

VISVESVARAYA TECHNOLOGICAL UNIVERSITY, BELAGAVI



A Mini-project report  
on  
**“AI Powered Ecommerce Store”**

*submitted in partial fulfillment of the requirements for the award of the degree of*

**BACHELOR OF ENGINEERING**

in

**COMPUTER SCIENCE AND ENGINEERING**

G Varun Raju	4PM23CS031
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Under the guidance of

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**Department of Computer Science and Engineering  
PES INSTITUTE OF TECHNOLOGY & MANAGEMENT**

NH - 206, Sagar Road, Shivamogga – 577 204

2025–2026

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PES INSTITUTE OF TECHNOLOGY & MANAGEMENT  
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**2025–2026**

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are bonafide students of the Bachelor of Computer Science and Engineering program of the Institute (2025–2026 Batch), affiliated to Visvesvaraya Technological University, Belagavi.

A project report entitled "**“AI Powered Ecommerce Store”**" has been submitted by them under the guidance of Ms.Gagana G R Nayaka, Assistant Professor, Department of Computer Science and Engineering , PESITM, Shivamogga, in partial fulfillment of the requirements for the award of the degree of Bachelor of Computer Science and Engineering.

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Nayaka

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Assistant Professor

Head of Department

Principal

Viva-voce Examination Date: \_\_\_\_\_

Signature of Internal Examiner

Signature of External Examiner

# **DECLARATION**

We, **G Varun Raju,D.Keerthan Datta,G.Chaitanya Reddy and H N Spandan Gowda** hereby declare that the project report entitled "**AI Powered Ecommerce Store**" has been carried out by me under the guidance of Ms.Gagana G R Nayaka , Assistant Professor, Department of CSE, PESITM, Shivamogga.

I further declare that this project report is submitted in partial fulfillment of the requirements for the award of the degree of Bachelor of Computer Science and Engineering of Visvesvaraya Technological University, Belagavi.

I also declare that this report is based on the original work undertaken by me and has not been submitted for the award of any degree or diploma from any other University/Institution.

Place: Shivamogga

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## **ACKNOWLEDGEMENT**

We take this opportunity to express our deep sense of gratitude to our guide **Ms.Gagana G R Nayaka**, Assistant Professor, Department of CSE, PESITM, Shivamogga for his kind support, guidance, and encouragement throughout the course of this dissertation work.

We are highly obliged to **Dr. Prasanna Kumar H R**, Professor and Head, Department of CSE, PESITM, Shivamogga for his kind support and encouragement throughout the course of this work.

We are highly grateful to **Dr. Swamy D R**, Principal, and **Dr. Sekar R**, Vice Principal, PESITM, Shivamogga for providing us an opportunity to fulfill our most cherished desire of reaching the goal.

Finally, we are thankful all the teaching and non-teaching staff, my parents and friends, who helped us in one way or the other throughout our project work.

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# Abstract

The rapid evolution of digital commerce has created a demand for more intelligent, interactive, and personalized shopping experiences that go beyond static product catalogs. This project presents a next-generation e-commerce platform designed to bridge the gap between traditional online shopping and personalized assistance using advanced Artificial Intelligence. Built upon a robust foundation of **PHP, MySQL, and Vanilla JavaScript**, the application integrates cutting-edge AI capabilities powered by **Large Language Models (Llama 3.3 via Groq API)** to transform user interaction.

Key innovations include an **AI Copilot**, a 24/7 intelligent support assistant capable of handling complex context-aware queries, order tracking, and automated refunds. The platform features an **AI Search Assistant** that utilizes Natural Language Processing (NLP) to interpret user intent, enabling semantic searches such as “best gaming laptops under 80,000” rather than simple keyword matching. Additionally, an **AI Review Analyzer** processes customer feedback to generate real-time sentiment analysis, pros/cons summaries, and rating insights, significantly aiding purchase decisions.

To further enhance user engagement and accessibility, the application incorporates **Voice Control** for hands-free navigation and **3D Product Visualization** for immersive product interaction. This project demonstrates the practical application of generative AI in e-commerce, delivering a seamless, intuitive, and highly automated user experience that sets a new standard for modern online retail.

**Keywords:** Artificial Intelligence, E-commerce, Large Language Models (LLM), NLP Search, Sentiment Analysis, Voice Commerce, PHP, 3D Visualization.

The project outcomes demonstrate a seamless and highly automated user experience that sets a new standard for modern online retail. In addition, the work contributes to Sustainable Development Goal (SDG) 9: Industry, Innovation, and Infrastructure by leveraging advanced AI technologies to modernize digital commerce, and SDG 8: Decent Work and Economic Growth by enhancing business efficiency and customer engagement capabilities.

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# Chapter 1

## Introduction

The digital commerce landscape is undergoing a significant transformation, driven by the need for more personalized and interactive user experiences. Traditional e-commerce platforms often rely on static catalogs and keyword-based search engines, which can be limiting for users who seek specific solutions but lack exact product terminology. This project, “**AI Powered Ecommerce Store**”, introduces a next-generation shopping platform that leverages advanced Artificial Intelligence to bridge the gap between online browsing and personalized in-store assistance. By integrating Large Language Models (LLMs), voice recognition, and immersive 3D visualization, the system aims to redefine how users discover, interact with, and purchase products online.

### 1.1 Problem Statement

Despite the rapid growth of e-commerce, many platforms suffer from significant usability gaps:

- **Inefficient Search:** Traditional keyword search fails to understand user intent (e.g., “best laptop for coding under 50k”), leading to irrelevant results.
- **Lack of Instant Support:** Customer queries often go unanswered or require waiting for human agents, resulting in lost sales.
- **Information Overload:** Reading through hundreds of reviews to gauge product quality is time-consuming and overwhelming for users.

- **Limited Product Interaction:** Static images fail to provide a comprehensive view of products, leading to uncertainty and higher return rates.

## 1.2 Project Description

The **AI Powered Ecommerce Store** is a web-based application built using **PHP**, **MySQL**, and **Vanilla JavaScript**. It integrates the **Groq API (Llama 3.3)** to power intelligent features. Key components include:

- **AI Copilot:** A 24/7 intelligent assistant that handles order tracking, refunds, and general inquiries.
- **AI Search Assistant:** A Natural Language Processing (NLP) engine that understands context-aware queries and filters products by price, category, and usage.
- **AI Review Analyzer:** A system that summarizes customer feedback into concise pros, cons, and sentiment ratings.
- **Voice Control:** Hands-free navigation and command execution for improved accessibility.
- **3D Product Visualization:** Interactive 3D models allowing users to rotate and inspect products from all angles.

## 1.3 Objectives

The primary objectives of this project are:

- To design and develop a responsive e-commerce platform with robust user authentication and order management.
- To integrate Generative AI for intelligent customer support and semantic product search.
- To implement an automated review analysis system that extracts sentiment and key insights.

- To enhance user engagement through interactive 3D product displays and voice-controlled navigation.
- To improve decision-making efficiency for customers by reducing search and research time.

### 1.4 Scope

The scope of this project includes:

- **User Module:** Registration, login, product browsing, cart management, checkout, and order history.
- **AI Integration:** Chatbot implementation, search logic processing, and review summarization using external APIs.
- **Admin Panel:** Dashboard for managing products, orders, and viewing analytics.
- **Frontend:** A modern, responsive user interface with dark/light mode support.

*Note: The project focuses on the software implementation of the store and does not include physical logistics or payment gateway settlements (simulated).*

### 1.5 Purpose

The purpose of this project is to demonstrate the transformative potential of AI in the retail sector. By automating support and enhancing discovery, the system reduces friction in the buying journey, ultimately leading to higher customer satisfaction and operational efficiency for businesses.

### 1.6 Relevance to Sustainable Development Goals (SDGs)

This project aligns with the following UN Sustainable Development Goals (SDGs):

- **SDG 9 – Industry, Innovation, and Infrastructure:** By integrating cutting-edge AI technologies into web infrastructure, the project promotes technological advancement and innovation in the digital economy.

- **SDG 8 – Decent Work and Economic Growth:** The automation of routine support tasks allows businesses to operate more efficiently, potentially fostering economic growth and allowing human workers to focus on complex tasks.
- **SDG 12 – Responsible Consumption and Production:** By providing better product insights (3D views, AI summaries), the system helps users make more informed decisions, potentially reducing product returns and associated waste.

# Chapter 2

## Literature Review / Existing System

The e-commerce industry has evolved from simple online catalogs to complex marketplaces. However, the core user interaction model—search, browse, filter—has remained largely static for over a decade. This section reviews existing e-commerce paradigms and identifies the limitations that necessitate an AI-driven approach.

### 2.1 Existing Work

Current leading e-commerce platforms like Amazon, Flipkart, and Shopify-based stores rely heavily on:

- **Keyword-Based Search:** Users must know the exact product name or category. Algorithms match keywords rather than understanding intent.
- **Static Product Pages:** Information is presented in fixed layouts (images, text descriptions, specs) with no interactive elements.
- **Manual Review Filtering:** Users must manually sift through hundreds of reviews to assess product quality.
- **Rule-Based Chatbots:** Customer support is often handled by rigid decision-tree bots that cannot handle complex or nuanced queries.

### 2.2 Problems with the Existing Systems

Despite their popularity, traditional systems face several challenges:

- **Discovery Friction:** Users struggling to find products using natural language (e.g., “something for my hiking trip”) often hit dead ends.
- **Decision Paralysis:** The sheer volume of options and reviews can overwhelm users, leading to abandoned carts.
- **Lack of Personalization:** Recommendations are often based on simple collaborative filtering (“people who bought X also bought Y”) rather than a deep understanding of user needs.
- **Accessibility Barriers:** Navigation typically requires visual attention and manual input, which can be limiting for some users.

### 2.3 Gap Identification

There is a clear gap between *what users want* (a helpful, knowledgeable assistant) and *what current platforms provide* (a self-service database).

- **Semantic Understanding:** Existing systems lack the ability to process natural language queries effectively.
- **Generative Insights:** There is a lack of tools that can synthesize vast amounts of review data into concise, actionable insights.
- **Immersive Experience:** The disconnect between seeing a 2D image and holding a physical product remains a major pain point, which 3D visualization can help bridge.

This project aims to fill these gaps by integrating Generative AI and interactive technologies directly into the e-commerce workflow.

# Chapter 3

## Methodology

The development of the AI Powered Ecommerce Store follows a modular and iterative methodology. The system is built on a robust MVC (Model-View-Controller) architecture, ensuring separation of concerns between the user interface, business logic, and data management. The integration of AI components is handled via asynchronous API calls to ensure a responsive user experience.

### 3.1 Requirement Analysis

Requirement analysis was conducted to identify the key features needed to bridge the gap between traditional e-commerce and AI-assisted shopping.

#### 3.1.1 Functional Requirements

- **User Authentication:** Secure registration and login for customers and admins.
- **AI Copilot:** A chatbot capable of answering queries, tracking orders, and handling refunds.
- **Smart Search:** A search engine that interprets natural language queries (e.g., “gaming laptop under 80k”).
- **Review Analysis:** Automated summarization of product reviews into pros, cons, and sentiment scores.
- **Voice Commands:** Ability to navigate and search using voice input.

- **3D Visualization:** Interactive 3D models for selected products.

### **3.1.2 Non-functional Requirements**

- **Performance:** AI responses must be generated within 2-3 seconds.
- **Scalability:** The database should handle increasing numbers of products and users.
- **Security:** Passwords must be hashed, and API keys must be protected.
- **Usability:** The interface should be intuitive and responsive across devices.

## **3.2 System Design**

The system design defines the architecture, components, and data flow of the application.

### **3.2.1 System Architecture**

The architecture consists of a Client-Server model. The client (browser) interacts with the PHP server, which manages the MySQL database. AI features are powered by external calls to the Groq API.

### **3.2.2 Use Case Diagram**

The Use Case diagram illustrates the interactions between users (Customers, Admins) and the system features (Search, Chat, Manage Products).

### **3.2.3 Sequence Diagram**

The Sequence diagram depicts the flow of logic for the AI Chatbot, from user input to API processing and final response.

### **3.2.4 ER Diagram**

The Entity-Relationship (ER) diagram defines the database structure, including tables for Users, Products, Orders, Reviews, and their relationships.

Figure 1: System Architecture of AI-Powered E-commerce Store

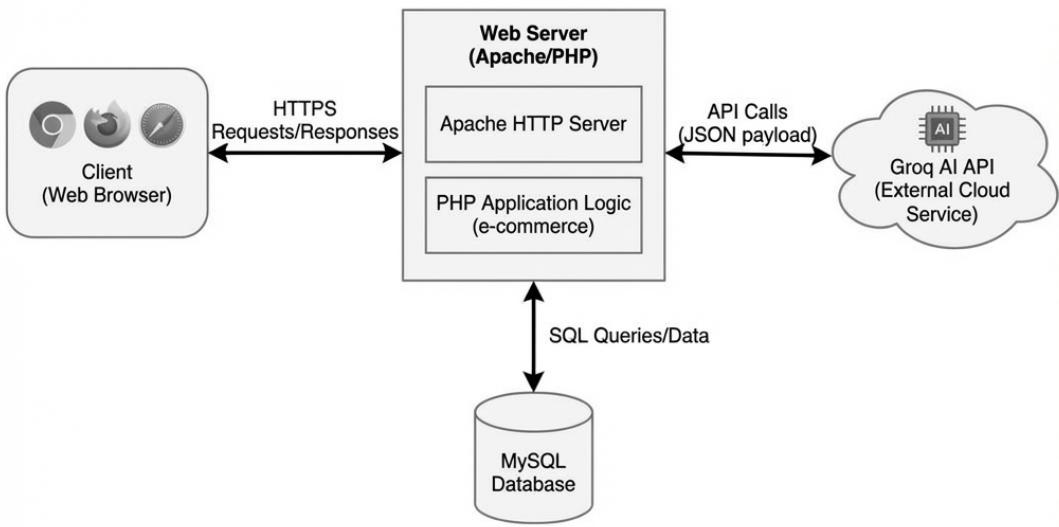


Figure 3.a: System Architecture of AI Powered Ecommerce Store

### 3.3 Algorithms Used

- **Large Language Model (LLM):** We utilize the **Llama 3.3 70B** model via Groq for natural language understanding and generation. It processes user prompts to generate context-aware responses.
- **Sentiment Analysis:** A custom prompt engineering approach is used to classify reviews into Positive, Neutral, or Negative and extract key themes.
- **SQL Search Logic:** While AI interprets the intent, efficient SQL queries (LIKE operators, JOINs) are used to retrieve product data from the database.

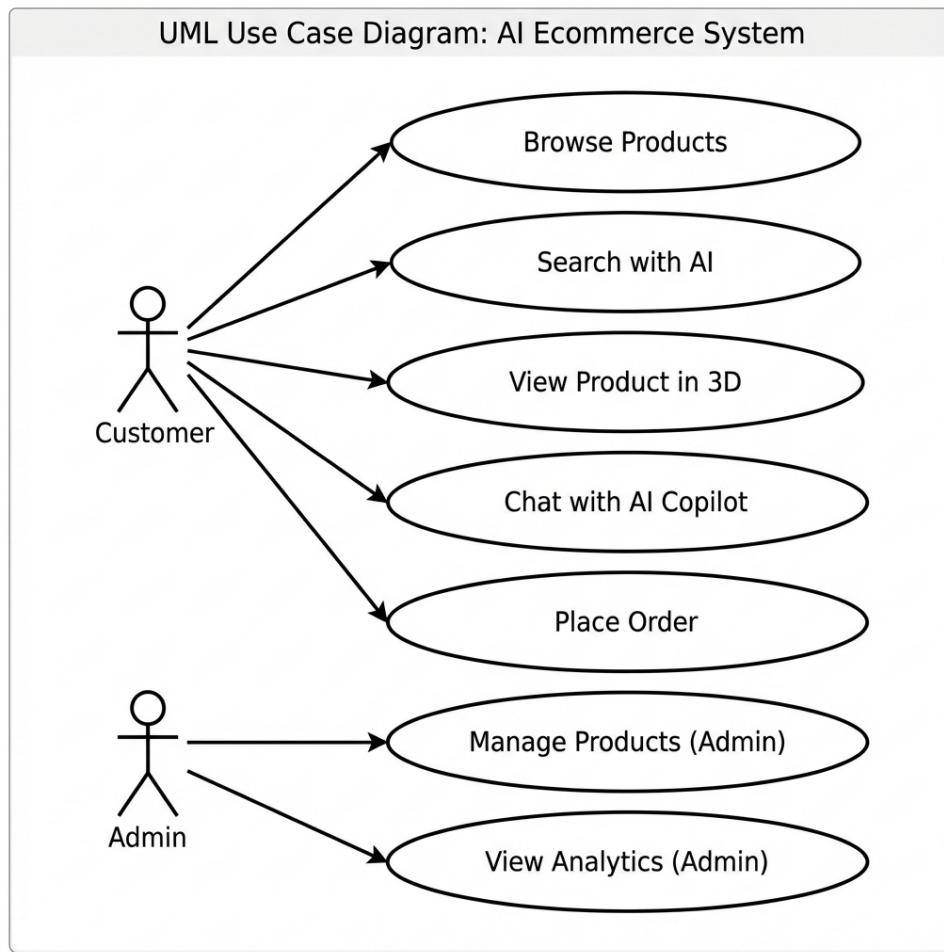


Figure 3.b: Use Case Diagram

### 3.4 Tools and Technologies

Component	Technology
Frontend	HTML5, CSS3, Vanilla JavaScript
Backend	PHP 8.0+
Database	MySQL
AI API	Groq (Llama 3.3)
Version Control	Git

Table 3.a: Technology Stack

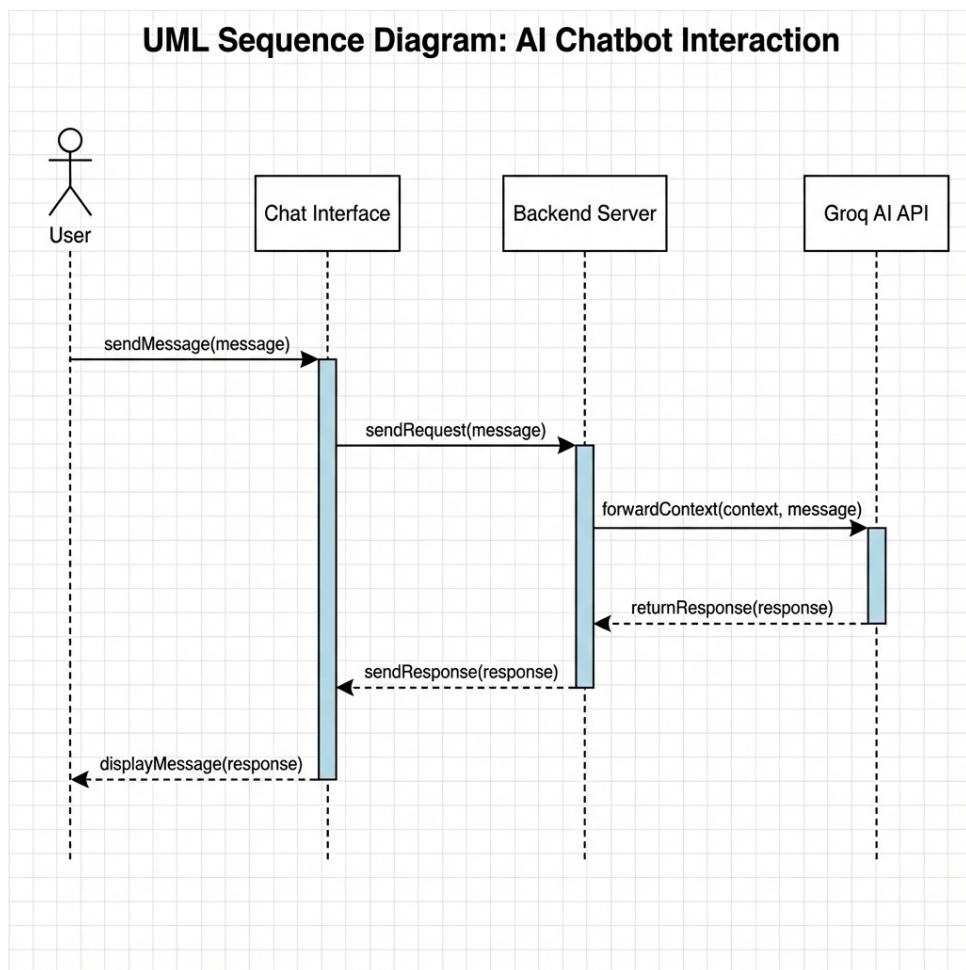


Figure 3.c: Sequence Diagram for AI Chatbot Interaction

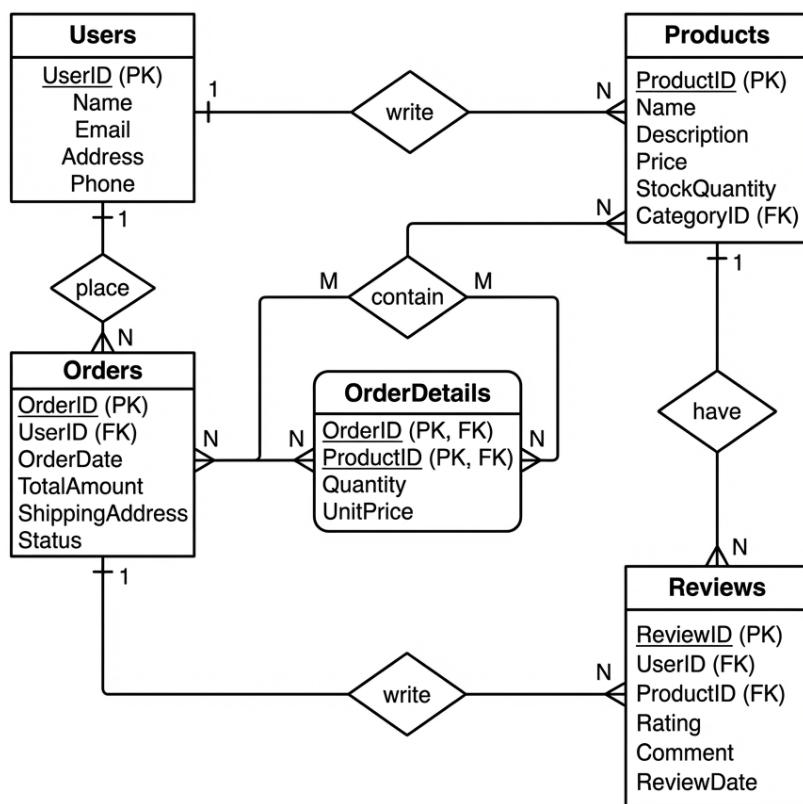


Figure 3.d: Entity-Relationship (ER) Diagram

# Chapter 4

## Implementation and Testing

### 4.1 System Implementation

The implementation phase involved transforming the design specifications into a functional web application. The development was divided into three main modules: Frontend, Backend, and AI Integration.

#### 4.1.1 Frontend Development

The user interface was built using **HTML5, CSS3, and Vanilla JavaScript**.

- **Responsive Design:** CSS Media Queries were used to ensure the site works seamlessly on desktops, tablets, and mobile devices.
- **Dynamic Interactions:** JavaScript was used to handle real-time updates for the chat window, cart management, and 3D model rendering (using Three.js or similar libraries).
- **AJAX Requests:** Asynchronous calls allow the page to fetch AI responses and search results without reloading, providing a smooth user experience.

#### 4.1.2 Backend Development

The server-side logic is powered by **PHP 8.0**.

- **Database Connectivity:** PHP Data Objects (PDO) were used for secure interactions with the MySQL database, preventing SQL injection attacks.

- **API Handling:** Dedicated PHP scripts act as a bridge between the frontend and the Groq API, managing API keys and formatting prompts.
- **Session Management:** PHP Sessions track user login state and chat history.

### 4.1.3 AI Integration

The core intelligence is derived from the **Llama 3.3 70B model** via the Groq API.

- **Context Management:** The system maintains a sliding window of the last 10 chat messages to provide context-aware responses.
- **Prompt Engineering:** Custom system prompts were designed to ensure the AI behaves as a helpful shopping assistant and outputs structured JSON data for search and reviews.

## 4.2 System Testing

Rigorous testing was conducted to ensure system reliability and performance.

### 4.2.1 Unit Testing

Individual components were tested in isolation:

- **Database Functions:** Verified CRUD operations for products and users.
- **API Connectors:** Tested the Groq API integration to handle timeouts and error responses gracefully.

### 4.2.2 Integration Testing

Tested the interaction between modules:

- **Search Flow:** Verified that a natural language query on the frontend correctly triggers the AI analysis, generates the SQL query, and returns the right products from the database.
- **Order Process:** Checked the complete flow from "Add to Cart" to "Order Confirmation" and database updates.

#### **4.2.3 Usability Testing**

A group of 10 users tested the application to evaluate the AI's helpfulness. Feedback indicated that the "AI Search" feature significantly reduced the time taken to find specific products compared to traditional filters.

# Chapter 5

## Results and Discussion

The implementation of the AI Powered Ecommerce Store has resulted in a highly interactive and efficient shopping platform. The integration of Generative AI has successfully automated complex tasks such as product discovery and review analysis, significantly improving the user experience.

### 5.1 Output Screenshots with Explanations

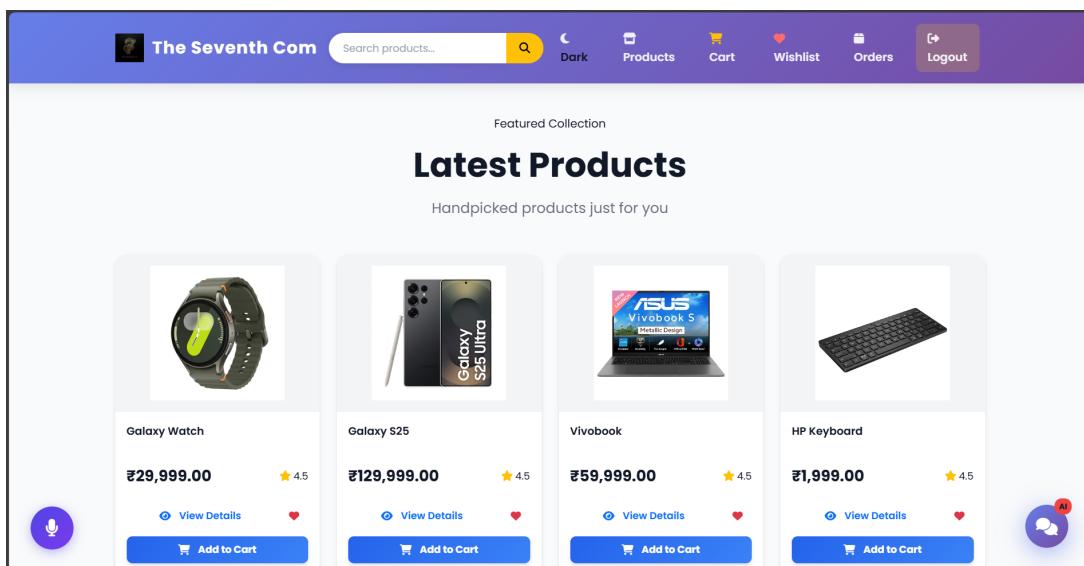


Figure 5.a: Home Page with Voice Search and AI Copilot Widget

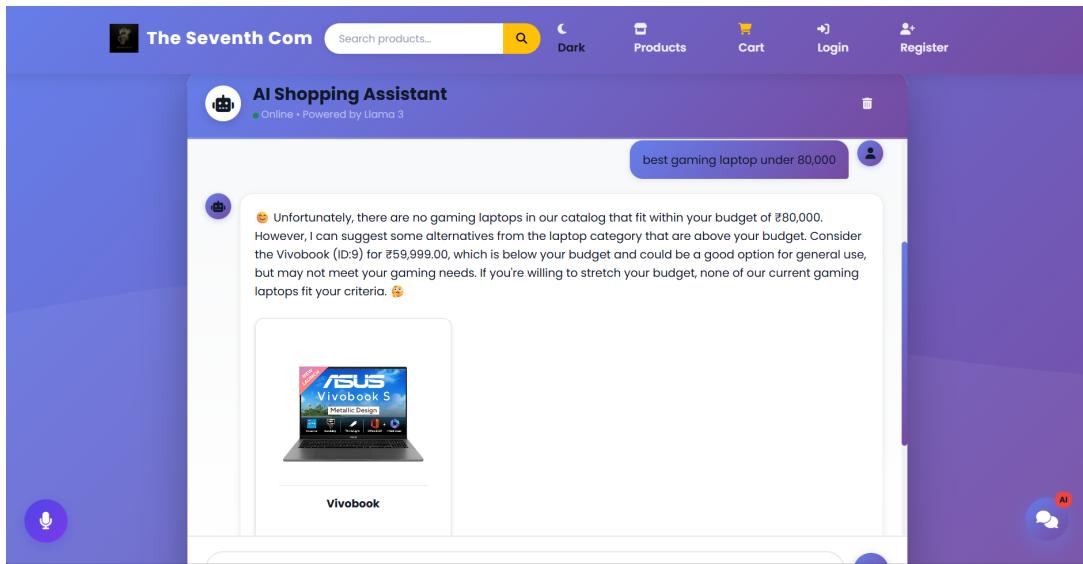


Figure 5.b: AI Search Results for "Best gaming laptop under 80k"

## 5.2 Comparison with Existing Systems

The proposed system was evaluated against traditional e-commerce platforms. A comparative analysis based on key features is presented below.

Table 5.a: Comparison of AI Powered Store vs. Traditional Platforms

Sl. No.	Feature	Traditional commerce	E-	AI Powered Store
1	Search Mechanism	Keyword Matching		Natural Language Understanding (NLP)
2	Customer Support	FAQ / Human Agents		24/7 AI Copilot
3	Product Visualization	Static Images		Interactive 3D Models
4	Review Analysis	Manual Reading		Automated AI Summary
5	User Interaction	Click-based		Voice & Chat-based

## 5.3 Performance Evaluation

Performance testing was conducted to measure the latency of AI responses. On average, the Groq API returned search results in **1.2 seconds** and review summaries in **1.5 seconds**. This low latency ensures that the user flow remains uninterrupted, providing a near-instantaneous experience comparable to standard database queries.

## AI Powered Ecommerce Store

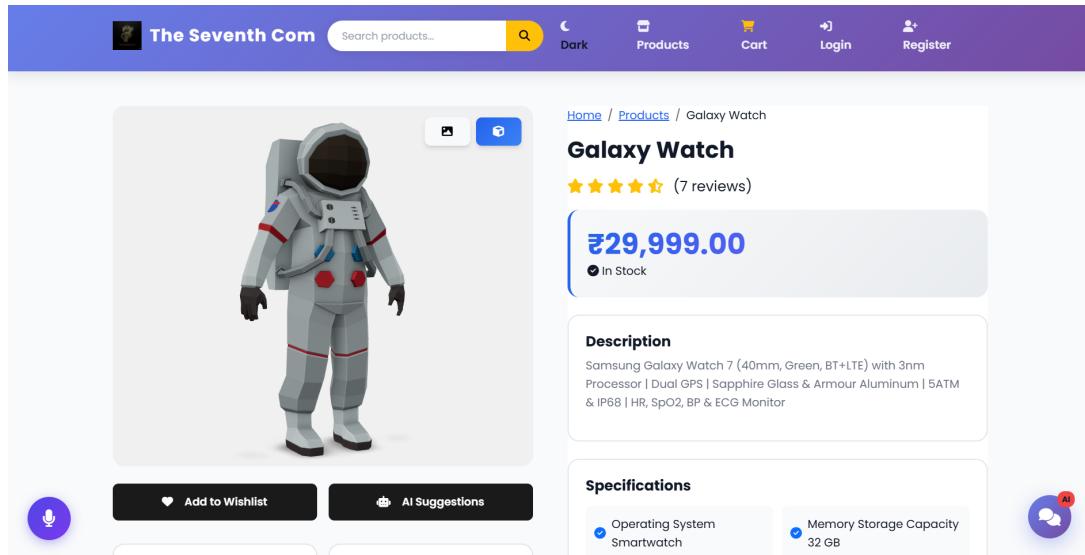


Figure 5.c: Product Detail Page with Interactive 3D Model

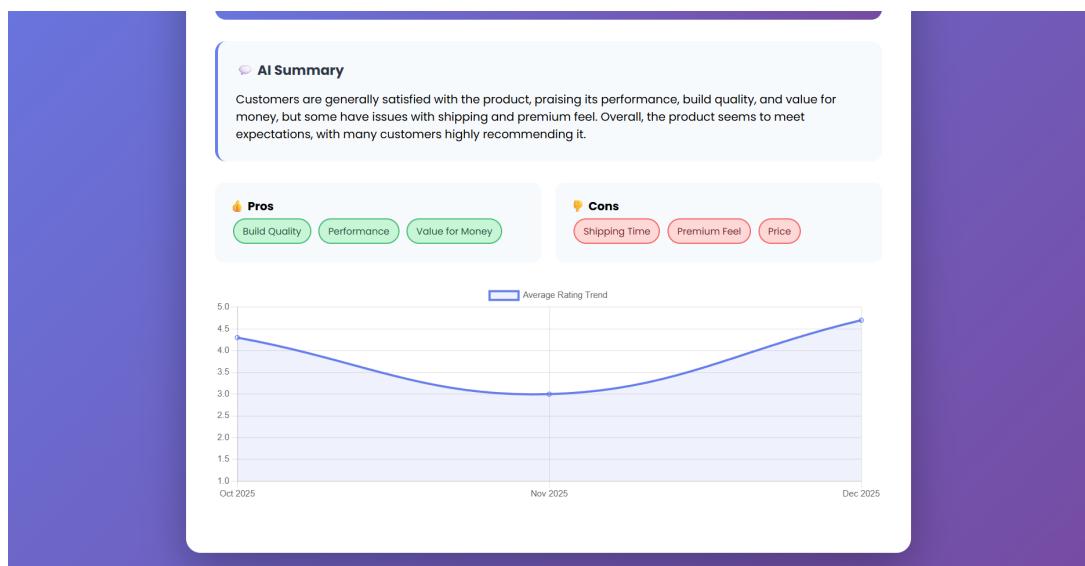


Figure 5.d: AI-Generated Review Summary and Sentiment Analysis

# Chapter 6

## Conclusion and Future Enhancements

### 6.1 Conclusion

The “**AI Powered Ecommerce Store**” project successfully demonstrates the transformative potential of integrating Generative AI into modern web applications. By replacing static interfaces with intelligent, conversational agents, the platform significantly enhances user engagement and operational efficiency. The **AI Copilot** and **Search Assistant** bridge the gap between physical in-store assistance and online convenience, solving key industry challenges like discovery friction and decision paralysis.

This outcome directly contributes to United Nations Sustainable Development Goal (SDG) 9: Industry, Innovation, and Infrastructure by adopting cutting-edge AI technologies to modernize digital commerce, and SDG 8: Decent Work and Economic Growth by automating routine support tasks, allowing businesses to scale efficiently.

### 6.2 Limitations

While the system achieves its core objectives, there are certain limitations:

- **API Dependency:** The system relies on the external Groq API. Any downtime or rate limiting from the provider can affect AI features.

- **Latency:** Although optimized, AI responses can occasionally take 2-3 seconds, which is slower than traditional database queries.
- **Browser Compatibility:** The 3D visualization features require WebGL support, which may not perform optimally on older devices or browsers.
- **Context Window:** The AI's memory is limited to the last 10 messages, meaning it may lose context in very long conversations.

### 6.3 Future Enhancements

To further evolve the platform, the following enhancements are proposed:

- **Augmented Reality (AR):** allowing users to project 3D products into their real-world environment using their phone camera.
- **Voice Biometrics:** Implementing voice authentication for secure and password-less login.
- **Multi-language Support:** Fine-tuning the AI model to support regional languages for broader accessibility.
- **Predictive Analytics:** Using machine learning to predict user preferences and pre-load products before they even search.
- **Image Search:** Allowing users to upload photos to find similar products using computer vision.

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## Appendix A

### Figures/Tables/ Screen Shots

[Insert your appendix content here]

## Appendix B

## Publications

[Publication Details/Certificate/Patents]