Fall 2021

EE382V: Software Testing in the Era of Nondeterminism
TTH: 3:30PM-5PM
Unique No: 17165

Instructor

August Shi (Assistant Professor)
Classroom: ECJ 1.318
Zoom classroom: `https://utexas.zoom.us/j/99680676631`
Email: `august@utexas.edu`
Office Hours (Zoom: `https://utexas.zoom.us/j/8630451375`): TTH 2PM-3PM; also by appointment

Teaching Assistant

Chenguang Zhu
`cgzhu@utexas.edu`
TA Office Hours (Zoom: `https://utexas.zoom.us/j/2753730070`): MW 3PM-4PM; also by appointment

Description

Software developers commonly rely on testing to check the quality of their software and to help detect bugs before they release. However, testing becomes challenging as software becomes more complex. The high complexity of software can lead to tests that nondeterministically pass or fail when run multiple times on the same software without any changes to the code. Such tests, commonly known as flaky tests, can lead developers to no longer trust their test outcomes, e.g., if developers run tests after they make changes to their code, any test failures they observe may not indicate real bugs they should fix. The main goal of this course is to understand the challenges in testing in face of such nondeterminism as well as research that mitigates these problems.

This course is organized as a series of research paper presentations and discussions. The selected papers will cover topics related to the main goal of the course, including techniques for detecting/debugging/repairing flaky tests, testing of concurrent software, testing for non-functional properties such as performance, and testing in inherently nondeterministic domains such as machine learning. This course will also include a project component where students are expected to propose and conduct a research project related to the topics covered in the course.

Prerequisites

Graduate standing or permission from instructor. The students are expected to have basic knowledge of data structures and object-oriented programming, and to have considerable programming experience.

Textbook

No textbook is required or used in this course.

Deliverables and Grading

The grade will be based on:

- Research project (70%)

- Presentation (15%)

- Participation (10%)

- Homework (5%)

Students must participate actively in the class and present at least one paper. The students will be asked to submit reviews for presented papers. Additionally, there will be assignments to help students make progress with their projects and broaden their knowledge in software development and software testing. The semester-long research project can be done individually or in pairs. Good projects will result in work that is of a quality expected of conference/workshop/journal publications. At the end of the course, students will present their projects to the class and turn in a final report.

Based on your points, you will get at least these grades: A (93%), A- (90%), B+ (87%), B (83%), B- (80%), C+ (77%), C (73%), C- (70%), D+ (67%), D (63%), D- (60%), and F (for less than 60%). The instructor reserves the right to lower the number of required points but will not increase them.

Collaboration

Students must complete the paper reports and other homework assignments individually and submit their own independent work. Students working in a team on a project will deliver a co-authored report and presentation.

Classroom Safety and COVID-19

To help preserve our in person learning environment, the university recommends the following.

- Adhere to university mask guidance.

- Vaccinations are widely available, free and not billed to health insurance. The vaccine will help protect against the transmission of the virus to others and reduce serious symptoms in those who are vaccinated.

- Proactive Community Testing remains an important part of the university's efforts to protect our community. Tests are fast and free.

- Visit `protect.utexas.edu` for more information

Class Recordings

Class recordings are reserved only for students in this class for educational purposes and are protected under FERPA. The recordings should not be shared outside the class in any form. Violation of this restriction by a student could lead to Student Misconduct proceedings.

ECE's Academic Honesty Statement

Faculty in the ECE Department are committed to detecting and responding to all instances of scholastic dishonesty and will pursue cases of scholastic dishonesty in accordance with university policy. Scholastic dishonesty, in all its forms, is a blight on our entire academic community. All parties in our community—faculty, staff, and students—are responsible for creating an environment that educates outstanding engineers, and this goal entails excellence in technical skills, self-giving citizenry, an ethical integrity. Industry wants engineers who are competent and fully trustworthy, and both qualities must be developed day by day throughout an entire lifetime. Scholastic dishonesty includes, but is not limited to, cheating, plagiarism, collusion, falsifying academic records, or any act designed to give an unfair academic advantage to the student. The fact that you are in this class as an engineering student is testament to your abilities. Penalties for scholastic dishonesty are severe and can include, but are not limited to, a written reprimand, a zero on the assignment/exam, re-taking the exam in question, an F in the course, or expulsion from the University. Don't jeopardize your career by an act of scholastic dishonesty. Details about academic integrity and what constitutes scholastic dishonesty can be found at the website for the UT Dean of Students Office and the General Information Catalog, Section 11-802.

Classroom Evacuation for Students

All occupants of university buildings are required to evacuate a building when a fire alarm and/or an official announcement is made indicating a potentially dangerous situation within the building. Familiarize yourself with all exit doors of each classroom and building you may occupy. Remember that the nearest exit door may not be the one you used when entering the building. If you require assistance in evacuation, inform your instructor in writing during the first week of class. For evacuation in your classroom or building:

1. Follow the instructions of faculty and teaching staff

2. Exit in an orderly fashion and assemble outside

3. Do not re-enter a building unless given instructions by emergency personnel

Students with Disabilities

UT provides upon request appropriate academic accommodations for qualified students with disabilities. Disabilities range from visual, hearing, and movement impairments to ADHD, psychological disorders (e.g. depression and bipolar disorder), and chronic health conditions (e.g. diabetes and cancer). These also include from temporary disabilities such as broken bones and recovery from surgery. For more information, contact Services for Students with Disabilities at (512) 471-6259 [voice], (866) 329-3986 [video phone], ssd@uts.cc.utexas.edu, or `http://ddce.utexas.edu/disability`.

Title IX Reporting

Title IX is a federal law that protects against sex and gender-based discrimination, sexual harassment, sexual assault, sexual misconduct, dating/domestic violence and stalking at federally funded educational institutions. UT Austin is committed to fostering a learning and working environment free from discrimination in all its forms where all students, faculty, and staff can learn, work, and thrive. When sexual misconduct occurs in our community, the university can:

1. Intervene to prevent harmful behavior from continuing or escalating.

2. Provide support and remedies to students and employees who have experienced harm or have become involved in a Title IX investigation.

3. Investigate and discipline violations of the university's relevant policies.

Faculty members and certain staff members are considered "Responsible Employees" or "Mandatory Reporters," which means that they are required to report violations of Title IX to the Title IX Coordinator at UT Austin. **I am a Responsible Employee and must report any Title IX related incidents that are disclosed in writing, discussion, or one-on-one.** Before talking with me, or with any faculty or staff member about a Title IX related incident, be sure to ask whether they are a responsible employee. If you want to speak with someone for support or remedies without making an official report to the university, email advocate@austin.utexas.edu. For more info about reporting options and resources, visit `https://titleix.utexas.edu/campus-resources` or contact the Title IX Office at titleix@austin.utexas.edu.

Land Acknowledgment

I would like to acknowledge that we are meeting on Indigenous land. Moreover, I/we would like to acknowledge and pay our respects to the Carrizo & Comecrudo, Coahuiltecan, Caddo, Tonkawa, Comanche, Lipan Apache, Alabama-Coushatta, Kickapoo, Tigua Pueblo, and all the American Indian and Indigenous Peoples and communities who have been or have become a part of these lands and territories in Texas, here on Turtle Island.

References

This course syllabus uses wording suggested by Prof. Mary Steinhardt and the Faculty Innovation Center (https://facultyinnovate.utexas.edu/effective-syllabus) at UT Austin. The Land Acknowlegement statement was released by an ad-hoc committee of UT Austin faculty members who belong to Native American or other Indigeneous Peoples on August 17, 2020.