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Abstract

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Chapter 1

Introduction

La Figure 1.1 è una figura di esempio.



Figure 1.1: Questa è una immagine di esempio

Things to add:

- where different types of coverage are useful
- Add formulas for coverage kinds

Coverage testing

Coverage is one of the metrics employed during testing to asses what portion of the source code is "covered" by the test suite i.e., what portion of the code is executed when the tests run. Coverage is essential to extract information about the general quality of a test suite and helps determining how

comprehensively the software is being verified. As a result, coverage can be classified as a white-box testing technique.

Source code coverage can be expressed according to different sub-metrics:

- Statement coverage aims executing every single statement in the code.
- Branch coverage, also known as decision coverage, measures how many decision structure have been fully explored by the test cases.
- Mutation coverage, also known as fault-based testing, aims at purposefully introducing faults in the program in order to check whether or not the test suite is able to identify them. If the fault is correctly detected, the mutant is "killed". One issue of mutation is scalability, since generating and compiling the mutants, before running the test cases, can be time consuming and quickly exhaust testing resources. Additionally, the introduced mutations can be classified as weak or strong: with strong mutation, the artificial fault is propagated to an observable behaviour, while weak mutants are confined to more specific environments.
- Function coverage measures how many functions have been called by the test cases.
- Condition coverage determines the number of boolean conditions/expressions executed in the conditional statements.

To reach statement coverage, it is sufficient to execute a branch in which the statement is control dependent.

A high coverage can sometimes be deceiving, however: in the case of Machine Learning Systems (MLS), where typically the source code is made up of a sequence of library functions and API invocations [2], thus resulting in very high statement and branch coverage with relatively modest test suites. Additionally, the effectiveness of such systems is highly determined by the dataset employed for model training and validation, which cannot be covered by tradition test cases.

Coverage can also be measured at any testing levels; while at the unit test-level we focus mostly on the coverage of statements and branches, at the system-testing level, the coverage targets shift towards more complex elements, such as menu items, business transactions or other operations that require multiple components of the system to work properly.

Automatic test case generation

Test case generation can be seen as a multi-objective problem, given that the goal is to cover multiple test targets.

Search-based approaches for test case generation use optimization algorithms to attempt to find the best candidate test case with the objective to maximize fault detection. Genetic Algorithms (GAs) are an example of an evolutionary search approach for test case generation; starting from an initial, often randomly generated, population of test cases, the algorithm keeps evolving the individuals according to simulated natural evolution theory principles. In this context, a typical fitness function of a GA would measure the distance between the execution trace of the generated test cases and the coverage targets.

Testing in the Internet of Things

Chapter 2

Literature

DynaMOSA, Dynamic Many-Objective Sorting Algorithm [1] is an approach that focuses on ..., and has been developed as an evolution of MOSA. This latter solution implements a many-objective GA to tackle test case generation and has three main features:

- instead of ranking candidates for selection based on their Pareto optimality, it uses a preference criterion. This criterion selects the test case with the lowest objective score for each uncovered target; these selected individuals are given a higher chance of survival, while other test cases are ranked with the traditional NSGA-II approach.

DynaMOSA has been employed with Java classes.

Traditionally, with evolutionary search-based approaches, the algorithm is applied multiple times, once for each coverage criterion; doing so may Ultimately, however, the effectiveness of the solution depends on the problem

Chapter 3

Conclusions

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Bibliography

- [1] F. M. Kifetwe A. Panichella and P. Tonella.
“Automated Test Case Generation as a Many-Objective Optimisation Problem with Dynamic Selection of the Targets”. In: *IEEE Transactions on Pattern Analysis and Machine Intelligence* (2018).
- [2] A. Author. “Article title”. In: *Journal name* (2099).
- [3] A. Author. “Tesi di esempio ISISLab”. 2099.
- [4] A. Author and A. Author. *Book reference example*. Publisher, 2099.
- [5] *Example*. URL: <https://www.isislab.it>.
- [6] V. Riccio G. Jahangirova A. Stocco N. Humbatova M. Weiss and P. Tonella.
“Testing machine learning based systems: a systematic mapping”. In: (2020).