CSE 222 – Data Structures

Project Announcement

You will design and implement a software system to solve a problem of your choice. The problem has to be gradually extendable since you need to add new modules as you learn new data structures. In the reports, you must explain why you considered the data structure is appropriate to implement the corresponding module, for each data structure used. Moreover, you need to give details about the performance improvement in the module via your data structure choice.

You will work in groups of 9/10 students. The groups will be formed randomly and announced through the MS Teams page of the course. If there is a non-contributing member of the group, with more than 70% majority of votes, the group has the right to get the member out of the project group. These members will get a grade of zero.

Each group will create a free GitHub account for their project, the group members will also be members of the git project and the development process will run on GitHub.

The **project proposal** will include:

- Group members
- Problem definition
- Users of the system
- Requirements in details
- Use-case diagrams
- The C4 model of the system (only the first two levels, not the component and code diagrams. See c4model.com)

The **2^nd^ project report** will include:

- The same parts in the project proposal. If there are changes in the parts, highlight and explain them.
- The C4 model of the system (only the first three levels, not the code diagram). Specify the data structures are used to implement components on the diagram. Explain how the data structures are used with the related components (not on the diagram).
- Class diagrams
- Sequence diagrams
- Activity diagrams (optional for extra points)
- The non-trivial implementation details.
- Test cases. Design integration test scenarios as much as possible besides the unit test. Explain each case briefly and specify which modules/components/activity will be tested by this case.
- Performance analysis of your code. Perform a theoretical analysis. Validate your theoretical analysis by experimental performance test.

The **final project report** will include:

- The same parts in the 2nd project report. If there are changes in the parts, highlight and explain them.
- The results of the tests. Use screenshots and tables to present the test results.
- Submit the final report and the implementation of the project to the MS Teams.

The **design and implementation process** will be as below:

- ➔ Upload the project proposal to the MS Teams page of course.
    - See the revision requests for the proposal and fix them. The revised parts should be explained in the 2nd project report.
    - Following set of data structures should be included in the project design:
        1. List,
        2. Stack or Queue,
        3. Binary Search Tree,
        4. Priority Queue.
- ➔ Implement the project by including the specified data structures and upload the 2nd project report to the MS Teams page.
    - See the revision requests for the 2nd project report and fix them. The revised parts should be explained in the final project report.
    - Following set of data structures should be included in the project design during the final phase of the project.
        1. Set - Map, the data structure should be navigable which has sorted access,
        2. Skip List,
        3. Graph,
        4. Balanced Binary Search Tree.
    - Implement and use a sorting algorithm in at least one module/specification. You must explain which sorting algorithm has been used and why (by explicit reasons) you used that algorithm.
- ➔ Implement the project by including the sorting algorithm and the specified data structures in the second list. Upload the final project report and implantation of the project to the MS Teams page.
- ➔ Present the project and make a demo.

Possible changes in the sets of data structures will be announced via the MS Teams page so, please check the MS Teams page frequently.

Please use the project forum channel under the MS Teams page of course for your questions. You may send an email to b.koca@gtu.edu.tr if you need to contact the TA privately.