

IIIT Bangalore
CS 731: Software Testing
Term I 2022-'23: Project Work

This document contains details and problems for a project in CS731 course in Software Testing. The goal of project work is to self-learn and understand the practical aspects of testing, through use of open source tools and the test case design strategies learnt in the course.

Guidelines

- All submissions for this assignment should be original work. **Plagiarism of any form shall not be tolerated and strict action will be taken against defaulters. In particular, zero marks will be awarded for project work and no make-up work will be assigned.**
- You need to work as a team of two members with your classmates, one team of two students per project. Please discuss amongst yourselves and finalize your team members and the problem you will be working on as a team. A form will be made available to choose your project and upload the names. Under special circumstances, a team of three students will be allowed. In such a case, there should be a clear distinction between the contributions of the team members.
- Your submission should be uploaded in the designated folder within the LMS course page.
- Submissions should be named in the format <roll-number-1-2>.tar.gz
- Deadline for final project submission is Saturday, 26th November 2022, 6:00 PM.
- The tarred-gzipped folder should include the files containing a link to the complete code repository that is used for testing, the test case strategy used (from amongst the listed strategies), designed test cases, (open source) testing tools used, executable files and details/screen shots containing the results of testing done. Please document the details in a small, plain text README file and include the README file in the tar, gzipped file.
- Kindly use your own source code, as appropriate for the chosen project. The source code used should provide at least one complete functionality or feature (should be written in the documentation of the code) and should contain approximately 1-2K lines of code, excluding documentation. In addition, source code should contain features specific to the chosen project, as detailed below. For e.g., a project using CFG criteria should have source code rich in control flow structure, a project using logic based testing should have decision statements with three or more clauses a project

with ISP should have clearly laid out requirements whose inputs can be partitioned based on the requirements, a project on web applications testing should have client-side code along with the required information like client-side constraints or user-session data etc.

- Evaluation will be done based on a review by one of the TAs and the instructor. During evaluation, the code and its functionality should be briefly explained along with the design of test cases and the execution of the test cases on the code should be demonstrated.
- Half the score for each student will be based on the success of team effort and half for each student's individual contribution. Please clearly document each team member's contribution in the README file.

Problems

- Control flow graphs: Projects that use graph based testing, with only control flow criteria. These projects need to use test cases that are designed for edge coverage and for prime paths coverage. Your code should have decision statements and loops that are nested, illustrating the use of prime paths in pulling out all possible ways of covering nested loops.
- Data flow graphs: Projects that use graph based testing, with only data flow criteria. Projects need to use du-paths based testing for designing test cases. Your code should have du-paths that are defined in presence of loops and include all-du-paths coverage.
- Design integration graphs: Projects that use graph based testing at the design integration level. The designed test cases need to use the call interfaces and criteria based on last-defs and first uses of the coupling variables. Your code should have function/method calls with parameters that can be considered towards coupling data flow.
- Logic-based: Projects that use logic based testing. These projects need to use at least one of the active clause coverage criteria (preferably correlated active clause coverage) to design test cases. Your code should have decision statements with at least three clauses in its predicates.
- Symbolic execution based: Projects that use symbolic execution to test for path coverage in source code. Source code should have rich control structure, including nested decision statements, loops and function calls.
- ISP-based: Projects that use input space partitioning. These projects need to be applied on code that have several inputs and clearly documented requirements that can be tested by partitioning the input domain. You need to design test cases based on pair-wise and T-wise coverage, along with boundary value analysis.

- Mutation source code: Projects that use mutation testing, based on mutation operators applied at the level of a statement within a method or a function. The mutated program needs to be strongly killed by the designed test cases. At least three different mutation operators should be used.
- Mutation design integration: Projects that use mutation testing at the design integration level, based on mutation operators for design integration. The mutated program needs to be strongly killed by the designed test cases. At least three different mutation operators should be used.
- Client-side web applications testing (user session data based): Projects involving testing of client side code of a web application based on recording and using user session data from logs.
- Client-side web applications testing (bypass testing): Projects that involve testing of client side code of a web application by designing test cases that bypass client-side validation and sending changed/corrupt input to the server.
- Server-side web applications testing: Projects involving manual modeling of web applications code, as relevant, using CIM and ATG models and testing them for coverage.

Testing tools

Please use the following testing tools as appropriate. In addition, you can use **any** available tool in the open domain to design your test cases based on the chosen project and provide details of the same in your documentation.

- The web applications to use various coverage criteria to design test cases as taught in the course. They are available under the section titled **Support software** in the course page <http://cs.gmu.edu/~offutt/softwaretest/>.

You can also directly generate your test cases by applying the criteria.

- Selenium: Available from <https://www.selenium.dev/>.
- JUnit: Available from <http://junit.org/junit5/>.
- Apache JMeter: Available from <https://jmeter.apache.org/>.
- Mocha: Available from <https://mochajs.org/>.