Academic Year 2025-2026 Semester 1

420407 - Software Design Patterns

Final Project

Requirements

Each team of candidates is required to refactor the source code of an existing software project by utilizing design patterns. It is highly encouraged to refactor a project that was previously developed by the team members. However, under exceptional circumstances, an open-source project may also be considered.

Teams are expected to apply FIVE design patterns discussed in the lectures (including ONE creational pattern, TWO structural patterns, and TWO behavioral patterns), as well as ONE additional design pattern that was not covered in the lectures. The list of design patterns on Wikipedia (https://en.wikipedia.org/wiki/Design_Patterns) can be utilized as a reference for exploring additional patterns.

During the refactoring process, teams are required to explore and practice the use of AI tools for multiple purposes, including but not limited to identifying refactoring opportunities, proposing design solutions, transforming the source code by applying design patterns, and evaluating the refactoring quality.

Teams are required to submit the refactored source code and a project report, and finally deliver a presentation on their work.

Submission

Each team is required to submit a package consisting of the following materials:

a) The complete set of source code after refactoring. If the total size of source code exceeds 20MB, please include the refactored parts only. In addition, the refactored pieces of source code should be clearly marked by comments, such as *"Refactored with XXX Pattern"*.

b) One project report that covers the following contents in the given order:

   1) The name of the software project, the team number, full names and matriculation numbers of all members, the contact number, the email address, and other particulars if any;

   2) A brief description of the software project, such as the background and major functionalities;

   3) Detailed presentation of the refactoring work, by highlighting the changed source code files and major differences before and after refactoring together with UML class diagram illustrations, and explaining the reasons for the changes (e.g. the

issues addressed, the benefits achieved, etc.);

4) Detailed presentation of the use of AI tools during the refactoring process, and a reflective discussion on the best practices, limitations, challenges and solutions, as well as other lessons learned;

5) Any additional information that may be relevant or valuable for discussion.

Note: The report should be written in English; file format for submission: PDF.

c) The final presentation slides, with the first slide presenting the name of the software project, the team number, and full names and matriculation numbers of all members.

Note: The slides should be composed in English; file format for submission: PDF.

Please place the source code (a) and the documents (b and c) into different folders, compress them into one ZIP file, and submit it via Canvas.

Presentation

Each team is required to present the final project within 10 minutes, followed by a Q&A session. The presentation should be delivered in English. Teams are required to:

a) Briefly introduce the project and the motivation for the refactoring.

b) Explicitly present and explain the application of the six design patterns. In particular, please present detailed comparisons of the source code before and after refactoring, by utilizing UML class diagrams with clear captions to illustrate the changes. In addition, please also discuss the rationales beyond the changes, explaining why they were necessary and highlighting the benefits they had brought.

c) Present the use of AI tools during the refactoring process, and a reflective discussion on the best practices, limitations, challenges and solutions, as well as other lessons learned.

d) Discuss other important issues involved during the refactoring work, as well as the corresponding solutions.

Grading Criteria

Grading Criterion	Weight
Application of ONE creational pattern, with detailed explanation	10%
Application of TWO structural patterns, with detailed explanation	20%
Application of TWO behavioral pattern, with detailed explanation	20%
Application of ONE additional design pattern, with detailed explanation	15%
The use of AI tools, with detailed discussion	15%
Quality of project report	10%
Quality of presentation	10%

THE END