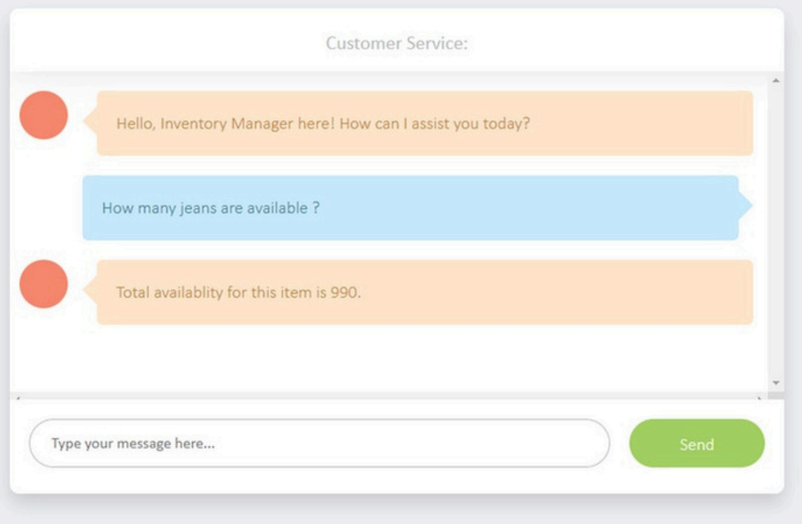


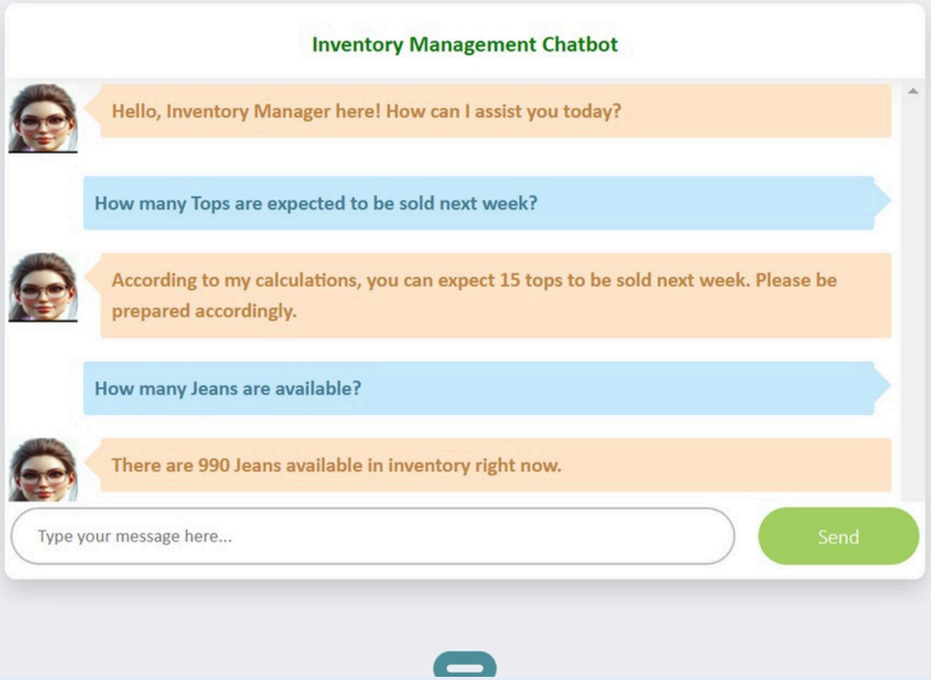


Chatbot Response vs. SQL Query Results

TESTING & RESULTS

Over the course of the week, updates were made to the chatbot's user interface.





FUTURE WORK

01

Implement a feature suggesting related questions after providing an answer to enhance user engagement and interaction. Develop a daily forecasting feature to predict future trends and provide insights for better decision-making.

02

Enhance the chatbot's functionality to retrieve data specific to item sizes and colors, offering more detailed and tailored information to users.

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THANK YOU!