Focus on your Strengths: Steps to a Successful Proposal (and Career in Systems?)

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Focus on your Strengths

- What do you like? What are you good at?
- Lots of aspects to professional life
  - Can't be great at everything
  - Better to be great at one thing than good at lots of things
- Compromise?
  - Alternate your focus different years…

Outline

- **Developing a Proposal: Finding a Topic**
- Writing your Proposal
- Doing Proposed Work
- Repeat!

Finding a Topic: Motivation

- Right motivation is important for systems research
  - Must convince audience of problem importance
  - Need to pitch your work
- Don't always use initial motivation
  - As learn more, can change problem you are solving
- Give multiple motivations
  - Different reviewers convinced by different aspects
    - Different experience, background, views

Finding a Topic: 1) Solve Known Problem

- Attempt to solve known existing problem
  - Improve someone else's basic idea
  - Show why your approach is better

- Drawback:
  - Relatively low impact
  - Difficult to be better than other experts
  - Even harder to convince reviewers that you will do better!

Finding a Topic: 2) Identify a NEW Problem

- Not as difficult as sounds!
- To start:
  - Don't need to know problem
  - Just identify important, complex system

- Measure in detail w/ workloads, understand it, make awesome graphs and visualizations
  - Great project for beginning students
  - Will probably find many problems!

Finding a Topic: Keep Your Eyes Open

- Which problem should you choose?
  1. Not just bug or minor problem, but fundamental flaw in many systems
  2. Missing terminology and metrics to describe problem
  3. Something you have ideas for fixing

Finding a Topic: Structure for (Small) Proposal

1. Study some system(s) very thoroughly
   - Initial results for how system(s) behave
   - Remaining questions about system(s)
   - New methodology for performing study

2. Solve specific problem in one system

3. Generalized framework for many systems

Outline

- Developing a Proposal: Finding a Topic
  - Use multiple motivations
  - Find a new problem
  - Understand existing complex systems
- **Writing your Proposal**
- Doing Proposed Work
- Repeat!

Writing your Proposal: Get Samples

- Read proposals from others in your area
  - Ask: many people will share
  - Reviews as well?
- Look at many at high-level
  - Some will match your style more than others
- Follow high-level format
  - Use their level of detail as guide

Writing your Proposal: Research Questions

- Have questions you propose to answer
  - Major and minor

- Don't just explain **what** you want to do
- Don't just explain **how** plan to do it

- Explain **why** you are doing this
  - What do you want to know?

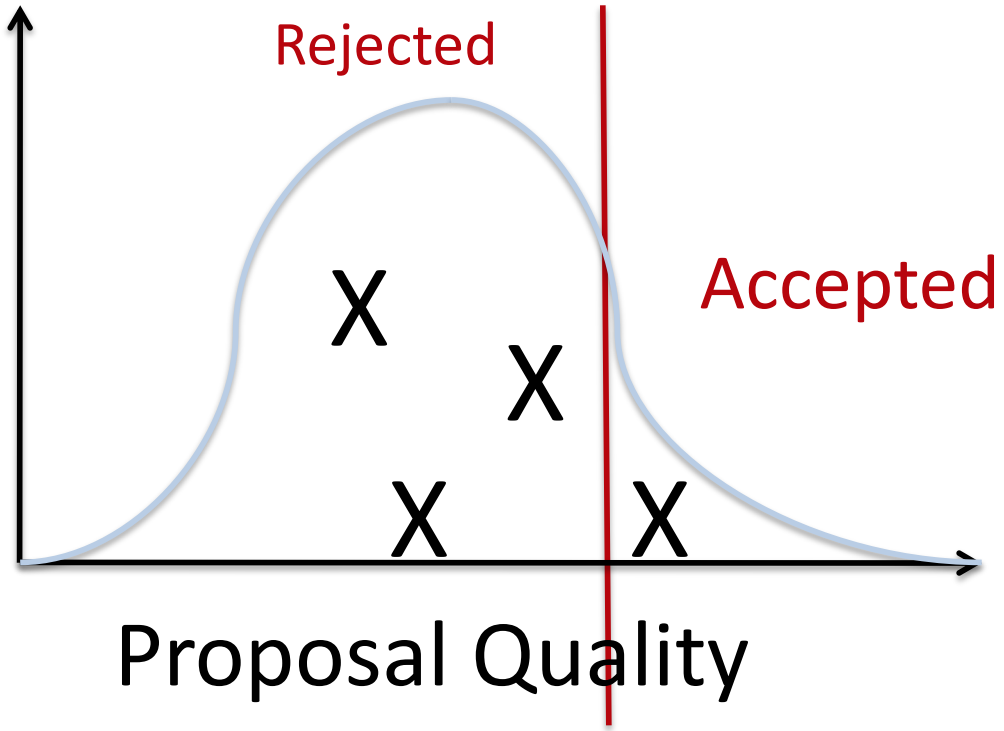
Writing your Proposal: Evaluation

- Your proposed evaluations matter!
  - Will your approach answer your questions?
- Initial results
  - Show some thoroughness
  - Show your high standard

Writing your Proposal: Polish

- Make proposal easy to read
  - Reviewers are smart,
    but busy and not same expertise
    - No one has exact same background as you
    - No one can read your mind
  - Spell things out, don't be subtle
    - Say most obvious things
    - Provide enough context for reviewers
- Get feedback

Writing your Proposal: Quality



Don’t promise what you can’t possibly deliver

Outline

- Developing a Proposal: Finding a Topic
- Writing your Proposal
  - Get Samples
  - Propose Questions
  - Demonstrate Evaluation
  - Polish; Quality >> Quantity
- **Doing Proposed Work**
- Repeat!

Mentoring Students: Students are your Mechanism

- Systems work:
  - much implementation, much evaluation
- Happy students are productive students
- Students need to be self-motivated
  - Aligned goals?
- Set standards for your students
  - One possible expectation:
    - Always have one primary paper working toward
    - Secondary role on 1 other paper

Mentoring Students: Autonomy

- Give each student **control** over their work
- Let them think of neat **ideas**
  - (or at least let them think they did!)
- Don't assign "credit" to who came up with what
  - Not productive and not true!
  - Requires many contributors to get to idea
- Shouldn't do work "because you told me to"
  - Should believe in what they are doing
  - Won't do it right if don't know why they are doing it

Mentoring Students: Wide Range of Talents

1. **"Beginning" (capable) PhD students:**
   - Does NOT mean: you tell them what to do and they implement…
   - Suggest range of ideas, see which they internalize
   - Will take longer to finish each task:
     - Remind of goals; Keep them on track with meeting goals
2. **"Middle" students**
   - Brainstorm with them over solutions
   - Help them see themes, generalities
3. **"Advanced" students**
   - Follow what they are doing
   - Quick feedback, bring up "reviewer-type" concerns

Fun to work with range!

Mentoring Students: Working as a Team

- Great benefit for students to collaborate
  - Learn from one another (esp junior from senior)
  - Progress happens even when one isn't working!
  - Much more fun
- Concerns?
  - Students don't work well together
    - Rare; don't work together on future projects! Primary vs. secondary
  - Credit
    - More authors doesn't hurt; More papers on CV seems better
    - Just matters for letters of recommendation
    - Pair senior as primary and junior as secondary; author ordering

Mentoring Students: Weekly Meetings

- Their job
  - Make meeting productive; set agenda
  - Learn right level of discussion for advisor
  - Show results w/ graphs! Need constant practice
- May cover material better w/ prepared slides
  - Keeps problem and motivation in mind
  - Tracks progress, can reuse explanations
- Meet even if no progress (esp. if!)

Outline

- Developing a Proposal
- Writing your Proposal
- Doing Proposed Work
  - Happy students are productive students
  - All students need autonomy
  - Different students need different guidance
  - Students work well in teams
  - Students need weekly guidance
- **Repeat!**

Repeat: Develop Qualifications

- Proposals are not anonymous →
  - Who you are matters
  - What you have accomplished matters

- Develop your qualifications
  - Become known in your community
  - Publish papers, attend conferences and workshops
  - If reviewers like past papers, builds confidence
  - Better to have fewer, “better” publications than more, mediocre ones

Repeat:
Leverage Your Expertise

- Explore topics where you have leverage
  - Don’t just solve problem others say is important
  - Some advantage compared to others

- Doesn’t have to be same sub-area, could be:
  - some complex system you know
  - some methodology
  - some technique

Advice Summary: Focus on your Strengths

Developing a Proposal: Finding a Topic

- Use multiple motivations
- Identify new problem
- Understand existing complex systems

Writing your Proposal

- Get Samples
- Propose Questions
- Demonstrate Evaluation
- Polish; Quality >> Quantity

Doing Proposed Work

- Happy students are productive students
- All students need autonomy
- Different students need different guidance
- Students work better in teams
- Students need weekly guidance

Repeat

- Develop qualifications
- Leverage expertise