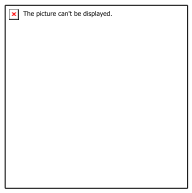
CS251: Intro to Software Engineering

Homework 1 - Introduction (7 marks)



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Introduction

In the era of Corona, digitization, economic uncertainty and AI-powered tools, a software engineering should adapt to these circumstances and adjust his skills to survive. In this assignment, we will investigate three different topics (1) Java / Scala / C# language, (2) possible employment chances with foreign entities to acquire foreign income and possible chances of running your own software business and (3) how to turn the threat of AI-powered tools into an opportunity.

Objectives

1- Learning Java / Scala / C# programming language
2- Learning about remote work opportunities for software engineers
3- Learning about investing money and building your own company
4- Learning to use AI-powered development tools

Instructions

1. The purpose of this assignment is to **learn, learn and learn** and then gain marks**.** If you focus on the second and forget the first, your time and life are wasted.
2. Students will work in groups of 3. Some tasks can be divided and some tasks **must be done by all members.** All work submitted must be integrated and fully understood by **all team.**
3. Team should provide one integrated report and one integrated solution of the problems.
4. Team should write their summary reports in **Arabic** (unless otherwise is specified) except non–Arabic speakers.
5. Any resources used should be (1) listed at end of the report and (2) cited inside the report where they were used.
6. Cheating or copying solutions from any source is not allowed and will be punished.
7. Use of AI tools is not permitted unless explicitly specified.
8. Deadline is **26 Feb. 2023 @ 11:50 pm**

Task 0 - Learning Java / Scala / C# (Individual - 0 marks)

In this task, you will go and learn one of the languages of Java, Scala or C# **on your own**. You can study Java from written tutorials or playlists like Desouki, Neseem, or Abdullah Almehmadi. You can study Scala or C# from any source or tutorial. **You need to learn Java / Scala / C# to the point that you can do small programs like you do in C++.** You have the choice of learning the language you like from these. It could be useful to do some research about these languages and choosing the one you prefer. But you should take into consideration (1) Lecture examples and exam questions will be in Java and (2) We will do a project in the course that will require using one language and **all you team members must know the same language.**

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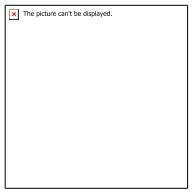

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Task 1: Develop Your First App in Java / Scala / C# (Group - 2 marks)

In this task, you will develop an application in Java / Scala / C#. You will build with your chosen language, a generic board-game playing system as described in Appendix I. Keep the interface but complete any missing details you cannot find in the appendix. Then you will develop one type of board; either an X-O game or a Connext-4 game and test it. (You can do both if you like) **Game must be all built from scratch with no use of external code or AI-assistants.**

This is your proof that you learned the desired language to a good enough level.

Task 2: Book Summary / Investment / Starting SW Business (Individual - 1 mark)

In this task we will educate ourselves about how to make investment, how to get money to work for us instead of working for it, how to accomplish tasks to the end, how to establish business in the field of IT and how to have significance and avoid insignificance. **Each student** will read and summarize one of these books according to his interest. You can read it in English or Arabic. Each summary will be **in Arabic in 3+ or more pages of single space size 12 font**. Last page of summary will be on **how you can apply these concepts in your life.** Summary **must be original** and not copied or auto-generated. Summary should reflect the main ideas of the book. Student can choose another book if they get professor's approval.

1- The Richest Man in Babylon
2- From Zero to One
3- Rich Dad – Poor Dad
4- كتاب كيف تنشئ مشروعا تجاريا وتديره وتحافظ عليه
5- حتمية بناء مشروعك الخاص https://www.youtube.com/watch?v=_AWux-OStac&list=RDLV_AWux-OStac&start_radio=1&rv=_AWux-OStac&t=2 including summaries from the books
   - Rework
   - Remote
   - Why We Work
6- Finish – Give Yourself the Gift of Done
7- نظام التفاهة

You can watch summaries in channels like أخضر or الزتونة or كتاب و على or others BUT you must read the original book or listen to it in audio.

Task 3: Study of Remote Work Opportunities (Individual - Group - 1 mark)

As the economic crisis deepens and the local currency sinks, it is important to secure a source of foreign income. In this task, each team member will study remote work opportunities and training opportunities like:

1) Freelancing and its different sites
2) Remote work with companies and hiring agencies (like https://www.turing.com/, https://magichire.co/, etc.)
3) Scholarships of recruiters that lead to work (like Andela, Manara, Alx, etc.)

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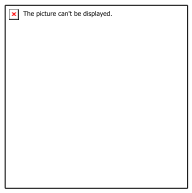

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Each student will read and **write a summary of at least two** of these sites or services. Team has two options:

1) Write a summary for each site/service that should be **about 500+ words** covering **(1) what this opportunity is about, (2) what it offers, (3) what the conditions are, (4) any other useful info and (5) your evaluation of it.** Produce **one combined** report for all summaries.
2) Or **instead of report**, they can produce a **one video or series of short videos** covering the same issues above.

Task 4: AI-powered Tools (Group - 3 marks)

AI-powered tools are here to stay. There is a wide range of them from auto-complete helper tools to full-blown language models like ChatGPT from OpenAI. These tools will be an integral part of developers' toolkit. In my opinion, they will have a dual impact on software development field:

1) They will be required as part of job requirements for future developers. Those who master these tools will ahead in the game and will be better employable.
2) These tools, especially language models will eliminate some of the jobs. Jobs that will survive are ones that require skills that the machine does not master yet.

In this task, we will explore different aspects of using these tools. In particular, students will:

1- **Write summary of other AI-tools.** Many AI-powered tools for programming are coming out. Each team member will take one tool (other than ChatGPT) and do evaluation of it and write a summary of (1) what it can do and (2) his experience in using it. Summary should be about 500+ words. An integrated report with the evaluation of the three tools will be delivered.
2- **Article on how these tools will impact developers and jobs.** In this article, the team will write 700+ words in Arabic or English about how the potential impact of AI-assistants on SW industry and how programmers' jobs might change or get eliminated. They should describe also how to take advantage of this wave to empower programmers.
3- **Building a system using these tools.** In this task, the team will do an experiment to generate two programs using AI-assistants like ChatGPT or Codex or others: one in C++ and another one in Python. Each one does the same as task 1 of building a generic game system and then making X-O game. You should give as many instructions and do conversations as needed to generate an accurate working game. Ask the system also to document it with enough comments. Test the game to ensure it works well. Evaluate the experiment and if AI-assistant did a good job or not.

Here is a list of links to start from. Feel free to search for any suitable resources **but you must write them in the report.**

https://sourceforge.net/software/ai-coding-assistants/free-version
https://atlasiko.com/blog/ai/top-ai-coding-assistants-for-programmers/
https://www.youtube.com/watch?v=1XNlXIqoQ7Y
https://www.youtube.com/watch?v=aJ4oudG25Jg&t=94s
https://levelup.gitconnected.com/how-to-use-chatgpt-for-developers-4e7f354bbc02
https://theconversation.com/ai-and-the-future-of-work-5-experts-on-what-chatgpt-dall-e-and-other-ai-tools-mean-for-artists-and-knowledge-workers-196783

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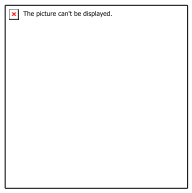

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What to Deliver

Team will provide one integrated zip file with pdf report that has the following items:

1- Cover page, title, date, faculty name, course name, team names and emails, **IDs, section**, phone of team leader
2- Table of contents and page numbers
3- Task 0: A table with team members, the language(s) they learned, hours spent in learning and sources used for learning
4- Task 1: Team will provide a description of the classes created and UML class diagram
5- Task 2: Team will provide 3 reports with summaries of individual readings
6- Task 3: Team will provide ONE integrated report with summaries of different chances
7- Task 4: Team will provide two reports (one on tools and one on future of programmers) and two descriptions of the AI-generated programs

The team will also deliver the code of the all programs they wrote nicely organized in separate folders with good names.

Marking Criteria

1. **2 marks** For developing a working program and game
2. **1 mark** For **individual** book summary
3. **1 mark** For integrated **group** report on remote work chances including 6 ones
4. **1 mark** For integrated **group** report on coding AI-assistants including 3 ones
5. **1 mark** For integrated **group** article on future of programming with AI-assistants
6. **1 mark** For developing a working programs and games
7. **Possible 0 for any student not contributing with the team**
8. **Possible –ve mark up to – 7 if any part is copied from net or books or other sources or AI-assistants are used when they should not be used.**

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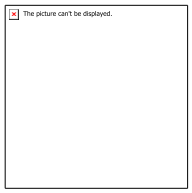

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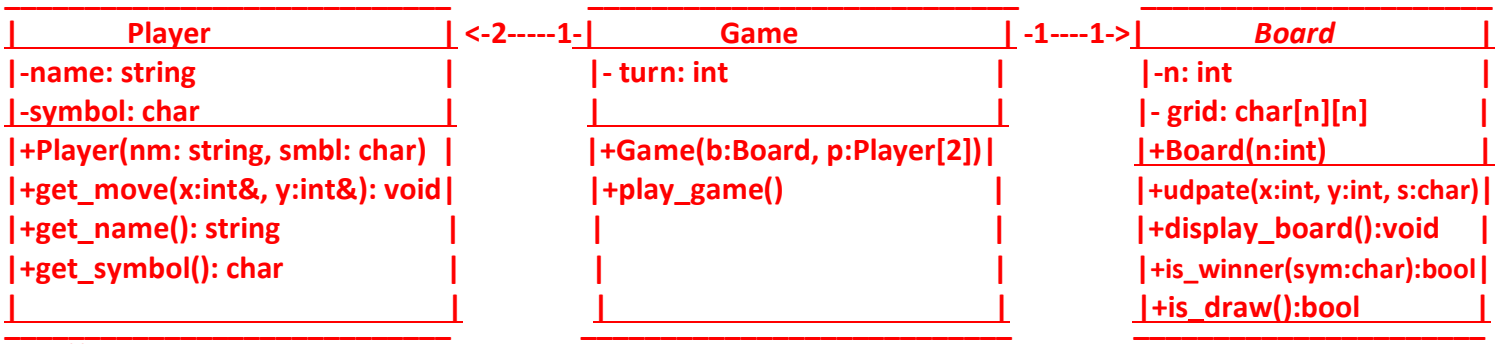
Appendix I: Board Game System Specifications

Class Player: It will represent a game player. It has some attributes like player name and symbol. It also has a constructor and a method to ask the player for the next move. Also it has getter methods for name & symbol.

Class Board: This is an abstract class. It is a grid of n x n squares. It has methods that support updating it with a new move and symbol, displaying current board state, checking for winners and draw. It also checks if a move is valid or not before updating board.

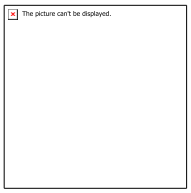
Class Game: This is the game class that has one or more methods to run the game playing algorithm. It is possible that some of the Board class responsibilities (like checking winners and draw) are done here. It can run any game and has a generic game playing algorithm. Client code should pass the board and players to it.

Can have class Move: It represents an action taken to place a symbol on an x, y square. It is possible that there is no need for such class and a move is represented by its basic components: x and y.



// Possible to have class **Move** and **Move Player::get_move()** and **void Board::update (Move m, char symbol)**

```
#ifndef _BOARD_CLASSES_H
#define _BOARD_CLASSES_H
using namespace std;
class Board {
protected:
   int  n;
   char grid[n][n];
public:
   // Set n and book space for n x n grid
   Board (int n);
   // Return true  if move is valid and put it on board or return false
   virtual bool update_board (int x, int y, char symbol) = 0;
   // Returns true if symbol owner wins
   virtual bool is_winner(char symbol) = 0;
```



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```
    // Return true if board status indicates a draw
    virtual bool is_draw() = 0;

    // Display the board and the pieces on it
    void display_board();
};

////////////////////////////////////////////////////////////////////////
/
// This class represents a player with a name and symbol to put on
board
class Player {
    protected:
        string name;
        char symbol;
    public:
        // Constructor to initiate player with name and symbol
        Player (string name, char symbol);

        // Get desired move: x, y
        void get_move(int& x, int& y);

        // Get symbol used by player
        char get_symbol();

        // Get name of player
        string get_name();
};

////////////////////////////////////////////////////////////////////////
///
// This class represents the engine that runs a board game
class Game {
    private:
        Board board;
        Player players[2];
        int turn = 0;
    public:
        // Constructor initializes the game with a board and players
        Game(Board board, Player& players[2]);

        // It runs the game and switches turns, until one wins or draw
        void play_game();
#endif
```