EE 382V
Software Evolution

Graduate Course, Spring 2009

Who is the instructor?

- A little about me...

- Please call me "Miryung" or "Dr. Kim."

- Ph.D., in Computer Science and Engineering from University of Washington, 2008

- Just moved from Seattle, WA to Austin, TX.

- Research area: Software Engineering

- Research focus: Software Evolution, Mining Software Repositories, Human Aspects of Software Development

Software Evolution

- "What are difficulties of changing software systems?"

- "What are efficient & effective techniques for analyzing, debugging, and testing software after making modifications?"

- Science into Design: "How can we develop and design extensible software?"

Mining Software Repositories
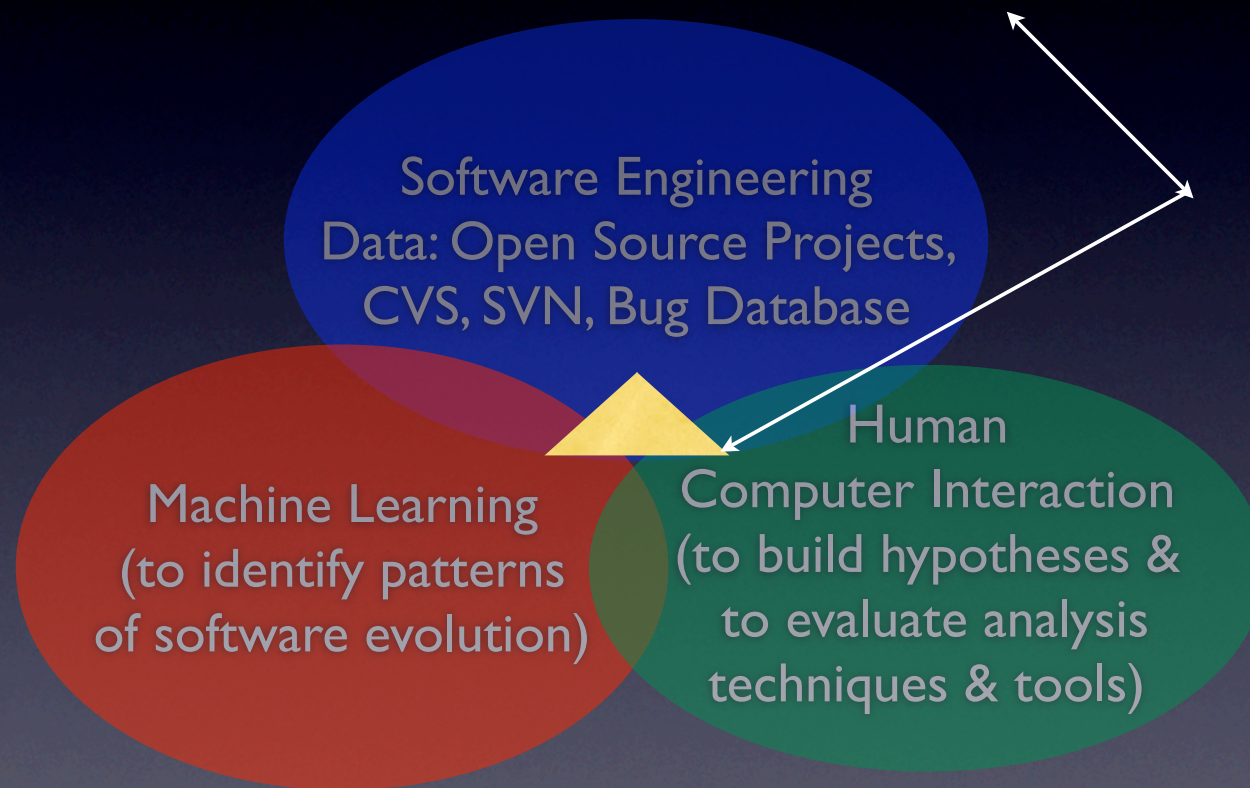
Human Aspects of Software Development

- It is human-beings to develop a program, communicate their design intent, and fix and evolve software.

- Software development is largely *collaborative* design process.

- How do programmers develop and understand a program?

My dissertation research

- Code duplication

  - An ethnographic study of copy and paste programming practices [ISESE 04]

  - An empirical study of code clone genealogies [FSE 05]

- Rule-based semantic program differencing

  - API level code matching [ICSE 07]

  - Logical structural diff [ICSE 09]

What is this course about?

Software evolution plays an ever-increasing role in software development. Programmers rarely build software from scratch but often spend more time in modifying existing software to provide new features to customers and fix defects in existing software. Evolving software systems is often a time-consuming and error-prone process. This course focuses on **state-of-the art methods, tools, and techniques for evolving software**.

What do you want to get out of this class?

- know more about version control systems

- relevant industry

- know more about SE research

- formal methods, rigorous approaches to addressing SE problems

- make your life easier by learning SE tools/ changes across many different files

- application of ML to SE

- precise approaches to SE analysis

What are my expectations and goals for you ?

- I hope you can have the same passion about software engineering research

- I hope you can approach software engineering problems *systematically*

- I hope you can acquire & practice research skills

Course Overview

- http://users.ece.utexas.edu/~miryung/teaching/EE382V-Spring/main.html

Course Overview

- Audience and Prerequisites

- Readings

- Optional Textbooks

Evaluation

- Reading Assignment: 20%

- Problem sets and any other non-project assigned tasks: 15%

- Project

  - Option (A): research project (55%)

  - Option (B): literature survey (35%)+ tool evaluation (20%)

Evaluation

- Students submit a brief proposal for either option (A) or (B).

- Which option should I take?

- Projects and tool evaluations can be done in team.

- Plagiarism

Communication

- Email
  - Email Header
  - Email Response Hours
  - cc TA
  - Use Blackboard
- Students with Disabilities

Topics

- Introduction

- Software Design for Ease of Change

- Design Patterns

- Software Architecture

- Empirical Studies of Software Evolution

Topics

- Corrective, Adaptive and Perfective Changes

- Program Differencing Techniques

- Mining Software Repositories

- Program Restructuring (Refactoring)

- Refactoring Reconstruction

Topics

- Crosscutting Concerns

- Delta Debugging

- Statistical Bug Isolation

- Regression Testing

- Change Impact Analysis

- Metrics and Visualization

Topics

- Reverse Engineering and Knowledge Discovery

- Code Duplication

- Source Transformation Languages and Tools

Reading Assignments

- Reviews are due by 8 PM the night before lecture.

- No late policy

- Review Formatting

How to read research papers

1. What are motivations for this work?

2. What is the proposed solution?

3. What is the work's evaluation of the proposed solution?

4. What is your analysis of the identified problem, idea, and evaluation?

5. What are the contributions?

6. What are future directions for this research?

7. What questions are you left with?

8. What is your take-away message from this paper?

Review Guidelines

- Stated goals and solution

- Cool or significant ideas

- Fallacies and blind spots

- New ideas and connections to other work

Review Grading

- 3 points: demonstrate exceptional insights

- 2 points: clear and concise, presented in your own words, understanding of key concepts

- 1 points: shallow, minimally-sufficient, little effort to reinterpret and paraphrase.

- 0 points: late, incomplete, never submitted

Class Discussion and Presentation Guidelines

- Each lecture, there will be an advocate and a skeptic.

    - 5-8 minutes

    - *Advocate*: elevator pitch for the paper, its topic and main results, why the idea is novel or why it is an improvement of previous works, why the result matter, etc.

    - *Skeptic*: why we should be cautious in interpreting the results, limitations & assumptions, additional research directions to build upon, improve, and augment the paper

Option (A):
Research Project

- Proposal

  - problem definition, your proposed approach, plan for evaluation, related work, a list of milestones & dates

- Project Checkpoint

- Midpoint Review

- Draft Report & Peer Reviews

- Final Report & Presentation Submission

  - an abstract, a well-motivated introduction, a discussion of related work, a description of your approach, your results & contributions, and so on

- Presentation

Option (B): Literature Survey

- must be done alone

- proposal: problem definition, motivation, an initial discussion of related work, a list of key papers, a list of milestones and dates

- draft and peer reviews

- final report and presentation

  - critical reading of the papers and your assessment, unifying framework identification, and open problems, etc.

Option (B):
Tool Evaluation

- proposal

  - which tool to evaluate and sketch of your evaluation approach

- report

  - identify the tool's strengths and weaknesses

  - identify future research directions

  - describe your own ideas on when and how this tool can change current software engineering practices; future impacts, how this tool can be adopted in practice

- Suggested Research Project Ideas

- Suggested Literature Survey Ideas

- List of Tools for Evaluation

Reminder

- Don't forget to sign up for class presentations.

- The first assignment is due this Friday: Fill out the background survey on the blackboard.

- The first reading assignment is due on Sunday 8PM.

- Start thinking about which project option to choose and with whom you want to collaborate; Option and group selection is due on Jan 27th, 9PM.