

# ABSTRACT

This report presents Geneva Clothing, a highly scalable full stack e-commerce platform developed as a premium prototype using Java and Spring Boot as the core backend framework. Leveraging Spring Data JPA, Spring Security, JWT authentication, BCrypt hashing, CORS control, and SQL injection prevention, the system ensures enterprise level security and fast backend response times. The backend architecture strictly follows SOLID principles for maintainability, extensibility, and scalability, enabling seamless integration with PostgreSQL and future microservices. The scalable RESTful API is available in the local network (LAN) during development and testing, allowing secure internal access via private IP. The scalable RESTful API supports product catalog, cart persistence, order simulation, and role-based admin controls. Built using the Waterfall model, the system demonstrates robust, secure, and high-performance backend design suitable for real-world deployment. Future enhancements include real payment gateways, AI-driven recommendations, and horizontal scaling with Redis caching.

**Keywords :** Spring Boot, Scalability, Security, JWT, SOLID Principles, LAN-Accessible Backend, PostgreSQL

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## **LIST OF ABBREVIATIONS**

AI	Artificial Intelligence
AIEO	Artificial Intelligence Engine Optimization
API	Application Programmable Interface
AR	Augmented Reality
B2B	Business to Business
B2C	Business to Consumer
C2C	Consumer to Consumer
CSS	Cascading Style Sheet
DOM	Document Object Manipulation
HTML	HyperText MarkUp Language
HTTPS	HyperText Transfer Protocol Secure
JPA	Java Persistence Application
JS	Javascript
JWT	JSON Web Tokens
MVC	Model View Controller
OAuth	Open Authorization
REST	Representational State Transfer
SEO	Search Engine Optimization
SPA	Single Page Application
SQL	Structured Query Language
TAM	Total Addressable Market
UI	User Interface
UX	User Experience
XSS	Cross Site Scripting

# **Chapter 1. INTRODUCTION**

## **1.1 Introduction**

E-commerce or electronic commerce, refers to the buying and selling of goods and services using the internet, along with the transfer of money and data to complete these transactions. According to a publication, e-commerce "lets people purchase goods and exchange information on business transactions online," [1] highlighting its role as a transformative business channel enabled by the internet. This definition underscores how e-commerce facilitates seamless interactions, from product browsing to secure payments, encompassing models such as business-to-consumer (B2C), business-to-business (B2B), and consumer-to-consumer (C2C). As noted in another overview, the rapid growth of technology and the internet has positioned e-commerce as a key mechanism for businesses to go global at the touch of a button, driven by advancements in information and communications technologies[2].The global e-commerce market continues to expand, with worldwide retail sales exceeding \$5.8 trillion in 2023 and projections for further growth fueled by mobile devices and digital payments [3].

The Geneva Clothing e-commerce website is a full-stack project designed to demonstrate a modern, premium online fashion store. It is built using HTML, CSS, JavaScript, and Bootstrap for the frontend, and Spring Boot (Java) with SQL for the backend. The system features a clean, responsive layout with smooth animations, video integration, customer testimonials, and social media elements to create a high end user experience.

Though the physical store location in “Kupondole, Lalitpur” and services like in-store pickup, appointment booking, and global returns are fictional, they are included to enhance design realism and showcase complete e-commerce functionality. The site includes dynamic sections such as product collections, pattern galleries, and a “We Love Good Compliment” testimonial area all aimed at building trust and engagement.

This project stands out by combining technical efficiency with visual excellence, targeting a clear Total Addressable Market of fashion conscious digital shoppers. It serves as a professional grade prototype that could support real business operations with minimal changes and little to none limitations

## 1.2 Problem Statement

Most existing e-commerce websites, particularly student and small-scale projects, suffer from significant limitations that reduce user engagement and market potential:

- 1. Outdated and Plain Design:** Many sites use basic templates with poor typography, low-quality images, and no visual hierarchy, resulting in a cheap and unprofessional appearance.
- 2. Lack of Premium User Experience:** Absence of modern UI elements such as smooth animations, video content, loading effects, and interactive transitions fails to create a luxury or trustworthy brand feel.
- 3. Static and Unengaging Content:** Pages lack dynamic features like customer testimonials, social proof, or lifestyle media, making the shopping experience dull and unconvincing.
- 4. Inefficient Technical Architecture:** Overuse of plain HTML and CSS without JavaScript and jQuery interactivity or scalable backend systems (like Spring Boot + SQL) leads to slow, rigid, and hard to maintain platforms.
- 5. Lack of OrderManagement and Packing System :** Most of the e-commerce website don't have a dedicated order management system integrated to manage the orders and packing.

This project addresses these gaps by delivering a visually rich, interactive, and technically robust e-commerce system with a strong premium identity.

## 1.3 Objectives

The main aim of our project is to develop a dedicated web application for selling branded clothing through this E-Commerce System . The objectives are :

The main objectives of this project are:

- 1. To develop a visually stunning and premium e-commerce website that delivers a luxury shopping experience through modern design, smooth animations, and high-quality media integration.**

2. To develop Order Management System for managing orders and packing orders along with proper notifications to the user.
3. To implement a full-stack system using HTML, CSS, JavaScript, and jQuery for the frontend and Spring Boot with SQL for the backend to ensure scalability, performance, and maintainability.
4. To create a strong brand identity using fictional yet realistic features (e.g., store location, in-store services, global returns) to demonstrate complete e-commerce functionality in a project context.
5. To target a clear Total Addressable Market (TAM) of fashion-conscious, digitally active consumers by offering a premium, mobile-responsive, and intuitive online shopping platform.
6. To set a benchmark for academic and prototype-level e-commerce projects by combining technical excellence with superior UI/UX design, surpassing the quality of typical student or basic commercial sites.

## **1.4 Scope and Limitations**

### **Scope**

- Full-stack e-commerce prototype using HTML, CSS, JS, jQuery (frontend) and Spring Boot with SQL (backend).
- Responsive, premium UI with animations, video, loading effects, and testimonial carousel.
- Fictional services (store pickup, appointments, global returns) implemented for design realism.
- Live demo deployed at <https://genevaclothingnepal.vercel.app/>.

### **Limitations**

- No real payment or live transactions checkout is simulated.
- No physical store or actual inventory all location and stock data are fictional.

- Not tested for high traffic or with SEO,AIEO and marketing tools.
- Some Design Errors have caused minor issues in the overall logic.

## **1.5 Report Organization**

This report is structured into six chapters to provide a clear, logical, and comprehensive documentation of the Geneva Clothing E-commerce System project. Each chapter builds upon the previous one, following the Waterfall methodology and academic reporting standards

**Chapter 1:** Defines e-commerce , introduces Geneva Clothing as a premium full-stack prototype, and outlines problems, objectives, scope, and report structure.

**Chapter 2:** Reviews literature on e-commerce evolution, UX, security, and tech stack; specifies functional/non-functional requirements and user roles.

**Chapter 3:** Explains development model with five adapted phases: scoping, design, development, implementation, and revision tailored to fashion e-commerce.

**Chapter 4:** Presents 3-tier architecture, PostgreSQL schema, and activity diagrams for admin and buyer workflows.

**Chapter 5:** Details tools (HTML/CSS/Javascript, Spring Boot, PostgreSQL), deployment, and testing (unit, system, acceptance) with test cases.

**Chapter 6:** Suggests enhancements (payments, AI, mobile app), summarizes achievements, and highlights TAM potential.

# **Chapter : 2 REQUIREMENT ANALYSIS**

## **2.1 Literature Review**

### **2.1.1 Introduction to E-commerce and its Evolution**

E-commerce has transformed global retail, evolving from simple online catalogs in the early 1990s to sophisticated, Data Science powered platforms today. According to Laudon and Traver (2020), e-commerce is defined as “digitally enabled commercial transactions between and among organizations and individuals,” emphasizing the role of the internet, mobile devices, and cloud computing[3]. The first secure online purchase occurred in 1994 through NetMarket, marking the beginning of B2C e-commerce. By 2023, global retail e-commerce sales exceeded \$5.8 trillion, projected to reach \$8.1 trillion by 2027 [4].

Key evolutionary phases include:

- Phase 1 (1995–2000): Basic websites (e.g., Amazon, eBay) focused on catalog display.
- Phase 2 (2001–2010): Rise of payment gateways, mobile commerce (m-commerce), and Web 2.0 interactivity.
- Phase 3 (2011–2020): Omnichannel integration, social commerce, and big data analytics.
- Phase 4 (2021–present): AI personalization, voice commerce, AR try-ons, and blockchain-based payments.

This project aligns with Phase 4 standards by incorporating responsive design, social proof, video content, and scalable backend architecture to support future AI and personalization features.

### **2.1.2 Recommender Systems**

Recommender systems are critical for increasing user engagement and sales. A paper by Linden et al. (2003) on Amazon’s item-to-item collaborative filtering demonstrated that

personalized recommendations can boost sales by 35%[5]. Two main approaches dominate:

- Collaborative Filtering: Predicts user preferences based on similar users' behavior.
- Content-Based Filtering: Recommends items similar to those a user has liked (e.g., same brand, color).

Hybrid models combining both achieve higher accuracy. While this project does not include live recommendations due to data volume constraints, the database schema supports:

- Product tags and categories (for content-based).
- User purchase and view history (for collaborative).
- API endpoints ready for Spring ML integration (e.g., Apache Mahout or TensorFlow Java).

Future enhancements can leverage PostgreSQL's JSONB for flexible recommendation storage.

### **2.1.3 User Interface (UI) and User Experience (UX)**

Nielsen and Norman (2012) define UX through 10 usability heuristics, including aesthetic and minimalist design, consistency, and user control. In fashion e-commerce, UX directly impacts conversion rates. A study by Baymard Institute (2024) found that 76% of users abandon carts due to poor navigation or slow load times.

Premium brands like Net a Porter and Farfetch use:

- High-resolution imagery with zoom.
- Micro-interactions (e.g., heart icons, smooth transitions).
- Progressive loading and skeleton screens.
- Social proof via reviews and Instagram feeds.

This project implements:

- Bootstrap 5 for responsive, mobile first grids.
- jQuery animations for loading states (“Loading Collection...”).
- Video banners and testimonial carousels for emotional engagement.
- Clean typography and luxury color palette (white, black, gold accents) to evoke premium feel.

#### **2.1.4 Security and Privacy**

Security breaches cost e-commerce businesses billions annually. The OWASP Top 10 (2021) lists injection, broken authentication, and XSS among top risks. A research emphasizes defense-in-depth [6]. This project implements:

Threat	Mitigation
SQL Injection	JPA/Hibernate prepared statements, input validation
Brute Force	Rate limiting, account lockout after 5 failed logins
CORS Attacks	Strict @CrossOrigin policies (allowed origins only)
Unauthorized Access	Spring Security with RBAC: ROLE_USER, ROLE_ADMIN
Data Exposure	BCrypt password hashing, HTTPS enforcement
OAuth Readiness	Configured providers (Google, GitHub) for future use

**Table 1 : Security in E-commerce System**

All authentication flows follow OAuth 2.0 Connect standards. Audit logs are stored in PostgreSQL for compliance.

#### **2.1.5 Technology and Frameworks**

Front-end Technologies

- HTML5: Semantic structure (<section>, <article>).
- CSS3: Flexbox, Grid, custom properties, animations.

- JavaScript & jQuery: DOM manipulation, API calls event handling.
- Bootstrap 5: Responsive framework, components (modals, carousel), utility classes.

## Back-end Technologies

- Java Spring Boot: Auto-configuration, embedded server (Tomcat), REST APIs.
- Spring Data JPA: ORM with Hibernate, reduces boilerplate.
- Spring Security: Authentication, CSRF protection, method-level security.

## Databases

Type	Database	Pros	Cons	Suitability
Relational (SQL)	PostgreSQL	ACID, joins, JSONB, triggers	Rigid schema	Best for e-commerce (orders, users)
	MySQL	Fast reads, wide support	Less JSON support	Good alternative
NoSQL	MongoDB	Flexible schema, horizontal scaling	No transactions	Logs, catalogs
	Redis	In-memory, caching	Not persistent	Session store

**Table 2 : Databases and their comparisons**

Chosen: PostgreSQL deployed with SQL scripts for schema versioning. Supports full-text search, JSONB for product variants, and triggers for audit logs.

## 2.2 REQUIREMENT SPECIFICATION

### 2.2.1 Project Overview

The Geneva Clothing e-commerce platform is a full stack web application developed as a high quality academic and independent project to demonstrate a premium, responsive online fashion store. It simulates a complete shopping experience with modern UI/UX, secure backend logic, and scalable architecture using HTML, CSS, JavaScript, jQuery, Bootstrap 5 (frontend), and Spring Boot, JPA, Spring Security, PostgreSQL (backend).

The system supports product browsing, cart management, user authentication, and order simulation, delivering a luxury brand feel despite being a non-commercial prototype.

### 2.2.2 Scope

#### Will Include

- **Product Catalog:** Dynamic display with categories, filters, search, and high resolution images.
- **Shopping Cart:** Add and remove items, persist through database after logged-in.
- **Payment Processing:** Simulated checkout flow with form validation with stripe.
- **User Accounts:** Registration, login, profile management, order history.
- **Order Tracking:** View past orders with status (Pending, Shipped, Delivered and simulated).

#### Will Not Include

- Physical Inventory Management (real stock updates).
- In-Store point of sale Integration or physical store operations.
- Multi-language Support or Currency Conversion.

#### Stakeholders

- I. Customers (Guest & Registered) – Browse, shop, track orders.
- II. Administrators – Manage products, view orders, user roles.
- III. Developers – Deploy, debug, extend functionality.
- IV. Project Evaluators/Reviewers – Assess code quality, design, and documentation.

#### Objectives

- Deliver a visually premium, mobile-responsive e-commerce experience.
- Implement secure authentication & authorization using JWT and Spring Security.

- Demonstrate full-stack integration with REST APIs and relational database.
- Simulate end-to-end user journey from browsing to order confirmation.

### **2.2.3 Assumptions and Constraints**

#### **Assumptions**

- Users have stable internet and modern browsers (Chrome, Firefox, Safari).
- Users possess basic digital literacy (e.g., form filling, navigation).
- Deployment environment supports Java 17+, PostgreSQL, and HTTPS.
- Test data (products, reviews) is preloaded for demo purposes.

#### **Constraints**

- Timeline: Limited to academic/project duration.
- Budget: No cost for third-party services (free tiers only).
- Compliance: PCI DSS not applicable (no real payments), but security best practices followed.

#### **User Roles**

Role	Permissions & Interactions
Guest User	Browse catalog, add to cart, view product details, simulated checkout
Registered Customer	All guest actions + login, save cart, view order history, update profile
Admin	Full operations on products/users/orders, access analytics dashboard, manage roles

**Table 3 : Role based interaction in e-commerce system**

#### 2.2.4 System Overview

A web-based, full-stack e-commerce platform with:

- **Frontend:** Responsive SPA like interface using Bootstrap 5 + jQuery animations.
- **Backend:** Spring Boot REST API with JWT authentication, role-based access, and PostgreSQL persistence.
- **Key Features:** Product catalog, persistent cart, secure login, order simulation, admin panel (API-driven).
- **Deployment:** Frontend on Vercel, backend and database on Render. Another branch is also supports localhost and Local Area Network.

### 2.3 REQUIREMENT SPECIFICATION

#### 2.3.1 Non-Functional Requirements

Category	Requirement
Performance	Page load time < 2 seconds (90th percentile), API response < 500ms
Security	JWT auth, BCrypt hashing, CSRF protection, SQL injection prevention, rate limiting
Scalability	Modular Spring Boot services, database connection pooling, horizontal scaling ready
Usability	Mobile-first, intuitive navigation, loading states
Reliability	99% uptime in demo, proper error handling, fallback UI for failed requests
Maintainability	Clean code, MVC pattern, commented APIs, SQL scripts for schema

**Table 4 : Non-functional Requirements**

### **2.3.1 Functional Requirement**

Functional requirements describe what the system should do. They specify the system's behavior and features, outlining what the user can expect from the software. Functional requirements deal with what the system should do or provide for users. Each requirement should be clear, measurable, and tied to user or system interactions.

1. User Management
2. Product Catalog
3. Shopping Cart
4. Checkout
5. Order Management
6. Search and Recommendations
7. Admin Dashboard
8. Payment (ONLINE)

#### **2.3.1.1 Admin Module**

- Manage Categories
- Manage Products
- Manage Product Reviews
- Manage Customer Orders
- Manage Banners
- Logout

#### **2.3.1.2 Customer Module**

- Registration
- Login

- View Order List With Status
- Update profile
- Logout

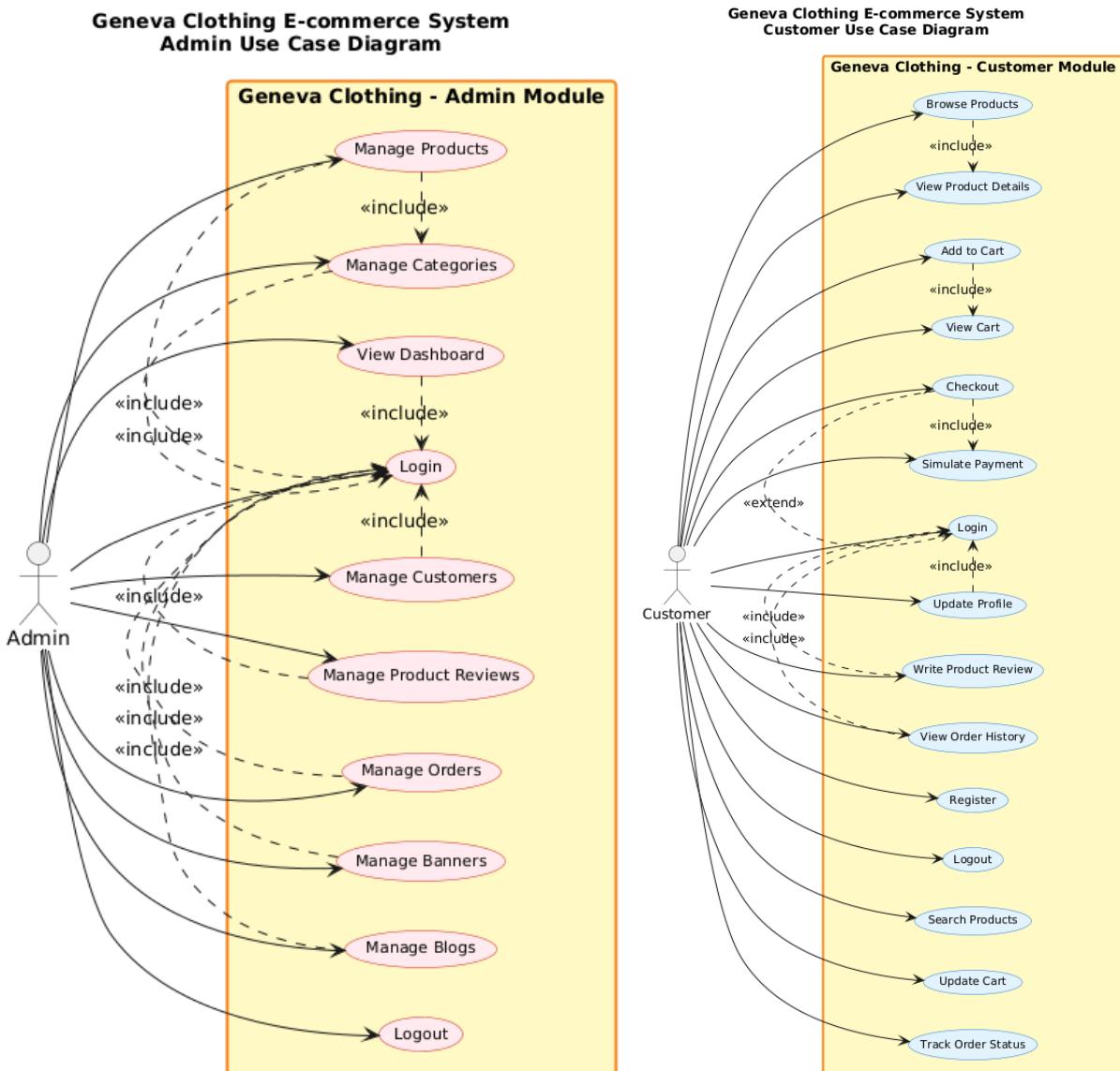


Figure 1 : Use case diagram of E-commerce System

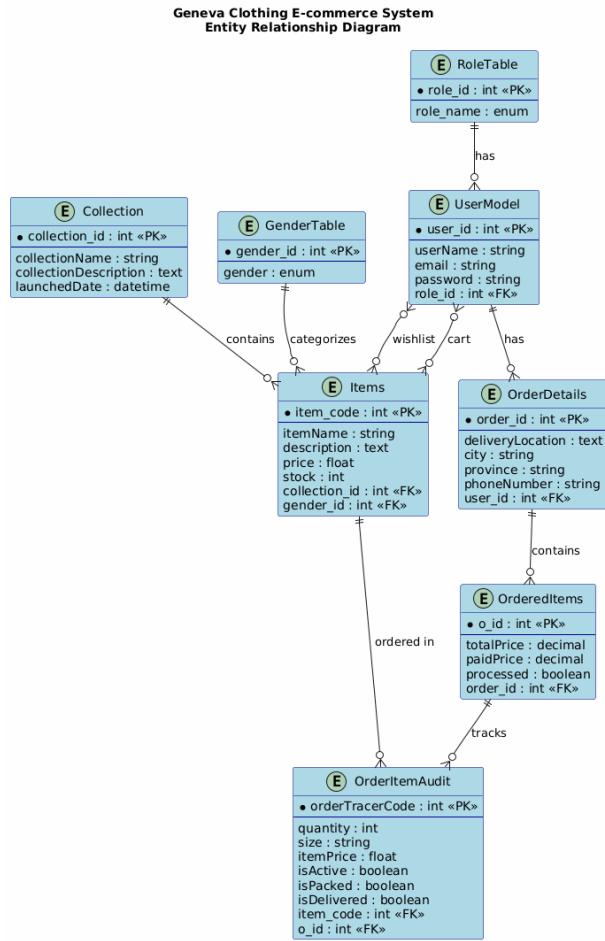


Figure 2 : Entity Relation diagram of Geneva Clothing

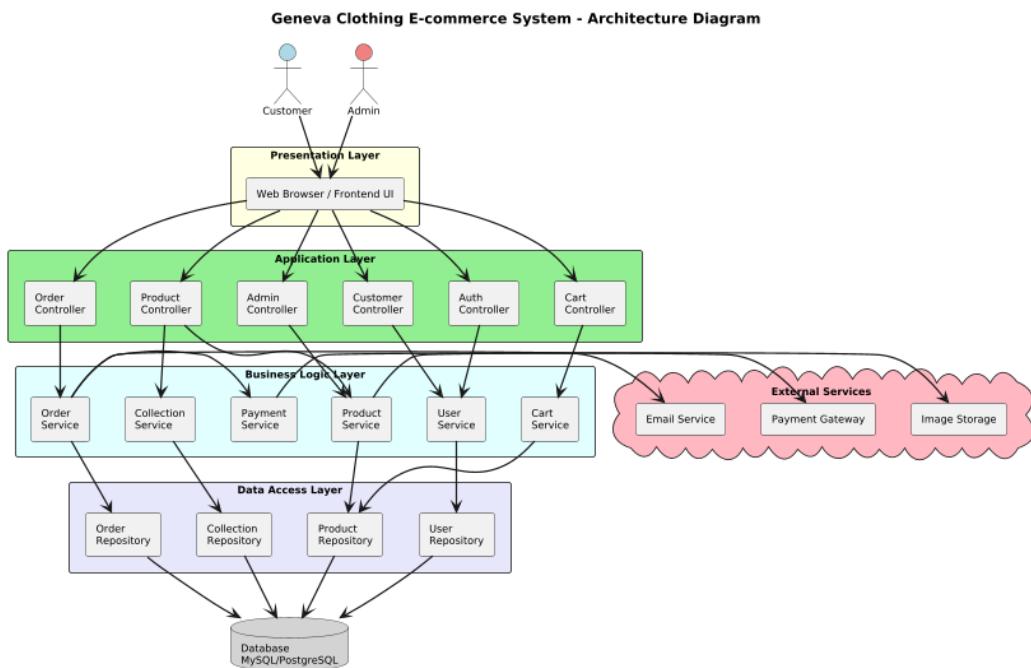


Figure 3 :Architecture diagram of Geneva Clothing

## **Chapter 3 :METHODOLOGY**

### **3.1 DESIGN METHODOLOGY**

The five phases during this project are :

#### **3.1.1 Scoping and Planning**

Objective: Define project boundaries, goals, and resources.

Activities in Clothing Brand Context:

- Identified target audience: Fashion-conscious digital shoppers (18–30 years).
- Defined core features: Premium UI, product catalog, cart, simulated checkout.
- Selected technology stack: HTML/CSS/JS/jQuery + Bootstrap 5 (frontend), Spring Boot + PostgreSQL (backend).
- Outlined fictional brand elements (Kupondole store, global returns) for realism.

#### **3.1.2. Conceptual Design and Research**

Objective: Translate requirements into visual and technical blueprints.

Activities:

- Conducted UI/UX research on premium fashion sites (e.g. h&m, Zara).
- Designed low-fidelity wireframes for home, product, cart, and checkout pages.
- Finalized color palette (white, black, gold), typography, and animations.
- Researched security best practices (JWT, Spring Security).
- Modeled database schema (users, products, orders, reviews).

#### **3.1.3 Development of Methodology**

Objective: Build frontend and backend systems based on approved designs.

Activities:

- Frontend:
  - Built responsive pages using HTML5, CSS3 (Flexbox/Grid), Bootstrap 5.
  - Implemented jQuery animations (loading states, carousels, hover effects).
- Backend:
  - Set up Spring Boot with Spring Data JPA, Spring Security, JWT.
  - Created REST APIs for products, auth, orders.
  - Designed PostgreSQL schema with relationships and constraints.
- Integration: Connected frontend to backend via JS fetch calls.

#### **4. Implementation of Methodology**

Objective: Deploy and integrate the complete system.

Activities:

- Hosted backend on Render with PostgreSQL database .
- Enabled HTTPS and rate limiting and other security measures.
- Performed end-to-end testing: User registration → Add to cart → Checkout → Order confirmation.
- Simulated admin actions via Postman (manage products, view orders).

#### **5. Revision of Methodology**

Objective: Evaluate, refine, and document the final system.

Activities:

- Fixed bugs: Cart persistence, JWT expiry, responsive breakpoints.
- Improved performance: Image optimization, lazy loading.
- Prepared final report with screenshots, code snippets, and future scope.

## **Chapter 4 : SYSTEM DESIGN**

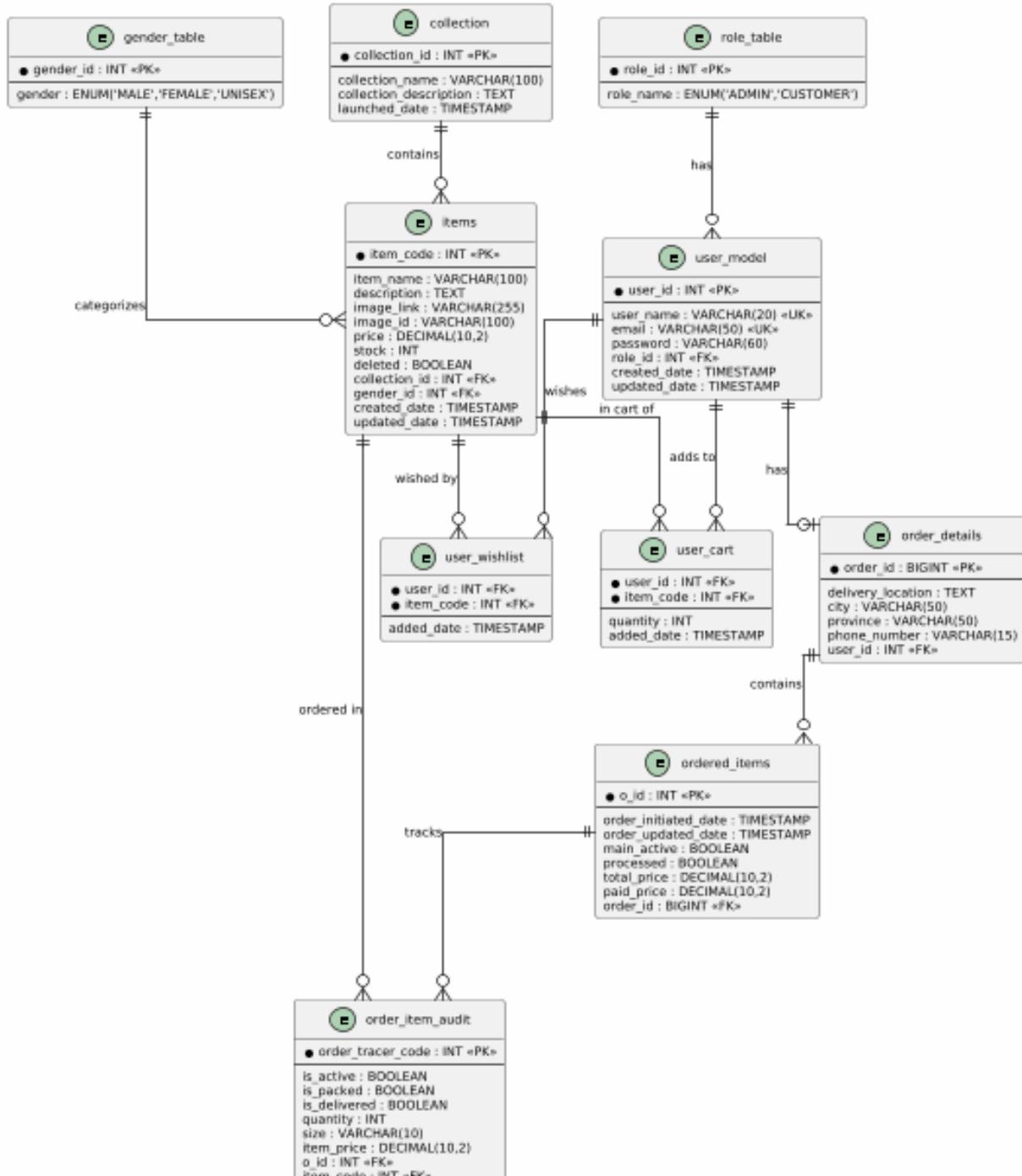
### **4.1 SYSTEM ARCHITECTURE AND OVERVIEW**

The project was designed and developed with the help of Object Oriented Design. The design phase transforms the requirements and analysis models into a detailed, implementation ready blueprint using Object-Oriented Design principles. The system is modeled around real world entities such as User, Admin, and Items where each object contains specific attributes and methods. Key OOP concepts like encapsulation, inheritance, polymorphism, and abstraction are applied to ensure modularity, reusability, and maintainability.

The system follows the Spring Boot MVC architecture integrated with JPA and Hibernate for data persistence and JWT-based authentication for secure access. The MVC structure separates the application into logical layers. The Model represents entity classes, the Controller handles API requests for item operations, and the Service layer manages business logic. The Geneva Clothing e-commerce system follows a three-tier client-server architecture with separation of concerns for scalability, maintainability, and security.

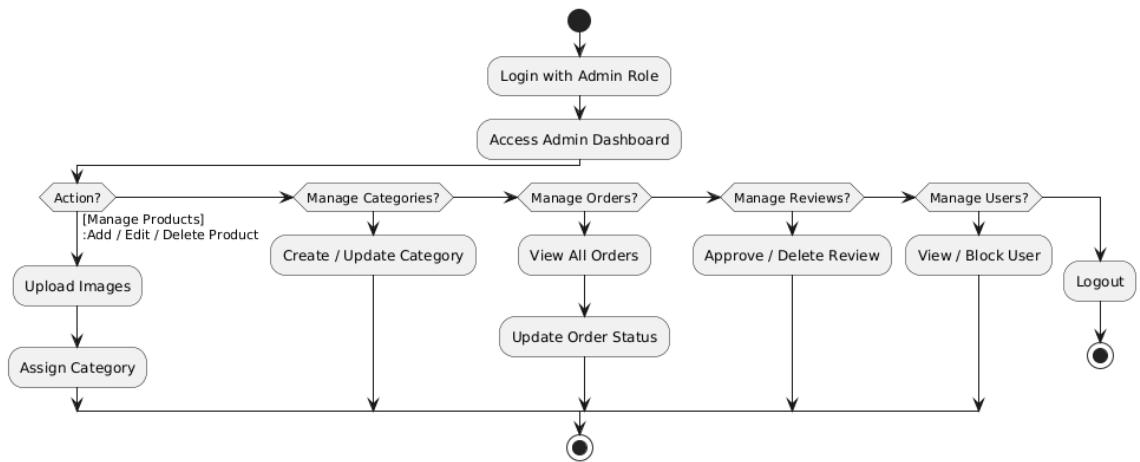
#### **4.1.1 System Architecture**

### Geneva Clothing E-commerce Database Schema Diagram

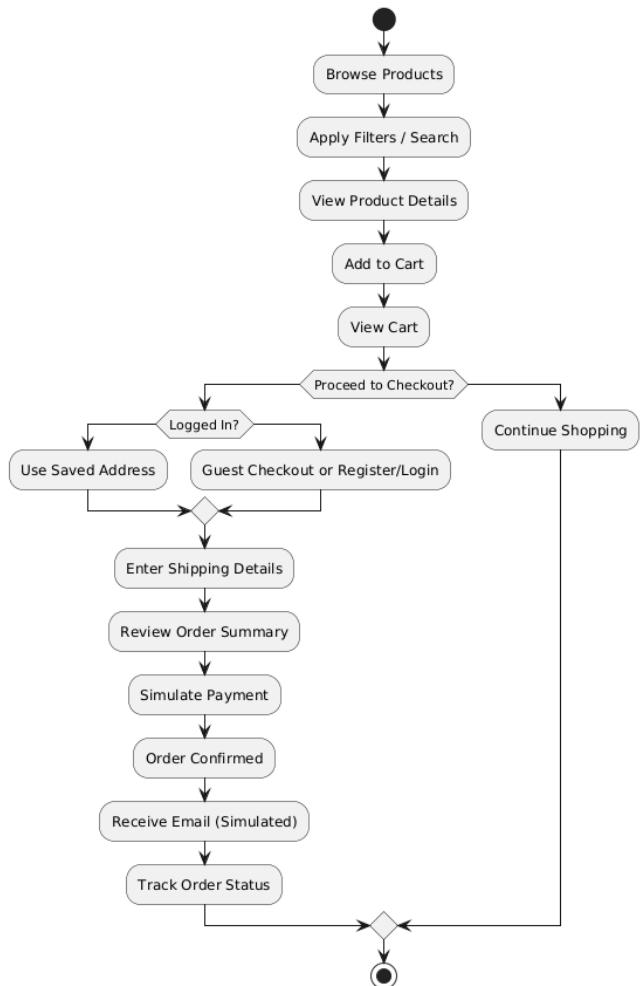


Symbol	Meaning		
PK	Primary Key		
FK	Foreign Key		
UK	Unique Key		
--o{	One to Many		
--o		One to One	

Figure 4 : Database design of Geneva Clothing



**Figure 5 : Activity Diagram for Admin in Geneva Clothing**



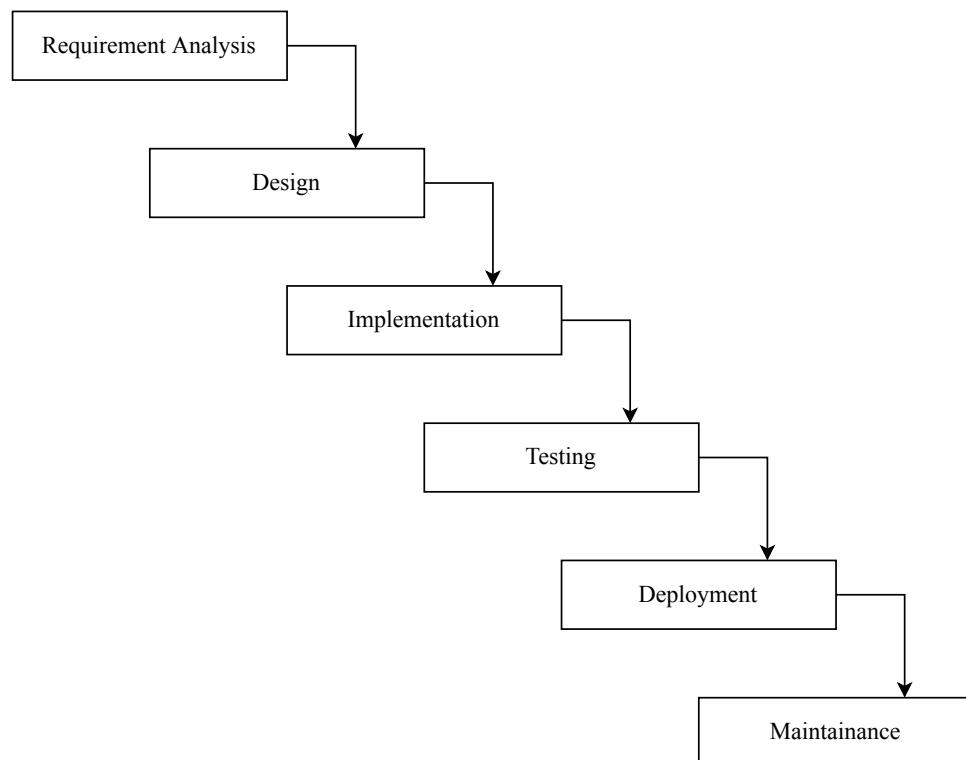
**Figure 6 : Activity Diagram for User in Geneva Clothing**

## 5 : IMPLEMENTATION AND TESTING

### 5.1 Implementation and Overview

The Geneva Clothing e-commerce project adopts the Waterfall Model a linear, sequential software development methodology due to its clarity, documentation focus, and suitability for well-defined academic projects. Each phase is completed before moving to the next, ensuring structured progress and easy traceability of requirements. While Agile is common in industry, Waterfall ensures complete, traceable deliverables perfect for project-based e-commerce prototypes.

The traditional Waterfall phases have been customized to align with the clothing brand e-commerce context and project goals.



**Figure 7 : Activity Diagram for Admin in Geneva Clothing**

## **5.2 TOOLS USED**

### **5.2.1 Front End**

- HTML5 Provides semantic structure using tags like <header>, <section>, <article>, and <video> for accessibility and SEO.
- CSS3 Custom styling with Flexbox, Grid, CSS variables, animations, and responsive breakpoints using media queries.
- JavaScript & jQuery Dynamic behavior: API calls, cart persistence, form validation, loading animations, and carousel effects.
- Bootstrap 5 Mobile-first framework for responsive grid, navbar, modals, carousel, and utility classes.

### **5.2.2 Back End**

- Java Spring Boot (3.x) Rapid development with auto-configuration, embedded Tomcat, REST controllers, and dependency injection.
- Spring Data JPA + Hibernate ORM for CRUD operations, lazy/eager loading, and query derivation from method names.
- Spring Security + JWT Secure authentication, BCrypt hashing, role-based access (ROLE\_USER, ROLE\_ADMIN), and CORS control.
- PostgreSQL Relational database with ACID compliance, JSONB support, indexes, and foreign key constraints.

### **5.2.3 OPERATING SYSTEM**

- Development: MacOS
- Backend Deployment: Render cloud platform
- Database: PostgreSQL hosted on Render
- Frontend: Static hosting on Vercel (Linux servers)

#### **5.2.4 Case Tool**

CASE (Computer-Aided Software Engineering) tools can aid in the development, maintenance, and documentation of software projects like music recommender android application. Following tools are used for this project:

##### **1. Integrated Development Environment (IDE):**

- IntelliJ Idea Ultimate : IntelliJ idea is the best IDE for Java and Kotlin development. Provided by JetBrains this is the best product for Java related development and goto IDE for java and kotlin developers.

##### **2. Diagramming Tools :**

- Draw.io and PlanetUML were used as the official diagramming tool for creating visual representation and system components and relationship. IntelliJ ideas built in feature of diagramming was also used.

##### **3. Version Control Tools:**

- Git is used for version control to track changes to our code base over time, collaborate on code development and manage releases and deployment.Github was used to manage the code remotely.

##### **4. Visual Studio Code**

- Visual Studio Code is open source IDE provided by Microsoft. Visual Studio was used to development of Frontend including html, css and js. VS Code was used to continuously test with branches using Git

##### **5. Postman**

- Postman was used for testing RestAPI Endpoints that were exposed by the application during the process of building the system.

## **5.3 Testing**

### **5.4.1 Testing Levels**

#### Unit Testing

- Tools: JUnit 5, Mockito
- Tested individual components:
  - ItemService.saveItem()
  - AuthController.login()

#### **5.4.2 Integration Testing**

- Tested API endpoints with Postman and curl
- Verified frontend-backend communication via AJAX

#### **5.4.3 System Testing**

System testing is performed on a completely integrated system to see if it meets the requirements.

- Conducted on live deployed version
- Validated end-to-end user flows:
  - Guest → Browse → Add to Cart → Checkout
  - Register → Login → View Orders → Write Review
  - Admin → Add Product → Update Order Status
- Checked **responsiveness** on mobile, tablet, desktop

#### **5.4.4 Acceptance Testing**

- 5 users tested UI/UX
- Feedback: “Premium feel”, “Smooth animations”, “Easy checkout”

#### 5.4.5 Test Cases

Module	Description	Steps	Expected Result	Status
User Auth	Register new user	1. Go to Register 2. Fill form 3. Submit	Account created, JWT issued	Passed
Product	View product list	1. Open homepage	Products load with images	Passed
Cart	Add to cart	1. Click "Add to Cart" 2. Cart Icon	Item appears, quantity = 1	Passed
Checkout	Simulate payment	1. Proceed to checkout 2. Fill mock card	Order confirmed, email simulated	Passed
Admin	Add product	1. Login as admin 2. Go to /admin/add Item 3. Fill form	Product saved in DB	Passed
Security	SQL Injection	Enter '; DROP TABLE users;-- in login	Query sanitized, no drop	Passed
Responsive	Mobile View	Open on 375px screen	Layout adjusts, menu collapses	Passed

**Table 5 : Different Tests in E-commerce System**

#### 5.5 Result Analysis

The System underwent both unit and integration testing to ensure that each component worked properly. This result demonstrated the items were added successfully created and stored in the testing database and then later modified as per request and deleted. The tests ensured the CRUD operation were successful and running of our System. Hence the tests performed as expected.

# **Chapter 6 :FUTURE WORK AND CONCLUSION**

## **6.1 FUTURE WORK**

The Geneva Clothing e-commerce system, while fully functional as a premium prototype, offers several high-impact enhancements for real-world deployment and scalability:

- 1. Real Payment Integration**
  - Integrate PayPal for live transactions.
  - Implement PCI DSS compliance, webhooks, and refund handling.
- 2. AI-Powered Recommendations**
  - Use collaborative filtering with TensorFlow Java or Python microservice.
  - Leverage PostgreSQL JSONB for user behavior logs.
- 3. Multi-Vendor Marketplace**
  - Add Seller Dashboard with inventory, payouts, and analytics.
  - Support commission-based revenue model.
- 4. Mobile App (React Native / Flutter)**
  - Build iOS & Android apps with push notifications.
  - Enable offline cart sync and AR try-on.
- 5. Advanced Admin Panel**
  - Full dashboard with charts (Chart.js), order heatmaps, and export (CSV/PDF) for data analysis.
  - Role based Access: SUPER\_ADMIN, SUPPORT, INVENTORY-MANAGER.

## 6.2 CONCLUSION

The Geneva Clothing e-commerce project successfully demonstrates a modern, premium, and secure online fashion store using full-stack web technologies. Built with HTML, CSS, JavaScript, jQuery, and Bootstrap 5 on the frontend, and Spring Boot, JPA, Spring Security, JWT, and PostgreSQL on the backend, the system delivers:

- A luxury user experience with smooth animations, video integration, and social proof.
- Robust functionality: Product catalog, persistent cart, user authentication, order simulation, and admin controls.
- High security standards: JWT, BCrypt, CORS, SQL injection prevention, and role-based access.
- Scalable architecture ready for real-world extensions.

Despite being a project-only prototype with fictional store elements, it exceeds typical academic standards in UI/UX quality, code structure, and deployment readiness. The live demo at <https://genevaclothingnepal.vercel.app> proves that student projects can rival professional platforms.

This system not only meets all functional and non-functional requirements but also establishes a strong foundation for a real clothing brand targeting fashion-forward digital consumers in Nepal and beyond.

## REFERENCES

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## APPENDIX

The screenshot shows the KAIRA website homepage. At the top, there is a navigation bar with links for HOME, SHOP ▾, PAGES ▾, CONTACT, SHARE, and SIGN IN. The main title "Pre-Fall Collection" is displayed prominently. Below the title is a descriptive text: "A rugged classic reimagined for the season. Crafted from durable cotton denim with a clean, timeless fit ideal for layering in the cooler pre-fall days. Stylish, versatile, and season-ready." Three fashion models are featured in the center: a man sitting on a bench wearing a dark puffer jacket over a white shirt, two women standing side-by-side wearing long beige coats and white pants, and a woman adjusting a white bucket hat while another person's hands are visible on her shoulders.

The screenshot shows the KAIRA website's account creation page. The title "Create Your Account" is centered at the top. Below it are five input fields with labels: "Email Address \*", "Username \*", "Password \*", "Confirm Password \*", and "Repeat your password". Each field has a corresponding placeholder text and a "Show" link. A large green "Sign Up" button is located at the bottom of the form. Below the form, a link says "Already have an account? Log in".

## Filter by Gender

[ALL](#)
[MALE](#)
[FEMALE](#)
[UNISEX](#)


AVERRA FEMME PANTS

1999.99\$

Soft-touch premium denim with a flattering fit. Averra Femme blends grace and edge for a confident, feminine look.



MARSEILLE CLOUD

150.00\$

A softly flowing white dress, exquisitely designed to capture elegance and grace, perfect for making a memorable impression.



SOFT LEATHER JACKET

100.00\$

A timeless leather jacket for men crafted to exude sophistication, confidence, and effortless style.



VIENNA ECLIPSE TOP

100.00\$

An elegant black top inspired by timeless charm, perfectly sleek and effortlessly chic.



## Shopping Cart

Review your selected items



Himalyan Rana

\$104.00

TOTAL  
\$104.00

SIZE

QUANTITY

Small

1



Himalaya Crimson Sweater

\$59.99

TOTAL  
\$59.99

SIZE

QUANTITY

Small

1

## Order Summary

Items ( 2 ) \$163.99

Shipping FREE

Tax Calculated at checkout

Total \$163.99

PROCEED TO CHECKOUT

# Complete Your Order

Review your order details and complete your purchase securely

**Delivery Information**

Delivery Address *	City *	Province *
Pattipa Marg	Sydney	Australia

Phone Number \*

9861077144

**Order Summary**

**\$ 164.00**  
Total Amount

**Order Items**

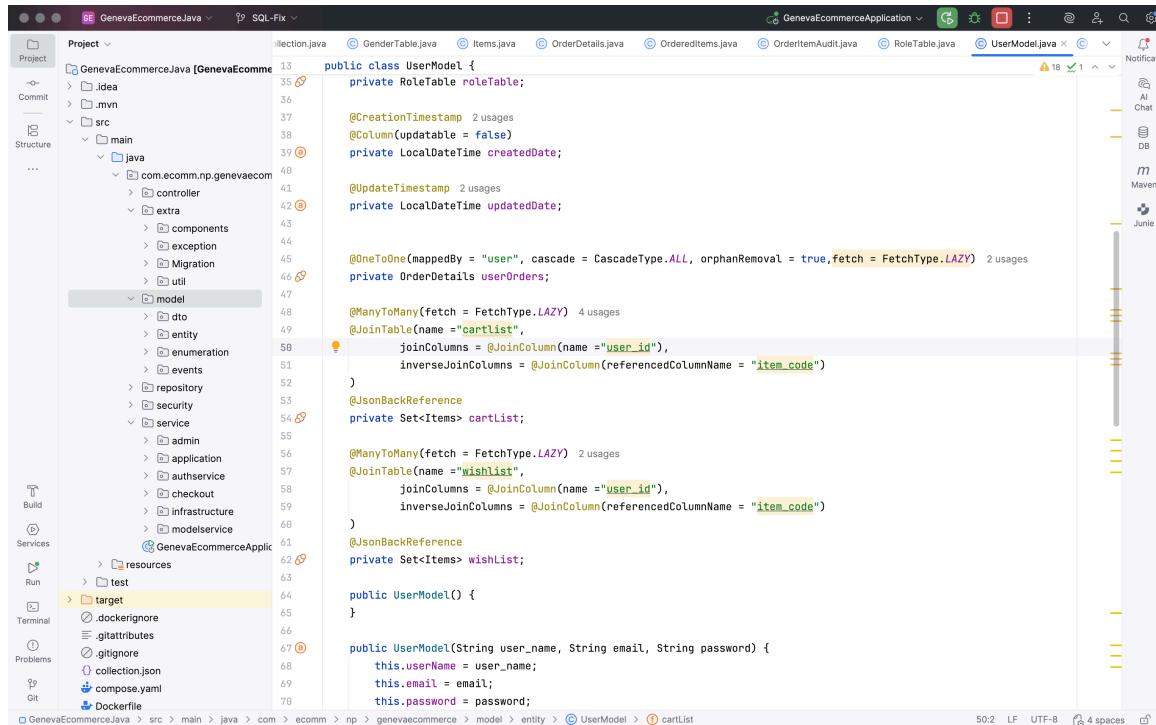
	Himalyan Rana Size: Small <b>104.00 each</b>	Qty: 1	104.00 Total
	Himalaya Crimson Sweater Size: Small <b>59.99 each</b>	Qty: 1	59.99 Total

**Payment Method**

Cash on Delivery  
Pay when your order arrives

OpenPay  
Pay online securely through OpenPay

**Place Order**



The screenshot shows a Java IDE interface with the following details:

- Project:** GenevaCommerceJava [GenevaCommerceApplication]
- Code Editor:** The file `UserModel.java` is open, showing Java code for a User Model class. The code includes annotations like `@Entity`, `@Column`, `@OneToOne`, `@ManyToMany`, and `@JsonBackReference`. It also includes methods like `getCartList()` and `getWishList()`.
- Project Structure:** The project structure shows a main package `com.ecomm.np.genevaecom` containing sub-packages like `controller`, `extra`, `model`, `repository`, `security`, `service`, and `util`. There are also `idea`, `.mvn`, and `target` directories.
- Terminal:** A terminal window is open in the `target` directory.
- Services:** Services like Maven and Juniper are listed.
- Build:** Build options are available.
- Run:** Run configuration is shown.
- Problems:** No problems are listed.
- Git:** Git status is shown.