Finding a Dissertation/Thesis Topic

Henri Casanova
ICS Graduate Chair
(henric@hawaii.edu)
A Research Topic

You need a research topic if you:
- are getting a Ph.D.
- are getting a M.S. thesis ("Plan A" at UH)

This is often the most difficult part of getting the degree
- And there is no easy recipe

It’s not rare to go through one or more topics before finding “the one”

This is especially true for a Ph.D. topic
- For now, I’ll assume we’re talking about a Ph.D., and I’ll talk about M.S. at the end
Finding an Area

The first step: Find one (or more) areas
- Based on the courses you took, and liked, in college
- Based on your personal interests
  - But it pays off to be a little bit strategic
- Based on graduate courses
  - Course projects can sometimes evolve into dissertations

Changing areas while in grad school is ok
- But you should know early on whether you think of yourself as a “theory and algorithms” person, a “systems and network” person, etc.
- Spanning multiple areas is often a great idea, but may require more work
- Find the right compromise between being pigeon-holed and spread too thin
Getting Exposure to an Area

- Attend Ph.D. (proposal) defenses
  - This is a good idea, regardless of the area
- Attend relevant seminars
  - Be broad
- Attend relevant conferences if possible
- Read articles from top conferences or journals
  - Find out whether the area is more about conferences or more about journals
  - Look at acceptance rates and ask your professors to identify the best venues
  - Read best paper awards
  - Read survey articles (ACM Computing Surveys)
- Ease into a literature search and review, following references
  - See slides on “how to write a lit review”
Defining a Topic

- Look at the literature and use critical thinking to identify open but attackable research problems
  - Articles point at open problems, but some are just too big for a student to take on
- Be inclusive in your thinking:
  - See how many research projects you can identify
  - Being “overly creative” is good at this point
- Discuss ideas early with your advisor and other professors and students. You’re not alone.
- Write ideas early on
  - You should have an informal, in-progress research plan
  - Maintain an annotated bibliography (see talk on “How to write a lit review”, Fall 2013 Graduate seminar)
- Read, read, read, read, read, read, read, read, read, ...
Defining a Topic

The topic should be realistic
- Make sure there are some “low hanging fruits”
- Make sure you can think of contingency plans for the riskier parts of the research
- Make sure you have the resources
- Make sure you have the data (or can obtain them)
  - Gathering datasets is often much more time-consuming than you think

Coming up with a timeline is always a good thing
- Even if it changes month-to-month

Do a preliminary research study as early as possible
- You want to know quickly if there is no hope
- And if it works, it will be part of your proposal
Defining a Topic

The topic should be interesting to you, to your advisor, and to the research community, at least to some extent

- Picking a topic you’re not interested in just because your adviser likes it or because it’s “hot” is not a good idea
- Picking a topic your advisor does not care about is not a great idea
- Picking a topic nobody cares about is not an option :)

How original?

- If it’s narrow and “incremental”, it’s not exciting
- If it’s so new that it’s not related to anything else, it will be hard to quantify your advances
  - Keep such ideas for “after Ph.D. research”
Defining a Topic

To summarize

- The research should be interesting to you and others
- The research must be justifiably novel
- The research must make quantifiable advances in the field
- The research must be doable in a reasonable time frame and with reasonable resources
One good way to organize and strategize your research is to build a publication tree

And yes, it changes month to month

A Directed Acyclic Graph of publications

Workshop papers
Conference papers
Journal papers
Posters

Let’s look at one example for my current Ph.D. student
Mark Stillwell’s Tree

Idea #1

ICS699 report

report
workshop
conf
journal
ICS699 report

Idea #1

Portfolio Lit Review

Idea #2

Tech Report

Idea #3

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report

workshop

conf

journal
Mark Stillwell’s Tree

ICS699 report

Portfolio Lit Review

Ph.D. Proposal

VTDC’10 (in prep)

IPDPS Poster

IPDPS’10

CCGrid’09

Tech Report

Journal? (in prep)

JPDC (submitted)

Dissertation

Idea #1

Idea #2

Idea #3

report

workshop

conf

journal
Mark Stillwell’s Tree

- **Idea #1**: ICS699 report
- **Idea #2**: Portfolio Lit Review
- **Idea #3**: Tech Report

- **Ph.D. Proposal**
- **VTDC’10 (in prep)**
- **IPDPS Poster**
- **IPDPS’10**
- **CCGrid’09**
- **Journal? (in prep)**
- **JPDC (submitted)**

- **Dissertation**

**Keywords**:
- report
- workshop
- conf
- journal

**Conferences**:
- ICS699
- CCGrid’09
- IPDPS’10
Mark Stillwell’s Tree

ICS699 report

Portfolio Lit Review

Ph.D. Proposal

VTDC’10 (in prep)

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IPDPS’10

CCGrid’ 09

Tech Report

Journal?

Journal? (in prep)

JPDC (submitted)

Dissertation

Idea #1

Idea #2

Idea #3
How Many Papers?

- Depends on the area
- A M.S. with one paper is considered a good thing
- A rule of thumbs that I have heard is that a Ph.D. dissertation should contain 3 conference papers
  - A Ph.D. with only one paper is typically a bit odd
  - But if it’s a SIGCOMM best paper, it’s fine :)

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Multiple Topics?

Should one explore multiple topics concurrently?

Initially, definitely, so that you can pick the winner

Nothing’s ever wasted

You may have to pursue two topics if your RA-ship is not aligned with your planned dissertation topic

Challenging

But a good way to increase publication visibility

A Ph.D. is the time in your life when you need to focus on one thing for a long time

This may not happen again, and you’ll think back to the good old days

So, in your first 3-4 semesters, multiple topics is fine, but you want to pick one relatively early on
And the M.S.?

A MS thesis should be doable in 2-3 semesters, so the topic should be much less ambitious.

Novelty is not as big a concern.

Often a proof-of-concept for already published ideas, with a few bells and whistles.

Getting a strong publication out of an MS thesis is typically really good news.

It’s just “business as usual” for a Ph.D. dissertation.

Check with your advisor about expectations, as they vary depending on the field and the advisor.

Topics come more often from advisors than from students, in my experience.

But advisors love students who have their own ideas!
Now What?

Topics to be discussed next:

- The proposal
  - Come up with a committee
  - Come up and successfully defend a proposal
- The thesis/dissertation
  - Doing the work
  - Writing it up
  - Defending it
The End

- Question?
- Feedback?
- Personal Stories/Advice?