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# AI-Assisted Requirements Analysis – Experiment II

SE 305 - SE 321

Software Specification and Design

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**Time: 75 Minutes**

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## 1 EXPERIMENT OVERVIEW

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This laboratory experiment extends the work conducted in Experiment I, where a client conversation was translated into structured requirements. These functional requirements were originally produced using AI-assisted analysis in Experiment I and will now be modeled visually in UML form. The objective of Experiment II is to **transform these textual requirements into standardized visual models** using PlantUML. AI-assisted techniques will be employed to generate Unified Modeling Language (UML) diagrams, specifically, a Use Case Diagram for the overall system and Activity Diagrams for selected functional requirements, whose outputs will then be validated and refined to ensure accuracy and completeness. Be sure that you are checking your work **iteratively**. The exercise emphasizes not only the generation of models but also the methodological rigor required for effective requirements engineering.

## 2 DIAGRAMMING WITH AI

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The experiment utilizes the text-to-diagram tool **PlantUML**. Large language models such as Gemini are well-suited to producing PlantUML code, since it relies on structured textual syntax. The generated PlantUML code can be rendered into diagrams using the **PlantUML Live Server** (<https://www.plantuml.com/plantuml>).

### 2.1 Phase 1: Use Case Diagram Generation

**Objective:** To develop a Use Case Diagram that captures the primary interactions between actors and the system for functional requirements.

#### How to Write the Prompt (Example)

To construct an effective prompt for Gemini:

1. Take the finalized **functional requirements** from Experiment I.

2. Identify the relevant **actors** (e.g., User, Psychologist).
3. Decompose the requirements into **use cases**
4. Formulate a structured instruction explicitly asking for PlantUML use case diagram syntax.

### Experiment Steps

- **Prompt Preparation:** Use the complete set of finalized functional requirements from Experiment I and translate them into a comprehensive set of use cases, including all relevant actor interactions.
- **Code Generation:** Instruct Gemini to generate a *single, complete* Use Case Diagram in PlantUML syntax based on these use cases.
- **Validation and Refinement:** Render the generated diagram in a PlantUML editor and refine it to ensure that all actors, system boundaries, and use case relationships accurately reflect the functional requirements.

### Deliverables

- Finalized PlantUML code for the Use Case Diagram.
- Exported diagram image (e.g., *UseCase.png*).

## 2.2 Phase 2: Activity Diagram Generation (Process Workflow)

**Objective:** Create an activity diagram that represents the workflow of a single functional requirement in a clear, step-by-step manner.

### How to Write the Prompt (Example)

To formulate a suitable activity diagram, ask Gemini:

1. Choose one **functional requirement** (each activity diagram must be based on a different requirement).
2. List the **steps sequentially**, including actions and decision points.
3. Explicitly request PlantUML activity diagram syntax for workflow representation.

### Experiment Steps

- **Requirement Selection:** Select three different functional requirements (e.g., “Generate Recommendations”, “Analyze Emotion”, etc.), one for each activity diagram.
- **Code Generation:** Instruct Gemini to generate a PlantUML activity diagram for each selected requirement.
- **Validation and Refinement:** Render each diagram in a PlantUML editor, ensuring logical correctness, proper decision branches, and complete coverage of the workflow.

### Deliverables

- Finalized PlantUML code for the three activity diagrams.
- Exported diagram images:
  - Activity\_Req1.png
  - Activity\_Req2.png
  - Activity\_Req3.png

### 3 ASSIGNMENT REPORT STRUCTURE

You will compile all your work into a single professional report. This document constitutes your **lab assignment submission** for SE 305 – SE 321. The report should follow this structure:

#### AI USAGE POLICY

**Use of AI Tools:** AI tools such as Gemini, ChatGPT, or other chatbots may be used *only for generating PlantUML diagrams*. They must **not** be used to write, draft, revise, summarize, or edit any part of the written report. All narrative explanations, analysis, and discussion must be entirely the student's own work. **(If detected -30 points)**

#### 1. Introduction (5 / 100 points)

- Purpose and scope of the project
- Brief description of the client and their problem

#### 2. Methodology (30 / 100 points) This section should briefly describe how the experiment was conducted, including the main steps and tools used.

- **Prompt Engineering:** Describe how prompts were created for Gemini and adjusted when needed.
- **Validation and Refinement:** Indicate how AI outputs were checked against the transcript and corrected.
- **Tools and Platforms Used:** List the main tools (e.g., Gemini, PlantUML Live Server, LaTeX) and their purpose.

#### 3. System Modeling and Diagrams (Experiment II) (30 / 100 points)

- **3.1 Use Case Diagram:** include diagram, describe purpose, provide prompt, and PlantUML code.
- **3.2 Activity Diagrams (For Three Requirements, Three Different Diagrams):** include diagrams, describe purpose, provide prompts, and PlantUML code.

#### 4. Discussion and Conclusion (35 / 100 points)

- Critical evaluation of the AI tool, including its capabilities and limitations in diagram generation.
- Discuss the differences between your submitted diagrams and the diagrams generated by the AI tool. What discrepancies or improvements can be observed?
- Reflections on methodological insights and lessons learned from the overall experiment. (You can discuss previous experiment as well.)

#### 5. Appendices (*Without proper appendices, your work will not be considered complete, and grading will be based on this.*)

- **Appendix A:** Requirements that used for this experiment.
- **Appendix B:** AI Interaction Log (FULL CHAT LOG NOT ONLY YOUR 1 PROMPT and AI's 1 ANSWER)

**IMPORTANT NOTE**

**IMPORTANT!** While the client interview will be conducted collaboratively as a team, all subsequent phases of this experiment—including transcription, requirements analysis, diagram generation, and final report preparation—must be carried out **individually**. Each student is responsible for preparing and submitting their own complete work.