

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

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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

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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 '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**

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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**

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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 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?