The Software Engineering Ph.D. Program at Carnegie Mellon

SE Ph.D. Immigration Course Overview

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institute for SOFTWARE RESEARCH

Software Engineering at Carnegie Mellon

Software engineering is the branch of computer science
that creates practical, cost-effective solutions
to computing and information processing problems,
preferentially by applying scientific knowledge,
developing software systems in the service of mankind

- from "Software Engineering for the 21st Century: A basis for rethinking the curriculum" by the CMU SE Faculty (Mary Shaw, editor).

The Software Engineering Ph.D. Program

- Our goal: to help you become future leaders of the SE field
  - **Researchers** developing SE tools and techniques that transform the practice of SE and open new fields of inquiry
  - **Educators** who train the next generation of SE students
  - **Practitioners** who drive innovation within their companies

- Any of these roles can be played in multiple settings
  - Research and teaching universities
  - Government laboratories or leadership
  - Corporate labs, development, or management

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- We believe a **community** is the best way to provide this help
  - Your advisor, fellow students, other faculty, and the ISR staff

New Faculty! New Faculty!

Eunsuk Kang

Heather Miller

SE Ph.D. Program Elements (1)

- Directed research in Software Engineering
  - Most of your time each semester and throughout the program
  - Goal: make original contributions to software engineering knowledge
  - Culminates in proposal, dissertation document, and defense
- Course requirements (7)
  - 17-808: Software Engineering Research
  - SYM: Symbolic mathematics and analysis
  - ENG: Software systems design and engineering
  - SOC: Software and issues in society, business, or public policy
  - BEH: Behavioral science research methods
  - 2 Ph.D. level electives
- Teaching (2)
  - Assist with teaching two courses
  - One introductory and one advanced
  - Non-native English speakers take International TA test
    - Spend 15 hours/semester in Intercultural Communication Center classes until Pass

SE Ph.D. Program Elements (2)

- Speaking skill
  - Give 2 talks per year in the software research seminar (SSSG)
  - Attend and provide feedback to other SSSG speakers
  - Sustained excellence → pass → continue practice!
- Writing skill
  - Write a high-quality scholarly document
  - Evaluated by 2 faculty, 1 Ph.D. student
- Practicum – a written document and presentation comprising:
  - An issue-focused reflection on personal SE experience, *or*
  - An empirical study of SE practice
- Thesis
  - A significant piece of original research in software engineering
  - Committee: Advisor + 1 ISR faculty + 1 SCS faculty + 1 external
  - Proposal: describe topic, significance, plan
  - Defense: present thesis contributions publicly
- Volunteer and contribute to the community!

Typical Program Sequence

COMPONENT	INTENSITY	COMPLETION TIME
Practicum	¼ time for 1 semester	By the end of year 2
Writing skills	variable	By the end of year 3
Speaking skills	SSSG	By the end of year 4
Required courses	each ¼ time for 1 semester	By the end of year 4
Thesis research & proposal	≥½ time	By the end of year 4
Teaching	each ½ time for 1 semester	By the end of year 5
Thesis research & dissertation	full time	By the end of year 5 (or 6)

- Notes
  - Every student is different—schedules vary substantially
  - You should spend ≥½ time on research every semester
  - Volunteering and speaking continue through the whole program

Pass/Fail Grading

- Course grades (mostly) don't matter: learning does
  - From your courses, get research tools and perspective on the field
  - We do expect students to earn the equivalent of a B- (or better)
    - Grades below a B- do not count toward program requirements
- Consistent with this philosophy, grades are recorded pass/fail on your transcript
- Pass/Fail process
  - It's a little complicated because the registration software doesn't directly support our policy—sorry about that!
  - You will automatically be enrolled pass/fail in ISR courses
  - For courses in other departments, fill out a pass/fail form
  - Instructors do have the discretion to make courses letter-graded only, so there may be a few exceptions to our general rule

What you can expect of us

- Advising
  - The most important relationship you will have
  - Match comes soon after you state preferences, due Sept. 21
    - Ok to match up earlier by mutual agreement
    - View as a long-term commitment
    - Free to change if needed
  - Academic guidance, especially in research
- Regular feedback
  - From your advisor, often on a weekly basis
  - Each semester from faculty after "Black Friday" meeting
- Financial support
  - All students in good standing receive free tuition and a stipend
- A supportive community!

An Important Note about Culture

- Computer Science is not as diverse as we would like
  - Mostly male
  - Many minorities underrepresented
- CMU is working to change this
  - Example: 50% of our incoming undergraduate class is female
  - But a lot of work remains!
- One big thing we can all do – support each other
  - Recognize that diversity brings benefits (Bogdan, and others, have extensive empirical evidence for this!)
  - Respect each other – avoid jokes, comments, etc. that reinforce stereotypes and make others feel unwelcome
- Talk to me or other faculty if you have concerns

The Ph.D. is a New World

- Research is your #1 job!
  - Start immediately, upon advisor match (or earlier)
  - Make progress each semester
- Nature of the work differs
  - You will be given ill-defined problems, and have to define them
  - Critical thinking and interpretation dominate fact-finding
  - Much of the feedback you get will be informal
- Responsibility for your progress is yours
  - Goals are long-term and high-level
  - Take initiative for your own learning, address your weaknesses
  - Your advisor and the community is there to help – we believe in you!

What you should do first

- Attend the immigration course
  - All faculty meetings in ISR – even if you know your advisor
  - Selected talks from other departments. E.g. CSD:
    http://www.cs.cmu.edu/~csd-ic/
- Find an advisor
  - Meet with faculty who share your interests
  - Start immediately, and expect multiple interactions
- Learn more about the program
  - SE Ph.D. website and wiki: http://isri.cmu.edu/education/se-phd/
  - SE Ph.D. program document
    http://isri.cmu.edu/education/se-phd/program/plan/se-phd-program-plan.pdf
- Take 15-808
  - Introduces SE research from ISR's point of view
- Consider another course, or focus on research
  - Ask potential advisors for recommendations; also other students