**Overview**

You are expected to apply any bug-detection tools (at least 3 tools) that we discussed in class or that you have found during your research to detect bugs in a set of open-source projects (at least 5 projects) of your choice. You then report what you found when you apply these tools (including the one you created in part I).

You are expected to do the following:

- Experiment:
    - Select a set of open-source subject projects on GitHub that meet the requirements
    - Select a set of bug detection tools (the ones we discussed or the ones that you found elsewhere)
    - Apply these tools to these subject projects.
    - Evaluate the bugs that the tools found and improve the result by selecting the correct input parameters or by applying filters
    - Discuss the detected bugs and indicate the pros and cons of the tools used.
    - Provide suggestions for others if they want to perform bug detection using such tools.
- Write a report (**no more than 8 pages**) that:

    - The application of tools to find bugs
        - The process of selecting subject projects (Give justification)
        - The process of selecting detection tools (Give justification)
        - The process of applying the tools (Provide any difficulties and how you overcome such difficulties)
        - The evaluation results and what is done to improve the results
        - The discussion of the detected bugs and the pros and cons of the tools.
        - Conclusion and suggestions for others if they want to follow your steps.

**Subject project and tools selection:**

You should select **at least 10-15 projects** at the start. Have clear selection criteria (e.g., types of application, programming languages, influence factors such as stars and number of forks). Try to be diverse by selecting different types of projects or different programming languages. Always select popular projects with **at least 50 stars or folks.** Try to have a focus. For example, you can decide to study only projects written in Java, then you need to select a diverse type of project that perform different things. Or you could decide to study only web development projects but then will need to diversify the languages.

Once you have selected your set of projects, you will then find the tool to perform detection. The selection of subjects will affect your selection of tools. For example, if you select only Java projects, then you will find only bug-detection tools for Java. Remember to justify your selection and explain why you select certain tools (e.g., it is popular, or it is easy to apply…). Find at least 5 tools at this step. Try to diversify your selection. For example, try to find different types of tools: static analysis, test case generation, etc.

Once you have your list of tools you will apply the tools to the projects. There might be projects that the tools can not work on and there might be tools that do not work with most of the projects. You can exclude such tools or projects from your results but remember to explain why. **Your evaluation should have at least results for at least 3 tools that are applied to at least 5 projects.**