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. COM S 413: understand the implementation challenges of program analysis algorithms
4. COM S 513: research experience of initiating and developing a new idea

Description

COM S 413 students will implement a program analysis algorithm from a paper. I will provide feedback regarding how important the algorithm is and whether it can be finished in a course project. I can also give advice on which tools and framework can be used. COM S 413 are welcomed to try research ideas, following COM S 513 requirements.

COM S 513 students will propose a study or a research idea relevant to program analysis. Note that if the project overlaps with your research, you should clearly specify what will be newly done in this course project.

Timeline, Deliverables and Grading Criteria

- Project idea (5 pt): **Mar 3 (Wed), 11:59 pm**
  - Team members
  - Project idea(s): if you need help to make decisions, you can submit multiple ideas.

  Grading criteria: Clarity of the writing (2 pt); Containing one good idea (3 pt)

- Project proposal and presentation (10 pt): **Mar 24 (Wed), 11:59pm**
  - presentation slides
  - 15 min presentation

        - Problem: why is it important? Data, news and evidence are encouraged
        - Approach description: what is the overall ideas and approach, why is it feasible and what are the challenges? (it will be great if you can support your rationale with early data)
        - Expected outcomes
        - Identified subtasks and plan (time and people) for accomplishing them

    Grading criteria
        - Presentation clarity (2 pt)
        - Significant problem and expected outcome (2 pt)
        - COM S 513: feasible and novel research idea (3 pt)
        - COM S 413: good design and software architecture (3 pt)
        - Well-thought subtasks and plan (3 pt)

- Final report and presentation (25 pt): **May 3rd (Mon), 2:15pm**
    - Presentation slides
    - 25 min presentation, including a demo
    - 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
    - Articrafts (all the code and data)

    Grading criteria
        - Presentation clarity (3 pt)
        - Demo success (3 pt)
        - Technical writing (6 pt): is the documentation/report clear and easy to understand? Is it complete? Is it insightful?
        - Is the problem addressed significant? (5 pt)
            - COM S 513: significant research results and novelty of the findings and ideas
            - COM S 413: the tool works with a comprehensive set of test cases
        - Is the approach/implementation/test cases correct? (5 pt)
        - Artificraft quality (3 pt): is it easily run and to be inspected? Is it correct?

Some open-source tools and dataset for your inspiration

- Patch verification via multiversion interprocedural control flow graphs
  - Code: https://github.com/iowastateuniversity-programanalysis/hydrogen
- A Comprehensive Study of Autonomous Vehicle Bugs
  - Data: https://sites.google.com/view/av-bug-study/home
- Automatic program repair
  - https://program-repair.org/
- Dynamic invariant detector
  - https://plse.cs.washington.edu/daikon/
  - Docker from program analysis lab @ Iowa State University: https://hub.docker.com/r/ashwinkj/daikon