CS527 (Topics in Software Engineering) is a topics course whose content varies from one offering to another.

In Fall 2013, the topics will be on dynamic and static program analysis along with analytic technologies (such as machine learning and data mining) for finding software faults, with an emphasis on systematic software testing. A 2002 NIST report estimates that software faults cost the U. S. economy $59.5 billion annually and that improving testing infrastructure could save $22.2 billion. We will discuss a number of techniques and tools that could reduce this cost. The focus will be on analysis of code, but we will also cover analysis of other types of software artifacts and their use in testing.

Similar courses were offered in Fall 2011, Fall 2010, Fall 2008, Fall 2007, Fall 2005, and Spring 2005.

Course Organization

Students will get familiar with the technical results as well as with the process of doing research in software testing and analysis. The aim is to involve students in projects in this field. For students who choose to work on research projects, the aim is to help students start research in this field or apply its results in their ongoing research projects. For students who choose to work on more engineering-oriented projects (e.g., some I2CS students), the aim is to have them try out some latest techniques and tools from research. The course readings will include classic papers and current state-of-the-art work. Students will read papers ahead of time, write review reports on papers, participate in discussions, present at least once during the course, and do a project in small teams or individually. Students will also write a paper describing their project and present their work at the end of the course. There will be a number of homework assignments to help students with the projects.

Prerequisites

Students should have basic knowledge of software engineering and programming languages. If you are not sure whether you can attend this course, please consult the instructor (NetID: taoxie).

Text Book

No textbook is required or used in this course.

Grading

Grades will be based on final project report, presentation, participation (review reports and discussion), and homework assignment(s).

In particular,

- Final Project Report [40%]
- Presentation [20%]
- Participation (reports and discussion) [20%]. For non-I2CS students, class discussion/attendance [3%] and submitted paper reviews [17%]. For I2CS students, submitted paper reviews [20%].
- Homework assignment(s) [20%], where HW0 [5%], project proposal [7.5%], progress report [7.5%]

Homework

Please use your @illinois.edu email addresses for all course communication. Note that you don't have to use the CITES email web interface but can use other clients, e.g., here are some instructions for setting up GMail to use @illinois.edu address. If the instruction there doesn't work, try the following:

- Step 1. Forward your Illinois email to your Gmail account (instructions: http://www.cites.illinois.edu/email/redirection/). Note that you should check inbox in both email accounts because some emails may not be forwarded and stay in the Illinois inbox.
  - The reason for some emails delivered to only your Illinois inbox but not forwarded to your gmail account is that these emails are sent through the MS Exchange Server (e.g., sent by others from another Illinois email account). Below is a way to make sure your emails sent to your Illinois are cleanly/totally forwarded to your gmail:
    - Make sure you finish Part 1 described here when logging in your web UIUC email client, don't check the checkbox of "Use Outlook Web App Light"; otherwise, you may not be able find the menu option to add inbox rules.
    - However, Finishing Part 1 would still keep duplicate emails in your Illinois account inbox. If you don't want to have duplicate emails in your Illinois account inbox after forwarding them to your gmail account, you can
      - Step 1: add the second inbox rule after the first rule created by finishing Part 1: please configure this second rule to [apply to all messages] delivered to the inbox and do the following [delete the message].
• Step 2: double click your first rule added after finishing Part 1 and expand the "More Options" and then uncheck the checkbox of "Stop processing more rules" (by default this checkbox is checked).

• Step 2: Configure your Gmail to send emails using your SMTP server (instructions: https://wiki.engr.illinois.edu/display/ENGRonline/Student+email). BUT if it doesn't work, please use the SMTP server info as below (from http://www.cites.illinois.edu/exchange/2010/otherclients.html):
  - Username: younertid
  - Password: Active Directory password
  - Email address: younertid@illinois.edu
  - Outgoing mail server: smtp.illinois.edu
  - Outgoing mail server: requires authentication
  - Outgoing mail server (SMTP) port: 587
  - Outgoing mail server security: TLS

• Step 3: Send an email to the Engineering IT to state that you plan to use the university SMTP server to send emails and request them to add your email address to the approved list. Below is a related post to explain the matter: http://www.cites.illinois.edu/exchange/2010/thunderbird.html

**Paper Review Reports**

Once students start presenting papers, there can be two or more papers discussed per meeting/lecture. If so, each student needs to read only one paper and to write only one review report. You can choose any of the papers listed for that meeting/lecture. Moreover, if you are presenting in a given meeting/lecture, you need not write a review report for any of the other papers allocated for that meeting/lecture.

Students should write review reports for papers to be discussed in class. Unless specified otherwise, all paper review reports are due before the beginning of the respective class (9:30am CST) and should address the following questions:

1. Choose one good point in either problem, solution, or evaluation and describe why you find it good. (Is the problem important? Is the solution interesting? Is the evaluation convincing?)
2. Choose one bad point in either problem, solution, or evaluation and describe why you find it bad. (Is the problem unimportant? Is the solution trivial? Is the evaluation weak?)
3. List one question for discussion. (If you send this well before the meeting, your question may appear on the slides. On-campus students may be asked to discuss their questions in class. Off-campus students may be asked to discuss their questions on the mailing list.)
4. Present your results of carrying out a donut/balloon exercise on the paper (see slides 34-36 here, to be discussed in the first set of lectures in class)
5. [Only before students start presenting papers] Describe one potential project based on this work. (Can the same problem have a different solution? Can the same solution be applied to a different problem? Would a bigger evaluation be appropriate?)

**Handing in Review Reports**

Review reports should be emailed to both the presenter AND the instructor (NetID: taoxie) AND the TA (NetID: nistor1) with "cs527 HW <date>" in the subject line (e.g., "cs527 HW 9/4") (where the date is the presentation date when the paper is discussed, NOT the day before the presentation date or any other date) and the review report inlined as the email body text NOT attached as an attachment (preferably as ASCII text). Review report policies:

- Students are welcome to discuss the papers (in the class mailing list or among a group of students/people in class or outside of the class) or study any third-party materials even before writing the review reports, and students are welcome to study any third-party materials but review reports should be written individually. CS527 uses the standard code for CS courses.
- If your review reports include information that other students/people or third-party materials contribute via the group/mailing-list discussion or your exploration, please make sure to acknowledge the source of the information in your review reports.
- Review reports are due by lecture time: 9:30am CST. If you submit by 10pm the day before, your questions/comments may be discussed during the lecture.
- You can't have any review report late; if you need an extension, ask in advance, and you may be assigned a make-up paper.
- You can omit up to two review reports; please inform us if you plan on omitting a review report.

We will enforce the following point deductions on the required formats (besides grading the content).

* emailed to both the presenter AND the instructor (NetID: taoxie) AND the TA (NetID: nistor1)
  If the presenter (or the instructor or the TA) is not in the recipient email list, 1 point out of 10 points is deducted.
* Put "cs527 HW <date>" in the subject line (e.g., "cs527 HW 9/4") where the date is the presentation date when the paper is discussed, NOT the day before the presentation date or any other date.
  If violated, 1 point out of 10 points is deducted.
* the review report inlined as the email body text NOT attached as an attachment
  If violated, 1 point out of 10 points is deducted.

Note that a paper presenter must send the presentation slides to the instructor and the TA via email before noon of the presentation day. Otherwise, 1 point out of 10 points allocated to the student presentation is deducted.
Class Discussion

To improve the live class discussion among on-campus students, students will go through the following steps:

Step 1. The instructor or the TA brings some small empty paper sheets to the class.

Step 2. In the beginning of the class, each student picks a paper sheet to clearly fill in (1) Name; (2) NetID; (3) the ID of the paper being reviewed (i.e., one of 1, 2, 3, and 4 based on the order in the paper list for that lecture), and submit to the instructor or the TA in the beginning of the class.

Step 3. Before the student presenter for a paper moves the presentation to discussion questions, the student presenter randomly selects a submitted paper sheet to call out the student name described in the selected paper sheet. Note that during Steps 3-6, the student presenter should not expose the slide of discussion questions on the projection screen. Note that if a randomly selected paper sheet does not include the ID of the presented paper, the student presenter skips the selected paper sheet till a randomly selected paper sheet includes the paper ID.

Step 4. The called-out student describes one discussion question (different from previously discussed ones) and his/her own answer/thinking for the student presenter and the rest of the class to further discuss.

Step 5. The student presenter and the rest of the class further discuss the described discussion question under the coordination of the student presenter.

Step 6. If sufficient time remains, go to Step 3 to call out the next student; otherwise, move on to Step 7 (sufficient time will be judged by the student presenter).

Step 7. Briefly go through the remaining not-yet-discussed discussion questions if time remains.

Implication to Grading:

Based on our syllabus and logistics slides, "Participation (reports and discussion) [20%]", we will allocate the 3% portion to class discussion and 17% portion for submitted paper reviews:

>> Submission of a paper sheet *within* the first 5 minutes of a lecture will get full credit for the class discussion of the lecture.

>> Submission of a paper sheet *after* the first 5 minutes of a lecture will get half credit for the class discussion of the lecture.

>> No submission of a paper sheet of a lecture will get 0 credit for the class discussion of the lecture.

Homework Assignments

HW0: Difficulties in Your Software Development

Homework assignments will not be accepted late without special permission.