

Fall 2008: EE382C.3 Verification and Validation

Instructor

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Time and Location

All lectures will be 5:00–06:30pm in ENS 116.

Prerequisites

The students are expected to have basic knowledge of data structures and object-oriented programming, and considerable programming experience.

Catalog entry

Advanced concepts and techniques for checking the correctness of programs and specifications. Topics include state-of-the-art research in systematic software testing, state-space exploration techniques, including symbolic techniques, for software model checking, heuristics-based approaches, as well as static program analyses, including those based on automated theorem proving, and behavioral specification languages.

Description

The process of software validation includes reasoning about (the correctness of) programs, whether formally—a process that is termed verification—or informally, and testing programs. This course focuses on verification and testing. A NIST report from 2002 estimates that software failures cost the US economy \$59.5 billion dollars annually and over a third of this cost could be saved using a better infrastructure for testing. It is widely accepted that testing currently accounts for more than one half of the cost of software development. Learning the techniques and tools presented in this course is likely to significantly increase the students'

productivity as software developers and testers and improve the quality of the code they develop.

The course is organized as a series of research/tool paper presentations and discussions. The selected papers will cover traditional and state-of-the-art techniques for software validation. (See the References Section for a list of candidate papers. Different papers may be selected in view of class preferences.) The course content will cover both techniques for dynamic analysis, such as glass box and black box testing, equivalence partitioning, boundary value analysis, test strategy and automation, regression testing and debugging, and techniques for static analysis, such as shape analysis, and also techniques for software model checking including those that employ artificial intelligence based heuristics.

Grading

The grade will be based on class participation (10%), homeworks and quizzes (40%) and a final group project (50%). Students must participate actively in the class. The final project will be done in a group of three or four students. A typical project would involve performing a case study using some tool(s) studied in the class. With instructor's permission, the students may choose to work on a suitable idea of their own. Good projects will result in work that is of a quality expected for conference/workshop publication. At the end of the course, students will present their projects to the class.

Textbooks

The following texts provide some basic material that would help students understand the more advanced material in the papers:

1. Software Abstractions: Logic, Language, and Analysis by Daniel Jackson. ISBN: 0262101149
2. Model Checking by Edmund M. Clarke, Orna Grumberg and Doron A. Peled. ISBN: 0262032708
3. Introduction to Software Testing by Paul Amman and Jeff Offutt. ISBN: 0521880386

References

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