Mapping out a Research Agenda

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Why do research?

- To satisfy intellectual curiosity
- To better understand things
- To be at the forefront of an exciting, technical field
- To always be learning new things
- Because that's what professors do!

Helpful Personal Qualities in Pursuing Research

- Creativity
- Curiosity
- Independence of thought
- Good communication skills
- Perseverance
- Self-discipline
- Interaction skills

Choosing a Research Problem

- Problem should be important
- Problem should hold your personal interest
- Problem should have depth, in terms of aspects possibly available for investigation
- Problem might come from questioning existing literature

Choosing a Research Problem

- Problem may be amenable to some technique you already have devised
- Problem may lead you into new technology
- Problem may be in a 'hot' area
  - Pros and cons

How to proceed?

- Set aside uninterruptible blocks of 'research thinking time' in your weekly schedule
- Familiarize yourself with previous work from the literature
- Critically examine previous approaches, questioning generality, practicality, validation

How to proceed?

- Frame long-term questions to be answered
- Use short-term objectives to subdivide research into manageable pieces
  - Divide work into investigations that 'fit' into a coherent whole
  - Make progress one paper at a time

How to proceed?

- Know what it means to 'solve a problem' or validate a technique
- Write papers and give talks about your work
  - Intuition, intuition, intuition
  - Exercise: do an in-the-elevator summary
- Develop a personal style
  - One at a time vs juggling several projects

How to proceed?

- Allow your graduate students to suggest explorations
- Re-examine your research achievements at regular intervals, to ensure progress towards answering long-term questions

SE Research

- What practical SW problems are you addressing?
- How will you validate your approach?
- How can you 'keep up' with this broad area of CS&E?
  - Attend conferences and network
  - Pick favorite journals and other research groups and periodically visit their websites

Specific Techniques

- Establish a reading group with your students
- Summarize attended conferences to others, to discuss key research issues encountered
  - 2-3 sentence summaries of each presentation
- Keep a research notebook where you can jot down ideas for later consideration
  - Go back and look at your entries!

Specific Techniques

- Teach a graduate seminar in your area of interest
  - Teaching is a learning experience
- Attend workshops, especially those with work-in-progress presentations
- Participate in grant evaluation panels and program committees

Specific Techniques

- Leverage your efforts with graduate students
- Use senior faculty mentor(s)
  - e.g., Obtain examples of funded proposals

Possible Pitfalls

- Switch of research areas during junior faculty years
  - Requires large time investment up front
- Controversial/risky research areas
- Obtaining negative results
- Interdisciplinary work

Collaboration

- Con: Need for junior faculty to establish a personal research identity
- Con: May be time-consuming
- Pro: Projects can be more complex and more realistic
- Pro: Allows groups to tap into personal strengths of participants

Biggest Challenge

How to develop a coherent research agenda with limited time to do so, while juggling the responsibilities of a junior faculty?