TED UNIVERSITY

Faculty of Engineering

Computer Engineering Department

CMPE_491 Senior Design Project I

PROJECT ANALYSIS REPORT

Name of the Project: JustiWise

Web Page URL: https://finalprojectjustiwise.github.io/CMPE_491/

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Contents

1. Introduction

The JustiWise project aims to address significant inefficiencies and challenges in the legal field by proposing an AI-driven web platform that streamlines legal processes, and enhances legal education. By integrating advanced AI technology, the platform automates routine tasks, enabling lawyers to focus on more complex cases. Additionally, it introduces virtual training modules, such as trial simulations and mediation sessions, to provide law students and professionals with practical, hands-on experience in interactive environments.

Through features like an AI-powered avatar that translates client narratives into legal terminology and advanced educational tools, JustiWise tackles issues such as high workloads for lawyers, slow and resource-intensive legal processes, and the lack of accessible and effective training platforms. The project aims to save time, reduce costs, and create a user-friendly system that adheres to legal and ethical standards. With its comprehensive approach, JustiWise aspires to transform traditional legal practices, enhance legal education, and deliver innovative solutions to meet the evolving demands of the legal profession.

2. Current system

The legal field faces several persistent challenges that hinder efficiency and accessibility. Current legal services often rely on traditional methods that are time-consuming and labor-intensive. This makes it challenging to meet the growing demand for legal services, particularly for smaller firms and independent practitioners with limited resources.

Legal education also suffers from a lack of modern tools and platforms to provide students with practical, hands-on training. The traditional classroom setting often fails to replicate real-world legal scenarios, leaving students underprepared for the complexities of professional practice.

Key challenges in the current system include:

a. Limited Automation in Routine Legal Processes: Tasks such as drafting documents require significant manual effort, leading to inefficiencies.

b. Insufficient Tools for Interactive Legal Training: Existing legal education methods lack immersive platforms where students can practice legal procedures, such as trials or mediations, in a realistic environment.

3. Proposed system

3.1 Overview

The JustiWise platform presents a transformative approach to improving legal processes, and advancing legal education. By integrating advanced AI technologies with intuitive interfaces, the platform automates repetitive legal tasks, provides dynamic training environments, and enhances overall efficiency in the legal field. It specifically addresses critical issues such as

the heavy workload faced by lawyers, barriers to accessing legal services, and the absence of interactive, hands-on training tools for law students and professionals.

Key features of the platform include:

a- AI-powered tools that translate client narratives into structured legal terminology, facilitating flawless communication between clients and lawyers.

b- Interactive training modules and simulations designed to prepare law students and legal professionals for real-world scenarios.

3.2 Functional Requirements

- **User Management:** Role-based access control with separate user profiles should be available for clients, lawyers, and students.
- **User Registration and Identity Verification:** Users should be able to create accounts with personal information. To ensure privacy and data integrity, users' identities must be securely verified.
- **Case Management:** Lawyers should have access to case management tools to track case progress, manage documents, and plan tasks.
- **Automated Legal Services:** Clients should explain their legal cases to an AI-supported avatar, and these descriptions should be translated into legal terminology and presented to lawyers.
- **Legal Document Processing:** The platform should provide AI-supported document analysis and features such as legal document generation, summarization, and verification.
- **Simulation and Training Modules:** The system should offer modules for lawyers and law students, simulating virtual trials and mediation scenarios for training.
- **AI-Powered Avatar**: The system must provide an interactive AI avatar capable of understanding client cases, converting them into legal language, and forwarding them to the respective lawyers.
- **Integrated Help System:** Users should be able to contact the support team by e-mail or support form when they encounter any problems. The support team should get back to the user within 24 hours at the latest.
- **Error Notification System:** When the system encounters an error, the system should notify the user with a pop-up notification on the right side of the screen showing the error code and content.
- **Reinforced Learning from Human Feedback:** The system should fine tune the model using the Reinforcement method, using the feedback and prompts given by the users as much as they allow.

3.3 Non-Functional Requirements

- **Security:** The application should implement security measures such as end-to-end encryption, database encryption, and hashing to protect user data and privacy. User authentication and authorization processes should be handled securely to prevent unauthorized access.
- **Performance:** The system should complete client inquiries and document processing tasks within 30 seconds , and simulations should operate in real-time with minimal latency; performance criteria will be determined in prototype testing.
- **Scalability:** The platform should support 1000 concurrent users (clients, lawyers, law students) simultaneously.
- **Usability**: Users should be able to become a member with 2 clicks, and after becoming a member or logged in, they should be able to access the menu they want with one click from the main menu. Users should learn how to use the system 2 hours after the first use**.** Guidance and training materials should be offered to users.
- **Compliance:** The AI system should operate in compliance with ethical and professional standards, particularly regarding legal regulations such as data privacy and non-discrimination.

- **Safety Requirements:** Application shall allow users to enable 2 Factor Authentication. Users can enter the application after entering their password and the code sent as an SMS. Each code is generated specifically for that moment and the user.

- **Reliability** : The system is dependable and shall always be available. It shall manage high user and data volumes without crashing or encountering performance problems.The product must swiftly and without sacrificing data recover from malfunctions

3.4 Pseudo Requirements

Technological Constraints and Limitations

- The system should be developed using Java Spring Boot and PostgreSQL for the back-end to ensure robust and scalable server-side operations.
- Python should be employed for artificial intelligence functionalities, including model training, data preprocessing, and dataset preparation.
- The front-end should be built with React.js for compatibility across web browsers, and Axios should be used to enable efficient communication with the back-end.
- A Large Language Model (LLM) from the Llama 3 family should serve as the core AI model for language processing tasks.
- The platform must operate within the current capabilities of AI technologies, ensuring accurate, reliable, and interpretable outputs without exceeding the limitations of existing models.

Data Privacy, Security, and Legal Compliance

- Compliance with data privacy regulations such as KVKK (Turkish Personal Data Protection Law).
- All user-uploaded documents and personal information must be securely stored and processed, utilizing industry-standard encryption protocols.
- The system must adhere to Turkish legal regulations, including guidelines set by bar associations, and ensure ethical AI usage by maintaining transparency and regularly reviewing potential biases.
- AI recommendations should always complement human decision-making to preserve the integrity and professionalism of legal processes.

Transparency in AI Decisions

- Users must clearly understand how AI recommendations are generated, with outputs referencing the specific cases or datasets that informed the decision-making process (e.g., "This recommendation was based on X case examples").
- The decision-making processes of the AI should be interpretable, fostering user trust and confidence.

Cost Efficiency

- The system should be cost-effective by optimizing infrastructure and minimizing operational expenses to ensure affordability for smaller law firms, independent practitioners, and students.

3.5 System models

3.5.1 Scenarios

Secure Login Process

- Actors: Students, Clients, Lawyers, Support Team.
- Users access the platform through a secure login system. Two-factor authentication is included to enhance security. If users encounter issues, the system integrates an error notification mechanism that guides them through troubleshooting.

Automated Legal Consultation

- Actors: Clients, Lawyers.
- A client narrates their legal issue using the AI-powered system. The platform processes the input, converts it into structured legal terminology, and forwards the summary to the lawyer. The lawyer can review, refine, and respond directly through the system.

Simulation and Training for Students

- Actors: Students.
- Law students participate in virtual simulations of legal processes, such as trials or mediations. The system uses AI-driven avatars to represent judges, lawyers, and clients, providing a realistic and interactive training experience. Feedback is provided after each session to aid learning.

Case Management for Lawyers

- Actors: Lawyers, Support Team.
- Lawyers use the platform to manage their cases, including tracking progress, organizing documents, and scheduling tasks. The case management module also integrates with the help system to provide guidance when needed.

Reinforced Learning for AI

- Actors: Lawyers, Support Team.
- The platform incorporates reinforced learning, where feedback from lawyers and support teams improves the AI's accuracy and performance in providing legal assistance.

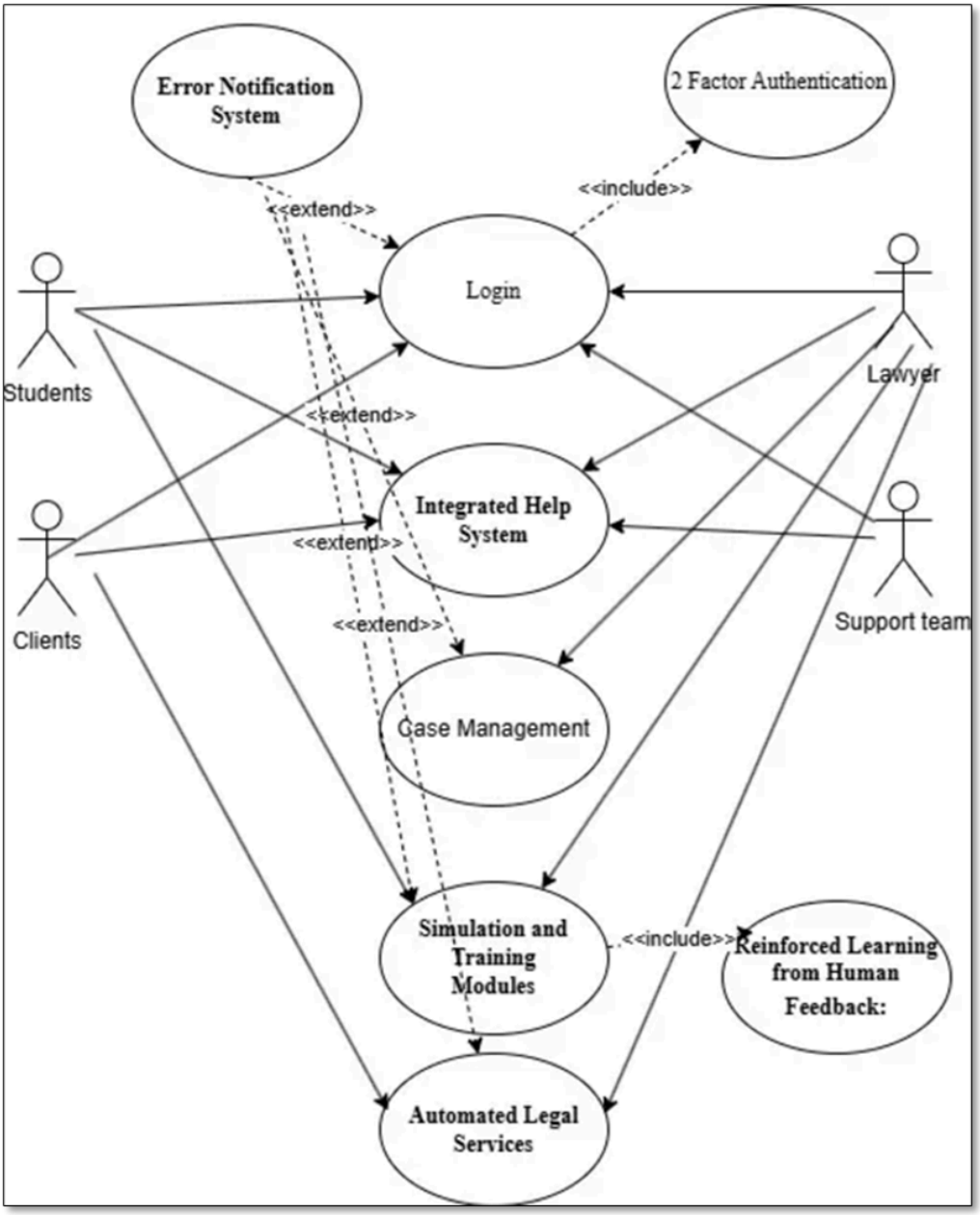
Integrated Help System

- Actors: All Users.
- The integrated help system provides on-demand support to all users. It offers step-by-step instructions and troubleshooting for features like login, case management, and training modules.

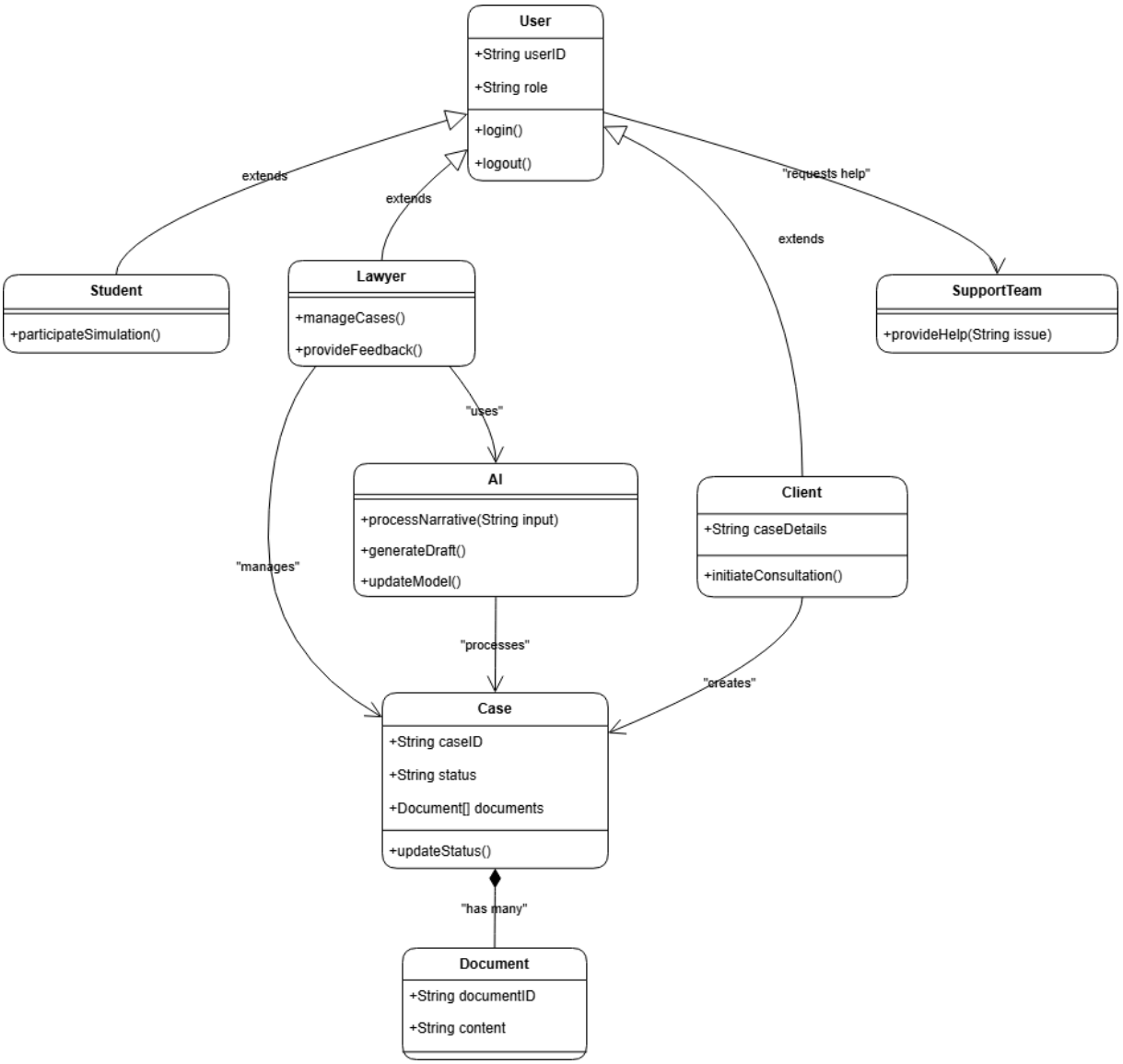
Error Notification System

- Actors: All Users.
- In the event of system errors or issues, users receive notifications with clear instructions for resolution. This ensures a smooth user experience and reduces downtime.

3.5.2 Use case model

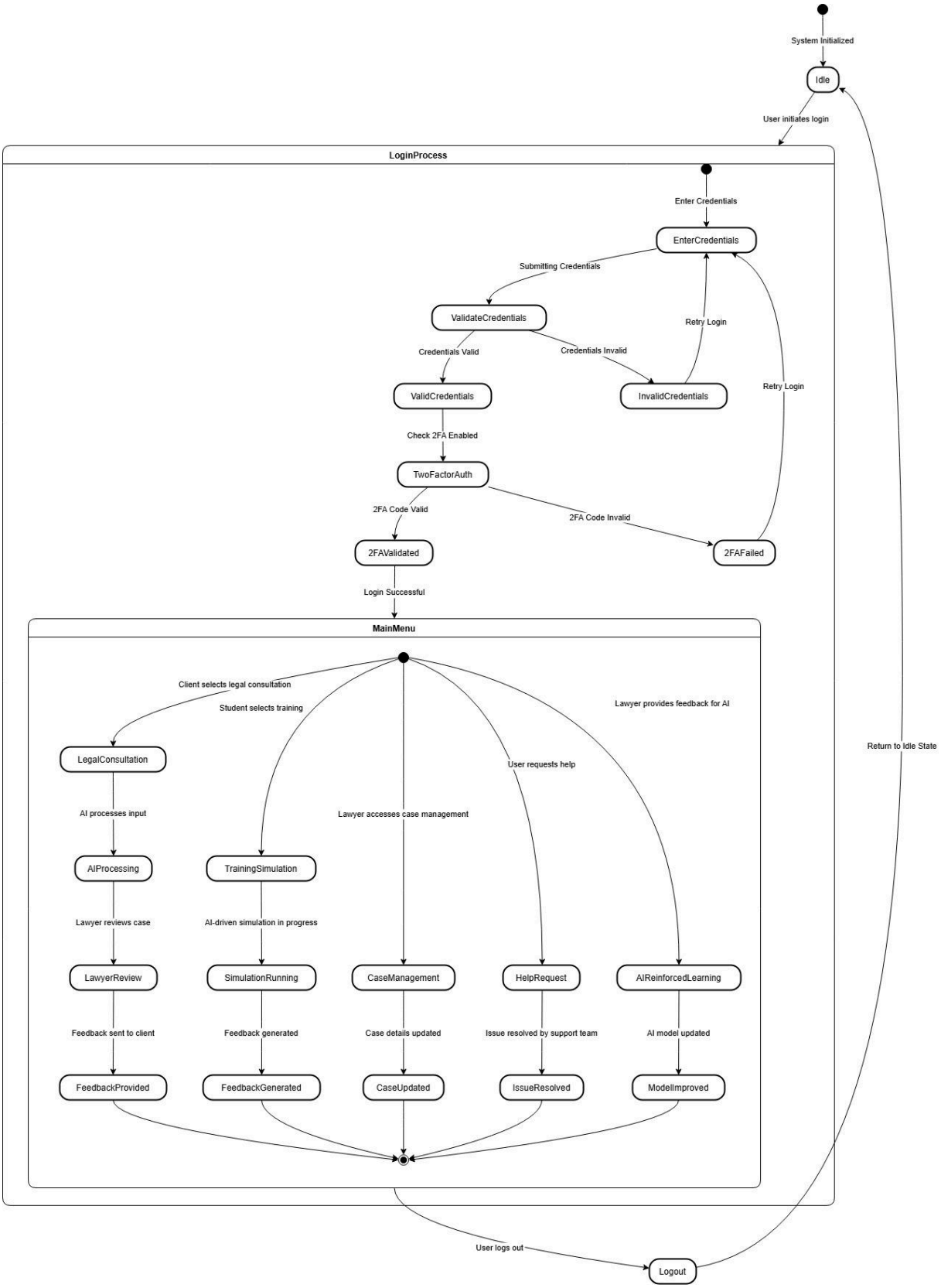


3.5.3 Object and class model

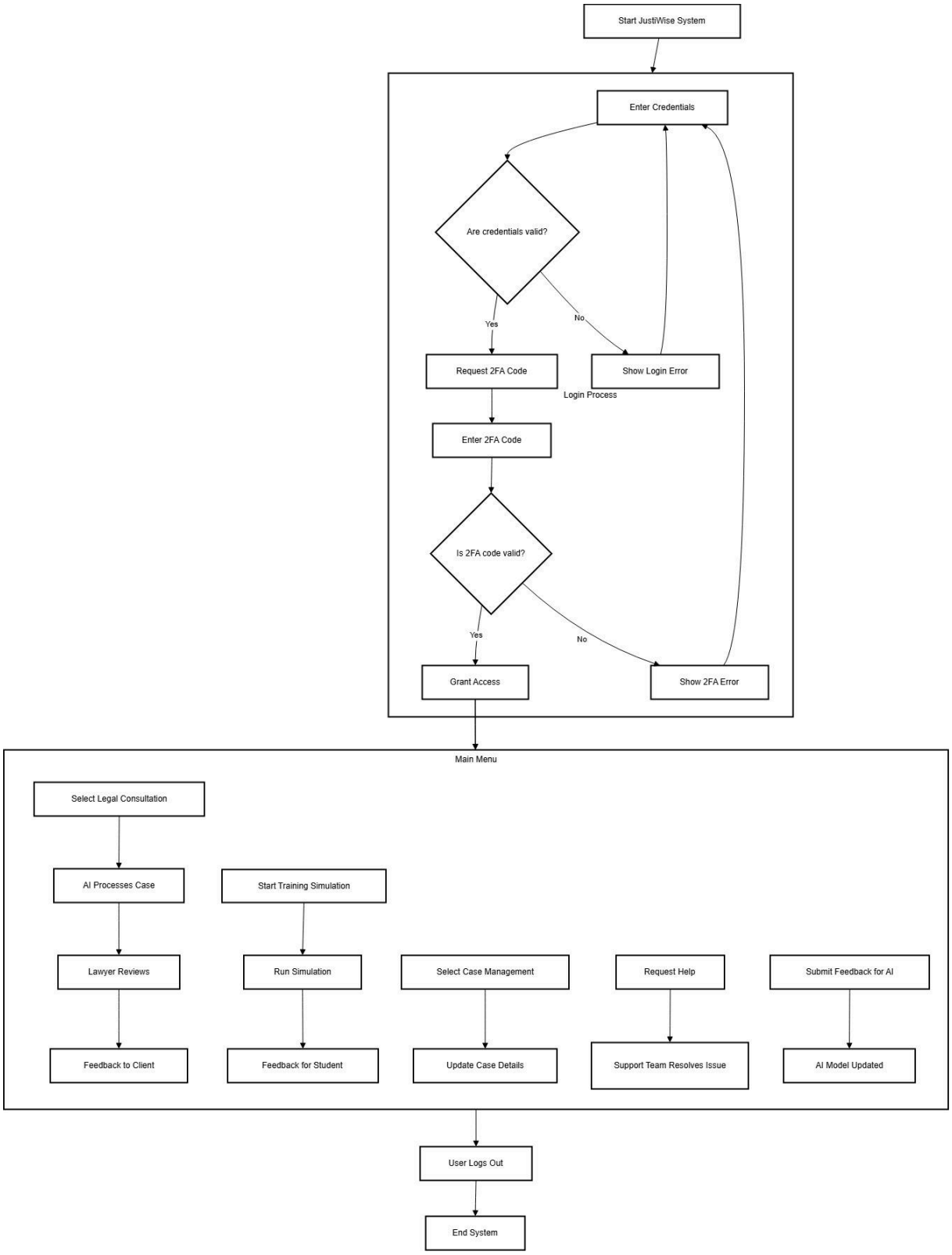


3.5.4 Dynamic models

a)State Diagram

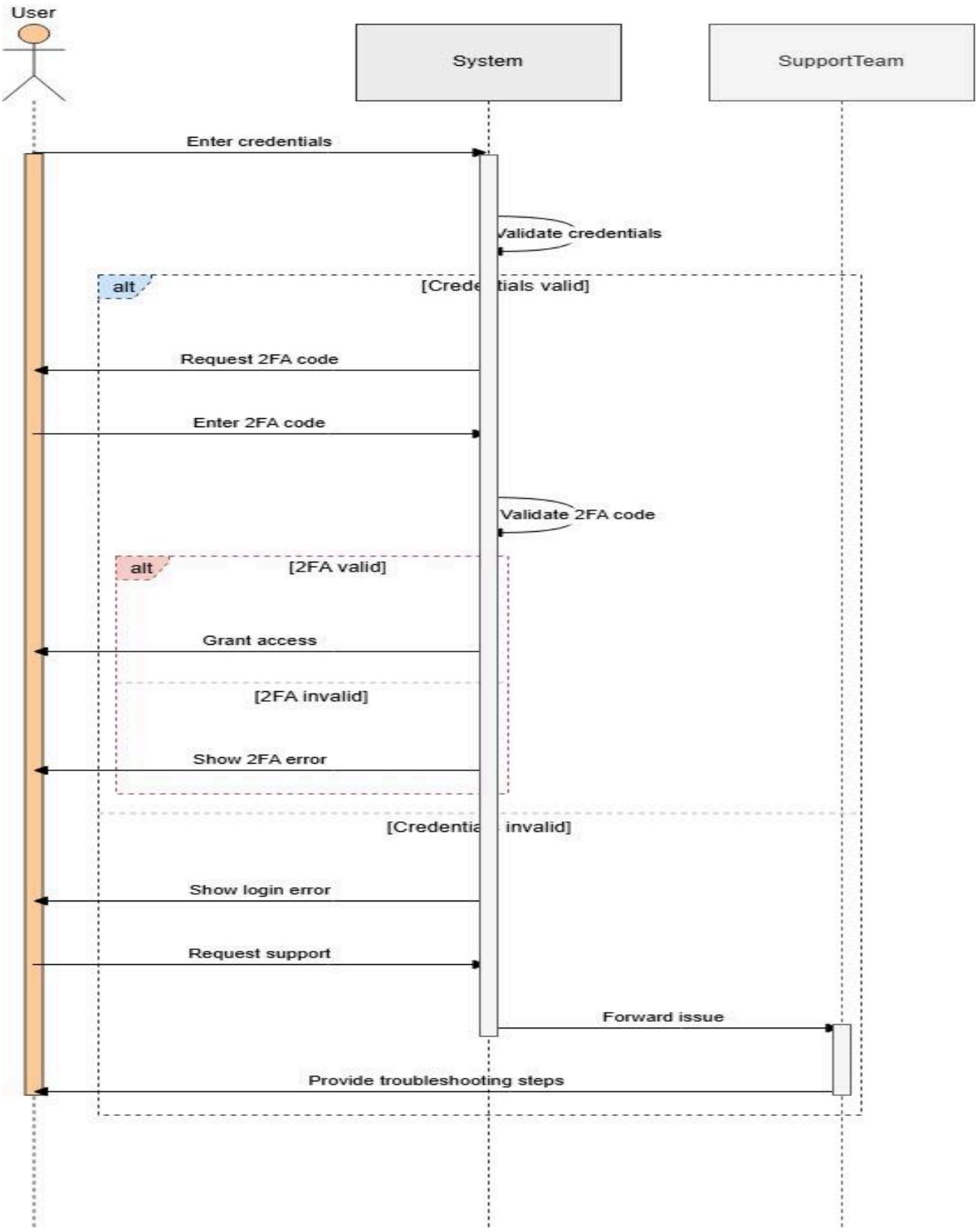


b)Activity Diagram

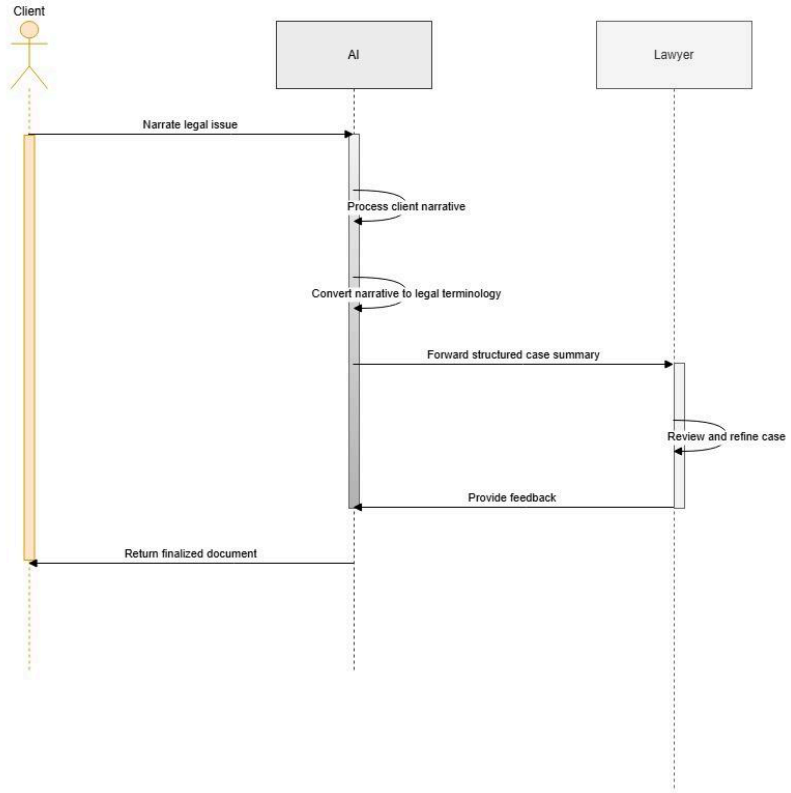


c)Sequence Diagrams

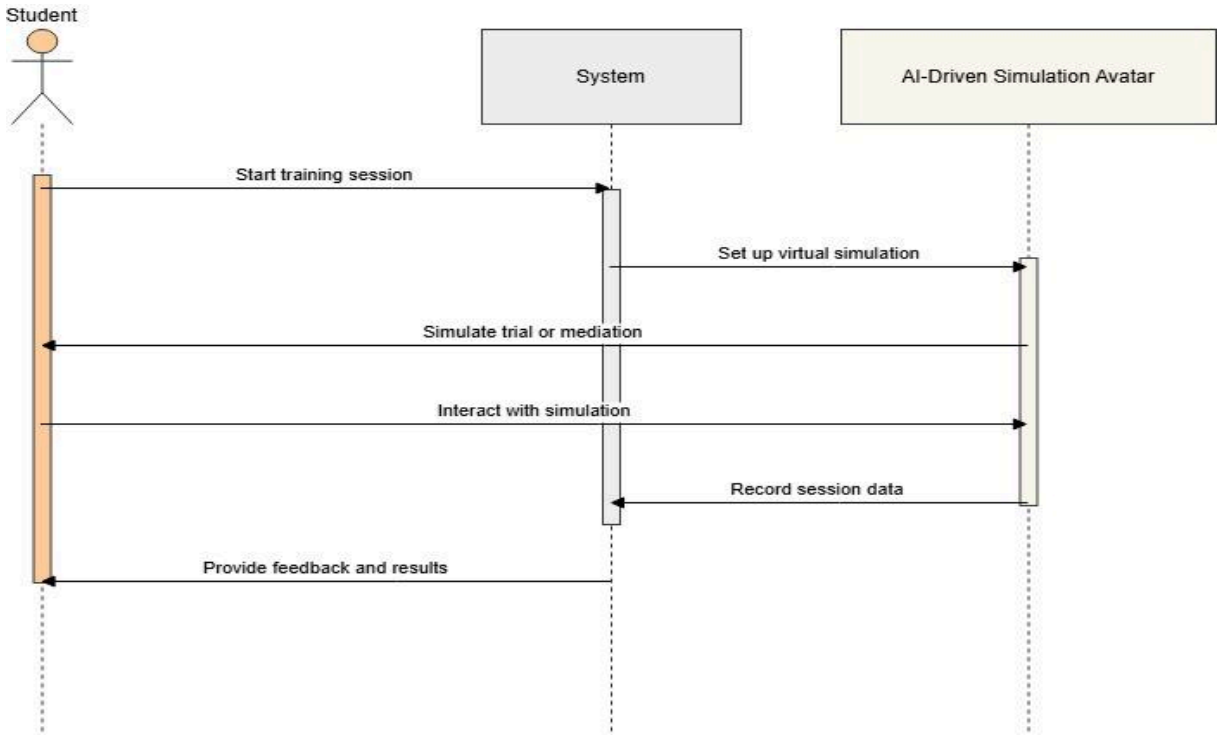
1) **Secure Login Process**



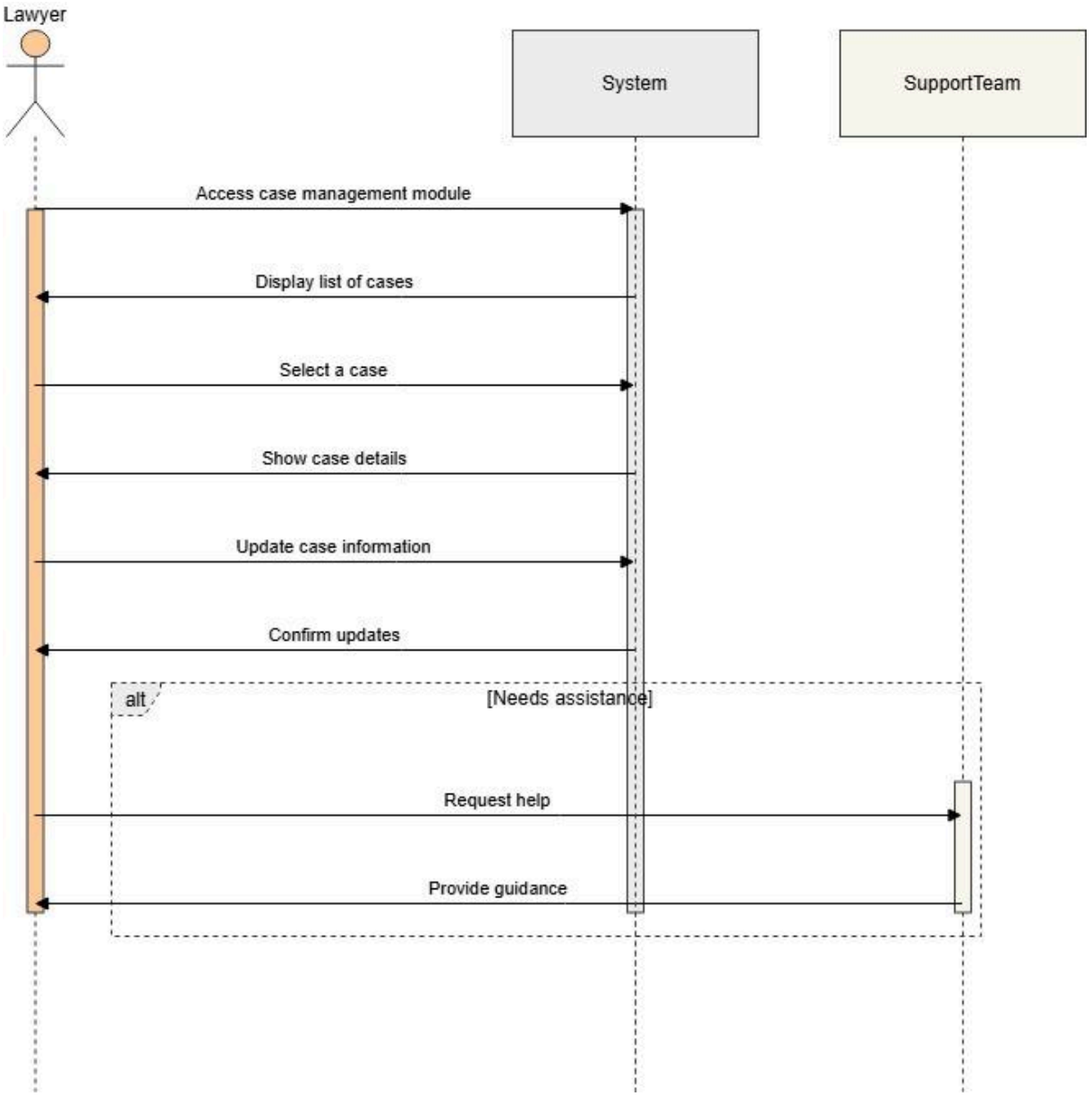
2) Automated Legal Consultation



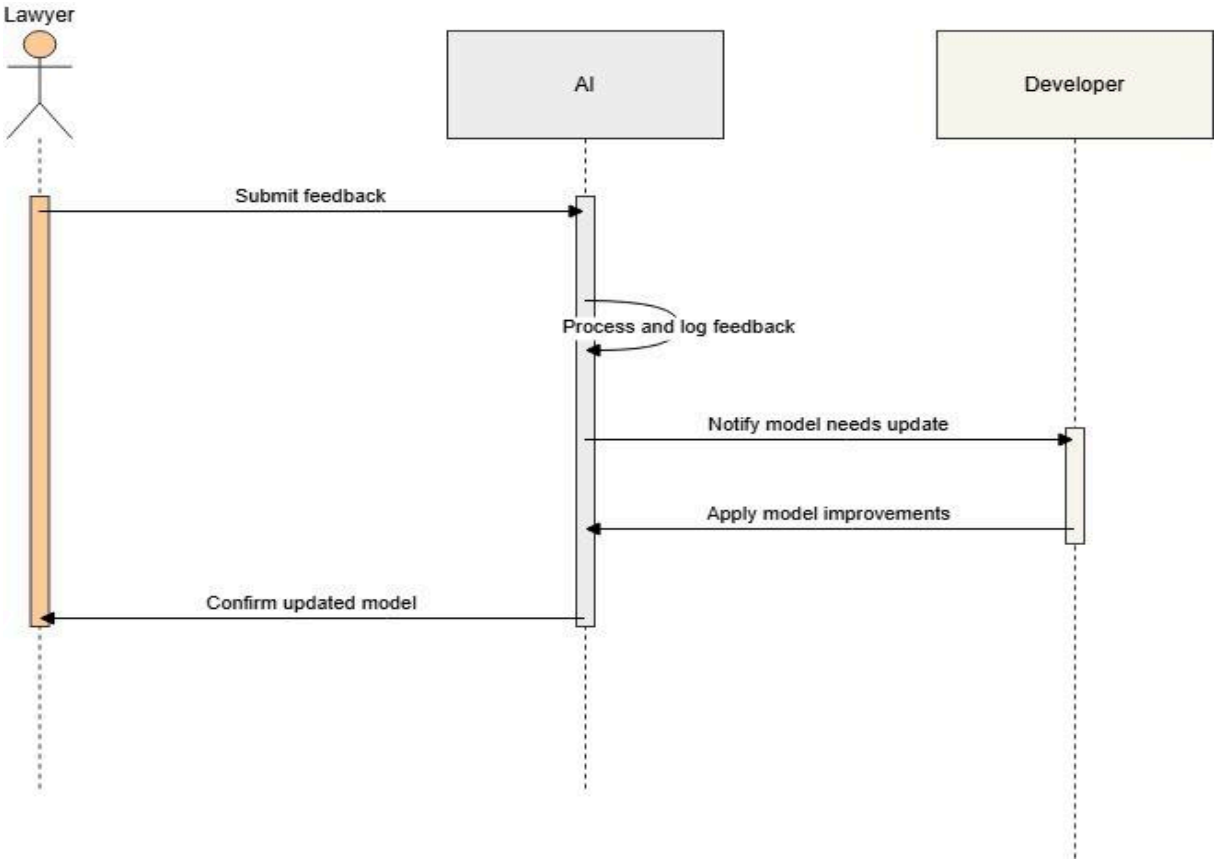
3) Simulation and Training for Students



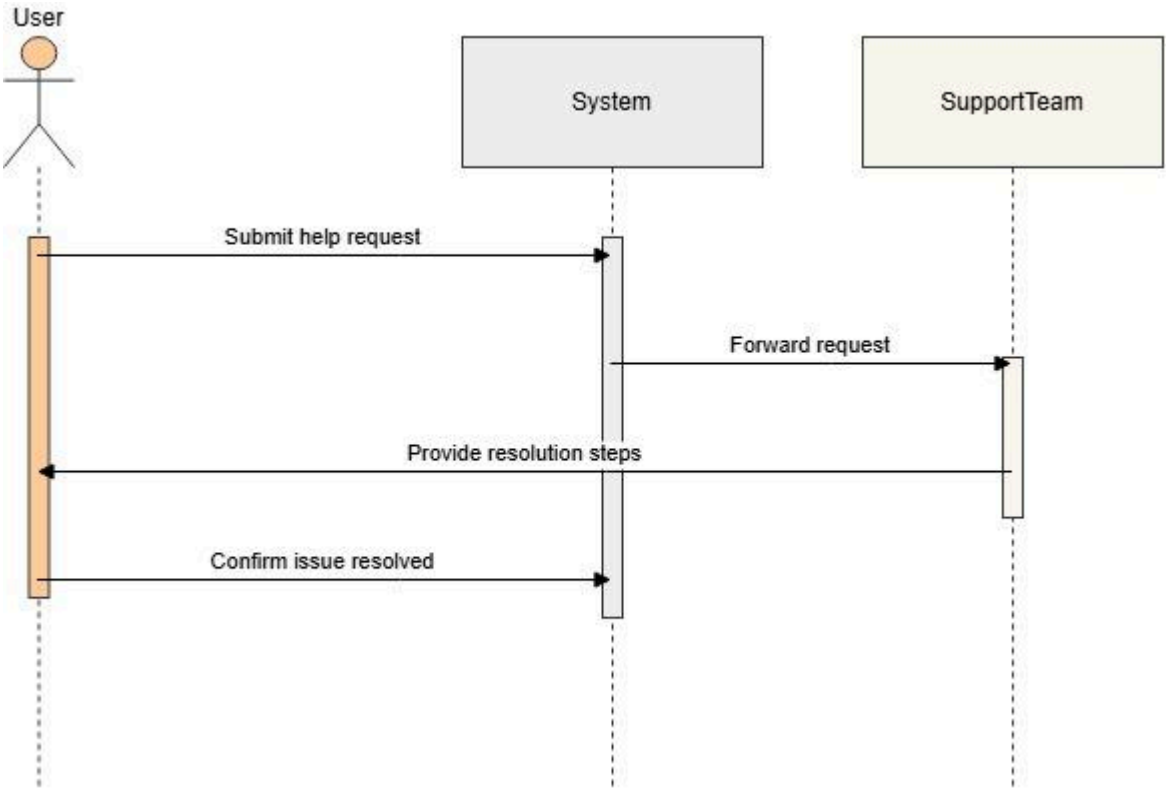
4) Case Management for Lawyers



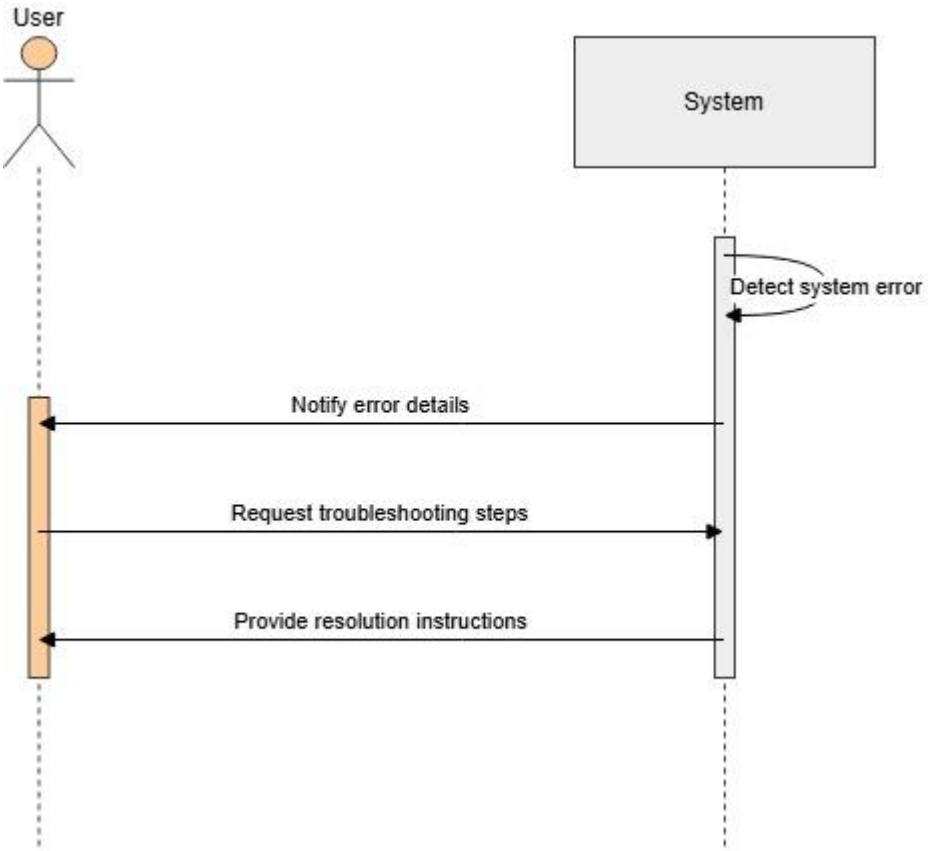
5) Reinforced Learning for AI



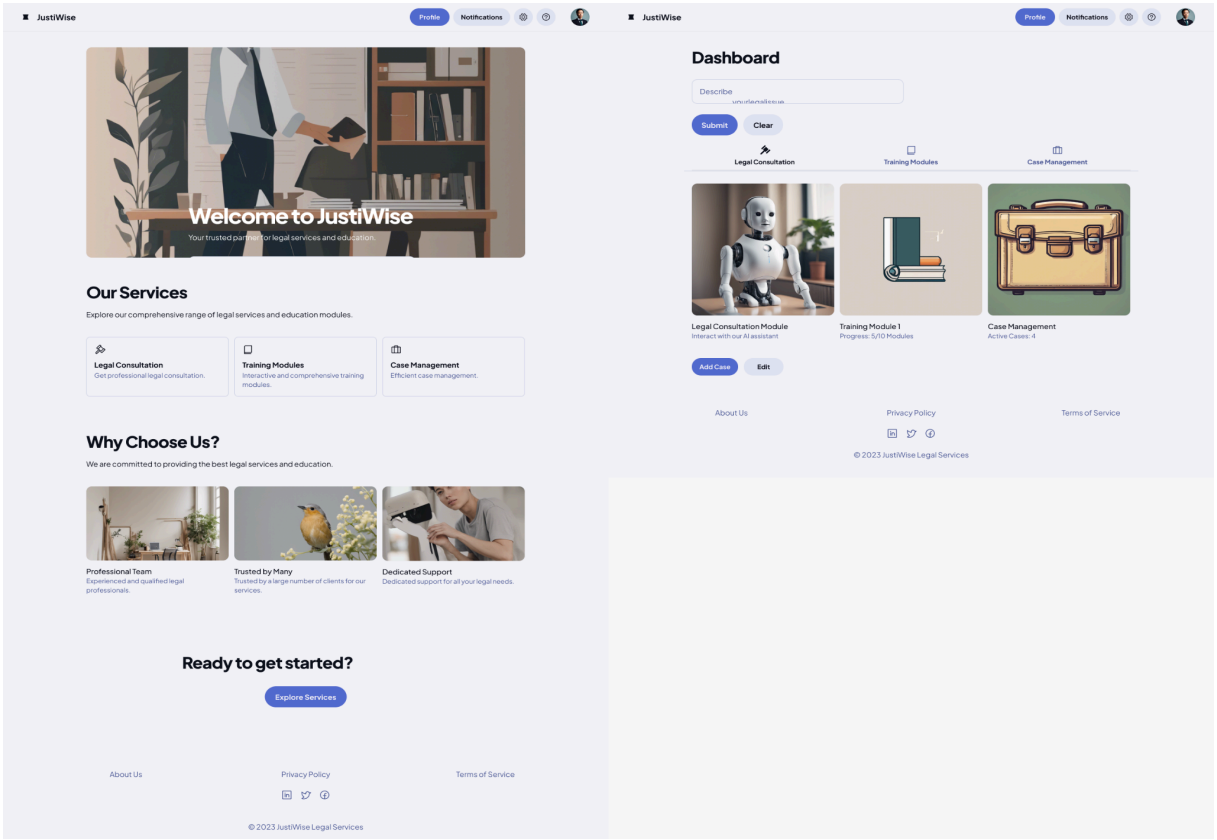
6) Integrated Help System



7) Error Notification System



3.5.5 User interface - navigational paths and screen mock-ups



4. Glossary

Artificial Intelligence (AI): The simulation of human intelligence in machines designed to perform tasks such as learning, reasoning, and problem-solving.

Avatar: A digital representation or character that interacts with users to facilitate services, such as translating client narratives into legal language.

Legal Document Analysis: The process of using AI to review, summarize, or generate legal documents efficiently.

Mediation: A process where a neutral third party assists disputing parties in reaching a mutually agreeable solution.

Mock Trial: A simulated courtroom trial used for educational and training purposes.

Natural Language Processing (NLP): A field of AI focused on the interaction between computers and human language, enabling the system to process and analyze client narratives.

Simulation: An interactive environment mimicking real-life legal scenarios for educational or professional training.

Two-Factor Authentication (2FA): A security mechanism that requires two forms of identification for access.

User Roles: Defined categories such as clients, lawyers, and students, each with specific permissions and functionalities.

5. References

[1] PERSONAL DATA PROTECTION INSTITUTION | KVKK | Personal Data Protection Authority. (2024). Kvkk.gov.tr. https://kvkk.gov.tr/

[2] The Code affirms an obligation of computing professionals to use their skills for the benefit of society. (n.d.). Www.acm.org. https://www.acm.org/code-of-ethics/

[3] IEEE - IEEE Code of Ethics. (n.d.). https://www.ieee.org/about/corporate/governance/p7-8.html

[4] Meta. (2024, April 18). Introducing Meta Llama 3: The most capable openly available LLM to date. Ai.meta.com. https://ai.meta.com/blog/meta-llama-3/