جامعة بيروت العربية
BEIRUT ARAB UNIVERSITY

# Pc and More

by

**Mohammad Shaaban**
**Mohamed Farhat**
**Mohammad Alhalim**
**Ali hneineh**
**Houssein Harb**

**Project**

Submitted in Partial Fulfillment of the Requirements for the Degree of bachelor's in computer engineering

Department of Engineering
Faculty of Engineering

Year Spring- 2025

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**Supervised by**

**Prof. /Dr Imane Haidar**

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# Project Description

## Project Overview

The PC Parts Shop Website is an advanced e-commerce platform designed for PC lovers who want to get their new computer hardware effectively. The website integrates a chatbot for customer support (it can answer any question related to PCs), additionally it has an AI-powered hardware recognition model for identifying PC components, and an advanced AI that assists customers in creating the optimal PC based on their needs and budget.

## Objectives

- Develop a user-friendly website for buying PC components.
- Integrate a chatbot to assist customers with inquiries and questions.
- Implement a PC hardware recognition model for identifying components from images.
- Develop an AI-powered PC configurator to recommend compatible hardware setups.

## Background

The project lies under the e-commerce and technology domain, satisfying the growing demand regarding customized builds and PC hardware. As the uses of computers increases in multiple domains (AI applications, gaming, and content creation), the demands of better, more functional computers arise. However, people with no background information about computer hardware will face a problem trying to assemble one that meets their needs, here comes our software that enhances the users' experience by providing for the user automated responses and recommendations through AI-powered chatbot assistance. The user might have a certain budget for the PC, using our AI integration, the user enters the budget and a complete build with the highest specs and detailed description about each hardware part is generated and everything is between the boundaries of the user's budget.

## Literature Review

The PC Parts Shop Website development requires research of existing products and related field studies as it features a chatbot alongside a PC hardware recognition model and a PC AI configurator. This literature review examines current web platforms alongside e-commerce sites and scholarly research to understand how they advance AI technology in PC component recommendations and customer service chatbots.

### *PCPartPicker (USA)*

1) Description: Online service for assembling and buying personalized PC setups. Offers automated compatibility checks along with price comparison tools and user reviews from community members.
2) Advantages:
    - Ensures compatibility
    - Vast product database
    - Community-driven reviews
3) Problems:
    - No chatbot integration
    - Lacks AI-based recommendations

### *Newegg (USA)*

1) Description: Newegg operates as an online store that focuses exclusively on selling computer hardware components along with peripheral devices and additional accessories. Users can read customer reviews and product ratings while also finding frequent deals on the site.
2) Advantages:
    - Large inventory
    - Costumer review
    - Discount combo deals
3) Problems:
    - No AI-based PC builder
    - Requires manual compatibility checking

### *PC and Parts (Lebanon)*

1) Description: This Lebanese online store provides computer components as well as laptops and various computer accessories. Supports both individual consumers and corporate clients.
2) Advantages:
    - Supports local market
    - Competitive pricing
    - Customer support
3) Problems:
    - No AI configurator
    - Requires sending emails for PC configuration

### *Research Paper: AI-based PC Build Optimization (2021)*

1) Description: Discussion about implementing AI recommendation systems that can help users to optimize PC builds based on their budget, peripherals, and compatibility. For example, "I Tried Optimizing My PC With AI" is a YouTube video in which the creator explores AI to optimize a PC build.
2) Advantages:
    - Improve cost-efficiency
    - Ensure compatibility checks
3) Problems:
    - Lack of real-time product availability tracking

### *Research Paper: AI Chatbots in E-commerce (2020)*

1) Description: Some Studies about chatbots in e-commerce with AI integration for better product selection and customer support.
2) Advantages:
    - Reduces support workload
    - Enhances user engagement
    - Improves response accuracy
3) Problems:
    - Struggles with technical queries
    - Trust issues

### *Summary Table*

| Ref No. | Authors / Platform | Description | Advantages | Problems |
|---|---|---|---|---|
| 1 | PCPartPicker (USA) | Online platform for building and purchasing custom PC configurations. Provides automated compatibility checks, pricing comparisons, and community-driven reviews. | Ensure compatibility; Vast product database; Community-driven reviews | Lacks AI-based recommendations; No chatbot integration |
| 2 | Newegg (USA) | E-commerce site specializing in selling PC hardware, peripherals, and accessories. Provides customer reviews, product ratings, and frequent deals. | Large inventory; Customer reviews; Discount combo deals | No AI-based PC builder; Requires manual compatibility checking |
| 3 | PC and Parts (Lebanon) | Lebanese online store offering PC components, laptops, and accessories. Supports both individual consumers and corporate clients. | Supports local market; Competitive pricing; Customer support | No AI configurator; Limited online features |
| 4 | Research Paper: AI-based PC Build Optimization (2021) | Discusses the implementation of AI-driven recommendation systems to help users optimize PC builds based on budget, workload, and compatibility. | Improves cost-efficiency; Ensures compatibility checks | Lacks real-time product availability tracking |
| 5 | Research Paper: AI Chatbots in E-commerce (2020) | Study on AI-driven chatbots for product selection and customer support in e-commerce. | Reduces support workload; Enhances user engagement; Improves response accuracy | Struggles with technical queries; Trust issues |

*Table 1:Summary Table*

# Applications

## *Online PC Retail*

- Can be used as an online store for selling PC components, and accessories.
- Competes with websites like Newegg, PCPartPicker, and Amazon but it has an AI recommender.
- Helps Computer builders by suggesting compatible parts based on budget.

## *Computer Retail Stores*

- Can be used by physical Computer shops to improve customer experience.
- Employees can use the AI tools to recommend builds based on customer budget and needs.

# Alternative Designs

## *Shopify*

- A fully hosted, SaaS-based e-commerce platform that allows businesses to create and manage online stores with ease.

## *Magento (Adobe Commerce)*

- A powerful open-source e-commerce platform for large businesses.

## *Desktop application*

- A desktop-based e-commerce application could serve as a dedicated shopping platform with enhanced performance and offline capabilities. For example, we could integrate an offline AI chatbot.

## *Google Cloud Vision API*

- Pre-trained AI that detects objects, text, and product labels in images. Instead of using our gemini model.

## *Custom OpenCV + TensorFlow Model*

- If we want full control, we can train a custom TensorFlow or PyTorch model for product identification. This would be a better alternative and faster than our current model.

## *WhatsApp Chatbot*

- Instead of a website chatbot, we can integrate AI-powered support into WhatsApp or Messenger.

## *Our Design*

- What we did was use a A to Z website using the most used frameworks and integrated them with Gemini AI using API key (using python) and trained the model based on our dataset.

# Project Planning

## Constraints

### *Implementation environment of the current system*

- *Technology stack:* Our project is based on standard web technologies (HTML, CSS, JavaScript and some related frameworks, with a basic python backend), this environment is sufficient for only simple e-commerce site which limits our abilities in using more complex and efficient interface.

### *Partners and collaboration*

- *Technical background:* Our team has basic to intermediate knowledge in different technologies used, so this means that we cannot help each other when needed. If anything goes wrong in the backend for example, we won't be able to help the backend dev guy.

### *Off-the-shelf Software*

- *Customization Limitations:* Using pre-built solutions speeds up development but may impose restrictions on customization and flexibility, potentially limiting the project's uniqueness.

### *Schedule Constraints*

- *Fixed Academic Timeline:* The project must be finished within our semester, with main milestones (prototype, testing, final submission) that are scheduled throughout the term
- *Tight phases deadline:* Each phase has its own submission deadline (documentation submission); This means that going back to the old phase to add or modify any new feature would not work, we must stick with our pre-defined plan.

### *Budget Constrains*

- *Limited Funding:* Each team member contributes a little bit of his savings, so funding is minimal. This restricts spending on premium hosting services and purchasing the required APIs to achieve our project milestones.
- *Reliance on Free Resources:* The project primarily uses free and open-source solutions, which are cost-effective but might not offer the same performance as commercial alternatives.

# Project Issues

## *Data Security Implementation Strategy*

- The security protocols for user accounts (such as OAuth) compared to conventional email password authentication methods remain undecided.
- The evaluation of encryption techniques used for safeguarding sensitive user information is in debate, with Advanced Encryption Standard (AES) and Rivest-Shamir-Adleman (RSA) algorithms being contemplated.
- The team has not yet reached a mutual consensus regarding the most effective strategy to ensure adherence to GDPR and PCI-DSS compliance requirements

## *Supplier and Inventory Management System*

- Delayed development of a real-time inventory update system.
- Unconcluded decisions on whether to build integration with supplier APIs or use manual entry for stock levels.
- There is a constraint concerning the management of out-of-stock items to avoid the risk of overselling.

## *Data Migration Process*

- The team has not decided on the best way to move user data, product lists, and order records.
- The team is debating this question: Step-by-step migration or direct cutover?
- Post-migration data validation techniques are under deliberation.

## *AI Model Bias and Inaccuracy*

- Recommendations made by AI might show preference towards certain brands or overlook user-specific requirements.
- The ways to detect and correct bias in AI models are still being developed.
- The group hesitates on whether to let users manually configure AI-recommended settings.

## *Financial Sustainability*

- The revenue model (commission-based vs. direct product sales) is still being analyzed.
- The cost estimation for maintaining AI and chatbot services is undetermined.
- Fundings for long-term sustainability remain undecided.

## Team Members Tasks

### *AI/ML Developers*

1) Mohammed Farhat, Mohammad Shaaban: Responsible for developing the Image Recoginition model, the AI PC configurator and the website's next level chatbot.

### *Web Developers*

1) Mohammad Alhalim, Houssein Harb: Resposible for creating the front end of the website, with all required user interface.
2) Mohammad Alhalim, Ali Hneine: Resposible for integrating the front end to a efficient and maintainable backend.

### *Data Collection*

1) Mohammed Farhat: Responsible for gathering data in order to fine tune and train models.
2) Responsible for collecting frequently asked questions (FAQs) and other necessary input for training the chatbot.
3) Mohammed Alhalim, Houssein Harb: Responsible for organizing the Database for the website.

### *Work Documentation(Report and README)*

1) Mohammed Farhat, Mohammad Shaaban, Mohammad Alhalim, Houssein Harb, Ali Hneine: Responsible for writing and maintaining the project documentation, including the final report and README file.

### *Other Development Tools*

1) Mohammed Farhat, Mohammad Shaaban, Mohammad Alhalim, Houssein Harb, Ali Hneine: Responsible for managing and organizing the project on GitHub, ensuring proper version control and collaboration.

## Ethical Issues

### 1. *Data Privacy and Security*

- *Principle*: Respect for privacy and confidentiality (ACM Code: 1.6, IEEE Code: 1.7).
- *Issue:* The website may collect personal user data (e.g., names, payment details, and browsing history).

### 2. *Transparency in AI Decision-Making*

- *Principle:* Honesty and transparency in all forms of communication (ACM Code: 1.3, IEEE Code: 2.4).
- *Issue:* The AI-driven hardware recognition model and PC configurator generate automated recommendations.

### 3. *Bias and Fairness in AI Models*

- *Principle:* Fairness and non-discrimination (ACM Code: 1.4, IEEE Code: 1.2).
- *Issue:* AI algorithms may favor certain products or brands, introducing bias in recommendations.

### 4. *Intellectual Property Rights*

- *Proper Licensing:* Using product images, descriptions, and reviews that are properly licensed or attributed to avoid copyright infringement.

## Software Model Process

For PC and More website, we used a combination of the Waterfall model and Reuse-Oriented approach to guide development. These models were chosen to ensure that the project's requirements will be met while minimizing cost and development

### *Waterfall model*

The Waterfall model was selected for our project because it is a plan-driven model, sequential phases that ensure a well-structured processes. The model's emphasis on completing each phase before moving to the next starting from identifying requirements and specifications moving to development then validation and finally reaching the evolution phase. All of this aligns with what we need in PC and More which involves integrating AI models, a hardware recognition system, and an advanced e-commerce platform.

The Waterfall model is particularly effective when:

- Requirements are well-understood from the beginning.
- The project demands a linear approach where feedback loops are minimal.
- Documentation and systematic validation are critical.

### *Reuse-Oriented Approuch*

The reuse oriented model was chosen alongside with the waterfall to enhance efficiency by integrating pre-built software components. According to Dr Imane's PDF the Reuse-Oriented model is ideal when existing components can meet part of the system's requirements, reducing development time and risk, which is exactly the reason we used it.

The ready built components we used are:

- Tensorflow and Pytorch libraries for AI model development
- React components that we used for our front end
- Gemini Studio that we used for fine tuning our models
- Django ready to go snippets for our backend

In conclusion, we were able to create a fully functional and efficient ecommerce website using minimum cost and time duration.

# Feasibility Study

## *Demand for PC Parts*

The global PC market is experiencing growth, with increasing demand for custom PC builds that are designed for a lot of uses including: gaming, AI development, and many more uses. Consumers prefer PC builds based on the performance and the budget constraints rather than prebuilt systems that are limited.

## *Competitor Analysis*

- **Major Competitors:** Amazon, Newegg, Micro Center, PC and Parts.
- **Challenges:** Established competitors that have strong suppliers, fast shipping, and a trusted brand name
- **Opportunities:** Differentiation through AI-powered features:
  - ✓ AI PC build recommendations based on budget and preferences
  - ✓ Image based product identification to help users find components easily

## *AI Model Feasibility*

- **Functionality:** Utilize Gemini's multimodal capabilities to process and analyze images of PC components, enabling accurate identification and categorization.
- **Advantages:**
  - ✓ **Advanced Multimodal Processing:** Gemini's ability to handle text, images, audio, and video allows for comprehensive analysis of various data types.
  - ✓ **High Accuracy:** Leveraging Gemini's state-of-the-art performance can lead to precise product identification, enhancing user experience.

## *Estimated Costs*

| Category | Estimated Cost |
|---|---|
| Domain & Hosting | $100 per year |
| AI Models | $50 per 1000000 tokens |
| Web Development | $0 (self-developed) |

*Table 2:Estimated Costs Table*

## *Break-even Analysis*

Expected profitability within **6-12 months**, assuming steady traffic growth and partnerships with suppliers.

## *Feasibility Verdict: Proceed with Adjustments*

- Focus on AI differentiation to stand out from competitors.
- Minimize hosting costs by using serverless solutions.
- Develop strategic partnerships for product sourcing.

By addressing the identified risks and leveraging AI features, the PC e-commerce shop has the potential to succeed in a competitive market.

# Tools/Technology

## *Programming Languages*

- HTML(Markup Language)
- CSS
- Javascript
- Python
- SQL

## *FrameWorks and Libraries*

- React.js
- Next.js
- Django
- GraphQL
- Pytorch
- Tenserflow
- Bootstrap
- Tailwind CSS

## *API Keys*

- Gemini API

## *Development Tools*

- GitHub
- Vscode

# Standards

## *IEEE 23026-2015 – Engineering and Management of Websites for Systems, Software, and Services Information.*

- Covers best practices for website usability, reliability, and maintainability.

## *UX/UI Design Conventions*

- Simple and Intuitive Navigation → Customers expect a clear menu with categories.
- Search Bar Always Visible → 30% of online shoppers use search immediately.
- Fast Checkout Process → One-page checkout or guest checkout improves conversions.
- High-Quality Product Images & Descriptions → Detailed images and specs reduce return rates.
- Persistent Cart (Shopping Cart Retention) → Saves cart contents even after leaving the page.

## *Performance & SEO Conventions*

- Mobile-First Design → Over 60% of online shopping happens on mobile.
- Fast Loading Speed (Under 3 Seconds) → Pages that take longer lose 40% of visitors.
- Schema Markup for Products (Structured Data) → Helps search engines show rich results.
- SEO-Friendly URLs (Clean & Descriptive) → Improves search ranking and click-through rates.

## Milestones

### *Project Kickoff & Requirement Gathering (✅ Completed)*

Project scope definition and objective alignment were prioritized during initial phases, with key capabilities including chatbot integration, AI configurator development, and hardware recognition modeling. (2 days)

### *System Architecture & Technology Stack Finalization (✅ Completed)*

Technology stack selection followed rigorous evaluation of frontend/backend synergies. Architectural debates between monolithic and microservices frameworks concluded with consensus-driven resolution. (1 week)

### *Prototype Development (✅ Completed)*

Functional prototypes encompassing UI/UX wireframes, foundational chatbot logic, and AI configurator proof-of-concept were successfully validated through stakeholder demonstrations. (3 days)

### *AI Configurator & Hardware Recognition Model Implementation (⏳ In Progress)*

Hardware compatibility algorithms are undergoing precision calibration. Continuous accuracy improvements are being implemented through iterative training cycles with augmented datasets (1 week)

### *Beta Testing & User Feedback Collection (🔜 Upcoming)*

Upon achieving core feature stability, comprehensive UX stress-testing will commence. Targeted feedback loops for chatbot responsiveness and configuration accuracy have been pre-scheduled. (2 week)

### *Performance Optimization & Scalability Testing (🔜 Upcoming)*

Load-balancing mechanisms will undergo simulated peak-traffic validation. Infrastructure elasticity will be enhanced through containerization strategies and database sharding protocols. (1 week)

### *Final Deployment & Marketing Launch (🔜 Upcoming)*

Platform readiness confirmation triggers phased rollout sequences. Concurrently, multi-channel awareness campaigns will activate to maximize market penetration velocity. (2 week)

# Requirements

## Use Cases

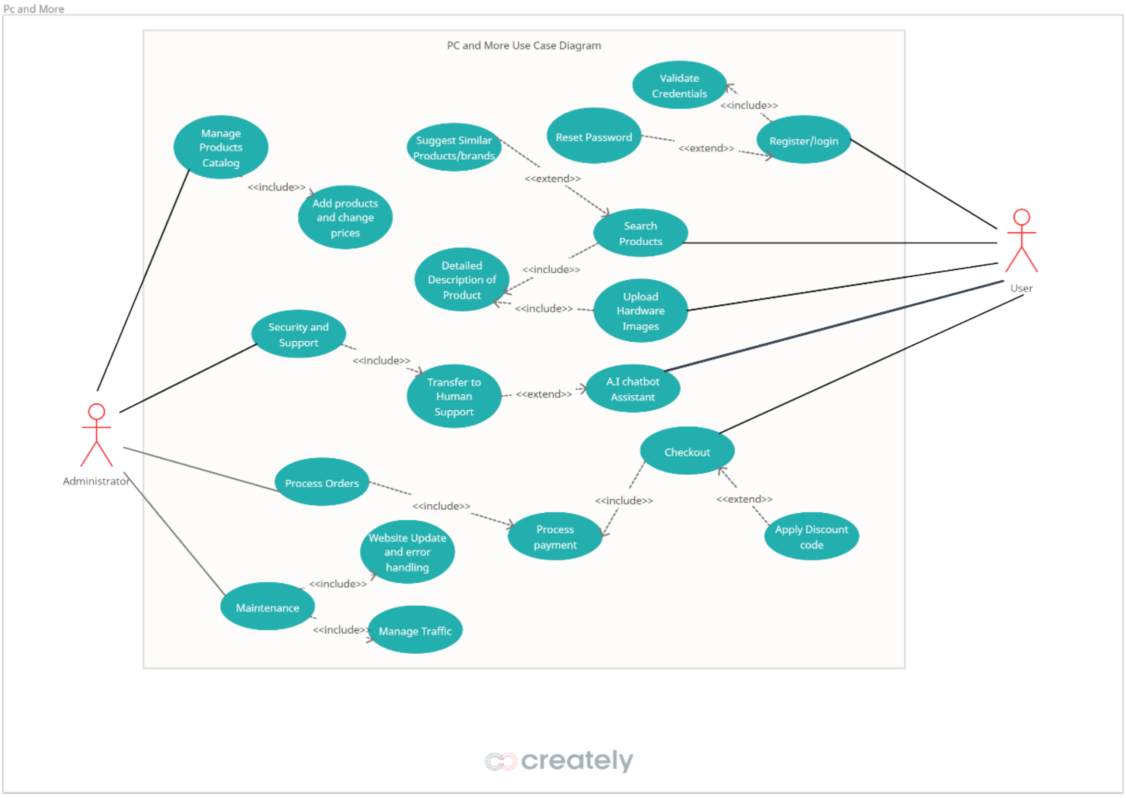


*Figure 1: Use Case Diagram*

This section begins to describe in more specific and precise detail exactly what steps the system takes in the course of its performance. Use cases serve not only to more specifically define the system (and its boundaries), but also to identify functional requirements, to identify initial objects / classes, and to organize the work.

## Functional Requirements

### *User Registration and Login*

- Users can create accounts using either a phone number or an email
- Users can change their passwords if forgotten
- Users can login using secure authentication system

### *Product Catalog Management*

- The website displays all PC components and categories
- Only admin users can modify or update data

### *Search and Product Recognition*

- Users can search for any product using keywords
- The system should support access to the camera to upload hardware images for recognition
- The AI model shall suggest matching or similar products

### *AI-Powered PC Configurator*

- Users shall be able to specify their budget, purpose (e.g., gaming, video editing, office work), and preferred brands and recommend a compatible set of components.

### *Chatbot Integration*

- The chatbot should assist the user by answering all his questions

### *Shopping Cart and Checkout*

- Users shall add products to a shopping cart
- The system shall calculate the total cost, including taxes and shipping fees
- Users shall proceed to check out and select a payment method
- Users can enter gift coupons upon buying

### *Order Management*

- Users shall view their order history and track ongoing orders
- Admins shall manage order processing, shipping, and cancellations

### *Payment Gateway*

- The system shall support secure online payment methods (e.g., credit/debit cards, digital wallets).
- Payment status updates shall be sent to users.

### *Notifications*

- Users shall receive notifications about promotions or order updates via email or SMS

# Data Requirements

## *Product Data*

*Attributes*

- Product Name (String, Required)
- Category (String, Required)
- Brand (String, Required)
- Price (Float, Required, greater than zero)
- Stock Quantity (Integer, Required, greater than zero)
- Description (Text, Optional)
- Product Image (File URL, Required)

*Storage & Constraints*

- Stored in PostgreSQL
- Unique Identifier per product (UID)
- Price validation to prevent negative values
- Stock quantity must be at least zero

## *User Data*

*Fields*

- User ID (ID, Primary Key)
- Full Name (String, Not Null)
- Email (String, Unique, Not Null)
- Password (Hashed, Not Null)
- Phone Number (String, optional)
- Address (JSON object supporting multiple addresses)
- Role (Admin, Seller, Customer)

*Constraints*

- Password must be hashed
- Email must be unique, no duplicate emails are allowed
- Address should follow a standard form

## *Order Data*

*Fields*

- Order ID (OID, Primary Key)
- User ID (Foreign Key to Users table)
- Products Ordered (Relational many-to-many)
- Total Price (Float, Not Null)
- Payment Status (Pending, Completed, Failed)
- Shipping Status (Processing, Shipped, Delivered)
- Order Date (Timestamp)

*Constraints*

- Each order must contain at least one product

### *AI Model Data*

*PC Build Recommendation Model*

- Input: Budget and preferred components
- Output: Suggested build (product IDs and explanation)

*Image Recognition Model*

- Input: PC component image
- Output: Predicted product name

### *Payment Data*

*Attributes*

- Transaction ID (TID)
- User ID (Foreign Key)
- Order ID (Foreign Key)
- Payment Method (Card, PayPal, etc.)
- Amount Paid (Float)
- Payment Status (Success, Failed, Pending)

*Constraints*

- Best to use third-party providers like Stripe or PayPal for handling transactions

### *Review & Rating Data*

*Fields*

- Review ID (RID, Primary Key)
- Product ID (Foreign Key)
- User ID (Foreign Key)
- Rating (Integer, 1 to 5)
- Review Text (Text, Optional)
- Timestamp

*Constraints*

- The ratings should be whole numbers (1-5)

### *Inventory & Supplier Data*

*Fields*

- Supplier ID (SID)
- Supplier Name (String)
- Contact Info (String/JSON)
- Products Supplied (Product IDs or names)
- Reorder Threshold (Stock alert level)

*Additional Requirements*

- Supplier performance should be tracked
- The inventory system should have alerts when stock is low

## Non-Functional Requirements

### *Performance Requirements*

- The System should respond to user requests with a limit of 1 second under normal conditions
- Database queries should be executed within 1 second for standard transactions
- The System should support 100 users minimum without performance degradation

### *Scalability Requirements*

- Handling of user traffic scaling up to 500 users
- Designing a support data expansion for the database to contain 1 million records

### *Availability Requirements*

- The system should be available all the time, ensuring minimal downtime
- The system maintenance should be scheduled outside peak hours

### *Security Requirements*

- Requirement of a multi-factor authentication for administration
- User data should be encrypted using AES-256 encryption
- The system should comply with GDPR and other relevant data protection regulations

### *Usability Requirements*

- User Interface should have no more than 3 clicks to access functionalities
- A help button should be provided to help users with navigation
- Support of light and dark themes according to user preference

### *Reliability Requirements*

- Backup data should be stored and protected offline in case of emergency
- Error handling should be an isolated functionality to reduce interference and data loss

### *Portability Requirements*

- The website should be compatible with different browsers such as Firefox, Chrome, and Edge
- The website should be compatible with different Operating systems such as Windows, Linux, and MacOS

### *Legal Requirements*

- The system should comply with industry standards such as ISO 27001 for information security
- All transactions should be maintained for at least 1 year for audit purposes
- Accessibility guidelines should be adhered to such as WCAG 2.1

# Design

## Class Diagram

Class: User

- - userID: String
- - name: String
- - email: String
- - password: String
- - phoneNumber: String
- - address: String

+ register()
+ login()
+ updateProfile()

Class: Product

- - productID: String
- - name: String
- - category: String
- - price: Float
- - stockQuantity: Int
- - description: String
- - imageURL: String

+ updateStock()
+ viewDetails()

Class: ShoppingCart

- - cartID: String
- - userID: String
- - items: List<Product>

+ addItem()
+ removeItem()
+ calculateTotal()

Class: Order

- - orderID: String
- - userID: String
- - items: List<Product>
- - totalPrice: Float
- - status: String
- - shippingAddress: String

+ placeOrder()
+ trackOrder()
Class: Payment

- - paymentID: String
- - orderID: String
- - amount: Float
- - method: String

- - status: String

+ processPayment()

Class: AIConfigurator
+ generateBuild(budget: Float, purpose: String): List<Product>

Class: ImageRecognizer
+ recognizeComponent(imageFile): String

Class: Chatbot
+ respondToQuery(query: String): String

Class: Review

- - reviewID: String
- - userID: String
- - productID: String
- - rating: Int
- - comment: String

+ submitReview()

Class: Admin (inherits User)
+ addProduct()
+ removeProduct()
+ viewReports()

Class: Supplier

- - supplierID: String
- - name: String
- - contactInfo: String
- - productList: List<Product>

+ updateStock()

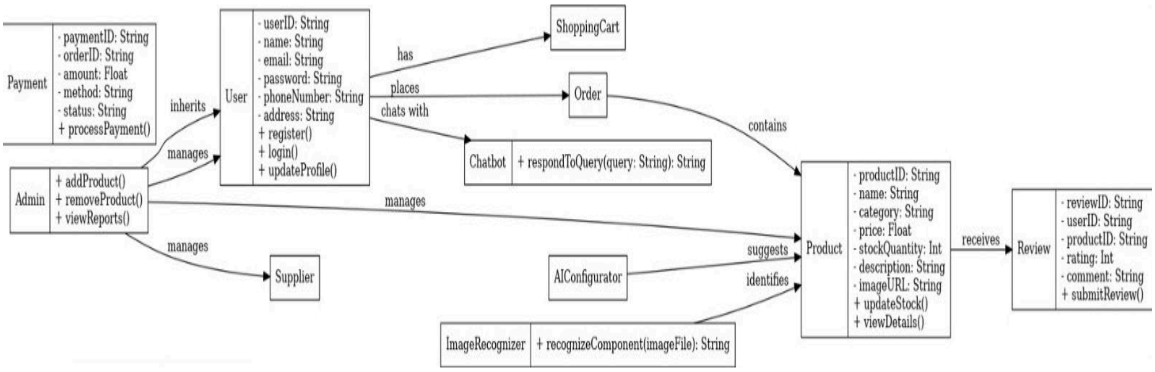


*Figure 2: Class Diagram*

## Context Diagram

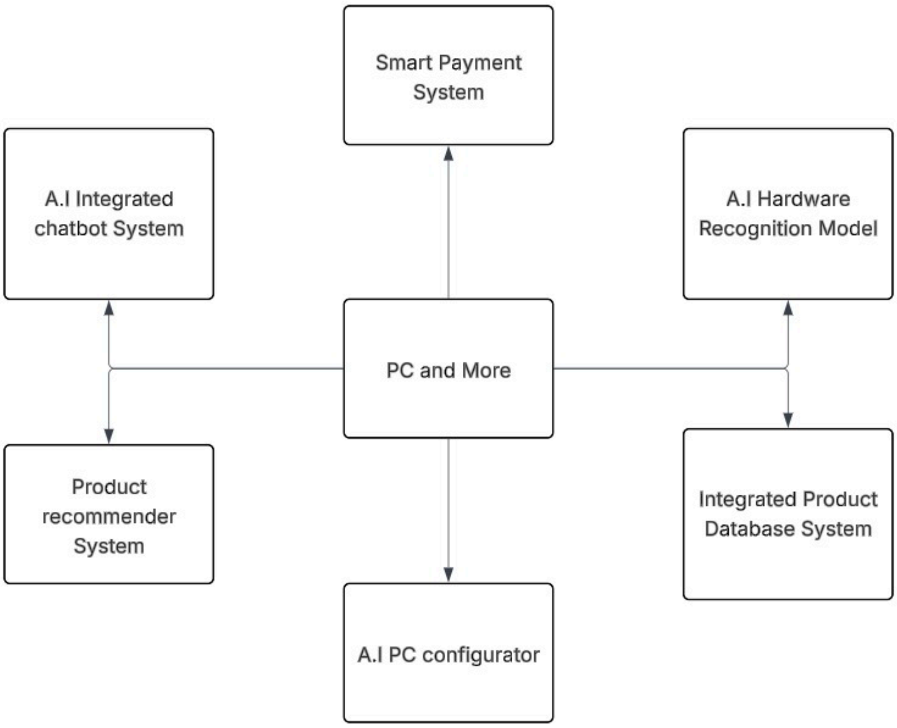

Smart Payment System
A.I Integrated chatbot System
A.I Hardware Recognition Model
PC and More
Product recommender System
Integrated Product Database System
A.I PC configurator

*Figure 3: Context Diagram*

## Sequence Diagram

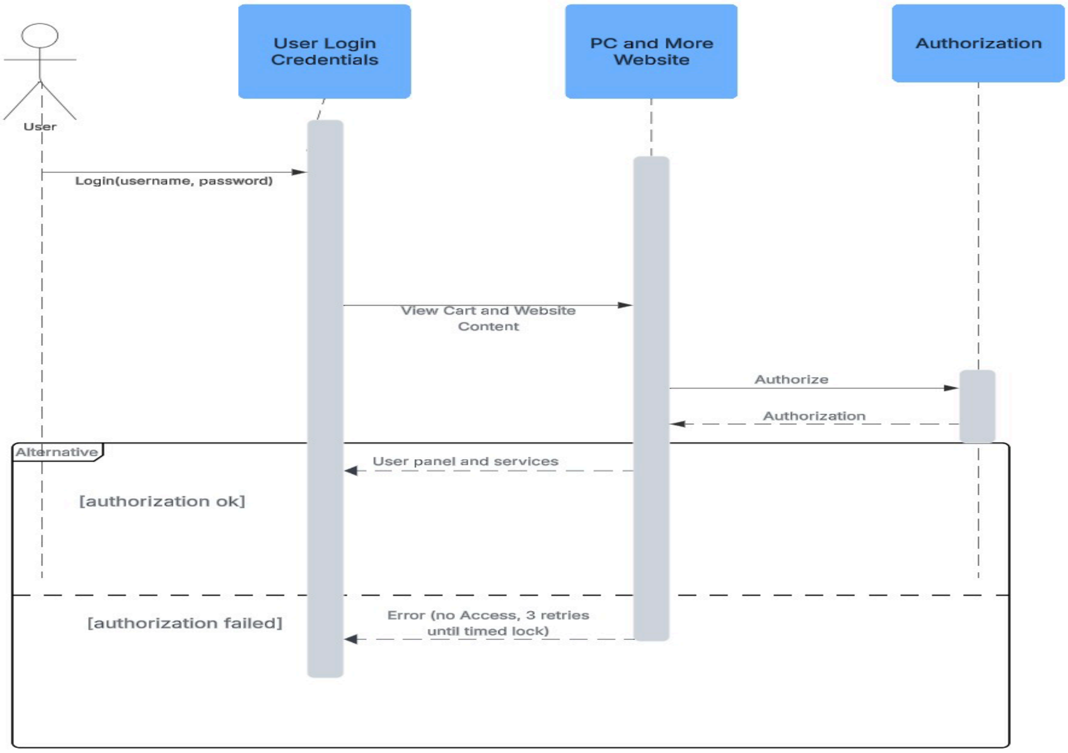


*Figure 4: Sequence Diagram*

# Structural (Classes and Association) Diagram

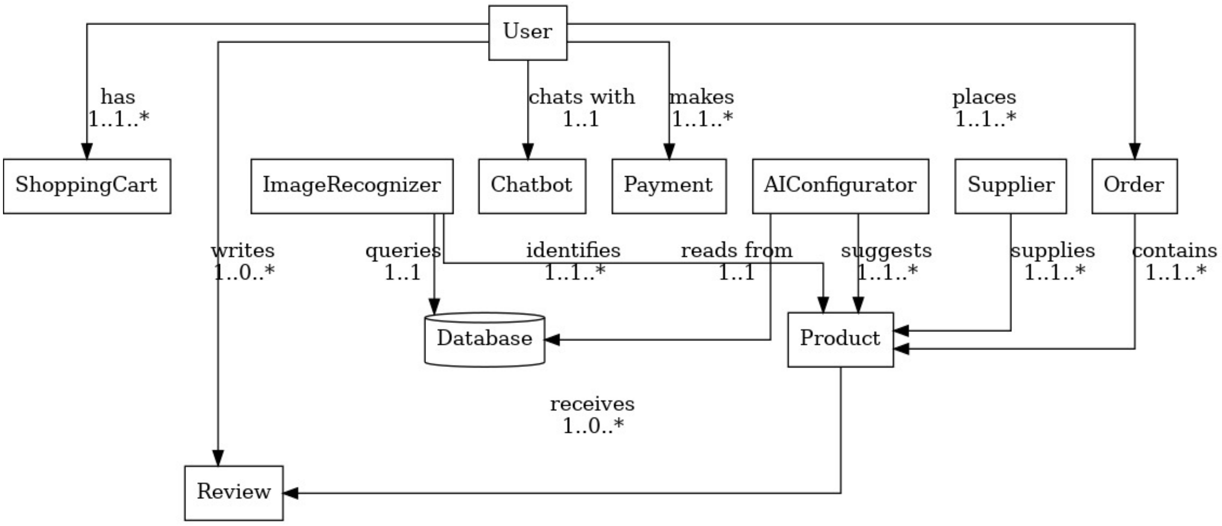


*Figure 5: Classses and Association Diagram*

# Test Plans

## Features to be Tested/not to be Tested

### *Features to be Tested*

- User registration and login functionality
- Product search and filtering
- AI-powered PC configurator suggestions
- Chatbot response accuracy
- Image recognition of PC components
- Shopping cart operations (add/remove items)
- Order placement and tracking
- Payment processing via integrated gateway
- Admin product management features

### *Feutures Not to be Tested*

- External APIs' internal logic (e.g., Gemini API response processing beyond our use case)
- Third-party payment gateway backend logic
- Hardware compatibility beyond recommended specifications

## Pass/Fail Criteria

- A test is marked **Pass** if the feature meets its expected outcome without bugs or unintended behavior
- A test is marked **Fail** if any of the following occur:
  - ✓ Unexpected error or crash
  - ✓ Output does not match expected result
  - ✓ Feature becomes inaccessible or unusable

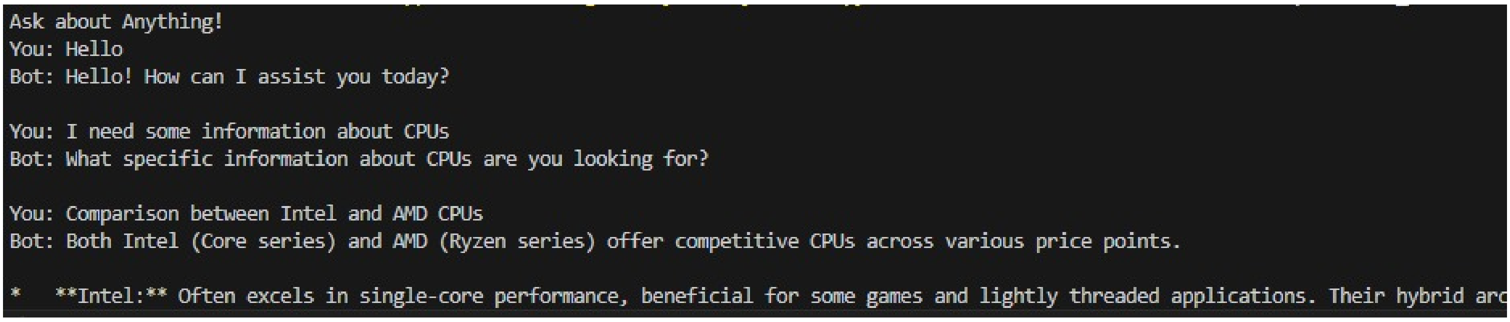
## Testing Material

- Google Chrome / Firefox
- Gemini API keys
- VS Code for debugging
- PostgreSQL database

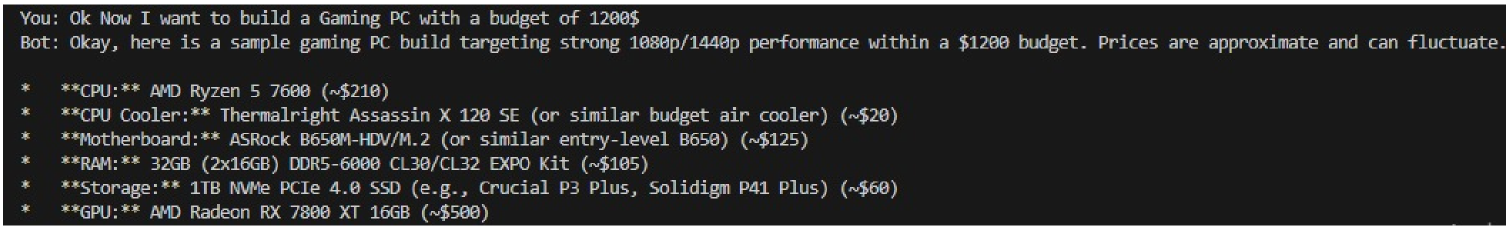
# Implementation

## Output

### *Models Before Integrating with Web*

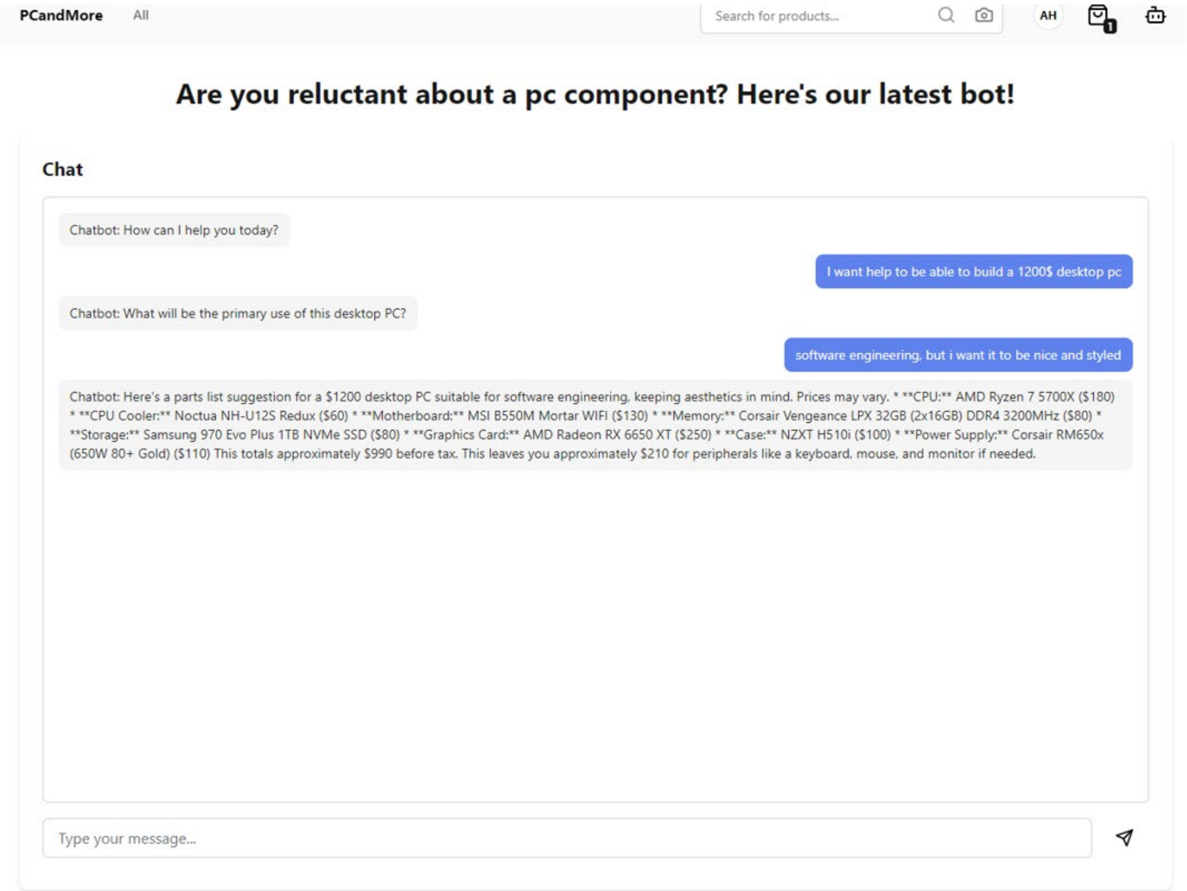


```
Ask about Anything!
You: Hello
Bot: Hello! How can I assist you today?

You: I need some information about CPUs
Bot: What specific information about CPUs are you looking for?

You: Comparison between Intel and AMD CPUs
Bot: Both Intel (Core series) and AMD (Ryzen series) offer competitive CPUs across various price points.

*   **Intel:** Often excels in single-core performance, beneficial for some games and lightly threaded applications. Their hybrid arc
```



```
You: Ok Now I want to build a Gaming PC with a budget of 1200$
Bot: Okay, here is a sample gaming PC build targeting strong 1080p/1440p performance within a $1200 budget. Prices are approximate and can fluctuate.

*   **CPU:** AMD Ryzen 5 7600 (~$210)
*   **CPU Cooler:** Thermalright Assassin X 120 SE (or similar budget air cooler) (~$20)
*   **Motherboard:** ASRock B650M-HDV/M.2 (or similar entry-level B650) (~$125)
*   **RAM:** 32GB (2x16GB) DDR5-6000 CL30/CL32 EXPO Kit (~$105)
*   **Storage:** 1TB NVMe PCIe 4.0 SSD (e.g., Crucial P3 Plus, Solidigm P41 Plus) (~$60)
*   **GPU:** AMD Radeon RX 7800 XT 16GB (~$500)
```

### *Models After Integrating with Web*



Are you reluctant about a pc component? Here's our latest bot!

Chatbot: How can I help you today?

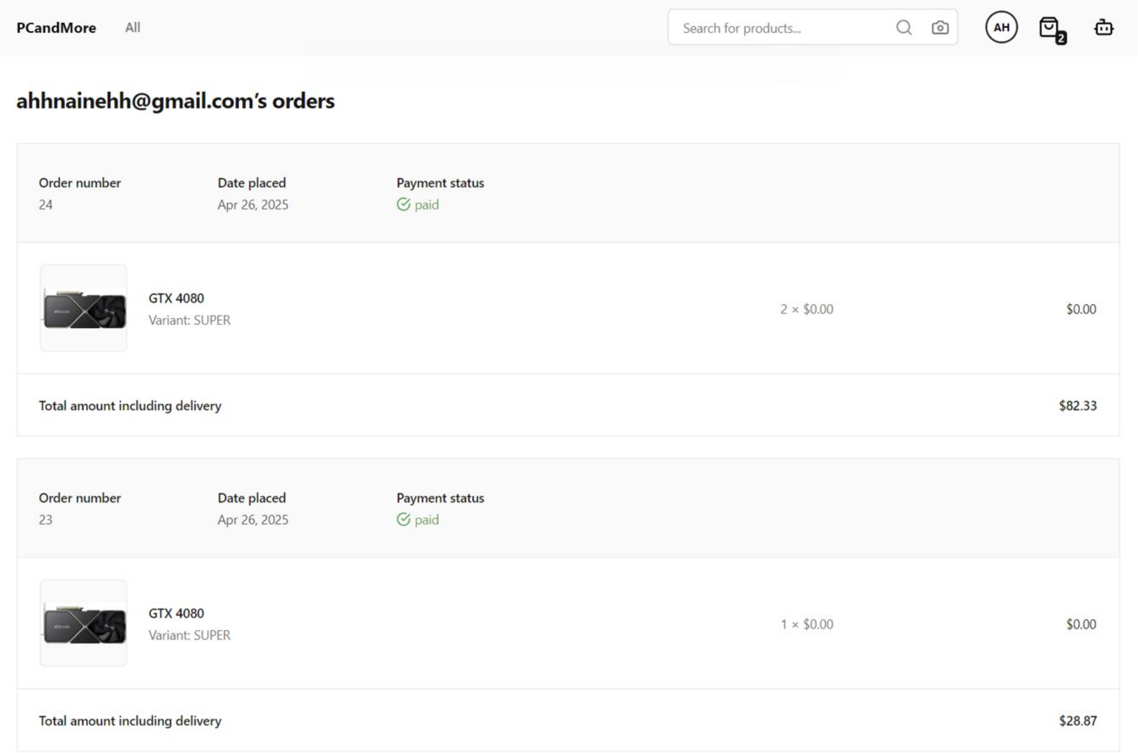
I want help to be able to build a 1200$ desktop pc

Chatbot: What will be the primary use of this desktop PC?

software engineering, but i want it to be nice and styled

Chatbot: Here's a parts list suggestion for a $1200 desktop PC suitable for software engineering, keeping aesthetics in mind. Prices may vary. * **CPU:** AMD Ryzen 7 5700X ($180) * **CPU Cooler:** Noctua NH-U12S Redux ($60) * **Motherboard:** MSI B550M Mortar WIFI ($130) * **Memory:** Corsair Vengeance LPX 32GB (2x16GB) DDR4 3200MHz ($80) * **Storage:** Samsung 970 Evo Plus 1TB NVMe SSD ($80) * **Graphics Card:** AMD Radeon RX 6650 XT ($250) * **Case:** NZXT H510i ($100) * **Power Supply:** Corsair RM650x (650W 80+ Gold) ($110) This totals approximately $990 before tax. This leaves you approximately $210 for peripherals like a keyboard, mouse, and monitor if needed.

# Our Website UI



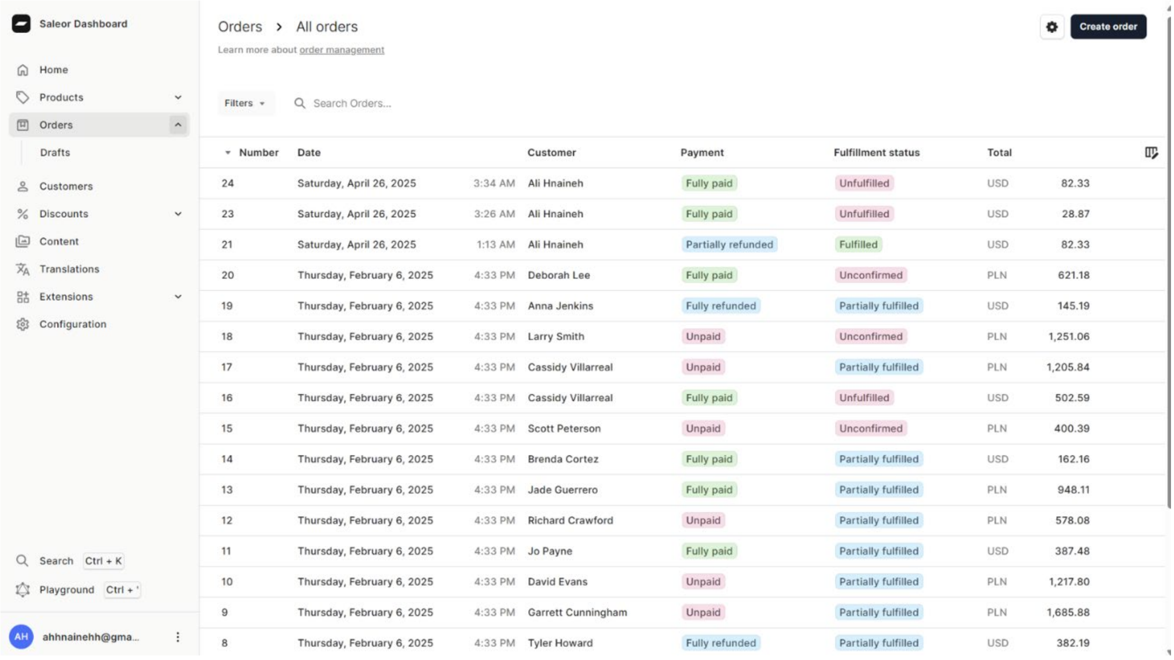
ahhnainehh@gmail.com's orders

| Order number | Date placed | Payment status |
|---|---|---|
| 24 | Apr 26, 2025 | ✓ paid |

| | | | |
|---|---|---|---|
| GTX 4080 | Variant: SUPER | 2 × $0.00 | $0.00 |
| Total amount including delivery | | | $82.33 |

| Order number | Date placed | Payment status |
|---|---|---|
| 23 | Apr 26, 2025 | ✓ paid |

| | | | |
|---|---|---|---|
| GTX 4080 | Variant: SUPER | 1 × $0.00 | $0.00 |
| Total amount including delivery | | | $28.87 |



Orders > All orders

Learn more about order management

| Number | Date | | Customer | Payment | Fulfillment status | Total | |
|---|---|---|---|---|---|---|---|
| 24 | Saturday, April 26, 2025 | 3:34 AM | Ali Hnaineh | Fully paid | Unfulfilled | USD | 82.33 |
| 23 | Saturday, April 26, 2025 | 3:26 AM | Ali Hnaineh | Fully paid | Unfulfilled | USD | 28.87 |
| 21 | Saturday, April 26, 2025 | 1:13 AM | Ali Hnaineh | Partially refunded | Fulfilled | USD | 82.33 |
| 20 | Thursday, February 6, 2025 | 4:33 PM | Deborah Lee | Fully paid | Unconfirmed | PLN | 621.18 |
| 19 | Thursday, February 6, 2025 | 4:33 PM | Anna Jenkins | Fully refunded | Partially fulfilled | USD | 145.19 |
| 18 | Thursday, February 6, 2025 | 4:33 PM | Larry Smith | Unpaid | Unconfirmed | PLN | 1,251.06 |
| 17 | Thursday, February 6, 2025 | 4:33 PM | Cassidy Villarreal | Unpaid | Partially fulfilled | PLN | 1,205.84 |
| 16 | Thursday, February 6, 2025 | 4:33 PM | Cassidy Villarreal | Fully paid | Unfulfilled | USD | 502.59 |
| 15 | Thursday, February 6, 2025 | 4:33 PM | Scott Peterson | Unpaid | Unconfirmed | PLN | 400.39 |
| 14 | Thursday, February 6, 2025 | 4:33 PM | Brenda Cortez | Fully paid | Partially fulfilled | USD | 162.16 |
| 13 | Thursday, February 6, 2025 | 4:33 PM | Jade Guerrero | Fully paid | Partially fulfilled | PLN | 948.11 |
| 12 | Thursday, February 6, 2025 | 4:33 PM | Richard Crawford | Unpaid | Partially fulfilled | PLN | 578.08 |
| 11 | Thursday, February 6, 2025 | 4:33 PM | Jo Payne | Fully paid | Partially fulfilled | USD | 387.48 |
| 10 | Thursday, February 6, 2025 | 4:33 PM | David Evans | Unpaid | Partially fulfilled | PLN | 1,217.80 |
| 9 | Thursday, February 6, 2025 | 4:33 PM | Garrett Cunningham | Unpaid | Partially fulfilled | PLN | 1,685.88 |
| 8 | Thursday, February 6, 2025 | 4:33 PM | Tyler Howard | Fully refunded | Partially fulfilled | USD | 382.19 |

# Conclusion

## Summary

Our project, PC and More, effectively offers an online marketplace for buying PC parts, integrated within the project, AI-driven functionalities like chatbot and PC architecture builder made for the user's aid and help build the user a pc with a certain budget without the user getting involved in picking each PC part if the user is inexperienced (low cost PC configurator) in the PC world, it also helps identify PC components through image processing and the AI's help. We used open-source tools to create a fully functional prototype.

## Novelty

Our project combines several AI cutting-edge technology aspects in a single software, ranging from the component recognition model, that takes an input image and processes it to give the components detailed explanation, to the PC builder that gives the user a PC build centered around the user's input budget and preferences, plus the chatbot which aids the user while navigating the website and by answering his questions, all these improves the users interaction and experience.

## Integrity and Values

While working on the project the team took into consideration and remained dedicated to the ethical issues the software must cover and secure, which included fairness, data privacy, and transparency in AI decision-making. The system compiles with the IEE/ACM code of ethics, which place a strong emphasis on upholding information security standards and user rights

## Future Work

For upcoming system iterations, several enhancements are planned:

- Enabling real-time product availability through using APIs from different suppliers and enhancing the AI configurator.
- Expanding the data set by adding more hardware types and increasing the recognition's model accuracy.
- implementing the platform at scale with improved hosting, multilingual user interface, and cutting-edge security features.
- including a support bot that runs on WhatsApp to increase accessibility and convenience. Increasing accessibility and scalability by using a support bot that runs on different platforms (WhatsApp, Telegram etc.… ).

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