Survival Guide at Computer Vision and Intelligence Systems Laboratory

Guanghui (Richard) Wang

Computer Vision and Intelligence Systems Laboratory

Toronto Metropolitan University

Toronto Canada

Survival Guide

- This is a collection of advice and policies for prospective and current students in my group
- Any aspect of the policies can be flexibly adjusted in practice
- Most slides are excerpted directly from Dr. Toshiya Hachisuka's document "Graduate Study Survival Guide"

https://cs.uwaterloo.ca/~thachisu/survival.pdf

Before your graduate study

Undergraduate vs Graduate

- Undergraduate
  - Learn subjects through textbooks and lectures
  - **Passive** learning
- Graduate
  - Investigate subjects by thinking and experiments
  - **Active** learning

Undergraduate

- Your goal is to learn subjects listed by the school
- Instructors **already paved** your "study highway"
  - Fixed set of topics to learn
  - Courses end after several weeks
  - Answers are clear and usually well-defined
- Your success is measured by **grades**

Graduate

- Your goal is to investigate a topic of your choice
- You **decide how you proceed** your research
  - Choose your research theme (with some help)
  - No limit on how far you can go
  - Answers are unclear and often undefined
- Your success is measured by **academic outputs**

Masters vs PhD

- Likely to have slightly different goals
- After finishing Masters
  - Industry job, but not necessarily in CV
  - Gain a bit of experience in research
- After finishing PhD
  - Industry job in CV or academic job
  - Prove that you can independently do research

Masters vs PhD

- In general, I prefer to accept students who are willing to continue until PhDs because:

1. The duration of MS is too short for you to be able to complete research by yourself
2. I would like to work on actual research with you, not just help you to obtain a degree
3. You will have more career options with a PhD (especially in computer science)

Think twice and more

- Lots of information available to help you decide whether you should pursue graduate study
- Your life will be **hard** if your main reason is
  - Only to get a better job (there's **no** guarantee)
  - Someone told you to do so (lacking **motivation**)
  - Learn subjects more (merely **a part of** research)
  - Only to pass with a degree (not a good **fit**)

Think twice and more

- **Contact me** before you apply
  - I generally want to accept a student who already has some knowledge of computer vision (If you haven't done, what are you waiting for? Why not study computer vision now?)
  - Show me how you've learned computer vision
- If you think it doesn't fit, consider another group
  - **Both** of us can be unhappy due to the mismatch

Personality checklist

- Are you very interested in research?
- Are you moderately ambitious?
- Are you persistent in a good way?
- Are you mentally and physically tough?
- Are you optimistic?

- If your answers to the above questions are all yes, one day, you might become a great researcher

Admission at TMU

- Apply through the official system
- I look for students who have both motivation and proven skills to be successful in research
  - Gain research experience in computer vision
  - Just doing well in courses won't be enough
- Admission is extremely competitive, but if you demonstrate a strong potential in research, you will have a good chance!

Preparing for graduate study

- Establish **solid and basic** knowledge/skills for what you want to investigate during your study
  - Read technical papers and figure out what you need to learn to fully understand them
    - No need to have concrete research topics yet (unless you are quite familiar with the latest work)
- If you have a chance to work on a research project, work hard and learn what to do in research

During your study

General goal

- Being able to tackle problems scientifically
  - Look at things objectively
  - Think logically and critically
  - Make hypotheses
  - Design experiments
  - Communicate your thoughts

General policies

- **Enjoy** your research
- You have **freedom** to work on topics you love
- You are **responsible** for your daily work
- Communication and publication are **important**
- Tasks in your study must be done in **English**
- I'll give you advice and help you to achieve **your goal**

Enjoy your research

- Work on things that you **really love**
- "Enjoying" does not always mean "playing"
  - Hard work can be **equally** enjoyable
- The key is that you work **hard** because you **love** it
  - **Not** because you need to do it, or somebody like your supervisor told you to do so
  - Great researchers I know all have this personality

You and your work

- **You are responsible** for your daily work
  - Make progress toward the deadline
  - Allocate working hours per day
  - Decide where and when you work
  - Regularly report your progress to me
  - Initiate discussion with me
- **Note**: I am supervising many students, not just you

Advisor-Student relationship

- The relationship is not symmetric
  - I am the only advisor for you
  - You are **not** my only student
- In a certain sense, you need to **grab my attention**
  - Initiate discussion and communicate with me!
- Remind me periodically what you are trying to solve, what we discussed, problems, plan, etc.

Advisor-Student relationship

- You are an (inexperienced) **junior researcher**, not my servant or my people, which means that
  - I don't force you to work on a specific topic
  - I don't micromanage your daily work
  - I expect you to be self-motivating
  - I expect you to have your own opinions
  - I expect you to be critical on me when necessary

Advisor-Student relationship

- Balance between having your own opinions and following what your advisor told you to do
  - You do not want to blindly follow what your advisor told you. Digest it by yourself first.
  - However, do not just ignore what your advisor told you. Your advisor wants you to be successful, and ignoring what they say won't be a good idea in general. Ask your advisor if you are not sure.

Three rules of questions

1. Ask **any question**
   - No question is bad. Asking no question is bad.
2. Ask **any time**
   - No need to try "finding" a good time for me
3. **Don't** speculate
   - What I tell you is what I think; no hidden words
   - Negative answer doesn't mean that I hate you

Communication

- Very important that **you initiate** communication
  - Report your status and progress
  - Notify me anything that needs my attention
  - Schedule a meeting when you want
- Do not wait until I ask you "how're things going?"
  - If you are asked, then you'd better not next time
- Many troubles are caused by miscommunication

Communication

- **Don't do the followings**
  - You are not sure what to do or how to solve a problem, but you **do not talk to anyone**.
  - You **haven't talked to** me for a month because there has been no meeting (whatever the reason).
  - You **do not listen to** what other people say just because you do not feel like doing so.

Communication

- **Instead, do the followings**
  - You are not sure how to solve a problem, so you **explain** it other people to see what they think.
  - You **initiate** communication with me to tell me you have been working on.
  - You listen to what other people say and try **both** what you think and what other people suggested.

Lectures and grades

- As I mentioned, your success is not measured based on how well you did in lectures
  - Use lectures to bootstrap your study in some relevant fields to your research
  - Don't focus on getting a good grade
  - Instead, focus on learning some good ideas that might be related to your research

Research topic

- You don't need to have a concrete research topic ready when you enter the Master's program
  - I will support you to come up with one
    - For PhD students, I expect something concrete
- Can take a long time (e.g., six months) to choose a topic if you are not sure what you want to do

Research topic

- You are free to work on a topic you like, but since I want your work to be meaningful, your research topic has to satisfy the two important criteria:
  - You are interested in solving it
  - The topic is promising and people in the field are interested in seeing a solution to it
- If you have no idea at all, I'll give you ideas
  - Are you sure that you really have **no** idea?

Research topic

- Can you do what you want to do?
  - Bad news: you have a limited amount of time in your graduate study, but you still need to do it.
    - Working on something that you don't know at all might be very risky.
  - Good news: you will learn a lot and might be able to do what you couldn't do.
- It's a tough question, but don't ignore this aspect.

Publication

- Most **important** but **stressful** aspect
- I expect you to **publish** papers in top venues
  - I will help you to write papers, but **don't** make me write a whole paper for you
- Papers are useful for job hunting
- Very good way to hone logical thinking skills
- Solid proof of your skills and knowledge

Publication - Ideal World

- In an ideal academic world...
  - Where you publish your paper doesn't matter
  - How many you published doesn't matter, because one paper might be extremely good
  - People respect your work regardless of those
- Let's face it: **in reality, where you publish and how many papers you have do matter.**

Publication - Real World

- Not all publication venues are the same
  - Some are highly regarded, many are not
  - Publication in very little-known venues can actually **damage** your work
- Top-tier: CVPR, ICCV, ECCV, NeurIPS, ICML, AAAI, ICLR, MICCAI, ICRA, etc.
- Aim for top-tier to **max** the benefit/effort ratio
  - I'd say, "Why not?"

My expectation on a MS student

- One paper should be submitted (hopefully accepted)
  - Encouraged to submit to the best venue
  - Second-tier venues are acceptable
  - Aim to complete your project in one year
- Your submission becomes the basis of your thesis

My expectation on a PhD student

- At least three full papers should be published
  - At least one paper published in a top venue
  - Others can be at second-tier venues
  - Aim to submit two papers per year
  - Have my permission before submission
- Acceptance can be a bit random, so review scores above the average can be counted as "published"

What if…

- "What if I couldn't pass your expectation?"
- Asking this question is **already wrong**
  - You are **not** working for me
  - Nobody (including myself) forces you to do so
- Failure is a natural part of any research, so I personally understand even if you couldn't make it
- Job hunting will be a different question since I don't give you a job offer. Yes, the reality sucks.

Go (way) beyond my expectation

- Satisfying my expectation **should not** be yourgoal
  - Your research is yours
  - It's not me who decides your success
  - Other people judge how well you did
  - Check how your peers (internationally) do
- In my opinion, my expectation is bare minimum
  - I want you to be internationally competitive

Webpage

- You **should** have your professional homepage
  - Extremely important for job hunting
    - Recruiters might look at your webpage
    - Consider it as an online CV and be professional
    - See other's webpage to find out what to list
- Do not put an internal research report
  - Someone can steal your ideas and publish papers

Authorship

- Authorship **matters** and can raise conflicts
- How people perceive you in general
  - First author - “this person did all the dirty work”
  - Last author - “probably the advisor”
  - The rest - “maybe they did something”
- Your thesis should include only first-authored work
  - Including non-first-authored work can be tricky

Authorship

- Multiple students in the same paper can be tricky
  - Order **matters** (i.e., who should be the first?)
  - **Dilution** effect of contributions (who did what?)
  - Who puts the resulting work into her/his **thesis**?
- In general, I avoid "multiple students per paper"
  - Discussion and collaboration among students is highly **encouraged**

Authorship

- My preferred style You -
  - first author
  - Others (if any), gift authorship is **prohibited**
  - Me - last author
- Benefits are twofold
  - You have **full** ownership of your project
  - **No conflict** on authorship with your peer

Your schedule

- Your schedule is driven by paper **deadlines**
  - **Select** the publication venue
  - Think about **milestones** toward the deadline
    - Aim to have a submittable paper **one or two weeks** before the deadline
    - **Adjust** milestones as you go
- I'll help you to make and adjust your schedule

Your schedule

- Don’t expect me to miraculously save you right before the deadline - instead, discuss with me regularly to adjust the plan
- Many people procrastinate and do a lot of last minutes work, but that **doesn’t** mean it’s good
- I recommend you work in the lab during “**normal**” hours
- Manage your working hours efficiently.
- **Always** think about your research

Research fellowship

- I encourage you to apply for any of them that you are eligible (never think "I am not good enough")
- Provides you three great benefits
  - Opportunity to step back (what is a big picture of your research and why it's interesting?)
  - Financial security (money!)
  - Network with external people (potential jobs)

Managing your data

- Use a version control system
  - For your future job (coding with many people)
  - For collaboration with external researchers
  - To share data with me and colleagues
  - Backup
- Put everything there (papers, data, code)
- **Don't** open source your data before publication

Scientific misconduct

- You as a researcher will **DIE** if you do any of them
  - Plagiarism - steal someone's (incl. your own) work
  - Falsification - modify results (e.g., photoshopping)
  - Fabrication - make up results that you don't have
- Zero tolerance (no degree is considered fine)
  - If I found out that you did any one of them in your work, I will urge you to leave my group

Mental issues

- Unfortunately, research can be mentally harsh and you can suffer from mental issues due to
  - Rejections of papers you worked for years
  - Couldn't get a job you like
  - Interpersonal troubles
- Remember: "**Graduate study is not all of your life**"
- Leaving your study can be the best option

Mental issues

- Some potential sign of mental issues
  - You **haven't communicated** with me (be it online or offline) more than a month
  - You are facing difficult problems but **never discussed** with anyone including colleagues
  - You are not sure what to do now/next, but you **haven't asked help** from anyone
- In general, ask for help - I am available for you

Toward graduation

Job hunting

- Successful job hunting requires
  - **Preparation** (good record of publication etc.)
  - **Action** (apply to anywhere you see your work)
  - **Luck** (may not have an opening that fits you)
- You can do your best on the first two, but be prepared and think flexibly when you are unlucky
  - Let's face it: best ones might not land best jobs

Career options

- Masters
  - Industry (generally not involving research)
    - Video game companies, movie production, or completely different things
  - PhD
  - Startup
- International options if you do well

Career options

- PhD
  - Academia
    - Very competitive
  - Industry (may or may not involve research)
    - International jobs are more available
  - Postdoc
  - Startup

Industry

- Potentially a good option salary-wise
  - Some bad exceptions exist (be aware)
- Usually less flexible
  - Your boss might decide what you need to do
  - Hard deadlines (missing ones = losing money)
  - Collaborative work (your work is not yours)
- Might be unrelated to your research

Industry research lab

- Might be a good mix of industry and academia
  - Google, Microsoft, Nvidia, Intel, etc...
- Sometimes flexible, sometimes not
- Salary can be quite good
- Historically, they do not last very long...
  - Change of policies, sudden budget cuts, etc.
- Patenting hell (what you've done is not yours)

National research lab

- Similar to industry lab
  - Just not profit-oriented
    - No (or less) teaching
- Long-term job security compared to industry lab
- Research topic and publication might not be flexible
  - Strategic goals might be already there
  - Might be forced to work on things you don't care

Startup

- Usually, buyout by a big company is the goal
  - Google, Facebook, Intel, etc.
- High risk, high return (money and recognition)
- Do it if you have a vision and necessary resources:
  - Tough mind and body
  - Help from other people
  - Have network

Academia

- Most flexible with less monetary benefit
  - Can work on what you want (up to funding)
  - Your work is yours and you are your boss
- Many different kinds of tasks in one job
  - Teaching, mentoring, advising, researching, fundraising, and managing - yes, it's chaotic
- **Extremely** competitive job market

Academia

- Tenure (permanent position)
  - Tenure evaluation comes after several years
  - May or may not happen in the same university
  - Criteria vary a lot, but "publish or perish"
- Not so much job security until you get tenure
  - Be prepared and open for other career options
  - Non-permanent post is increasingly typical

Postdoc

- Temporary research job toward a faculty position
  - Usually a few years of fixed-term contract
  - No guarantee of a "better" next job
  - Not well paid
- Increasingly typical for a PhD student who wants to ultimately land a faculty job
  - Be prepared and open for other career options

THANK YOU