Training strategy

vishvAs

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1 High level strategy

1.1 Deliberate practice

Get frequent, accurate feedback - either by examining your own skills (eg: reading papers), or by listening to/ talking to others.

1.2 Possible further training

Get post-doctoral training, or get a second PhD at the top department.

1.3 Learning with courses

- Also see the strategy for learning from lectures in career skills strategy document.
- Read before attending the lecture. Read after the lecture. Tackle exercises.
- Befriend and acquire contact details of at least 3 students.
- Bringing photocopies of relevant pages of the book to the class helps in quick understanding and orderly recording.
- Regularly attend office hours.
- You can contribute to the discussion and lectures in the classroom in exactly two ways: By asking questions, or by answering questions. Contribute cleverly in both ways, and you will be considered an attentive student.
- Take easy courses, which are short on labor, and which are of appropriate level. Some students take courses even until they graduate. This ensures that knowledge acquired does not dissipate due to disuse. Research is more important.
- Consider ut CIS survey ratings, ratemyprofessor.com, utlife.com ratings before taking courses.

1.3.1 Target items to learn

Acquire proper prorgamming skills: Reason about programs well; learn the theory to do this.

1.3.2 Exam strategy

Read up homework solutions and results; write them in cheat-sheet. Solve many problems as warmup. Beware the calculation mistakes. Use separate sheets for separate questions. Don't over hydrate yourself. Sleep well. Solve easy, short questions first; solve many questions parallelly.

Strategy for open book exams.

2 Advisor search

2.1 Qualities of good advisors

"A good advisor will give you a hot topic to work on where you can get results that people will find interesting. A good advisor will be so famous that merely being their student will cause people to be interested in you. A good advisor will go to bat for you when it comes time for you to get a job. A good advisor will be politically well-connected and lubricate your way straight to the holy groves of academe. A good advisor will also work your butt off and scare the crap out of you by expecting you to know about millions of things - don't let that put you off." [Ref]

Some advisors are good mentors, interested in development of the student's abilities and career. Others are just employers, whose agenda does not necessarily include a student's growth.

2.1.1 Knowledge gathering

About the advisor's personality and working style:

Does he have experience advising students? Does he know how to behave with students?

Do his students like him? Do you respect him? (He does not have to be a nice person.)

What problems do his student face with him?

Does he give sufficient advice to his students? Is he accessible?

How much autonomy is granted to students? Are students under heavy pressure?

When the time for independent work arrives, will everything be smooth?

How experienced in advising students is he? Older professors are more skilled at advising students. Younger professors are more eager for research.

About the advisor's research:

> What is he famous for?
> Does he have money?
> Is he eager and enthusiastic about his research?
> Does he still do research independently?
>
> About the topic being studied:
>> What are the important problems being studied?
>> What is the fraction of time they spend with pen and paper?
>> What kind of mathematics is involved?
>> What is the long term applicability of the skills learnt due to the research work?
>
> About the research group:
>> Is the group collaborative?
>
> About the career path:
>> Where have his students gone?

2.2 Narrative for time spent in umass

I tried computational biology research at UMass. My undergraduate education, from which I graduated 4 years earlier was very dissatsifactory; I had almost no exposure to research; let alone research in complexity theory, algorithms, AI and machine learning. At UMass, I discovered that protein structure prediction was too experimental for my taste and that theory and machine learning appealed to me more, with their use of mathematics. Hence, I decided to properly explore computer science and try research in theoretical computer science.

3 Benefitting from advisors

3.1 Meeting research advisors

The less time spent in understanding your work, the more time the advisor can spend in providing feedback, the better the meeting. See the oral presentations section in career strategies.

Frequency: Meet at least once a week, perhaps even more frequently during summer.

3.1.1 Things to discuss

Discuss thesis points and research.

Ask for things that you need.

3.1.2 Avoid buildup of hidden strains

Ask general questions. Ask specifics follow-ups to general responses:

Do you report progress regularly enough? Is the information adequate?

Are you devoting enough time for your research versus your other duties?

Are there ways you can improve how you work together? Does the advisor feel that you are responsive enough to her criticisms.

Are you maturing professionally?

3.2 Dealing with the advisor

Don't treat advisor as a stranger. Keep the channels of communication open.

3.2.1 Giving the (potential) advisor proper metrics

Finding the right things natural; aka raw instinct: ie, excellence in learning from examples.

Display attacks on problems, increased knowledge and understanding.

"We will talk about possible problems or possible ways to find a good problem for you. If you obtain results, then you get yourself an advisor." [Fan Chung Graham]

Confidence, critical taste.

3.2.2 Report progress

Report progress regularly and build a relationship within which problems can be solved, should they arise. Be honest.

Meet advisor one-on-one regularly - at least once a month. You can meet with secondary members less regularly - perhaps once in two months.

Solicit feedback every semester from advisor. "What are my strengths and weaknesses?"

Send monthly progress reports to your advisor and committee members.

3.2.3 Research strategy for working with indrajita

Focus on getting the research right.

Keep him happy, but don't necessarily follow his instructions to the letter. Often, it is very sub-optimal to follow his instructions in detail; over the long run it could result in ruination.

Take initiative and plan your own research.

Read 2 or 3 papers each week, and discuss these with him.

Find your own, fresh problems and work on them.

3.2.4 Collaborate with eager researchers

Collaborate extensively with pradIpa ravikumAra, perhaps end up with him as a co-advisor or even as primary advisor.

Retain TA job. Thus, you will retain flexibility in your choice of advisors.

Part I

Grad School strategy

4 PhD: location and plan

If possible, get a PhD at utexas with a good advisor, working on a desirable topic. If that does not happen, get a masters degree, and do the PhD elsewhere; perhaps in India (CMI, IMRes, IISc, IIT, Harish Chandra Institute etc..) or in another university in USA.

4.1 Why high priority for PhD at utexas?

UTexas provides an excellent and diverse research environment. Bright people from all over the world come here. Thence I learn about other fields and cultures too.

shruti is here.

utexas degree carries slightly more prestige around the world than a CMI or IMRes degree.

utexas provides a more comfortable research, well paying environement than elsewhere. Standard of living in austin is much better, with cleaner environment, easy access to processed food.

I have already invested much time and effort in settling down here. If I move elsewhere, especially to India, I will have to repeat this.

4.2 Admission elsewhere: Potential recommenders

Zhengdong Lu.

Brent Waters: Nice to me when we pass each other. Did fairly well in course with him.

pradIpa ravikumAra: Nice person, possibly understanding. Sat in on his course, intend to sovle his homework well.

Adam Klivans: Possibly supportive; may look at past failure in collaboration as bad timing and missed opportunity.

Alan Cline: I've served as his TA for 3 courses.

5 Strategies

5.1 Research

5.1.1 Researcher, not student

Think of yourself, not as a student, but as a researcher.

Research assistantship with indrajita must be viewed as a temprarily desirable employment, where you gather credentials and qualifications to gain superior employment as soon as possible.

5.1.2   Acquiring research capability

Some time (1 year) is required to gain adequate strength and comfort in a research area. I am yet to gain that in any area, including data-mining, colt, graphical and statistical learning theory.

5.1.3   Establish research credibility

PhD is a way of establishing research credibility. Be sharply focused on the results.

Publish well, and in good quantity. Write a monograph or two. This, and acquiring recognition in the research community is the main thing, not the thesis, which is a mere formality.

5.1.4   Advisor search

See research advisor search strategy. See there for positives and negatives of various (potential) advisors.

5.2   General strategy

5.2.1   Finish quickly

Look for the thesis topic - now.

The fact is that nobody knows everything. Don't wait. Just get started.

Outsource work which can be outsourced. Example : Hire a statistics student or an undergrad.

5.2.2   Teaching

Do teach for a quarter or a semester at maximum, but avoid investing extra time into it. Do not be distracted! Research is more important than making extra money!

5.2.3   Behave

Have a blemish free reputation. The advisor should be unreservedly proud of you, and must think of you as a junior colleague.

Do not gossip about professors. Never say bad things within the university or research community.

Dress neatly, be thoroughly professional, modest and cheerful.

Relationship with the advisor:

Arrange your working hours to coincide with those of your advisor.
Remain friendly and cheerful.

5.3 Risks in grad school

Sour relationship with the advisor.

Possible reasons may include sexual or racial harassment, job insecurity, a sense of duty in sabotaging an unworthy candidate. These aren't the rule, but neither are they rare exceptions.
Poverty
Low status
Long hours
Total length of the ordeal
Social isolation
Difficult interactions with advisor and committee.

5.4 TA strategy

5.4.1 Good TA jobs in CS department

CS 336 Analysis of Programs taught by Alan Cline.

CS 349 by Cline and Rich.
Alan Cline's Linear Algebra course was found easy by Prateeka. 30 hours load for entire semester.
The elementary courses with course numbers $\leq$ CS305 seem to carry light loads.

5.4.2 Bad TA jobs in CS department

Taehwan TAed with Dr Mitra and complained about overwork.

Soumojit TAed with Prof. Ramachandran and complained about overwork.
CS307 by Mike Scott required 14 to 15 hours of work per week. It had 2 discussion sections.
Prateek Jain's TA job with Prof. Dhillon seemed heavy.

5.4.3 Places to find summer TA jobs

You are allowed to TA courses in both summer sessions.

The various departments of Mc Combs Business School: visit offices in various levels. Last time I emailed Sharon.Bryant and Jeanie.Brown at mccombs.
In case of Accounting or Finances department, you must email individual instructors.
Engineering departments.

ECE: Contact Melanie Gulick who sits in Ground floor. Usually no jobs are available due to abundance of ECE grad students.

BME: .

Natural Science departments:

Math.

Physics.

School of Information science.

In order for the appointment to be processed, you must be registered for a full course load (3 credits for summer and 9 for long semesters).

If you are unable to make a case for the relevance of the course to your degree/ program of study, you must pay non-resident tuition (2250$ vs 1450$). If the academic advisor is not lineant, you need to justify the relevance of your appointment to the course of your study by explaining how your computer science skills are used and developed in the course of the job. Saying that it will be relevant to the degree in the same way a minor course would be may not work in all cases.

Astronomy: Ajay TA'd there in Spring 2010.

5.4.4   Grading

Have a list of things to check.

Grading programs:

Make scripts.

Grading papers:

Grade the entire bundle, enter scores later.

Do grading at night, at home for example, when creativity and productivity are low.

6   Relationships to cultivate

6.1   Potential choices for research advice

6.1.1   In CS

6.1.1.1   Pradeep Ravikumar

Works on statistical machine learning: inference, graphical model selection.

Reasons   Assistant professors still deeply involve themselves in the problem at hand. They provide pertinent suggestions when it comes to experimentation, help you write papers. Older professors tend to be much more hands-off.

He maintains good connections in the machine learning/ statistics community.

Connections matter later in getting opportunities.

Strategy Read a couple of his papers, especially High-dimensional Ising model selection using l1-regularized logistic regression and talk to him. Understand it with prateeka's help. Thereby you will have an advantage over others.

Approach him and express interest in working on a project with him which will lead to a publication.

6.1.1.2   Kristen Grauman

Prateeka has said that she is an excellent advisor.
Started off prateeka in research.

6.1.1.3   Joydeep

Works in data mining. Reputed to be a nice person.

6.1.1.4   Bill Press

Highly accomplished cross-disciplinary researcher. He is active, capable of doing mathamtics and programming. Has 3 students: CAM or BME. Was looking for biology students who would validate his theoretical predictions.

6.1.1.5   Anna

Very hard to get results. Interesting area.

6.1.1.6   Matt Lease

Work not very mathematical, very applicaiton oriented.

6.1.1.7   Brent

A hot area. Does applied, not theoretical cryptography.

Commanded a student to work on a certain problem, without getting any input. Results seem easier compared to complexity theory. But, cryptography, being useful for those interested in preserving secrecy: like corporations and governments, does not seem to be interesting yet.

6.1.2   Potentially bad choices for research advice

6.1.2.1   Adam and Greg

Have refused to advise me, based on their (mis?) judgement of my current level of theoretical ability. However, in our later interactions, I see in Adam implicit doubt and regret over this.

Narrative for failure of collaboration with Adam   Combination of bad timing and impatience. Bad timing: Did not know basic things when I met him: such as Chebyshev's inequality, Chernoff bound, Hoeffding inequality, martingale, use of 'linearity of expecation' was not second nature; so he was skeptical. Impatience: I did not want to wait long enough for him to evaluate me; so I checked out other research areas.

6.1.2.2   indrajita

Works in applications of linear algebra and optimization in data mining. Seems interested in having me as his student.

His personality is explored elsewhere. Thence, I find that I do not admire his working style and personality (Asserts / displays dominance far too often), and that his research interests, especially the ones for which he has funding, are not the ones closest to mine. But, he is highly influential in the department; and pradIpa appears afraid to offend him. Also, pradIpa is considering very interesting projects with indrajita's lab. So, the idea is to be coadvised by indrajita.

indrajitasya dehabhAShAM cha durguNAn anusaran asmi iti bhayaH.

Possible narrative for failure of attempt to get advice

indrajita-saMshodhanAlayasya tyAgaH

asmAt lAbhaH   tasya kAryashailiH anuchitaH. kRRita-kAryeShu pragatyAH viShaye tApanAya asya asatya kathanAt cha bhayotpAdana-yatnAt muktiH prApyate. kaH Api kAryeShu kushalaH api nirbhayena vishrAntyA sthAtuM na shaknoti. punarpunaH anAvashyakaM api svAmitvaM pratipAdayati. I observed his interactions with me and other students; Our personalities and working styles are not compatible.

tasya dIkShA-virodhe kArya-karaNe (udAharaNArthaM saMshodhanAlayAt anyaiH saha kArya-karaNe) asvAtantryAt cha akaushalAt muktiH.

prAyaH anyebhyaH AchAryebhyaH uttarAH sUchanAH prApyante.

tat-paraM ahaM tasmai na roche, taM avalambituM na shaknomi iti jJNAtaM saMbhAShaNebhyaH; yat mayA samyak na prakaTitaM tat-dIkShA-avalambakasya cha kAryeShu tat-sImita-kAÑkShasya vinayaM.

His research interests are not the ones closest to mine: Options seem to exist for exploring more abstract questions by more theoretical methods.

asmAt naShTaH   saha-saMshodhakaiH saha saMbhAShaNasya cha tebhyaH jJNAnArjanasya naShTaH.

6.1.2.3   David

Confirmed negative impression, due to tussle with Adam. Also, has a sufficient number of students. Hard to get results.

6.1.2.4 Vijaya

Recent students have had trouble adjusting to her working style. Not known if she is actively pursuing independent research.

6.1.2.5 Gouda

Intemperate, many theoretical but mostly impractical ideas.

6.1.2.6 Ray Mooney

Works in NLP, rather than in machine learning. Is known to be slightly averse to theory and mathematics, but focuses on heuristics and system building in problem-solving.

6.1.3 In ECE

6.1.3.1 Sujay Sanghvi

Works on optimization, matrix decompositions, graphical models.

6.1.3.2 Constantine C

Going by his webpage, it is likely that he will expect me to take his course first.

6.1.3.3 Harris Vikalo

works in estimation theory.

6.1.3.4 Gustavo De Veciana

Going by Jaechul, he will expect me to take his course first.

6.1.4 In Math

6.1.4.1 Lexing

He is known to be looking for students, and has funding. He is currently co advising one student working in quantitative finance. His area of research is in fast algorithms for problems from continuous mathematics. Research area very interesting, with wide ranging applications in Science. This could be an opportunity to learn a great deal of beautiful mathematics seen in his papers.
> Impression about Lexing: Enthusiastic in teaching, conveys excitement and close memory of important algs, shows off during teaching: makes radical difference in student interest and perception.

6.1.5   In BME

Orley Alter: works on Genomic Signal processing. Well known in the biology community. She uses much Linear algebra: mainly applies well known, simple linear algebra techniques in the biology community where they are largely unknown. She has 2 students from ECE, is known to recently have refused one.

Imaging research center: Russell Poldrack. Manish Saggar, student of Riisto works with him.

6.1.6   In TACC

Chris of TACC and Robert proposed a numerical analysis project to interest Jesse. Works on sparse linear algebra, whereas Robert works on dense linear algebra.

6.1.7   Business school

carlos carvalho organized a workshop on bayesian non-parametrics, and asked insightful questions.

6.1.8   Biology

6.1.8.1   edward marcotte

Known to be a prodigous and excellent researcher.

Eager for results.

7   The thesis

7.1   Thesis committee

- Thesis committee will help guide you and help you find a job. It will consist of core members, who are convinced during the proposal, and secondary members, who come in later. Manage the thesis committee:

  Advisor will be the chairperson, and indeed, the most important person. He has the power to resolve differences among committee members, though in some cases, this is impossible.

  Populate the thesis committee with members who are genuinely motivated to improve your thesis, and are not out to score points against other committee members, or you.

  Their skills should complement each other, so that you can draw on them for help. Young professors have a reputation for being particularly harsh.

  Don't pick luminaries if they are inflexible. Flexibility is especially important while choosing secondary committee members.

  Ask other students and recent graduates about their experiences.

Make sure they aren't about to go on a sabbatical or retire.

Draw them into the thesis process as soon and as thoroughly as possible.

Develop the ability to do independent work. Don't bother them.

Solicit, and be responsive to their advice. Give in to minor points. Not many people are likely to read your thesis. Circulate your understanding of their advice, to be sure.

Going away and writing your complete thesis can lead to practical and political problems.

Get chapters reviewed as you go along. Circulate polished drafts. Delay in reading drafts is a common cause for delay in completion. Try gently to get a commitment on the deadline.

You can change the committee. Changes in committee are easier earlier in the process. If someone cannot attend, consider taking extra time to choose substitutes.

Try to get the thesis committee to meet annually to review progress, and to iron out differences. This way, approvals can be "on record".

Faculty members are not obliged to work on your committee. You should convince them that they can help you with little work on their part. It is best for the advisor to approach them.

7.2 Problems between committee members

Try to get the advisor to solve it amicably. Otherwise, call a meeting of the full committee. Final resort: alter your committee.

7.3 Problems between you and a committee member

Act quickly before the impression solidifies. Talk openly.

If problem is with a secondary committee member, seek advisor's help.

If even that fails, seek mediation from department chairperson or university ombudsman.

Final resort: alter your committee. Do it tactfully, let him save face, don't tell him or anyone about your reasons.

Repercussions minor if the problem is with a secondary committee member. Relationship with an advisor is a serious matter. It is a risk to constitute the committee with him after that. It is like divorce.

7.4 Thesis proposal

The Thesis proposal is a contract with the committee, a sales pitch and a research plan. If there are changes, there can be renegotiation.:

Start writing a thesis proposal immediately upon finding possible thesis topics. If the topic turns out to be intractable, now is the time to change it.

Ask everyone you can for their opinions.

It can give you a head start in writing your thesis. Many parts of the proposal can make it intact to the thesis. It is desirable to make it specific, factual and detailed, specifically in the sections which will be later adapted into the thesis. This can also reduce far-reaching changes induced by the committee.

The proposal is but a proposal. So, don't spend too much time on it.

7.5   Thesis writing

Many people fall into a state of epic procrastination when it comes to writing the thesis.

Do not think that you have to read everything related to the topic before you start writing. The brain has bounded short-term memory capacity.

Do not find refuge in displacement activity. Keep an eye on the metrics.

Writing skills are improved and maintained only by regular practice.

Generally, including time for research, one can produce around 3 pages of thesis material per day. So, a 200 page thesis draft can take 3 months.

Material which can be directly used in the thesis:

The thesis proposal

Course papers - Choose topics of material importance to you.

Research papers: Write up results and analyses as experiments are completed.

Understand the treatment and structure in outstanding theses.

Thesis = Front Matter + Body + Back Matter.

Title should be full of key-words used by researchers while searching for references.

In acknowledgment section, mention all important people, including committee members. Keep it professional. Do not gush.

Submit chapters as they are written.

While making substantial revisions to the thesis, consult more than one thesis member - Their advice can often be contradictory.

Keep it as short as possible. Don't polish thesis endlessly. Even the search committee will not read a 600 page thesis - They look at published papers.

7.6   References

1. Getting What You Came For: The Smart Student's Guide to Earning an M.A. or a Ph.D. (Paperback) by Robert Peters