CSC 431 – Spring 2025

Software Requirements Specification (SRS)

Project: Interactive Fragrance Recommendation System (ScentMatch)

Authors:
Zoey Lee
Cole Foster
Anthony Givans

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Version History

Version	Date	Author(s)	Change Comments
1.0	2/19/2025	Zoey Lee, Cole Foster, Anthony Givans	Initial version
1.1	2/24/2025	Zoey Lee, Cole Foster, Anthony Givans	Added the finishing touches

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1. System Requirements

1.1 Functional Requirements

1.1.1 User Profile and Registration

Title	**User Profile Registration**
Description	The web application will capture basic user information including name, age, gender, contact info, shipping address, and payment information.
Priority	0 (highest)
Precondition(s)	User accesses the webapp
Basic Flow	1. User navigates to the registration page 2. User enters name, age, gender, contact info, shipping address, and payment details 3. System validates and stores the user profile
Postcondition(s)	A new user profile is created and stored for personalized service
Use Case Diagram	UC-001

1.1.2 Scent Preference Initialization & Embedding

Title	**Scent Preference Initialization & Embedding**
Description	On registration, users indicate whether they know their scent preferences. If not, the system assigns a popular scent profile; if yes, their preferences are recorded and used as context for embedding generation.
Priority	0 (highest)
Precondition(s)	User completes registration
Basic Flow	1. User is asked if they know their scent preferences 2a. If they do not, the system assigns a popular scent profile 2b. If they do, user-specified scent preferences are recorded 3. User information is transformed into an embedding using a fine-tuned BERT model 4. The embedding is stored in the database with the user profile
Postcondition(s)	User profile now includes an embedding vector representing their scent preferences
Use Case Diagram	UC-002

1.1.3 Scent Recommendation and Order Processing

Title	**Scent Recommendation and Order Processing**
Description	Based on the user's embedding, the backend returns a recommended scent product. The system then uses the stored shipping and payment details to place an order for the scent.
Priority	1
Precondition(s)	User profile and embedding are established, scent database is populated

Title	Scent Recommendation and Order Processing
Basic Flow	1. Frontend calls backend with username 2. Backend accesses embedding for user from database 3. Backend computes similarities (via cosine similarity & ANN) and returns a recommended scent product name 4. Backend uses the user's shipping and payment info to place an order with Amazon API 5. Once the scent is shipped, the user is prompted for a review before the next order is processed
Postcondition(s)	Optimal scent for user is calculated and ordered to the saved user address
Use Case Diagram	UC-003

1.1.4 Feedback and Rating System

Title	Feedback and Rating System
Description	Users can rate and provide detailed feedback on the received scent. This information is used to update the user's embedding and improve future recommendations.
Priority	1
Precondition(s)	User has received a scent and is logged in
Basic Flow	1. User receives the scent and is prompted to leave a review 2. User submits rating 3. System updates the user's embedding based on the rating
Postcondition(s)	User's profile is updated and refined for future recommendations
Use Case Diagram	UC-004

1.1.5 Subscription and Iterative Order Cycle

Title	**Subscription and Iterative Order Cycle**
Description	The system manages a recurring subscription where every 30 days the user receives a new scent recommendation, reviews it, and their embedding is updated for the next cycle.
Priority	3
Precondition(s)	User is registered, has an active profile, and has completed initial preference setup
Basic Flow	1. Every day, the backend queries the database for users who received their previous scent 30 days ago 2. The scent recommendation and order system is called for these users 3. After delivery, the feedback and rating system takes effect for each user
Postcondition(s)	A continuous subscription cycle is maintained with updated recommendations
Use Case Diagram	UC-005

1.2 Non-Functional Requirements

In addition to qualitative descriptions, the system is expected to meet the following quantitative targets:

1.2.1 Real-Time Recommendation Performance

Title	**Real-Time Recommendation Performance**
Description	The system should deliver recommendations in real-time with minimal latency, even as the scent database scales.
Priority	0 (highest)
Statistical Targets	- Average response time: ≤ 200ms - 99% of queries processed within 300ms - 1000 queries per second under peak load

Title	Real-Time Recommendation Performance
Applicable FR(s)	1.1.2, 1.1.3, 1.1.4

1.2.2 Usability and Accessibility

Title	Usability and Accessibility
Description	The web application shall be intuitive, accessible, and responsive across devices (web and mobile).
Priority	1
Statistical Targets	- Accessibility: Conform to WCAG 2.1 AA standards - User satisfaction: ≥ 90% positive feedback in usability tests
Applicable FR(s)	All

1.2.3 Data Protection and Secure Transactions

Title	Data Protection and Secure Transactions
Description	The system must protect user data, shipping and payment information, and ensure secure transactions.
Priority	0 (highest)
Statistical Targets	- Data breaches: Zero tolerance - Encryption: 256-bit encryption for sensitive data - Compliance: 100% compliance with GDPR, CCPA, and related regulations
Applicable FR(s)	1.1.1, 1.1.3, 1.1.4

1.2.4 System Reliability

Title	**System Reliability**
Description	The system must maintain high availability and reliability during operating hours.
Priority	2
Statistical Targets	- Uptime: 99.9% uptime guarantee - Mean Time Between Failures (MTBF): ≥ 10,000 hours - Mean Time to Recovery (MTTR): ≤ 30 minutes
Applicable FR(s)	All

1.2.5 Data Integrity

Title	**Data Integrity**
Description	The system must ensure the accuracy and consistency of all fragrance and user data.
Priority	1
Statistical Targets	- Data consistency errors: < 0.01% occurrence - Regular audits: Quarterly data integrity audits
Applicable FR(s)	All

2. System Constraints

2.1 Tool Constraints

2.1.1 Language Modeling Frameworks

Title	**Language Modeling Frameworks**
Description	Use modern frameworks (PyTorch 2.x) along with Hugging Face Transformers for a BERT-based embedding model.
Priority	1

Title	Language Modeling Frameworks
Technical Specifications	- Model size ≤500MB - ONNX for model optimization and deployment

2.1.2 Database Management System

Title	Database Management System
Description	Utilize a scalable DBMS with vector embedding support (e.g., PostgreSQL with pgvector, Pinecone, or Milvus) for efficient similarity searches.
Priority	3
Technical Specifications	- ANN indexing for sub-100ms query times

2.2 Language Constraints

2.2.1 Programming Language and Libraries

Title	Programming Language and Libraries
Description	Use Python for backend development and Next.js (JavaScript/TypeScript) for the frontend to support deep learning and web development integration.
Priority	3

2.3 Platform Constraints

2.3.1 Web and Mobile Compatibility

Title	Web and Mobile Compatibility
Description	The system must work on web browsers and be compatible with mobile devices.
Priority	0 (highest)

2.4 Hardware Constraints

2.4.1 Server and GPU Requirements

Title	**Server and GPU Requirements**
Description	Servers with GPU support are required for efficient model training and inference.
Priority	2

2.5 Network Constraints

2.5.1 Bandwidth and Connectivity

Title	**Bandwidth and Connectivity**
Description	The application should be optimized for varying network speeds to ensure low latency.
Priority	2

2.6 Deployment Constraints

2.6.1 Cloud-Based Deployment

Title	**Cloud-Based Deployment**
Description	The system shall be deployed on a scalable cloud infrastructure (e.g., AWS, Google Cloud) to ensure high availability.
Priority	3

2.7 Transition & Support Constraints

2.7.1 Maintenance and Model Updates

Title	**Maintenance and Model Updates**
Description	The system must include regular updates and maintenance for both software and ML models to incorporate new data and feedback.
Priority	4

2.8 Budget & Schedule Constraints

2.8.1 Project Budget and Timeline

Title	**Project Budget and Timeline**
Description	Development must align with the academic semester schedule and adhere to budget constraints.
Priority	1

2.9 Miscellaneous Constraints

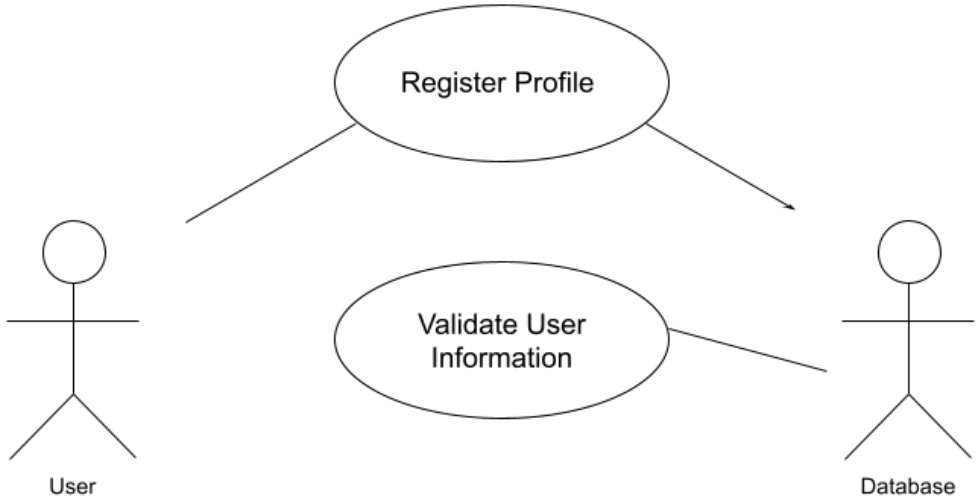
2.9.1 Regulatory Compliance

Title	**Regulatory Compliance**
Description	The system must comply with GDPR, CCPA, and other relevant data protection regulations.
Priority	0 (highest)

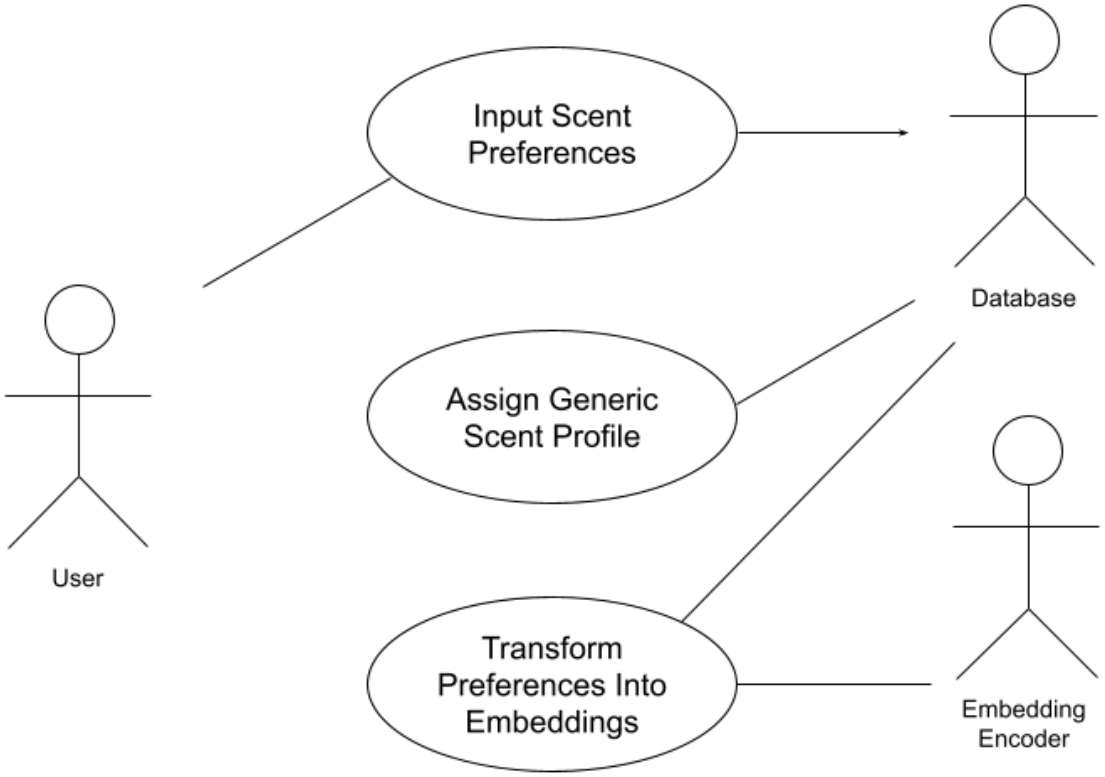
3. Requirements Modeling & Technical Architecture

3.1 Use-Case Diagrams and Interaction Models

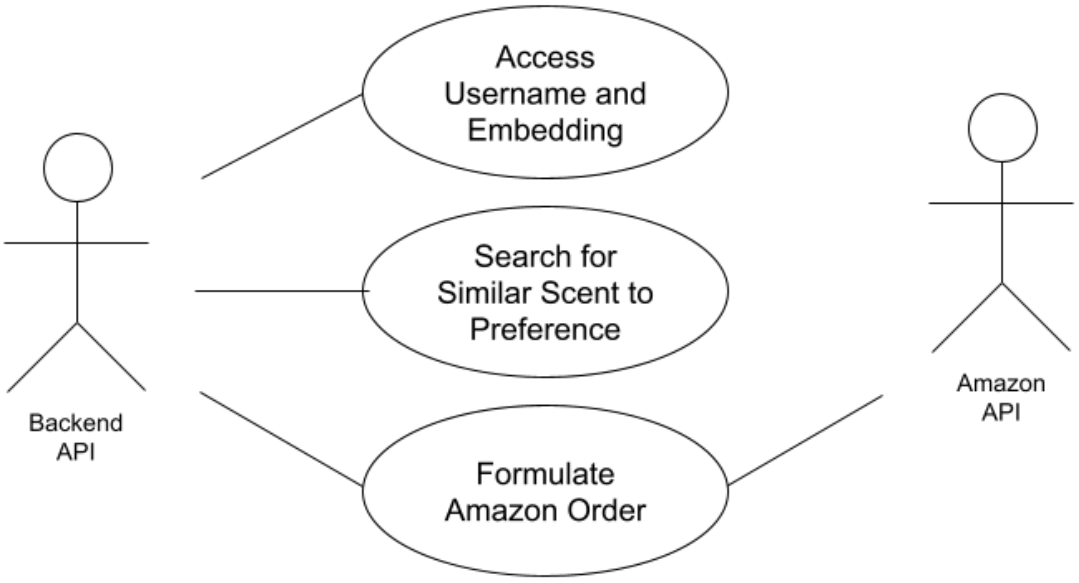
3.1.1 User Profile Registration Use Case



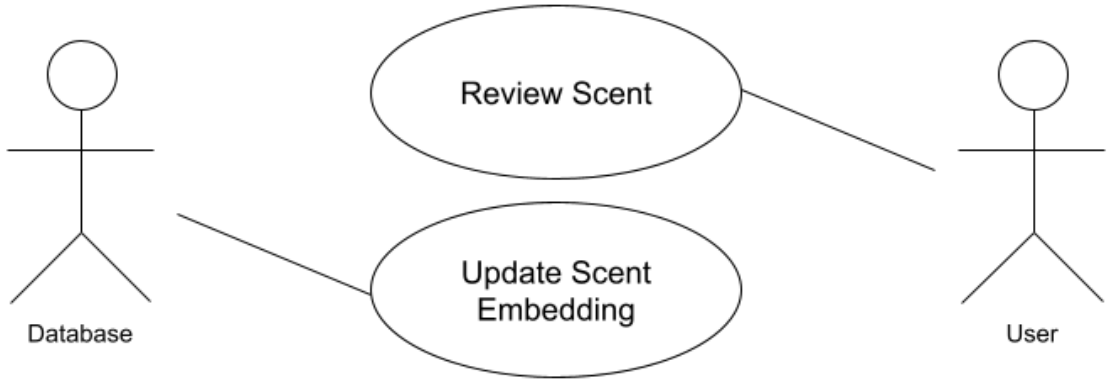
3.1.2 Scent Preference Initialization & Embedding Use Case



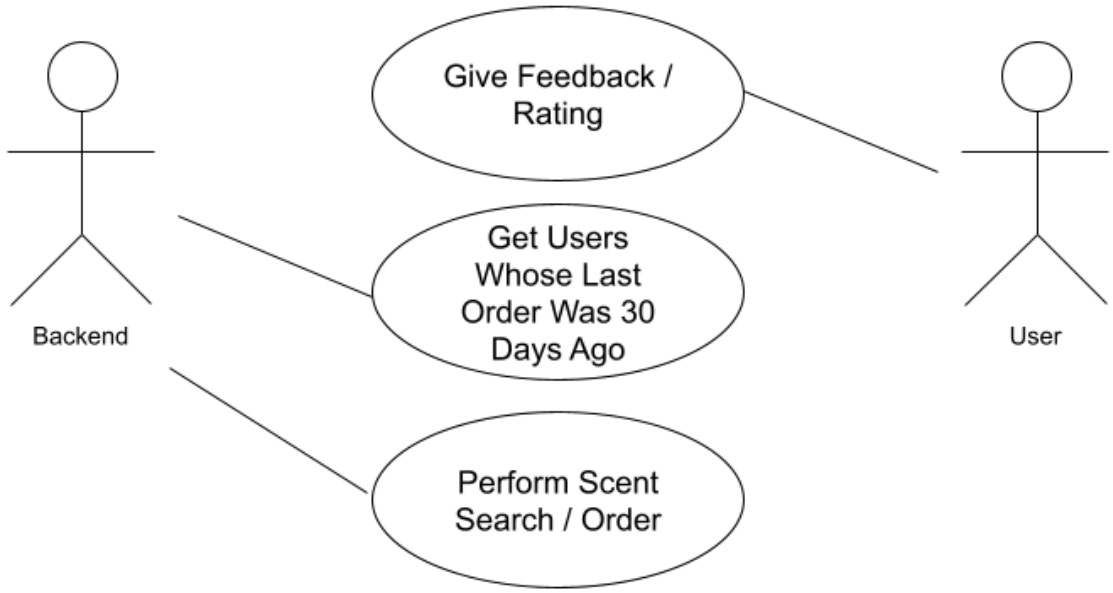
3.1.3 Scent Recommendation and Order Processing Use Case



3.1.4 Feedback and Rating System Use Case



3.1.5 Subscription and Iterative Order Cycle Use Case



4. Evolutionary Requirements

4.1 Functional Requirements Evolution

4.1.1 Social Sharing

Title	**Social Sharing**
Description	Allow users to share fragrance discoveries on social media.

Title	Social Sharing
Priority	5
Precondition(s)	User is logged in and has engaged with the system
Postcondition(s)	Fragrance details are shared externally
Use Case Diagram	NONE

4.2 Non-Functional Requirements Evolution

4.2.1 Continuous Model Refinement

Title	Continuous Model Refinement
Description	The recommendation engine continuously adapts based on user feedback to improve accuracy and relevance.
Priority	3
Applicable FR(s)	1.1.2, 1.1.4, 1.1.5

4.2.2 Localization

Title	Localization
Description	Support multiple languages and adapt recommendations for regional fragrance preferences.
Priority	4
Applicable FR(s)	All