

Building Your Research Program in Academia

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The billing for this session

- Developing a research plan
- Building and leading a strong research team
- Publishing
- Publicizing your research
- Funding
- Networking
- Collaboration

Not in 30 (or even 90) minutes!

Bits of wisdom

Gleaned (borrowed, stolen) from:

- *Building a Research Career*, Francine Berman, UCSD
- *How to Have a Bad Career in Research/Academia*, David Patterson, UCB
- *Mapping Out a Research Agenda*, Barbara Ryder, Rutgers
- CRAW Career Mentoring Workshops

Plus some personal observations thrown in

Prologue

“Research can be an extremely rewarding and satisfying career. Facing, managing, and eventually overcoming uncertainty is a powerful experience, as is knowing that you have contributed something to the body of knowledge in your discipline that no one has ever known before. Research is both an art and a science: It requires you to know your subject and to know yourself, to have knowledge of the mechanics of solving a problem, as well as a feel for what is promising and what is not. For many people, the experience of conducting research provides an opportunity to grow not only as a researcher, but as a person, in a deep and substantive way, and is well worth the commitment and effort.”

-- Building a Research Career, Francine Berman
www.cra.org/Activities/craw/projects/mentoring/

Research Plan

Goal: A body of work with impact

- Selecting a problem
- Investigating the problem
- Validating the results
- Publishing the results
- Transferring technology

Selecting a Problem

Problem should:

- Be important (*important* \neq *difficult*)
- Pique your interest
- Have sufficient depth
- Be a good match for your abilities

Selecting a Problem

Problem may come from:

- A “future direction” of your thesis
- An offshoot from another problem
- The literature, conferences, workshops

Leverage strengths of local
environment

Investigating a problem

- Set aside “big blocks of uninterrupted time” for research
- Familiarize yourself with previous work
 - Know what is “new” v.s. “known”
 - Question assumptions, generality, practicality, validation, ...
- Break problem into manageable pieces
 - Puzzle pieces v.s. abstraction levels
 - Long-term and short-term research goals

Investigating a problem

- Favor simple, elegant solutions
 - Easier to “sell”
 - Cost less to validate
- Build prototype and run experiments
 - Discover practical weaknesses
- Solicit feedback
 - Write up and present intermediate results
 - Assess progress and consider mid-course corrections (know when to fold)

Validating a Result

Know what it takes (problem dependent)

- Proof-of-concept prototype
- Case studies
- Empirical studies
- Enable others to reproduce the result
 - Make tools with benchmarks available

Where to Publish

Preferred Journals

- *ACM Trans. Software Engineering & Methodology*
- *IEEE Trans. Software Engineering*

Other Journals

- *Software: Practice & Experience*
- *Empirical Software Engineering*
- *Journal of Software Maintenance*
- *Journal of Automated Software Engineering*
- ...

Where to Publish

Research Conferences

- *International Conf. on Software Engineering (ICSE)*
- *Foundations of Software Engineering (FSE)*
- *Prog. Lang. Design & Implementation (PLDI)*
- *European Softw. Engr. Conf. (ESEC)*
- *Internatl. Symp. Softw. Testing & Analysis (ISSTA)*
- *OO Prog. Systems, Lang. & Applications (OOPSLA)*
- *Automated Software Engineering (ASE)*
- *Tools & Algos. for Constr. & Anal. of Systems (TACAS)*
- ...

Where to Publish

Conference papers

Journal papers

Timely publication & feed back	Describe results in more depth
Expose leading researchers to your work	Receive higher quality feedback
Widely available in digital libraries	Evidence of maturity (esp. for P&T)
Are considered prestigious	Not as “hit or miss”

Where to Publish

- Workshops are good venues for preliminary ideas most in need of feedback
- Avoid venues that may be discounted by your professional community. If uncertain:
 - Get advice from a more senior researcher
 - See who is on the program committee
 - Look over past proceedings

Other Issues for Publishing

- Quality counts more than quantity:
quality >> quantity
- Make your ideas understandable
 - Use standard terminology and notations
 - Develop intuition to explain formulas
 - Use clarifying examples
 - Illustrate ideas through figures
- Be sure paper is well organized

Other Issues for Publishing

- Clearly differentiate
 - The work you build on (provide citations!)
 - The contribution of the paper
- Include a related work section
 - Find related work: portal.acm.org,
www.melvyl.cdlib.org, citeseer.ist.psu.edu
 - Place your work in context: don't just summarize the other work

Other Issues for Publishing

- Learn from rejection
 - Do not take criticism personally
 - All reviewers' comments have *some* merit
 - Revise and resubmit
 - For journal resub: Indicate how you addressed comments in cover letter
- Do *not* simultaneously submit the same work to multiple venues

Other Issues for Publishing

- To submit a paper that is based on conference paper(s) to a journal
 - It must be judged to add sufficient value
 - The differences must be explained in:
 - the submitted paper
 - a letter to the editor-in-chief
 - The conference publication(s) must be noted on the new paper's title page

Other Issues for Publishing

- Use understandable, interesting prose
 - *The Elements of Style*, Wm. Strunk jr. and E. B. White
 - *Bugs in Writing*, Lynn Dupre
- Consult a technical editor or seasoned mentor

Other Issues for Publishing

Guard your good name!