No Longer an apprentice

- Graduate school - apprentice with “master”
  - How to find problems
  - How to tackle problem
    - Breaking them into smaller chunks
    - Adding assumptions - then try to remove them
  - How to valid your ideas with experiments
  - How to write papers
  - How to give talks, network
  - Ready to go

- Independent researcher - RESEARCH AGENDA
What research problems?

First: Get out all publications from dissertation - papers, journals

- Work on problems directly from PhD. dissertation
- Work in same area of dissertation but different problems
  - E.g., testing
- Work in new area of software engineering
- Work in new area of computer science
Continue with your PhD work

**Pros**
- expert in area
- have background and experience
- have infrastructure
- know literature
- know community and are known in community

**Cons**
- Tired of it!!!
- Division of work with adviser
- Is it still relevant and important to community?
Work in same area – different problems

**Pros**

- New, exciting area
- Know some of background
- *Can relate to your PhD. dissertation*

**Cons**

- Need to literature search
- Need to find out who is in the area and network
- *May need to build different infrastructure for experimentation*
Work in SE but different area

Pros
- Exciting, stimulating
- Still same general community

Cons
- Need to find important and relevant problems
- Need to do extensive literature work
- Need to become an expert in area
- Build new infrastructure
Work in different area of CS

**Pros**
- Can take your ideas from SE into another area

**Cons**
- Find problems
- New community
- Develop new colleagues
- New to do very extensive research
Which one?

- Varies with length in field and pressure
- New PhD- either of first two continue in dissertation area
  Work in complementary problems in same area
- Later - Work in new fields in SE, computer science
How to proceed?

- **Schedule uninterruptible** blocks of ‘research thinking time’ in your weekly schedule – precious and sacred time
- Start and continually update an updated “research project” list
  - Different categories
- When student comes to talk to you, use lists for choice
  - Different levels: Ph.D. M.S. B.S. students
- Set up goals and deadlines and make them
How to proceed?

Short term research projects:
4 months - 3 years
Ph.D., M.S. and undergraduates levels

Long term research 4 - 6 years
Big idea - umbrella
Break into smaller projects that together solve big problem - different students working on same area
How to proceed, cont.

- Keep a research book -
- Lists of research ideas, ideas from conferences, things tried and failed
- Go to conferences for new ideas and network
- Actively recruit good graduate students
  - Put a limit on number of students and type of degree sought
  - Careful of student defined projects in new area
- Keep a list of call for paper deadlines on board - plan
Make inroads in securing funding

- NSF grants
  - Career awards – when to submit
    - Limited numbers of time
  - Other types of NSF grants
- Industry – colleagues
  - Google, Microsoft faculty fellowships
  - NVIDIA and others – small grants to faculty
- In industry – Figure out how to have own project.
- Participate in grant evaluation panels and program committees
Find mentors and think about mentoring

- Separate from adviser - for a number of years in terms of publications - still mentor
- Find other mentors - depending on research, colleagues in department, department chair, remote colleagues
- Think about how you want to mentor
  - What did your adviser do right and wrong
Transitioning

- Ph.D. work - focus on one problem
  - Did little else professionally
- Juggle time and problems - students
- Re-examine your research
  - at regular intervals (yearly, start of summer)
  - to ensure progress towards long-term questions
Specific Techniques

- Establish a reading group with your students
  - Papers in research area
  - Papers from conferences
- Summarize attended conferences to others, to discuss key research issues encountered
  - 2-3 sentence summaries of each presentation
- Teach a graduate seminar in your area of interest
  - Teaching is a learning experience
  - Get students
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
- **Visit web sites of collaborators and competitors regularly**
Don't

- Continue to publish with adviser
- Do research that is not deep - doesn't generalize, provide foundation
- Flutter from research project to research project
- Get involved with too many research projects
Biggest Challenge

How to be successful with a research agenda with other responsibilities?

- teaching
- committees
- department work
- professional service – keep numbers down
- families and social life

Guard time and be strict!!