

Sports Concussion Assessment System Project

Purpose

Learners will develop an application that can help sports medical practitioners monitor athletes' conditions for symptoms of concussion. Currently, one of the most commonly used tools for assessing concussions is a paper-based diagnostic tool. The app learners will develop aims to help sports medical practitioners make a more timely diagnosis of concussions and avoid subsequent issues that could put the athletes' well-being at risk. Learners will get hands-on experience with key concepts of app development, including actors, use cases, use case diagrams, object identification, class diagram development, and Java implementation.

Objectives

Learners will be able to:

- Elicit requirements for a software system using user scenarios and diagrams.
- Identify objects from a given scenario.
- Develop class diagrams for identified objects.
- Apply UML notation to develop class diagrams and use case diagrams.
- Implement an application using Java.

Technology Requirements

- Astah UML
- Java 17
- Java Development IDE: Eclipse or VSCode

Project Overview

Phase I: Eliciting requirements using use cases, use case diagrams, and CRC diagrams.

Phase II: Object identification and class diagram development.

Phase III: Implementation using Java.

Project Description

Develop a software system called "Sports Concussion Assessment System." It should be an app that helps sports medical practitioners receive and evaluate the conditions or symptoms of athletes after each game/training session for a possible concussion.

The system will have two (2) groups of users: athletes and sports medical practitioners.

Athletes will enter their health conditions or concerns based on [well-defined symptoms](#) (see **Figure 1: Symptom Evaluation**) through the athlete application (ideally, this could be deployed on a smartphone or hand-held device), as well as their pain levels on a numerical scale from 0 (no pain) to 6 (severe pain).

The app should use the criteria in the table from **Figure 1: Symptom Evaluation** to determine the difference in athlete symptoms between two successive games or practices and report on the athlete's condition, which the sport medical practitioner may use to advise athletes as needed.

All symptom information required for this project is available in **Figure 1: Symptom Evaluation**.

Symptom Evaluation

How do you feel? Score yourself on the following symptoms listed below, based on how you feel now.



	none	mild	moderate	severe			
Headache	0	1	2	3	4	5	6
Pressure in head	0	1	2	3	4	5	6
Neck pain	0	1	2	3	4	5	6
Nausea or vomiting	0	1	2	3	4	5	6
Dizziness	0	1	2	3	4	5	6
Blurred vision	0	1	2	3	4	5	6
Balance problems	0	1	2	3	4	5	6
Sensitivity to light	0	1	2	3	4	5	6
Sensitivity to noise	0	1	2	3	4	5	6
Feeling slowed down	0	1	2	3	4	5	6
Feeling like "in a fog"	0	1	2	3	4	5	6
"Don't feel right"	0	1	2	3	4	5	6
Difficulty concentrating	0	1	2	3	4	5	6
Difficulty remembering	0	1	2	3	4	5	6
Fatigue or low energy	0	1	2	3	4	5	6
Confusion	0	1	2	3	4	5	6
Drowsiness	0	1	2	3	4	5	6
Trouble falling asleep	0	1	2	3	4	5	6
More emotional	0	1	2	3	4	5	6
Irritability	0	1	2	3	4	5	6
Sadness	0	1	2	3	4	5	6
Nervous or anxious	0	1	2	3	4	5	6

Results

Total number of symptoms
(Maximum possible 22)

Symptom severity score
(Add all scores in table, maximum possible: $22 \times 6 = 132$)

Do the symptoms get worse with physical activity?

☐ Yes ☐ No

Do the symptoms get worse with mental activity?

☐ Yes ☐ No

Overall rating

If you know the athlete well prior to the injury, how different is the athlete acting compared to his/her usual self? *Please circle one in response*

no
different

very
different

unsure

Figure 1: Symptom Evaluation

Basic Operation: Input symptom evaluation (22 factors) after each game. Your app should then store data for the five (5) most recent games in a suitable data structure. Athletes can see the symptom summary for each game by selecting a symptom summary button. The symptom summary includes:

- Total number of symptoms
- Symptom severity score
- Overall rating (no difference, very different, unsure) — after comparing with the summary of the previous game

Once the athlete submits his or her symptoms through the application, sports medical practitioners should be able to review the symptoms and view the "risky condition indicator" for each athlete. "Risky condition" is defined as "a dramatic change in the athlete's symptom severity in two successive games" (i.e., "very different" overall rating). The overall severity rating is used to confirm the risky condition in the athlete. Based on the "risky condition indicator," the sports medical practitioners can advise each athlete as needed.

Overall Severity Rating	Criteria* comparing the last two games' symptom summaries	When athlete selects the "Am I at Risk?" button...
No difference	Total symptom difference < 3 && severity score < 10	Display a green image
Unsure	Total symptom difference < 3 && severity score ≥ 10	Display a yellow image
Very different	Total symptom difference ≥ 3 severity score ≥ 15	Display a red image

* This is **not** the criteria doctors use. Do **not** use this for any actual diagnostic purposes.

Directions

Technology Set Up

You have **two (2) options** to complete the project code: A) You can use a **local setup**, or B) you can use **Apporto**. Your choice will likely depend on what technology you have access to. Please review the set up directions for each option in the *Welcome and Start Here* module of your course, "Technology Set Up: Sports Concussion Assessment Project & Directory Management Project", and select the one most appropriate for you and your system.

Project Directions

Download a copy of the *Template_Your Name_CSE 598 ASAD_Sport Concussion Assessment System Project* document. You will use this document to submit your responses for Phase I and II.

Please add the current session and year (e.g., Spring A 2020, Fall B 2021) and your name where indicated in the header of your copy of this template.

Phase I

Refer to the *Template_Your Name_CSE 598 ASAD_Sport Concussion Assessment System Project* document to complete Phase I.

Part 1

Identify and describe all of the actors and major use cases of the system.

Include your descriptions on your copy of the learner submission template in the space provided for Phase I Part 1. You may add pages if necessary.

Part 2

Using your response from Phase I Part 1, draw a use case diagram using **Astah**. Use proper UML notations while drawing your use case diagram.

Take a clear screenshot of your completed diagram and include this in your copy of the learner submission template in the space provided for Phase I Part 2.

Phase II

Refer to the *Template_Your Name_CSE 598 ASAD_Sport Concussion Assessment System Project* document to complete Phase II.

Part 1

Using the basic operation scenario given in the Project Description, develop **two (2)** major use case descriptions for the athlete and sport medical practitioner.

Include your descriptions on your copy of the learner submission template in the space provided for Phase II Part 1. You may add pages if necessary.

Part 2

Using your response from Phase II Part 1, identify potential objects and create a CRC diagram for **each** object.

Include your potential objects and CRC diagrams in the space provided on your copy of the learner submission template in the space provided for Phase II Part 2. You may add pages if necessary.

Part 3

Using your identified objects from Phase II Part 2, draw a UML class diagram using **Astah**. Make sure you are reflecting the relationship among objects by using proper UML notation to reflect the relationship among objects.

Take a clear screenshot of your completed diagram and include this in your copy of the learner submission template in the space provided for Phase II Part 3.

Phase III

Use Java to develop a console application that implements the functionalities described in Phase III Parts 1, 2, and 3. Java implementation of given functionalities includes objects identified in **Phase II**.

Functionalities:

- Symptom Entry
- Display Symptoms Summary
- "Risky Condition"
- Exit

You will save and submit your code as a ZIP file.

Part 1

Input symptom evaluation (22 factors) after each game. The app should then store data for the five most recent games in a suitable data structure. (See **Figure 2: Sample interface for collecting symptom severity information from injured athletes by the system.**)

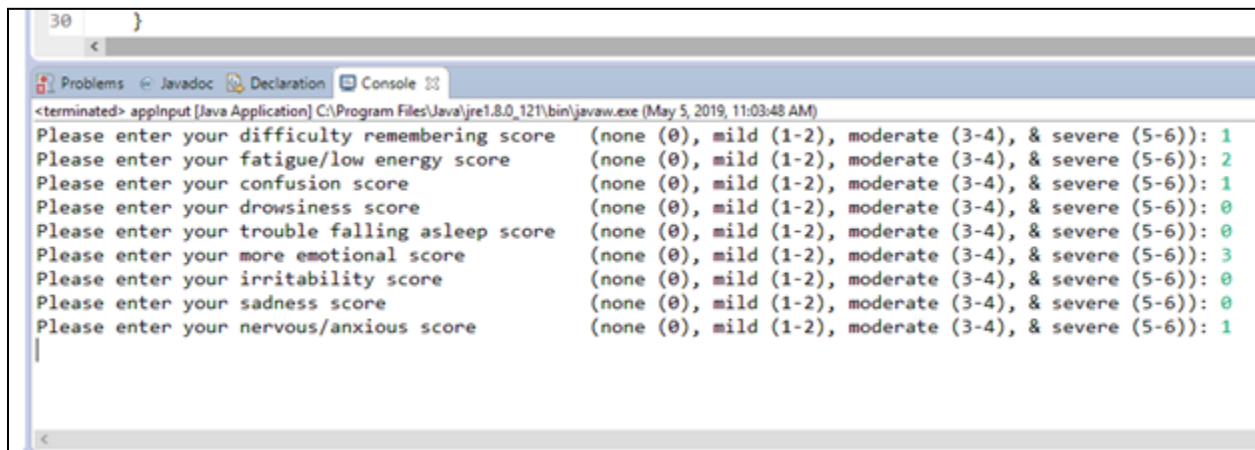


Figure 2: Sample interface for collecting symptom severity information from injured athletes by the system

Part 2

Athletes can see the symptoms summary for each game by selecting the symptom summary option. The symptom summary includes:

- Total number of symptoms
- Symptom severity score
- Overall rating (no different, very different, unsure) – after comparing with the summary of the previous game.

Criteria*:

No difference: Total symptom difference < 3 && severity score < 10

Unsure: Total symptom difference < 3 && severity score ≥ 10

Very different: Total symptom difference ≥ 3 || severity score ≥ 15

** This is **not** the criteria doctors use. Do **not** use this for any actual diagnostic purposes.*

Part 3

Display the risky condition indicator. "Risky condition" is defined as a dramatic change in athlete's symptoms severity in two successive games. An overall severity rating (no difference, very different, and unsure) is used to confirm the risky condition in an athlete. When the athlete selects the "Am I at Risk?" button, the athlete will be notified of his or her condition:

If no difference: Display a green image.

If unsure: Display a yellow image.

If very different: Display a red image.

Submission Directions for Project Deliverables

You are given a limited number of attempts to submit your best work. The number of attempts is given to anticipate any submission errors you may have in regards to properly submitting your best work within the deadline (e.g., accidentally submitting the wrong paper). It is **not** meant for you to receive multiple rounds of feedback and then one (1) final submission. Only your most recent submission will be assessed.

You must submit your Sports Concussion Assessment System Project deliverables in the designated submission space in the course. Learners may not email or use other means to submit any project for review, including feedback, and grading.

The Sport Concussion Assessment System Project includes two (2) deliverables:

1. **Phase I and II PDF:** Phase I and II of your project must be a **single PDF** with the correct naming convention: *Your Name_CSE 598 ASAD_Sport Concussion Assessment System*

Project. You are **required** to use the provided template document, *Template_Your Name_CSE 598 ASAD_Sport Concussion Assessment System Project*.

2. **Phase III ZIP file:** Phase III of your project must be a **single ZIP file** with the correct naming convention: *Your Name_CSE 598 ASAD_Sport Concussion Assessment System Project_Phase III*.

Making File Submissions in Canvas

Before submitting, confirm that your deliverables follow the requirements for the project, and then submit your work in the designated submission space in the course. File submissions are manually graded by the course team.

1. In your course, go to **Submission: Sports Concussion Assessment System Project Report**.
2. Click **Start Assignment**.
3. Click **Choose File**.
4. Locate and select **one (1)** deliverable file from your device.
5. If needed, click **+Add Another File** and repeat Steps 3 and 4 until all deliverables are added.
6. Select the **agreement** and then click **Submit Assignment**.
7. (If needed and allowed) To resubmit files:
 - a. Return to the Canvas submission space, click **New Attempt**, and repeat the process from Step 3.

Evaluation

Please review the rubric for how your Sport Concussion Assessment System Project will be graded. Projects will be evaluated based on each criterion and will receive a total score. Projects missing any part of the project will be graded based on what was submitted against the rubric criteria. Missing parts submitted after the deadline will not be graded.

Review the course syllabus for details regarding late penalties.

Rubric

Rubrics communicate specific criteria for evaluation. Prior to starting any graded coursework, learners are expected to read through the rubric, so they know how they will be assessed. You are encouraged to self-assess your responses and make informed revisions before submitting your final report. Engaging in this learning practice will support you in developing your best work. Points may be

deducted at the discretion of the faculty for disorganized submissions that convolute the grading process.

Component	No Attempt	Undeveloped	Developing	Approaching	Meets
Phase I Part 1: Identification of use cases and actors.	Provided no response.	Submission does not identify correct key use cases and actors.	Submission is missing many key use cases and actors.	Submission identifies a significant majority of the main use cases and actors.	Submission identifies all of the main use cases and actors.
Phase I Part 2: Use case diagram with correct UML notations.	Provided no response.	Submission provides a use case diagram, but the diagram is incorrect.	Submission provides a use case diagram, but the diagram contains many incorrect UML notations and/or did not use the right modeling tool (Astah).	Submission provides a use case diagram, which has a few incorrect UML notations.	Submission provides a use case diagram, which uses proper UML notations and is drawn using the right modeling tool (Astah).
Phase II Part 1: Athlete and sport medical practitioner use cases.	Provided no response.	Submission is missing at least one (1) use case or contains incorrect use cases.	Submission includes two (2) use cases, but they are missing several major operational scenarios.	Submission includes two (2) use cases, which include a majority of the important operational scenarios and are missing no more than two (2) important scenarios.	Submission includes two (2) use cases, which include all important scenarios.
Phase II Part 2: Identification of potential objects.	Provided no response.	Submission does not identify any objects, or incorrectly identifies all objects.	Submission identifies objects, but several key objects are missing or are incorrectly identified.	Submission identifies most of the major objects, with only a few incorrectly identified or missing.	Submission identifies all of the major objects.
Phase II Part 3: UML class diagram.	Provided no response.	Submission provides an incorrect UML class diagram.	Submission provides a UML class diagram, but the diagram has several incorrect UML notations or did not use the right modeling tool (Astah).	Submission provides a UML class diagram, and the diagram correctly identifies most of the major objects but contains a few incorrect UML notations.	Submission provides a UML class diagram, which uses proper UML notations and the right modeling tool (Astah).
Phase III: Java implementation of given functionalities.	Provided no response.	Submission is missing all major system functionalities.	Submission implements most of the major functionalities, but implementation does not match or include the objects identified in Phase II.	Submission implements the major functionalities, but is missing some objects identified in Phase II.	Submission implements all the major functionalities, and implementation includes all the objects identified in Phase II.