CPEN 321 Software Engineering
Winter 2023

M3: Design (Monday, October 16, 12pm PT)

This is a group assignment. The deliverable for this milestone is a **design specification** for the project idea selected by your client. The design specification consists of:

- A list of main modules, databases, and external components whose APIs you plan to use in your project's back-end (aim for 3-4 modules, not counting databases and external components). Explain in 1-2 sentences the purpose of each element.
    - Remember to consider the single responsibility, least knowledge, and other architectural principles.
- For each module, a list of its interfaces:
    - Each interface must have a meaningful name, parameters, and return value.
    - You can use any style of interfaces to describe the interactions between back-end components: either Java-style method calls or HTTP/REST.
- Frameworks you plan to use (MongoDB or MySQL, cloud provider, etc.).
- A diagram showing dependencies between modules and dependencies between modules and databases/external components.
    - "Boxes" in the diagram correspond to modules and links show call dependencies between the modules. Links must be directional, i.e., A→B means that module A calls B via at least one interface defined in B. A←→B means that A calls B via at least one interface defined in B, and B calls A via at least one interface defined in A.
    - Note: This is a free-form diagram rather than a class diagram. Also, we do not ask you to specify the front-end design for this milestone. Yet, you can add "front-end" to your diagram as one "box", to help visualize calls from the front-end to the back-end.
- Select 2-3 most important non-functional requirements specified in M2B (you can refine them if needed). For each, describe in 1-2 sentences how you plan to implement your project so that the requirement is realized.
- Describe your design for the main project "complexity". E.g., if you plan to implement a complex algorithm, specify its inputs, outputs, main computational logic (as pseudo-code), and state why it is complex.

You will use assistive AI technology (namely, ChatGPT 3.5) when working on this assignment. The assignment has three main educational goals:

1) Practice the process of designing a project.
2) Explore trade-offs between different design alternatives.
3) Explore the usefulness of AI tools in software engineering processes.

As such, you **must document and critically analyze** all usages of ChatGPT during the process of working on this assignment in a systematic way described below. This analysis **must be submitted** as part of the assignment and will be graded. Using ChatGPT 4 or any other version is **not allowed**, for fairness (so that all students will get the same level of support).

WORKFLOW:

1) Convert the initial design specification produced in the lab for the project selected by your client (referred to as Design D in the rest of this document) into a digital format.
2) Refine it as needed.
3) Use the refined design specification **as an input** to ChatGPT (GPT-3.5: https://chat.openai.com/). Use ChatGPT as a virtual consultant to assist you in further refining this specification.

- Keep a record of all your conversations with ChatGPT (prompts and replies). You will also submit the entire conversation with ChatGPT to show how your conversation led to the final deliverable. **Submissions without the conversations will lose all marks for the milestone**.
- Keep in mind that the responsibility for the final deliverable, which will be graded, is **yours**. As such, you will need to critically review the outputs of ChatGPT, ask follow-up questions to improve the result, and ensure you are satisfied with it before you submit.

4) If your conversation with ChatGPT does not lead to a satisfactory result after several iterations, you can decide to stop and provide your own final solution. You will need to provide an **explanation** of whether and how ChatGPT improved your initial submitted draft.

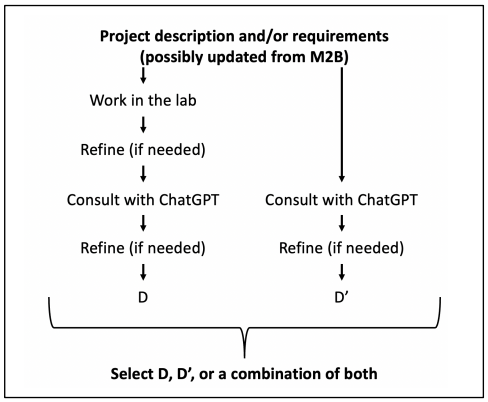
Once you are satisfied with the final deliverable for D, start working on an alternative design (referred to as Design D' in the rest of this document).

5) For D', start a new ChatGPT conversation and input your project description and/or requirements (*possibly updated from M2B*), **without providing any of your design specification versions as an input**. Use ChatGPT as a virtual consultant to assist you in defining the design specification for your project.
   - Keep a record of all your conversations with ChatGPT (prompts and replies). You will also submit the entire conversation with ChatGPT to show how your conversation led to the final deliverable. **Submissions without the conversations will lose all marks for the milestone**.
6) Continue the refinement until a satisfactory result is reached.
7) If your conversation with ChatGPT does not lead to a satisfactory result after several iterations, you can decide to stop and improve the solution provided by ChatGPT. You will need to add an **explanation** of whether and how you improved its solution.
8) Compare D and D', identifying the main strengths and weaknesses of each design alternative.
9) Select the final design specification for your project, which can be D, D', or a combination of ideas from both. Explain how you arrived at this design, i.e., which ideas from both design alternatives you used and why.

In summary,

- **For design D**, you will start from the initial design specification defined in the lab and refine it with the assistance of ChatGPT.
- **For design D',** you will start from the description of the project idea and/or requirements and derive the design specification with the assistance of ChatGPT.

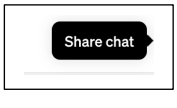
The schematic representation of the process you need to follow is in the right-hand side picture.



SUBMISSION. The submission for this milestone will include two parts:

PART I: All ChatGPT conversations (prompts and replies) used when working on this milestone. Each conversation should be saved and uploaded as an HTML file, using the procedure described below:

- Click on the "Share Chat" icon in the top right corner of the ChatGPT Web window.
- Click on "Copy Link". The link to the chat will be copied to clipboard.
- Open the link in a new tab of a Web browser.



- Save the page by pressing Ctrl + S.
- Name the file using the following schema: X_N.html, where
  - X is the name of the design alternative: either D or D'
  - N is the sequential number of the chat for the same project. For example, "D _2" is the second chat for design D.
    - You must have at least one conversation per design alternative. If you only have one conversation, you must still add a sequential number for consistency, e.g., "D' _1".

Submissions without attached ChatGPT conversations will lose all marks for the milestone.

PART II: a PDF file named "M3_Report", which includes the following information in the order specified below:

- Names and student numbers of all group members
- A short description of the project
- The contribution of each group member to the work done for this milestone **[2 points]**
  - 1-2 sentences per member
- Major decisions and changes in the scope of the project (since M2) **[2 points]**
- For D **[18 points]**:
  - Either the initial project design (identical to M3A submission) or, in case you refined the specification after the M3A submission and before starting to use ChatGPT, an updated specification **[2 points]**
    - No points will be given for the design specification D if the M3A is missing!
  - An explanation of whether the refinement was needed or not, and why **[5 points]**
  - File names of all ChatGPT conversations that were used to refine the initial design specification and a short description of the purpose of each conversation **[3 points]**
  - An explanation on whether ChatGPT output was used "as is" for the final design D. If not, explain which parts were used, which were not used, and why **[5 points]**
  - Design specification D **[3 points]**
- For D' **[11 points]**:
  - File names of all ChatGPT conversations that were used to produce the design specification and a short description of the purpose of each conversation **[3 points]**
  - An explanation on whether ChatGPT output was used "as is" for the final design D. If not, explain which parts were used, which were not used, and why **[5 points]**
  - Design specification D' **[3 points]**
- Final Design **[52 points]**
  - Main differences between D and D' **[4 points]**
  - Strengths and weaknesses of each design alternative **[8 points]**
  - Final project design specification **[36 points]**
  - An explanation of how you arrived at this design alternative **[4 points]**
- Reflections. You must answer all following questions in 1-2 paragraphs each [**15 points**]:
  - Which process (starting with an initial spec as in D or starting with ChatGPT as in D') allowed you to arrive at a higher-quality result and why?
  - How long did each of the processes take, overall? Which process was faster?
  - Which process was more enjoyable and why?
  - What are the advantages of using ChatGPT?
  - What are the disadvantages of using ChatGPT?
  - Is there anything else you would like to share about this process?

Good luck and have fun!