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COM S 413/513 Final Project

Learning Objectives

1. Teamwork and collaboration
2. Connect program analysis and software engineering knowledge learned throughout the semester
3. Implementation and research experience in the area of program analysis

Description

You will work in a team of 2-4 students to accomplish a final project on the subject of your interest. COM S 413 students are expected to finish an implementation centric project, or the implementation part of a research project. COM S 513 students are expected to work on developing a new research idea or adding some research components into an implementation project. In the following I provided a list of potential project ideas for your considerations. You are welcome to propose your own ideas. The instructor will discuss your proposal and approve your ideas:

1. Dataflow analysis: Generate control flow graph and implement a dataflow analysis, e.g., reaching definition analysis or liveness analysis, and apply it for a type of bugs you want to detect, e.g., null-pointer dereference. You can select any programming languages you are interested in. You will also provide a few test cases that can demonstrate the functionalities of your tool.
 - a. COM S 413: implement the dataflow analysis
 - b. COMS 513: show it can work on detecting certain types of bugs
2. Abstraction interpretation: reproduce AI² paper
 - a. COM S 513
 - b. COM S 513 5% extra credit: if you extend it to a new layer of neural network or proof its robustness for another type of adversarial attack
3. Fuzzing testing: implement a fuzzer based on the algorithm provided in the lecture slides and customize
 - a. COM S 413: using existing approaches
 - b. COM S 513: integrate your novel design for the components

Timeline, Deliverables and Grading Criteria

- Project proposal: **Due 10/18 in class**

Deliverable: slides

- Present one or more ideas you are interested in pursuing in your final project, including both the problems you aim to solve and initial ideas of your solutions. For each idea, you will justify why it is important, what are the expected contributions if successful and lay out your steps moving forward
- If you plan to work on the ideas I provided above, you will define the scope of the project and lay out your steps moving forward

Grading criteria (5 pt):

1. Your proposal contains a properly scoped idea (2 pt)
2. You have a well-thought plan (2 pt)
3. Your presentation is clear (1 pt)

- Final presentation and demo: **Due 12/6 and/or 12/8 in class**

Deliverable: slides, expect 20-25 min a team including Q&A

- The presentation should include the goal of your project, an overview picture of your solution, components of your solution, benchmark/test cases, your results, related work and why your work is novel (if you work on research), future work

- Final report: **Due 12/14 11:59pm**

- COM S 413: readme and design document
 - Using readme, I should be able to run your tool and find where the source code, test cases, and output are located
 - Using design document, I should be able to navigate through your code and understand your design decisions
- COMS 513: research report (COM S 513)
 - Problem statement and why it is important
 - Approaches or algorithms you developed
 - Experimental setup
 - Results
 - Related work
 - Conclusions and future work
- Artifacts (all the code and data)

Grading criteria for the final demo, presentation and report (25 pt):

- COM S 513: significant research results and novelty of the findings and ideas (5 pt)
COM S 413: the completeness of the implementation, the tool works with a comprehensive set of test cases (5 pt)
- Your approach is correct (5 pt)
- Your presentation is clear and complete (3 pt)
- Your technical writing is clear and easy to understand and is complete? (5 pt)
- Demo success (3 pt)
- Artificraft quality (4 pt): is it easily run and to be inspected? Is this correct?