Making the Most out of Grad School

Dr. Alexandra (Sasha) Fedorova
School of Computing Science
SFU
Introduction

• Ph.D. in Computer Science at Harvard 2000-2006
• From December 2006: Assistant Professor at SFU
• Co-founded Systems Networking and Architecture research Lab
Outline

• What is your goal?
  – Industry
  – Industrial research
  – Academia
• Imagine your ideal CV
• Work towards your ideal CV
• A few words on networking
Identify your Target

• Say you want to go to academia
• Very competitive: 200-500 applicants per position
• Identify your target schools
• Find CVs of recently hired assistant professors
• Identify common key properties of their CVs:
  – The number and kind of publications
  – The kind of experience
• Now you know your target
Typical Properties of a “Good” CV

- Visibility in top conferences or journals
- Hard to say how many publications you need, but it is the impact that counts
- 10-15 publications in workshops or low-end conferences may look worse than 1-2 publications in top conferences in your field
- Good publications are key
- How to maximize your chances of getting them?
Getting Published

• Identify the topic
• Pose the research question
• Imagine your “final product”
• Set the milestones
• Be efficient
• Adjust your course
Identify the Topic

• Often students tend to choose grand and vague topics
  – I will find a cure for cancer
• Honourable goal, but may not get you where you want
  – You only have limited time and resources
Identify the Topic

• Choose something doable
• Something that *maximizes your own skills and abilities*
• This will take time! Be patient
• Become *very* familiar with a particular area
  – Take a grad course
  – Do a directed reading course
  – Ask your supervisor for directions
  – Work with another student/researcher on a project – the fastest way to learn
Pose the Research Question

• Pose your research question such that *you cannot fail*
  – Do not set yourself up for a negative result
  – For example...
Posing the Research Question

• Example 1:

“The goal of my research is to find the cure for cancer.”
If you do not find the cure by the time you graduate, you will have failed.

• Example 2:

“The goal of my research is to identify how therapy X affects the growth rate of cancer tumours.”
Regardless of the answer you will have learned something and so you will have contributed to research.
What Is Research?

• By the time you graduate your need to demonstrate that you know how to do research well

• Research is:
  – Application of the scientific method
  – To a problem area of interest to the community
  – With the goal of furthering the understanding
  – Deepened understanding may bring new solutions
  – ...or suggest new research directions
What Research is NOT

• Building / implementing things for their own sake

• A common misconception: “I will build this new software/model/etc. and this will be by research”.
  – Hmm…. Will your system/model further the understanding of a problem or a phenomenon?

• Another misconception: I must find a new solution to problem X
  – This will likely happen if you understand the problem. But setting this as your goal may be too rigid.
A Word about Random Experiments

• Several groundbreaking scientific discoveries were made through random experimentation
• Be discrete about this
• Remember, *you have limited time*
• If you like doing this, leave some time in your week for this
• But *diversify your investment* by following the traditional path as well
Getting Published

• Identify the topic
• Pose the research question
• Imagine your “final product”
• Set the milestones
• Be efficient
• Adjust your course
Imagine Your Final Product

• So you have posed your research question
• Imagine the *ideal conference paper* addressing this question
• Before you begin doing anything WRITE AS MUCH OF THAT PAPER AS YOU CAN
  – You’ve already done much research when deciding on a topic choice
  – So you can already do a lot
Writing Before Doing

• Writing helps thinking
• Imagine you are writing for someone else
  – For a program committee member reviewing your paper
• You will subconsciously attempt to be clear
• As you write you will identify gaps in your understanding and in methodology
Early Paper Structure

• Introduction:
  – Here you must identify the goal of your research and *motivate* it
  – Writing this section will tell you if your goal and motivation are clear, if they need work or must be changed

• Methodology
  – Once your goal is clear, identify *how you will get there*
  – What resources will you need? Do you have them?
  – Will your methodology lead you to answer the questions you posed?
Early Paper Structure (cont.)

• Format of the final results
  – What kind of results can you get? Think of all possible outcomes
  – What results do you expect to get and why?
  – Describe those imaginary results in the paper
  – Even create imaginary charts
Early Paper Structure (cont.)

• Look critically at the resulting early paper
  – Are you satisfied? Would you accept this paper to a top conference or journal?
  – What must be changed?
• Do write!!! Don’t just think over it.
• This will take time – it’s okay, it will help you later
• This is already doing research
• This is risk management
• This is maximizing your productivity
Knowing Where Your Are Going

• You cannot get to your destination unless you know where you are going
• Imagining your destination in vivid detail is like knowing exactly how to get there
Getting Published

- Identify the topic
- Pose the research question
- Imagine your “final product”
- Set the milestones
- Be efficient
- Adjust your course
Set the Milestones

- If you have a good “early” paper – that’s trivial
- Your milestones will fall naturally out of your section on methodology
- You will also identify areas where you must do more reading or thinking
Set **Timed** Milestones

- Associate a deadline with each milestone
- You will have a short-range milestones and long-range milestones
- Milestones *make things appear doable*
- Before you begin your year, have milestones for the year
- Before you begin your week, have milestones for the week
- Before you begin your day, have milestones for the day
Getting Published

• Identify the topic
• Pose the research question
• Imagine your “final product”
• Set the milestones
• Be efficient
• Adjust your course
Be Efficient: A Few Obvious Facts

• It was shown that checking e-mail 100 times a day makes you stupid
  – Do one thing at a time, don’t context switch
• Listening to music / watching TV while doing research makes you forget what you have done
  – Create good conditions for productive thinking
Be Efficient

• Do not reinvent the wheel
• If someone has already done something, use their data, use their methodology
• There is no glory in doing lots of hard work
• Work hard, but also work smart
Collaborating With Other People

- Scientists with most publications collaborate a lot
- Simple math: you cannot do it all by yourself
- Can you benefit from working with others?
- Example:
  - You investigate effect of therapy X on the growth rate of cancer cells.
  - It would be also useful to know the side effect of X w.r.t. Z
  - You cannot do it all yourself. Maybe your supervisor can suggest this supplementary project to another student?
  - Are there junior grad students or undergrads that can help you with experiments?
People Are Your Greatest Resource

- Talk to people about your research
- Talk to people who serve on program committees of journal review boards
- Give them a 5-minute spiel about your research
- They will ask questions, they will give you constructive criticism
- You will get clues how to adjust your work
- They will be ready to accept your work once they see it
- They are also potential employers – they must know you!
Adjust Your Course

• Research is risky
• Sometimes things do not turn out the way you thought
• It’s okay – research must be risky!
• Be ready to adjust:
  – Modify your goal, your methodology
  – What have you learned?
  – If you have learned something new, you have not wasted time, so it’s okay
Summary

• Set your goals
• Envision your final product ... in the greatest detail
• Goes for your CV, for papers
• Write early paper drafts. Writing helps thinking.
• Be efficient, collaborate and talk with others
• Adjust your course – research is a risky business. Minimize your risk, but don’t fear it
• Have fun! Treat this like your own enterprise!