Demystifying PhD Admissions in Computer Science

A Handbook for Navigating CS PhD Admissions in the U.S.

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Contents and Summary

Preface

Having been involved in PhD admission committees for many years, I've observed that students—especially those in smaller countries, less well-known universities, or 1st generation college students—often lack a clear understanding of the Computer Science (CS) PhD admission process at US universities. This confusion not only discourages them from applying but also creates the perception that getting admitted to a CS PhD program in the US is unrealistically difficult.

So I want to share some details about the admission process and advice for those who are interested in applying for a *PhD in CS in the US*. Originally, this book was written for international students, but has been expanded to generalize and include specific tips for *US domestic students* (§C). Moreover, while this book aims at students interested in CS, it might be relevant to students from various STEM (Science, Technologies, Engineering, and Mathematics) disciplines (§1.2). Furthermore, although many examples are specifics for schools that I and other contributors of this book know about, the information should be generalizable to other good R1 institutions in the US.

This book can help *US faculty and admission committee* gain a better understanding of international students and their cultural differences (§J). By recognizing and leveraging these differences, CS programs in the US can attract larger and more competitive application pools from international students.

I hope this book will help you understand the CS PhD admission process in the US and make informed decisions. Additional information about the book can be found in §L.

Part I

Introduction

Chapter 1

Should You Apply?

"Don't make fun of graduate students. They just made a terrible life choice."

THE SIMPSONS

Many students, especially those from less well-known universities and smaller countries, often wonder if they should apply to a CS PhD program in the US. Common concerns include (i) the **difficulty of getting admitted** and (ii) the **cost of graduate study** in the US.

Much of these uncertainties stem from the lack of information and guidance on the admission process in the US. Social platforms like Facebook and Reddit are full of confusion and contradictory information. This book aims to address these concerns.

Not any harder than other countries Applying to a good US university *should not* be any harder than at schools in other countries. It might even be more flexible since CS PhD in the US *do not* require having an MS or a research topic, proposal, or adviser in advance (§1.7 compares CS PhD study in the US to other countries). It doesn't even require having a CS background (§1.4). If you believe you have a chance in other countries, e.g., Australia, Canada, Japan, Germany, UK, South Korea, and Singapore, then you will surely have a chance in the US as well.

Note that the most selective US schools, e.g., top 10 in CS (§K), are extremely competitive for everyone, regardless of background. Don't be discouraged if you don't get into a "household name" university; hundreds of excellent CS PhD programs offer world-class research opportunities (§13.2).

Standing out is important (§11.3)! US programs also value applicants from diverse and nontraditional backgrounds. If you're not from a top school, or your path has been unusual (e.g., you climb Mt. Everest, you may actually stand out—in a good way!

Many students, especially those from smaller countries or schools, feel *imposter syndrome*—worrying they're "not good enough", or get discouraged when competing with others with "stronger" profiles (§11.2.1) Remember (§2): admissions committees look for potential, not perfection, and for evidence you'll thrive in research environment and fit well at their institution—in other words, things that usually have nothing to do with your GPA or GRE scores.

Funding Is Not An Issue In most cases CS PhD students *do not* need to worry about funding, especially at good R1 universities in the US. If you are admitted, you will almost certainly receive *full funding* (§12) to support your study.

Your funding includes tuition, health insurance, and stipend (in STEM field you get paid for your study!). Moreover, you often receive additional benefits such as summer pay (§12.3.2), laptops (§10.4), and traveling to conferences and workshops.

Full funding for CS PhD students is the norm in the US, and I'd go as far as to say that if you are not admitted with full funding, you might want to not accept the offer. The reason is that CS is in high demand and you're actively contributing to improving the reputation of the university and more generally advancing CS.

Vu While full funding is standard for CS PhD as mentioned above, always double-check the details of your offer (§10.3) before accepting, especially for programs outside STEM or at smaller/private universities.

1.1 What's a PhD in CS?

A PhD in CS is a *research* degree. Unlike undergraduate or even Master's programs (§D), which focus on breadth of knowledge through coursework, a PhD is about depth and pushing the boundary of a specific area within a CS field (e.g., software verification within the field of programming languages or formal methods). You will become an expert in your area of research and contribute something new to the field that has never been done before.

This series of pictures from Matt Might illustrates what a PhD means.

Career-wise, a CS PhD prepares you for jobs that require deep technical expertise and the ability to do independent research. Many graduates become professors

or academic researchers while others pursue positions in industry research labs, advanced engineering teams, or technical leadership positions. The degree also opens doors to national labs, government agencies, and startups, where the ability to solve unknown and complex problems is necessary.

A PhD is not just a degree, it is a **journey** that transforms you into a researcher. You will learn how to think critically, solve problems, deal with adversity, and work independently. You will also learn how to write and "sell" your work, collaborate with others, and effectively communicate your ideas. In the end, you will have a deep understanding of your chosen field and become an expert in your area of research. In fact, you will know about your research topic more than *anyone* else in the world, including, in many cases, your adviser! This is a scary thought, but it is also exciting and rewarding.

1.2 CS Fields and Areas

CS is a broad academic discipline with many specialized areas of research. Understanding the structure of CS can help you communicate your research interests and goals more effectively, e.g., in your SOP (§5), and also assist you in finding suitable advisers and research topics (§14.1).

Disciplines At the highest level, academic *disciplines* are broad domains of scholarly study, such as CS, Mathematics, Physics, Biology, Economics, Law, Social Sciences, and the Humanities. Universities typically have entire departments and degree programs centered on these disciplines (e.g., a Dept. of Computer Science or of Economics).

STEM fields collectively refer to the disciplines in the domains of:

- **Science:** Physics, Chemistry, Biology, Geology
- **Technology:** Computer Science, Cybersecurity, Data Science, Information Technology
- **Engineering:** Electrical, Mechanical, Civil, Chemical, and Bioengineering
- **Mathematics:** Pure and Applied Math, Statistics, Operations Research

Fields Within a discipline such as CS, we have *fields*—major branches that often correspond to faculty groups, conference communities, and sometimes even degree tracks. Common fields in CS include: Artificial Intelligence (AI), Machine Learning (ML), Software Engineering (SE), Programming Languages (PL), Theory of Computation (TCS), Systems, Computer Architecture, Security and Privacy, Computer Vision (CV), Natural Language Processing (NLP), Human-Computer Interaction

(HCI), Databases, Networking, Graphics and Visualization, and Computational Biology

Most faculty have a "home" field with which they are primarily associated, but may also publish in related fields. For example, SE researchers often work in PL and Formal Methods; Security researchers may also work in Systems and Theory.

Areas Within a field, we have *areas*—narrower subfields where people specialize. For example, PL includes Type Systems, Formal Verification, Program Synthesis, SE includes Testing, Program Repair, Empirical SE, and AI4SE (a new and fast-growing area), and ML includes Supervised/Unsupervised Learning, Reinforcement Learning, and ML Theory, and AI traditionally includes Planning, Reasoning, and Robotics (though many of these are now distinct fields). Some areas are growing so large that they are becoming fields in their own right. ML, for instance, originated within AI but is now widely regarded as a standalone field.

Topics and Projects Finally, we have *research topics*, which refer to concrete problems or techniques within an area. For instance, Model Checking, Theorem Proving in Formal Verification, and Mutation Testing, Test Prioritization, and Symbolic Execution in Software Testing.

At the finest granularity, a research *project* or dissertation focuses on a specific question within a topic (or cross-topics and even cross-areas). For example: "How can symbolic execution be applied to generate high-coverage test cases for deep neural networks?"

For example, my own research profile can be structured as:

- **Discipline:** Computer Science
- **Fields:** Software Engineering and Formal Methods
- **Areas:** Software Verification, Testing, and Analysis
- **Topics:** Theorem Proving, Symbolic Execution, Test Generation
- **Project:** Applying automated theorem proving to verify the correctness of deep learning systems, and generating benchmarks to evaluate formal verifiers

1.3 How long to complete the CS PhD program?

Typically it takes 5–7 years for CS PhD in the US. This is usually longer compared to other countries (§1.7), which might require having an MS (§D.1).

The first two years you typically take coursework (somewhat equivalent to an MS study), find an adviser, and learn how to do research. The next 2–3 years you focus on your research, form a dissertation topic, and get results published. The last 1–2 years you continue to publish, write and defend your dissertation, and look for

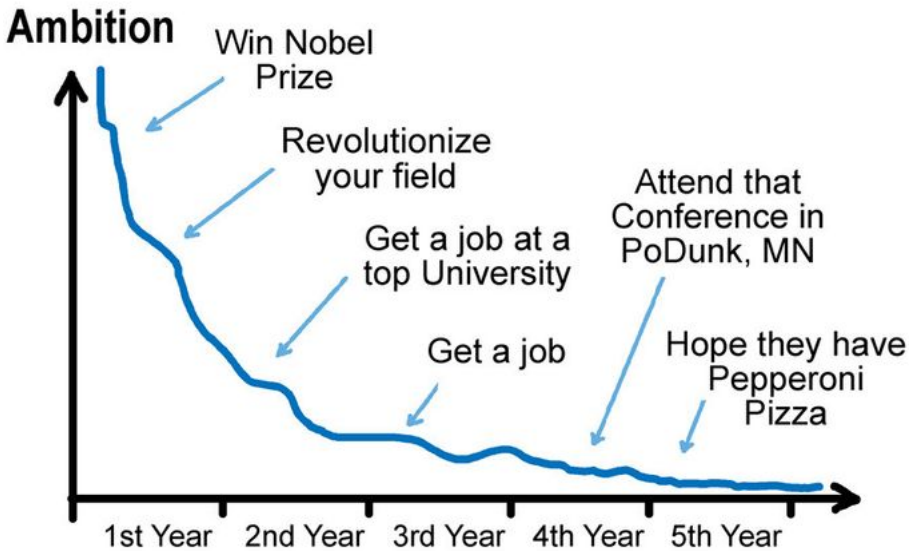


Fig. 1.1: The "ambition" level of a PhD student over their years of study (they miss the 6–7th year when the ambition is *"Just let me graduate"*).

a job. Within these 5–7 years, CS PhD students often take a "leave of absence" for 1–2 semesters or summer to do internships at companies and research labs.

I start my PhD with an MS, and it took me 7 years (Fall'07–Fall'14). I spent half a year doing an internship at the Naval Research Lab. My PhD did take a bit longer than usual, but allows me to explore new research areas and topics.

1.4 Undergrad Not in CS or Related Disciplines

You still can apply to PhD in CS *as long as* you can demonstrate you are ready for it through your background, research experience, LoRs, statements, etc. You might be even able to leverage this to make your profile stand out as mentioned in §11.3.

A main concern adcom (§2.1) has for a non-CS or non-STEM student is if you have the sufficient technical background obtained through core CS courses. So you need to show that you have such knowledge through your coursework, projects, or research. For example, if you have taken a class on Algorithms, even from online course from Coursera, you can talk about it in your SOP. If you have done a project that requires knowledge of OS or have a professional certification (e.g., A+) through work, you can talk about it. If you have done research that requires knowledge of Discrete Maths, you can talk about it. You can also ask your LoR writers to talk about your technical background.

Core CS topics Common CS knowledge that you should know are:

- **Programming Foundation**: programming concepts in modern languages such as C++ or Java.
- **Discrete Math**: logic, set theory, proof techniques
- **Data Structures and Algorithms**: linked lists, trees, sorting, searching
- **Computer OS or Systems**: memory management, file systems, processes

In short, you *do not need* to formally take CS courses, you just need to show that you have this essential knowledge, e.g., through the mentioned ways. Many universities are well aware that incoming graduate students might not have all the technical background, so they often have a *"bridge"* courses to help students catch up. For example, GMU has four bridge courses corresponding to the four core areas above that incoming students can take to catch up on their CS knowledge.

I would advocate for a non-STEM student who shows that they have a strong drive for CS by studying core CS knowledge through various channels (e.g., self-study through online courses, projects, etc.). I have seen many students with non-CS backgrounds who are very successful in CS PhD. I also have seen many students with CS background who are not successful in CS PhD. So it is not about your background, it is about your drive and passion for CS research.

1.5 Is MS Required for CS PhD Admission?

No, while other countries often require an MS for PhD student in CS (§1.7), it is common in the US to apply for a PhD program directly after a 4-year undergrad program (e.g., after getting a B.S degree). Most CS PhD programs are designed so that students can get MS degree "along the way" to PhD, e.g., after finishing the 2-year course work.

However, MS can help admission if it gives research experience or is from a more well-known school than your undergrad institution (§6). Moreover, if you have an MS then some course work *might be* transferred for course credits, which *might* save some time. But in general don't count finishing earlier just because you have an MS.

I start my PhD with an MS in CS from a US university. I found that the MS helped me in gaining research experience, but I still had to retake courses because I did my MS at a different university. So in the end, I did not save any time because of the MS.
In general, don't worry if you don't have an MS. But also don't feel that you wasted your time if you have an MS, as it can help you in research.

Tab. 1.1: Comparison of the CS PhD program in the US and other countries

Aspect	US PhD Programs	Other Countries
Duration	5-7 years	3-5 years
MS Required	Not required	Often required
Coursework Required	Yes (first 2 years)	No
Research Proposal Required	No	Yes (in some countries)
Academic (Faculty) Job	Direct	Postdoc
Work Life Balance	Less	More

1.6 Can I apply for PhD in CS for the Spring or Summer?

Typically, most students apply to start their PhD study in the Fall. This means they send in their application around December and receive admission notification sometime in the Spring, and officially begin their PhD study in the Fall (August or September).

Fall—the start of an academic year—is the most common start time for PhD programs in the US, and many universities only accept new PhD students in the Fall. Importantly, applying for the Fall allows you to apply for funding opportunities (§12) that are available only for Fall admits, such as TAships (§12.1.1) and fellowships (§12.1.2).

However, many universities also accept PhD students in the Spring or Summer, especially when you have a specific adviser who would fund you through an RAship (§12.1.2). This is less common, and you would loose funding opportunities that are available only for Fall admits.

GMU allow PhD students to start in the Spring, but not recommended. Two of my PhD students started in the Spring, but that was because I have funding to support them right away. In general, we can get student in the Spring or even Summer (I never tried), but we would need to have RA for them and they are no longer eligible for various benefits for Fall admits (e.g., GMU gives Fall admits stipend for their first summer in the PhD program). So in short, it's possible, but we do not recommend it.

1.7 PhD in the US vs. Other Countries

Tab. 1.1 summarizes the main differences between CS PhD in the US and other countries. Note that these differences can vary by institution and country. Some countries might have a PhD program that is similar to the US. The following are some common differences:

- **MS requirement and PhD duration** CS PhD programs in the US do not require an MS degree (as mentioned in §1.3 and §1.5). In contrast, many other

countries require having an MS degree before joining a PhD program. This means that US PhD programs are longer (5–7 years, 2 of which are coursework) than other countries (3–4 years, no coursework).

- **Project proposal** in many countries, you have to choose a project and adviser *during* the application process (e.g., you write a proposal to a potential adviser). But this allows you to start your research right from the beginning.

  In the US, you often start your PhD without an adviser or project and find them later. Usually you have two initial years to take classes, explore and find an adviser and research topic.

- **Course work** In the US ou will spend the first couple of years taking classes and exploring potential adviser and research topics. After that, you have to pass a series of exams during your PhD—qualifying exam, comprehensive exam, thesis proposal defense[1].

  In other countries, you often start your research right away and work on the research project you proposed with the adviser you chose. Moreover, you might not have exams like those in the US or only have to do a few of them.

- **Funding** In many countries, funding comes from the university or the gov't. This funding often has a fixed duration, e.g., 3 or 4 years. In the US (§12), funding (e.g., RA) comes directly from your adviser (no fixed duration). There are also fewer TA opportunities in European universities compared to the US.

- **Academic Position after PhD** In other countries, PhD graduates interested in academia typically apply for additional research appointments, i.e., postdocs in the US, and then consider faculty positions.

  In the US, PhD graduates often apply directly for faculty positions. Postdoc for US graduates is no longer a popular option as it was before. The reason is that US PhD programs are longer, so you already have enough research experience (e.g., papers) to apply for faculty positions. In contrast, in other countries, PhD students often finish their PhD earlier and need more time to gain research experience before applying for faculty positions.

- **Work-life Balance** PhD students in the US are often said to be overworked compared to other countries, e.g., in Europe. This is partly due to the longer PhD program and that US PhD students are often paid through TA, which requires them to do TA in addition to their own research. In contrast, PhD students in other countries are often paid through fellowships, which might not require doing TA.

[1] ABD (all but dissertation) refers to a PhD candidate who has finished all course work and exams and only needs to write and defend their dissertation.

Work-life balance is more of a personal and cultural issue than a regulatory one. US academia is known for its intense work culture, because students themselves are fiercely competitive (after reading this book you would see how competitive it is to get into a good PhD program in the US), and faculty are expected to publish frequently. The system strongly favors those that work hard and produce results, which can create a culture of long hours and high stress.

Chapter 2

How is Your Application Evaluated?

After you submit your PhD application, it will be checked for general requirements—whether you submit your transcripts and standard scores? Usually, this screening process is done through a central university system, i.e., not by CS faculty.

After screening, your application is complete and forwarded to the CS department for further evaluation. If you don't pass screening, the system will tell you what is missing and what you need to do. So pay attention to your email and check your application status regularly.

Hakan: At GMU, for full consideration, students should make sure to submit *ALL* required documents by the application deadline, and should never assume that some required documents (such as official TOEFL scores or official diplomas/transcripts) will be waived by the admissions office. If something is listed and not marked as "optional", it is mandatory and they should plan for submitting all those.

2.1 Admission Committee

Your applications are reviewed by a PhD Admission Committee (adcom) that consists of faculty members in CS. Adcom members have a wide range of expertise and background to ensure diverse perspectives in the evaluation process. For example, there would be faculty who specialize in various areas such as AI, systems, theory, HCI, and so on. In some cases the committee can involve affiliated faculty from different disciplines.

The size and the review load of the adcom depend on the department size. At GMU, the PhD adcom typically has 15–20 faculty, and each committee member is assigned to review about 30 applications. Note that most large schools, including GMU, have separate adcoms for MS programs (§D).

The PhD adcom typically involves assistant professors in the department (see

§14.2 for various types of faculty). This provides junior faculty the opportunities to recruit students. The adcom chair will likely be a senior faculty, but they will not review individual applications and instead assign them to committee members. The chair will look at various factors such as research interests or mentioning faculty names to assign the applications to appropriate faculty, e.g., I am often assigned to review applicants interested in software engineering.

Each application is assigned to about three adcom members, who will evaluate your profile and reach a consensus. They will consider various factors including LoRs, SOP, research experience, GPA, test scores, and interviews. More details about these factors are discussed in Part V.

Vu: At GMU, we usually decide that a full-time PhD candidate is either (i) admitted with funding (§12) or (ii) rejected. In other words, in most cases, we either admit you with full funding or reject your application. In some rare cases, we admit without funding because you have funding on your own, e.g., supported by your government or having external fellowships. We justify our decision (§2.5) with a summary of your application, where we list strengths, e.g., came from a well-known school, and weaknesses, e.g., weak and generic LoRs.

2.2 How Applications are Assigned to Adcom Members?

Adcom members typically can view any submitted applications. However, we only review those that are assigned to us, which are already too many. Adcom chair will assign applications to reviewers based on their expertise (e.g., if a student says they want to do SE or interested in working with me), and reviewers will only evaluate those applications. Occasionally we might look at other applications, (e.g., if the student contacted me, I know that student, or they are from a school in Vietnam that I am familiar with, etc). However, even if we look at them, we usually do not get involved in their evaluation directly.

Note that the assigned reviewers are the main ones deciding your application, but at many schools other faculty in the department can also have access to your application and provide inputs and opinions on your profile. Thus, it helps to contact faculty (§14.5) and mention faculty you're interested in in your SOP (§5).

2.3 How are Decisions Made?

After reviewers have evaluated an application, adcom chair will review all evaluations, look at entered notes, and ask reviewers to discuss and resolve discrepancies to reach a consensus (e.g., a reviewer wants to accept but the other wants to reject). Typically, the decision is made entirely by the reviewers. There is *no involvement* from the adcom chair, department chair, or others. In most cases adcom members, even those reviewing the same application, make decisions independently and do not

talk to each other (just a common practice to avoid biasing). In some rare cases we might (§2.4).

Even if *all* reviewers recommend acceptance, the application is not automatically accepted, especially if no faculty is willing to advise the student. For example, if the student is interested in a research area that no faculty is working on, or an area where no faculty is taking new students (e.g., AI/ML where faculty likely already has many students) then the student will not be admitted (see more rejection reasons in §11.2). This is increasingly common as the number of applicants grows much faster than the number of available faculty. Note that not every CS faculty can formally advise and graduate CS PhD students (§14.2).

However, if the student has contacted a faculty member and that faculty is interested in the student and has made this known to the adcom, then the student is likely to be admitted, even if the faculty does not have funding. This thus shows the benefit of contacting faculty (§14.5).

If the student mentioned a faculty in their SOP, adcom might ask that faculty to look at their application and if they are interested in the student. Even if the student has a weak profile (but still passes the minimum requirement from the university), they might be admitted if a faculty is willing to take them. Adcom members, especially in the US, are very reluctant to go against the faculty's decision (e.g., if a faculty wants to admit a student, we are not going to reject them).

2.4 Do Adcom Members Talk to Each Other?

We typically review applications independently and do not talk to each other. This is to avoid biasing, e.g., if one reviewer says they want to accept, the other might feel pressured to accept as well.

However, when there are discrepancies in evaluations, the adcom chair will ask reviewers to discuss the application to reach a consensus. We might also talk to each other for interesting or strong applications, e.g., how to recruit this student or who should be the adviser. If the student mentioned a faculty member in their SOP, we might ask that faculty if they are interested in the student.

Note that other disciplines might have different practices. For example, adcom might select a top list of applicants and then discuss them in a meeting to determine who to interview. Fig. 2.1 shows an example of how a PhD admission committee in Physics evaluates applications. In CS, both the reviews and interviews are often done independently (§9.1).

2.5 How Long To Evaluate An Application?

In the schools I've been at, the application deadline is in Dec, and adcom meets when school starts in mid or end of Jan. Adcom chair sends out review assignments to adcom members, about 30ish per faculty (§2.1). We usually have about 2 weeks

From a prof. in Physics at an R1 university: We have a pretty well fleshed out grading rubric for applications that has categories like grades, research, writing ability, etc. I would say our rubric is weighted about 1/2 on academics (research, LORs, grades) and 1/2 on the idea of "grit" or "resilience" (engagement, leadership, working through obstacles).

The rubric helps a lot to standardize how committee members grade, and speeds things up a bit because you know what to look for. We spent what seemed like forever on the details of the grading system (e.g., what does a a score of '3' vs a '2' in writing look like?) but now it's very helpful.

We also do roughly three rounds of selection: a first "triage" round to determine the top 100 applications, a second round to determine about 25 people to interview, and then a third round to decide the actual offers. That also helps to speed things up a bit, since in the first round with all the applications you can move fairly quickly since you just need to sort into "good" and "bad". By the time we're getting into the details and reading everything more closely in rounds 2 and 3 most of the applications have been removed from consideration. So for this method I do maybe 5 minutes per app in round 1, but closer to 20 minutes per app in round 2, and usually round 3 is long discussions about specific people.

Fig. 2.1: An example of how a PhD admission committee in Physics evaluates applications. Note that this is not common in CS, where we typically do not have a grading rubric and do not discuss applications in a meeting.

to review all applications. As mentioned in §2.4, adcom members review applications individually and independently. We only discuss when there are disagreements (adcom chair will determine which applications to discuss).

I typically reserve a whole day (or two days) to review all applications. On average, I spend about 10–15 minutes reviewing each application (less for clear rejections and more for potential acceptances). While this seems short, it is not that difficult to tell if an application is good or bad. In fact, this is twice what other faculty spend on average, e.g., Philip Guo spent 3–5 minutes per application.

For each application, our system compiles a single PDF file, which consists of a summary (degrees, GPAs, etc), transcripts, test scores, LoRs, a CV, SOP, and writing samples (§8.2). I usually read in this order. I start with the *summary*, checking for low GPAs or test scores below the university minimum (§7). I then skim the *transcripts* for low grades in relevant courses, noting issues like "many low grades in main courses or unknown international school with good GPA". These are not as important as LORs or SOP but I read them first because the review system has questions about them (e.g., "is GPA good? is IELTS sufficient?")

I read carefully *strong LoRs* and skim weaker ones, noting either strong letters from well-known professors/researchers and talk about research experiences or weak letters with generic content (e.g., "student was in my class"). I skim over *CV* and look for publications, research experiences, and notable achievements. I take notes of things like "published papers in top venues" or "gold medal in an international competition".

I skim weak *SOPs* but read strong ones carefully. I note whether the SOP is exciting, research-oriented, standing out, and tailored to our program (e.g., if they are familiar with the work of some faculty or have talked to them). These notes are entered into the evaluation system.

Finally, I enter my decision, which is usually either a rejection or an offer of admission with full funding (e.g., from TA). I also recommend very strong candidates for the University Presidential fellowship., which is a fellowship from GMU that provides funding similar to an RA (§12). Note that while the system has other decision options, eg., admit without funding, provisional admission (e.g., if they need to take some courses), I do not use them, simply because we either reject or admit with funding.

Note that I *do not* need to interview a student to make a decision. I can tell from the application if they are strong or not. However, if I want to recruit a student, I will ask them to chat with me. This is quite different than in other discipline where reviews, interviews, and selection are done in multiple rounds (see §2.4 for an example in Physics).

Of course my recommendation is just one of the three or four faculty who review the application. The adcom chair will compile all recommendations and make a decision based on them (§2.4). If there are disagreements, adcom chair will ask the reviewers to discuss the application. Unfortunately, even if all reviewers recommend

a student, they might not be admitted (§11.2) if there are too many students or they are not a good fit for the program (e.g., no one is willing to advise them).

2.6 Waiving Application Fee

Some universities do waive—for example, Rice, TTIC do not have fee for PhD applications and many universities for domestic students (§C). Some programs also waive if the applicants attend some of their opening sessions. Some programs waive if the applicant provide proof of financial difficulties, e.g., a statement from a financial adviser or a bank statement.

However most do not waive the application fee, which is typically a requirement of the university. Individual departments and programs do not have the flexibility to waive the application fee, even if they want to.

Vu: In my opinion, requiring applicants to pay the fee helps ensure their seriousness, as it filters out non-serious candidates. Most CS programs already receive way too many applications and would be overwhelmed if the application process were free—*"hey it's free, so I can just apply to as many schools as I want to increase my chance of getting in"*. Even with application fee the competition is already very tough, imagine if the application is free and the number of applications triples or quadruples.

Note that if you have financial difficulties, you can ask the department for a waiver, but this is typically only granted in exceptional cases.

Part II

Application Materials

"Son, if you really want something in this life, you have to work for it. Now quiet! They're about to announce the lottery numbers."

The Simpsons

The goal of adcom is to evaluate your research experience, potential, and interest to see if you *fit into its PhD program*! The emphasis here is *fitting*, which varies from school to school, faculty to faculty, and even from year to year. The committee will look at various factors, but the most important ones are letters of recommendation (LORs), statements of purpose (SOP), and research background and experience, e.g., publications.

Chapter 3

Letters of Recommendation (LoR)

"To whom it may concern... D'oh!"

THE SIMPSONS

Letters of Recommendation (LoRs) are crucial for PhD because (i) they paint a picture of your research ability and potential from someone who has worked with you, and (ii) adcom trust the opinions of your LoR writers, who are usually faculty members or researchers who have the expertise and reputation to evaluate your research ability (§3.1). Most PhD programs require at least *two* LORs.

When reviewing applications, I usually read LoRs first, then the SOP (§5). If these make a strong impression, I skim through the rest of the materials; if not, I pay closer attention to other aspects before making a decision (§2.5).

3.1 LoR Writers

Choose your LoR writers carefully, as they can make or break your application. LoR writers are often your research advisers and professors who have mentored you in research. A *strong* LoR is from people meeting the following criteria:

1. **Personal knowledge**: They should know you well enough and have worked closely with you through research projects (much preferred) or coursework. This allows them to write a letter that is *personalized* and *specific* to you.

2. **Credibility**: They should have sufficient expertise and reputation to effectively assess and vouch for your research capabilities and potential. Ideally, your recommender should be an active researcher with a PhD or extensive research experience.

3.1.1 LoR from Well-Known People

Having a strong letter from well-recognized researcher (§H) can *significantly boost* your application. Such letters can outweigh other weaknesses such as limited publications or low GPA. Adcom members trust people they know or have heard about and respect. A well-known researcher is unlikely to recommend someone who is not good because it would damage their reputation.

However, don't worry if you haven't worked directly with well-known researchers. A strong, personalized recommendation from someone who knows you well, even if less famous, is far more valuable than a generic letter from a prominent figure who barely knows you. So again, the emphasis is on *personalized* and *research-focused* letters–the fame is a bonus, not a requirement.

It is fine to get letters from a postdoc or even a senior PhD student who has worked closely with you and can write a strong letter. An enthusiast letter from a postdoc who has mentored you in research for the past six months is much better than a generic letter (§3.1.2) from a well-known person.

Didier *Should letter writers have PhDs?* In Rwanda, a lot of students interact more with teaching faculty who might not have PhD.

Vu: This is an interesting detail that US faculty might not be aware of. Students should mention this in their SOPs (§5). In general, someone with a PhD has been through the research process and therefore can better evaluate your research ability. But if you do not have such writer, then someone who can properly evaluate your research ability is OK (and still better than someone who has a PhD but does not know you well).

3.1.2 Generic Letters are Bad

When the writers do not know much about the applicants (e.g., just taking some course with them or not making any impression to write about), they might write a *generic* and short letter, which is not useful and also considered weak.

This does not mean the ref writer is not good or does not care about you, but they just do not know you well enough to write a strong letter. So it might be a

good idea to directly ask if the prof. is willing to write a *strong* letter for you. If not, then you should ask someone else. For example, if a student I don't know well asks me to write a letter for them, I will explicitly tell them I don't know them that well to write much about them, and such a short, generic, and weak letter will not help their case (§3.2.6).

Several international students mentioned that some professors are unwilling to write letters or write weak ones because they do not want (good) students to go abroad or only go to places where they want the students to go to. If you are in this situation, you should find someone else to write for you.

Sometimes students would go to great lengths just to get letters from "top" professors in their school—like department head or dean (§3.1.3). But as mentioned, if these professors do not know you, their letters would likely be generic and carry little value (sometimes red flags). Moreover, a top professor at your university might not be well-known to US faculty (see more details in §3.1.3 and §6). So save the trouble and get letters from *any* professors/supervisors who know you well and can write a good letter about *your* research ability (§3.1.1). It's better to have a good personalized letter about your own research ability from someone who is less well-known than a generic/weak letter from a well-known person.

3.1.3 LoRs from Dept Chair, Dean, or Supervisor at Work

Many students, especially international applicants, try to get LoRs from high-ranking administrators in their universities such as department chair/head, dean, or director. The students never worked with these people (they might take a class or so with these profs), but mistakenly believe that these LoRs are valuable due to the writer's high position in the university. However, as mentioned in §3.1.2 such a generic LoR has little value because the writer does not know you well and can talk in depth about your research ability.

Moreover, while being well-known and respected in your local university, these writers might not be very active in research, e.g., haven't published in recent years (§H). Thus they might not be well-known and recognized by adcom members.

In my experience in reviewing applications from international students, letters from admin people are often generic and do not provide much value. In many case, the letter reads like it was written by a student (§3.1.4), and thus is a red flag. So if you are in this situation, you should find someone else to write for you as mentioned in this section.

Many students get letters from supervisors from companies where they did internships or are working. It is OK as long as it is a research-based personalized letter. Again, the emphasis here is *research*, i.e., the letters should describe your research experiences and potential. Letters focusing on non-research projects at a company won't carry much weight.

Finally, despite best intentions, the writers might not have the experience to write a strong LoR or lack the ability to evaluate your research ability. This is unfortunate but common, and if you are in this situation, you should find someone else to write for you (see §3.1 and §3.1.1).

Hung: A sad reality is that most professors in Vietnam **DO NOT** know how to write a good letter, or are lazy in writing letters hence delegate the writing to the students. Unfortunately, there is no easy solution to this problem.

3.1.4 Self-written Letters are Bad

Many letter writers ask students to write their own letters—a common practice in many countries. Unfortunately, such letters have *little value* and are considered weak by reviewers—why can you not even find someone who cares or knows enough about you to write a candid personal reference letter? Instead of the ref. writer talking about you, in it is you who write about yourself (and they just sign the letter).

Self-written letters are *easy to spot* because an experienced professor would write differently compared to an undergraduate student. For example, they can provide convincing and concrete examples based on their experience and compare you to their own students, and of course the writing style is different—imagine the difference between a letter written by a professors who has been writing letters for decades and a letter written by an undergraduate student who has never written a letter before, even if the student has subscribed to ChatGPT+ (§5.2). Worse yet, if we suspect that the student wrote the letter, it is a red flag as we will question both the student's integrity and the letter writer's credibility (because they allow this to happen).

Well-known and well-respected profs would *not* ask you to write your own letter (in fact, even not well-known ones wouldn't do this to students they care about). This might be a common practice at specific universities and the students do not have a choice as they need the letter. However, think about this: if a prof. does this often, then they either don't know how to write a LOR (more common than you would think) or simply do not know or care enough about you. In any case, such LoRs are not useful and might even hurt your application. So if you are in this situation, you should find someone else to write for you.

3.2 Asking for LoRs

As mentioned in §3.1, LoR writers should be someone who knows you well and has the credibility to evaluate your research ability. In the US, it's common for students to explicitly ask if the writer would be willing to provide a strong letter, and the writer are also very direct in their response. If they are not willing (you should be thankful that they are honest with you), then you should ask someone else.

Below are some tips to approach your LoR writers:

- **Ask in advance** You should ask for LoRs *at least a month* before the deadline. People have commitments and writing a strong LoR takes time (§3.2.6), so give them enough time to write a strong letter for you.
- **Waive your right (§3.2.1)** You should always waive your right to see the letter. This shows that you trust your writers and that you are not trying to twist their words.
- **Help your writers (§3.2.2)**You should tell your writers the programs you are applying to, their deadlines, etc. You can also share your SOP with them and other details about your research experience and potential.
- **Ask for feedback** If the writer is very close to you and willing to, you can ask them for feedback on your SOP (§5) and other application materials. If the writer is a professor, they might have served in adcom committees, seen many SOPs, and can provide valuable feedback.
- **Follow up and Stay in touch** Follow up with your writers to make sure they have submitted the letters on time. Note that their letters might have a different due date than your application (§3.2.3).

  After your writers have submitted all of their letters, *thank them* (§3.2.4). Let them know the outcome of your applications and stay in touch with them. This will help you build a relationship with them and you might need them to write for you again in the future.

3.2.1 Waiving Your Right

When you ask someone to write a letter for you, *you should always waive your right*. Choosing not to look at a reference letter is pretty standard in school and job applications. When you waive your right to see the letter, it adds a layer of trust, showing you're confident in your choice of referees and that you're not trying to twist their words. It's also about keeping things open and honest between you and your letter writers and encourages them to be real about your strengths and qualifications. Plus, it keeps things private.

If you do not waive your right, the letter writer might refuse to write for you or write a generic letter that does not help your case. Reviewers also might raise concerns about a letter that is not waived, e.g., if you do not trust your letter writers, then you should find someone else to write for you. In short, it's a standard practice and a way of keeping things straightforward and respectful in the whole recommendation game.

If you ask me to write a letter for you and do not waive your right, I will refuse to write for you. Of course I will first explain to you why you should waive your right and what it means (many students actually do not understand this practice), but if you still insist on not waiving your right or you want to see the letter before it is submitted, then I will not write for you.

3.2.2 Helping Your LOR Writer

As mentioned in §3.1.2 and §3.1.4, do not write your own letter and generic letters do not give much value. Thus, to help your writer to write a strong, customized LoR, you can provide them details or unique things about yourself. For example, let them know about your GPA, research and work experience, papers (if any), or anything you want them to mention. If the GPA in your program is highly competitive (§6.2) and they know that, remind them to talk about it in the LOR. You can also provide them with a draft of your SOP so that they can see what you are saying about yourself and complement that with their own perspective.

Sometimes your writer will explicitly ask you for such information, but if not, you should provide it anyway (especially if you have not interacted with them much or have not done much research with them).

If your grading system is not US standard, or you are from a good school but is unknown outside your country, you can ask your reference writers to explain that in their letters. For example, "Bach Khoa" are the top universities in Vietnam for STEM studies but few people outside Vietnam know about them. So if you are from there, you should ask your reference writers to mention that.

3.2.3 Reminding Your Writers

After entering your writers' information in the application system, you should tell your writers about that and let them know they will soon receive an email from the university to submit their letters. You should also tell them when you submit your application and remind them to submit their letters on time if they haven't done so.

Note that most places only have deadlines for the applicant, but are very flexible with the letter writers. In many cases your LOR writers *are not given any deadline*. Fig. 3.1 lists several LOR invitation emails I received from various universities in the past few years.

Also, many places do not begin the admission review process right after the deadline and work on application reviews in the next semester (mid-January).

Thus you do want to send reminders because professors can be quite busy and might forget to submit their letters, especially when there is no explicit deadline. However, do not send too many reminders as that can be annoying to the writers.

No deadlines: Examples with no deadlines given

Sample 1: .. is applying for admission into the Computer Science (Ph.D.) program in the Graduate School at the University of Massachusetts Amherst and has listed you as a reference.

They have waived their right of access to see your reference.

You may submit your reference online via the Graduate Reference Center, which is located at .. Please use the email address and code shown below to log in to submit this reference.

A timely response is important for this applicant to be favorably considered. Please be aware that the applicant's admission could be contingent on your prompt response.

Sample 2: Dear ..

.. has requested that you write a letter of recommendation for their Illinois graduate application. We greatly appreciate your feedback on X's ability to succeed in their graduate studies at Illinois.

In an effort to make this process as easy as possible for you, we offer the ability to upload your recommendation letter online through our secure website. To submit your recommendation, please use the link below. This link is unique to this recommendation and should not be shared or forwarded.

Thank you!

Sample 3: .. is applying to the University of Nebraska-Lincoln and has named you as a recommender. **This applicant has waived the right to view your recommendation.**

Please complete our brief recommendation form (or if necessary, decline to recommend).

Should you experience any technical difficulties or require assistance with your account, please contact CollegeNET Support.

Thank you.

With Deadlines: Examples with deadlines given

Sample 1:

Dear Dr ..

.. has listed you as a reference in an application to the EECS graduate program at MIT. If you are not .., please ask .. for the correct letter submission information. Please submit your letter here: ..

The deadline for the applicant is **Dec 15**; we start the admissions process immediately after that date, so we would appreciate receiving your recommendation by then. The applicant can see if you have submitted a letter, and may remind you.

Even though the applicant knows the link for submitting a letter, the applicant is unable to read your submitted letter. The https URL ensures that you connect to MIT's graduate admissions server. That server accepts letter submissions, but will not reveal a submitted letter. The link .. provides a bit more information on MIT's approach to collecting letters of requests.

Thank you!

Sample 2: Dear Recommender,

The applicant listed below has applied to a graduate program in the School of Computer Science at Carnegie Mellon University and has requested a letter of recommendation from you.

Applicant: ..

Click Here if your mail system provides html content or use the URL below to enter your letter of recommendation in PDF form only.

Your letter of recommendation is due by **12 p.m. (Noon) EST on December 10, 20XX**.

Thank you for taking the time to respond.

Fig. 3.1: Examples of LOR invitation emails

3.2.4 Thanking and Updating Your Writers

After your application is submitted and your writers have submitted their letters—i.e., the wait begins (Part III)—you should send quick thank you notes to your writers. This serves both as an acknowledgement that you know they have submitted the letters and as an appreciation for their help.

You should also update them with the outcome of your application, regardless of whether you are admitted or not. In addition to being a common courtesy, this can also help maintain a good relationship with your writers (§J.4), which can be useful in the future (e.g., if you need another letter for another round of applications or for a job reference).

More generally, you should do the same for anyone who has helped you during the application process, such as profs. who provided advice, mentors who guided you, or friends and family who supported you.

3.2.5 Will It Be Annoying If You Ask For Many Letters?

I personally do not mind writing many letters for my students *once I have agreed to write for them* (§3.2.6). Profs. in general are used to writing many letters, especially during the application season. Moreover, once a letter is written, it can be reused for multiple applications, so it does not take much time to submit the letter to different universities (5–10 minutes per submission).

Note that we often do not write a new letter or customize the letter for each application. Instead, we write you a LoR, which is customized for you, but can be used to apply for multiple schools (e.g., "Dear Admissions Committee", instead of "Dear MIT Admissions Committee").

However, some cases might raise some eyebrows, e.g., if you only aim at very top schools that the writers believe are not a good fit for you, or if you apply to too many schools (30+?) then the writers might question your seriousness or your ability to get into these schools. In short, don't overdo it, but applying to 10–15 schools is perfectly fine and common.

3.2.6 How Do I Write a LoR?

If a student asks me to write letter for them, I will generally agree as I believe it is my responsibility. I will ask them to waive their right to see the letter (§3.2.1), and will not write if they do not do so.

I will also let the student know if I cannot write a strong letter for them (e.g., I don't know them that well), and suggest they find someone else. If they insist, then I will write for them. While I try to say something positive, e.g., the student is hardworking and receive good grades, the letter will still be short and weak (§3.1.2). Usually it takes me about *5–10* minutes to write such a "weak" letter.

Strong letters take a lot longer as it will be personalized. While I have a general template for LoR, it still can take me *an hour or more* to write it. I often ask the students to provide information (§3.2.2) and what they think I should highlight in the letter. They can also provide me their SOP (if they already have written one) so I can complement what they say with my own perspective. I often do not share what I write with the students, just to keep it more genuine and honest.

My letter always has the university letterhead, my signature, and is signed and dated. While using a letterhead or signing the letter is not required (I never paid much attention to these when reading LoRs), it makes the letter more official and professional. This website has the template of the letter with letterhead and signature: `https://www.overleaf.com/read/xzyrxkdjfxsp#2a1f9e`.

I usually submit a letter for a student in batch (e.g., I submit to all universities that student is applying to at the same time). Typically, each submission takes from 5–10 mins, depending on the application system. I will also let the student know when I have submitted the letter, and ask if I miss any.

Chapter 4

Research Experience

"I've got to study harder and publish faster!"

THE SIMPSONS

Here we look at publications and other research experiences that can strengthen your application. §E provides more information on how to find research opportunities, e.g., during your undergrad study.

4.1 Publications

The most concrete evidence of research ability is having *papers in reputable international journals or conferences*. Having published papers, especially at top venues, is a sign that you have been successfully involved in research.

Publications are *never required* for PhD application. However, given the competitiveness of CS admission, they can significantly strengthen your application and *are becoming the norm*. Applicants admitted to top schools, especially in popular fields or areas of research such as ML and NLP, often have multiple first-authored papers at top places. Fig. 4.1 shows examples of applicants to Stanford CS PhD.

Not the First Author Being the first author typically means own the work and therefore knows the research well. However, it's *perfectly OK to be second or third or even last*. Adcom members know it is difficult to publish a good paper, and so being a co-author is still a good sign about your research experience. In any case, especially in the case when you're not the first author, you should explain the work and your contribution. Better yet, have your LoR writers (§3.2.2) talk about your work and contribution in their letters.

Publications Not Relevant To CS or Your Research Interest If you have published papers in other fields, e.g., physics, math, or even CS but not in your

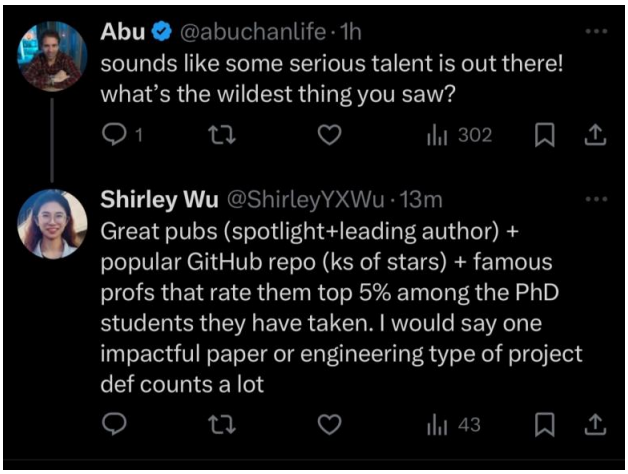


Fig. 4.1: Applicants to top CS programs have multiple first-authored papers at top places.

research interest, you should still talk about them in your SOP (§5) and upload them as writing samples (§8.2). While not as strong as CS publications, they still show your research ability and experience.

4.1.1 What If You Don't Have Any Publications?

Many students do not have the opportunity to publish papers. Thus, other writings, even those under submissions or even rejected, would still help. Be sure to upload your these with your application (§8.2) and mention them in your SOP (§5). Adcom members can quickly skim over the paper to determine its quality (§2.5).

Note that local conferences and non-English journals or conferences do not carry as much weight since their quality is often unknown. However, if you have published in such places, you should still upload them, mention them in your statement, and explain why they are good.

Craig: GMU and many other universities allow you to upload your published papers and other writing samples (§8.2). In many cases, even if the papers were not published at top places, we can still determine their quality by simply skimming over the paper.

Many international students mention Scopus Q1, which consists of various journals from IEEE, Elsevier, and many other publishers. I don't know/recognize many of the journals listed in Scopus Q1. This might be something to be mindful of, as **CS** faculty might not be too familiar with Scopus or journals listed there, so devote some part in your statement to discuss the significance of your papers.

Thanh: Due to academic culture, professors in Vietnam usually aim for (international) journals instead of conferences. Could you give some tips on how to know whether a journal is good (CSrankings, unfortunately, only consider conferences)?

Vu: One way is looking at what well-known researchers publish. For example, if you are interested in a field X, you can use CSRankings to look at active faculty in X, and then look at their websites to see what journals they publish at.

4.2 Work Experience

Work—more specifically, research—experience at *well-known research laboratories*, such as Microsoft Research, can strengthen your application. The emphasis here is *research* places, not software development or non-research work. For example, working at a FAANG (Facebook, Amazon, Apple, Netflix, Google) company as a software engineer does not count as research experience, although it can be helpful for MS applications (§D). Similarly, a LoR from your supervisor for non-research experience might not count much (§3.1.3). So do not spend much time talking about development job in your SOP.

Note that adcom reviewers might not be familiar with all research labs, especially those outside the US. For example, while VinAI is well-known in Vietnam and potentially in Asia, it might not be well-known in the US. So you or your LoR writers should explicitly say something about them in your statement or letter. In general, if you did some good research work, then you should mention that in your SOP and ask your supervisor to write about it in their LOR (§3).

4.3 Competitions

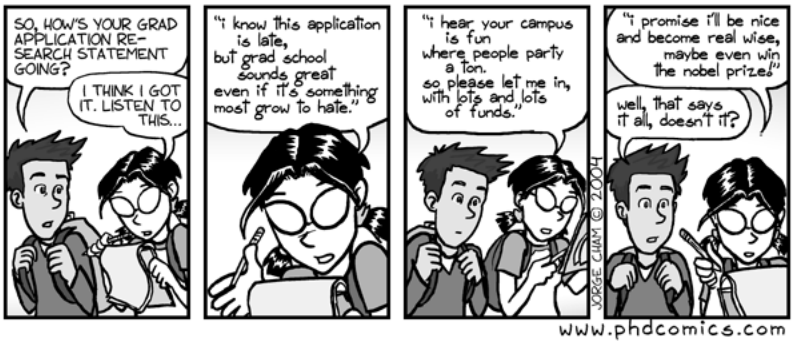
Winning *internationally recognized competitions* can demonstrate your research potential. For example, participating in Math Olympiads if you want to do theory or winning ACM programming contests if you want to "build" systems, e.g., software analysis. So do talk about them in your SOP (§5) and have your LoR writers mention them in their letters (§3.2.2).

Chapter 5

Statement of Purpose (SOP)

"All my life I've had one dream: to achieve my many goals."

THE SIMPSONS



While you might not have control over LORs (§3) or where your go to school (§6), you do over your statement of purpose (SOP) or personal statement[1]! A well-written SOP also shows that you can communicate, which is very important in research, and that you can effectively teach and communicate with students, which is important for TA funding (see §12). Many SOP samples for CS are available here.

In your SOP, focus on research potential (§4) and convince us through your experience, e.g., published papers (§4.1). Back up your claims with *concrete evidence*. For example, if you say you have experience with teaching, then show what you did, e.g., undergrad TA or mentoring someone. If you say you work on a research project, then show some results, e.g., paper submitted (or even rejected), achieved certain performance improvement over the state of the art.

[1]Few schools separate these documents and ask you to write both: SOP, which focuses on research experiences, and personal statement, which is everything more personal, e.g., why PhD, challenges, etc

You should talk about things that adcom members might not know about and can help make you **stand out** in the application pool of thousands of applicants, e.g., your personal Github project with hundreds or thousands of stars or your regular contributions to well-known open-source projects (see §11.3 for increasing your admission chance).

This is a simple task often overlooked by many applicants: **tailor your SOP** to the institution you're applying for, e.g., why do you apply *here*? who do you want to work with? Provide names of professors who you're interested in (if they are not already in the adcom, your application might get forwarded to them for evaluation; and they might be interested in interviewing and recruiting you). This shows that you're serious and have done homework on places you're applying to. Adcom will look for this part (§11.2).

Finally, have your SOP reviewed by your LoR writers (§3.2.2) and professors, especially those who have served in adcom, or even postdocs or PhD students as they have been through this process.

I often read LORs and SOP first (§2.5). If I am persuaded by then, I would skim over other factors and advocate for admission (unless I see red flags in other parts). However, if I am not convinced, then I will likely recommend rejection (unless I see something stand out in other parts).

Do careful research on professors, don't mention *emeritus* or adjunct faculty (§14.2). Also, be careful not to send statements to the wrong schools or provide wrong information (e.g., talking about school X but mentioning working with profs. at school Y; and do not talk about George Washington when applying to George Mason). I have seen such statements more times than I should.

5.1 Kiss of Death in SOP

- **Too personal** Don't talk about your personal issues, e.g., family, health, relationship, etc. This can raise concerns about your ability to handle the PhD. Also, don't talk about religious or political beliefs (§J).
- **Criticizing** your current or previous institution or professors. Just like in a job interview, don't badmouth your current or previous employer because it raises concerns about your ability to work with others.
- **No concrete evidence to back up claims**: For example, saying you are passionate about a research topic without showing any experience. This is where specific names (work submitted at conf. X), numbers (outperformed SOTA by Y %), and examples (worked on project Z) can help. These names, numbers, and stats are harder to fake and concretely show your experience and potential.

- **Use flowery and AI-like language**. Don't use AI to write your SOP (§5.2). Not that hard to raise suspicion. Though you can ask AI to check your grammar and spelling.

- **Not customized to the program**: If your SOP can be sent to multiple programs with few changes, it is too generic. Do some research and mention why you want to spend the next 5–7 years there.

- **Mentioning wrong professors**: Do not mention emeritus professors or those who have left. Teaching and adjunct faculty are often not active in mentoring PhD students (§14.2). Do your homework and mention profs who are till active in research.

- **Too Long and Fancy Format**: Keep it under 2 pages[2]. Don't use too much coloring or fancy fonts (like those in Words). Don't use left alignment (seems to be default in Words) as it is hard to read.

  CS academics like using LaTeX (common way to write our papers and other documents), so write your SOP using LaTeX (with Times or default font, 11pt, and 1-inch margin as described in §I).

5.2 Using AI

As AI and LLMs become more popular, many students wonder if they could use AI tools such as ChatGPT to help with their statements and if the university or adcom reviewers would check and penalize them for doing so.

Personally I *do not* check your statements for AI contents. First, I do not have the time to do that. It is much easier for me to just read the statement and see if it makes sense and stands out (§2.5). Hint: AI-generated content reads very strangely and faculty is just too experienced in reading essays and SOPs from students to not notice it. Second, AI-checking technology is very unreliable and inconsistent. For example, a checker might claim that 80% of an essay is AI-generated while another says it is 0%.

Finally, I think it is fine to use AI to help you polish your writing, e.g., the "proofread" feature in Apple's `Writing Tools` is quite useful for fixing writing issues or finding better terminologies or phrases. This can help international students who might struggle with writing English and are not familiar with the academic writing style (you see how many "thus" used in this book?).

[2]May vary but this is my personal preference.

Chapter 6

Your School and Grades

"Woohoo! I'm a college man! I won't need my high school diploma anymore"

THE SIMPSONS

6.1 School

Graduating from top universities *that adcom members recognize helps*. For example, if you are an international student and your school is well-known, then it is *"top foreign"*, which is a plus. However, if we do not know much about schools in your country, then we are uncertain about the quality of your school and likely treat your school as *"unknown foreign"*, which can be a minus point.

The reason is similar to LoRs from well-known researchers (§3.1.1). If we know your school has a good reputation, then we can trust its education and grades. Otherwise, we are uncertain about the quality of the school and the grades you received.

Many international students mistakenly assume that their school is well-known, but in fact, it is not (§11.2). For example, although "Bach Khoa" is one of the best universities in Vietnam, it is not commonly recognized in the US—their confusing acronyms HUST and HCMUT only make it worse.

If you think your school has strong reputation, mention it in your SOP with concrete evidence like rankings or awards. You can also ask your LOR writers to talk about your school (§3.2.2). Of course, if you're interested in working with Vietnamese, consider CS programs in the US that have Vietnamese professors.

Sometimes PhD adcom in the US will share a document such as this one, which lists the top schools in several countries. We also ask other faculty and students if we think they know about the place. For example, when I was a postdoc at UMD, members of their CS PhD adcom asked me to evaluate applicants from Vietnam. During my time at UNL and now here at GMU, I have looked at Vietnamese applications (whether they are assigned to me or not) and provided input to their reviewers, e.g., X is the top tech school in Vietnam and so it should be *top* instead of *unknown* foreign, which makes a huge difference.

Deepak: If an applicant is anxious about their school not being known outside their country, they can provide information about their school and department, with independent sources where such information can be verified.

6.2 Grades

Compared to other factors such as LoRs (§3) and research experiences (§4), grades generally do not matter much for CS PhD admission. PhD in CS is a research degree and doing well in undergrad courses does not necessarily mean you can do research—other factors such as research experiences, pubs, LoRs are more important. In fact, many CS faculty members themselves have bad grades in undergrad courses (and some were proud of that!).

Jeff Erickson (UIUC) has an undergraduate GPA (2.4/4.0) and wrote a blog about it.

Nonetheless, if you are from a well-known school (§6), having good grades do help (not a lot though), e.g., adcom members often note details such as "good GPA from well-known school (§2.5). However if your school is not well-known, having top grades or rankings usually will not help because we cannot evaluate them (e.g., we don't know how hard it is to get a 4.0 or A's at your school). This can be an issue for students in many top international universities where the competition is so high that very good students can still have low rankings from these schools (and be overlooked by adcom).

As with school reputation, you and your LoR writers can mention the grading system of your university if you think that is helpful for adcom to evaluate (§3.2.2).

Thanh: Vietnamese universities typically offer specialized programs, such as the talented engineer program at HUST, that have highly competitive entrance exams and a limited number of available slots (e.g., 30 per year). However, these programs often set higher requirements for students, including more demanding tests and assignments, resulting in lower GPAs and overall rankings. For example, 3.5 GPA students from such talented programs are typically much better than 4.0 GPA students not in those programs. Similarly, variations in GPA standards exist among different universities, with technical universities generally having lower GPAs than economic universities. These make gaining admission in the US difficult as US faculty are not familiar with these issues.

Vu: Vietnamese students and even faculty often lament how this grading system hurts Vietnamese students applying abroad. One way to mitigate this is to make these issues known in your SOP. Universities with Vietnamese profs are probably aware of them, but in general your letter writers *and* you can explicitly mention these in their letters and your statement.

Bad Grades While having good GPA might not help much (again, due to other more important factors such as LoRs and research experiences), having bad GPA can hurt your application. Many universities have a minimum GPA requirement (e.g., > 3.0) and will automatically reject applications with lower GPAs. If you have bad grades, you should explain them in your SOP or better yet, have your LOR writers explain them in their letters if they know the reasons.

Moreover, having bad grades in relevant courses, e.g., Math and CS, can be a red flag. Adcom members often scan through transcripts (§2.5) looking for C and lower grades in Math and CS courses and might raise concerns if they see several of them. Note that bad grades in non-relevant courses, e.g., about politics or history, are not as concerning.

Should you explain bad grades in relevant courses in your SOP? If you have just a few, they do not matter much, so don't spend much time explaining them (many adcom reviewers themselves have bad grades in relevant courses!). But if you have many bad grades for an entire semester or year due to some specific reasons, then you can explain them in your SOP.

Chapter 7

Standard Tests (GRE and IELTS)

"I've got to study harder. Everyone knows standardized tests are biased against the poor, the lazy, and the stupid."

THE SIMPSONS

7.1 GREs Are Optional and Do Not Matter for PhD Admissions

While a few schools still require taking the Graduate Record Examination (GRE) exam (e.g., UCF), most good CS PhD programs in the US **no longer** require it. The reason is that GRE scores do not correlate well with research ability, which is the most important factor for PhD admission. Note that many faculty members themselves did not take the GRE or had bad scores.

Thus, if you have bad GRE scores or haven't taken the GRE, then don't waste time (re)taking it. Being optional really means optional, and not taking it will not hurt your application. However, if you took it and have really good scores then it might be worth it to include (and perhaps talk about) them in your application, but don't expect them to make much difference. But if your scores are bad, then you should not include them in your application, which can be a red flag.

I often see students asking about GRE requirements on internet forums or Facebook groups, only to get completely incorrect answers. Some people insist that you "need" to take the GRE or be in specific high range to get a chance. Some of these people are from other disciplines that do require GREs, not CS (but still want to show off their knowledge of CS). Ignore these! GREs are neither required nor valuable for CS PhD admissions today. Maybe 20 years ago (e.g., when I applied in 2007), but not today—the GRE requirement has been obsolete for a long time now, e.g., many CS faculty—especially younger ones—have never taken the GRE themselves.

Also be careful that some people are trying to ~~scam~~talk youinto paying for (their) GRE prep or "consulting" services. Don't fall for these and waste your time. There are far more important things than the GRE that you should focus on for CS PhD admission such as your LoRs (§3) and research experiences (§4).

Note that while GRE is not important for CS PhD admission, it might be required or important for MS admission (§D). This is because MS programs are more course-based and thus care more about grades and standardized tests.

7.2 English Tests (IELTS, TOEFL)

Unless your degrees are from the US or certain countries such as these, you will need to take standardized English tests. On one hand you will need to show some level of English proficiency, but on the other hand, you do not need to have very good scores in these tests (many adcom members themselves were once international students and struggled with English). You should just do well enough to pass the minimum requirement set by the university.

You might wonder why you need to know English well when you focus on CS topics that are mainly math and programming. As you will see in your PhD study, you will need to read and write a lot, and the papers you read and write will be in English. You will also need to communicate with your advisor, collaborators, students, and other people.
Also, the university often requires a certain level of English proficiency for TA (§12.1.1), as you will need to communicate with students.

Just as with grades (§6) and GRE (§7.1), having high scores in English tests might not help, but having too low scores can be a red flag and sometimes results in an automatic rejection (§11.2), e.g., below the minimum requirement.

Here is the minimum requirements at GMU. Being above this might not mean much, but below is a red flag.

- GPA: ≥ 3.0 in your undergrad (but we also consider the rank/prestige of your school)
- GRE: not required
- English proficiency requirements (one of the below)
  - TOEFL: 80 OR
  - IELTS: ≥ 6.5 OR
  - DuoLingo Graduate English: ≥ 120 OR
  - Pearson Test of Academic English: ≥ 67

Chapter 8

Other Materials

"I'm not a college graduate. I'm not even a high school graduate. But I'm a pretty good judge of character."

THE SIMPSONS

8.1 CV

Most schools require you to upload your CV with your application. The main difference between a CV and a resume is that the former is more comprehensive and longer, while the latter is shorter and focuses on job-related experiences. So you don't need to adhere to the 1-page rule of resume in job searching, CV has no such requirement and is often longer.

Use your CV to summarize your achievements, e.g., publications, awards, and teaching experiences. You can also list your personal website, projects, or contributions to open-source projects (§8.4) Prepare your CV in such a way that allows reviewers to quickly scan to identify major achievement.

Most applicants do not have much to put in their CVs. Thus adcom members usually do not pay much attention to CV's (and definitely do not screen applicants based on them). So do not spend too much time on your CV, just make sure it is easy to skim through (§2.5) and well-organized around research activities and achievements.

8.2 Writing Sample

It is a good idea to upload a writing sample, e.g., a paper you wrote, a report, or a thesis. Whether the paper is published, not published, on Arxiv, or even rejected (but you think it's good), you should upload it. Because samples are part of the

application package, adcom members can quickly skim through it to see your research and writing abilities.

A quick read through a writing sample can reveal a lot about your research work and writing skills, which sometimes are not well presented in your SOP or LORs. But of course if your writing sample is not good, then it can hurt your application. So make sure you upload something serious and well-written.

8.3 Online Courses and Certificates

These do not carry much weight as they do not show research ability. We do not care much if you have taken an online Coursera AI course or have a professional certificate from Microsoft. However, as mentioned in §1.4, if you do not have a CS background, you might be able to use these to show you have sufficient CS knowledge.

8.4 Personal Website and (Github) Projects

These are *not* required but are increasingly common. In CS, academic websites are *very* common and used to showcase research, publications, and projects. You don't need fancy websites with tons of javascript and animations. A simple website with your name, photo, research interests, publications, and projects is enough. You can use free services such as GitHub Pages to create your website. Many CS students also use Github to host their projects and showcase their involvement in open-source projects.

You can mention your website and projects in your CV (§8.1) and SOP (§5). Having popular projects or active contributions can help you stand out (§11.3), especially if you do not have much research experience.

Many students include linkedIn (or Facebook) profiles in their applications. While these are popular when applying for jobs, they are not very useful for PhD application evaluation. Many adcom members are not familiar with linkedIn (and definitely do not want to go to a page that requires us to have an account and login), so it is better to have a something like personal and project websites, which are far more common and easier to access.

Part III

After You Apply

Chapter 9

Interview and The Waiting Game

Bart: "Are we there yet? Are we there yet? Are we there yet?"
Homer: "No!"
Bart: "Okay, how about now?"

THE SIMPSONS

After you submit your applications, the waiting game begins! For many students, this is a very stressful time. This section provides some information and tips to help you get through this time.

9.1 Interviews

After you apply, you *might* get interviews. The most common case is that a prof. is interested in working with you and wants to chat, e.g., to offer RA (§12.1.2). In some cases, the interview is done by several professors, e.g., to see if a student fits in their group or to recruit a very strong student to their program.

When do interviews happen? The timeline for interviews varies. Faculty set up interviews based on their busy and erratic schedule. Some try to get interviews done before the winter holidays, while others do them after the holidays. Do not be surprised if you get an interview invitation at the last minute. Some profs. are informal and may just email you to chat (e.g., *"could you chat in an hr?"*), while others might schedule a formal interview (e.g., *"can you chat at 2 pm on Friday or 10 am on Monday?"*).

Some programs *do not do interviews* at all (§9.2). They review applications and make decisions based on them. If you do not get an interview, it does not mean you're out.

At GMU, faculty are encouraged to interview candidates. For very strong candidates, the interview is actually to recruit them. In some cases a faculty interviews a candidate that they see potential and want to advocate for their admission. Without the interview, such applications may be more likely to be rejected.

In short, getting an interview is a good sign; it means that someone is considering you. If we are not interested in your application, we will not proceed with an interview.

Preparing for interviews Typically, an interview takes about 15–30 minutes, and one important aspect of evaluation is your ability to effectively communicate, including speaking and understanding English. You might be asked to talk about your research experience and interests and to read a paper and discuss it. In some rare cases you might also be asked to solve a problem (one of my colleagues at GMU likes coding interview).

You should treat the interview as an informal chat. Prepare an *"elevator pitche"* about your research experience and interests. You might also want to have a 5-minute presentation about your research. If a prof. asks you to read a paper, do it and be prepared to discuss it. You should also ask if you need to prepare for coding. Finally, the interview gives you an opportunity to ask questions, e.g., about the program and the professor's research. You should definitely ask as it shows that you're interested. See some questions you can ask.

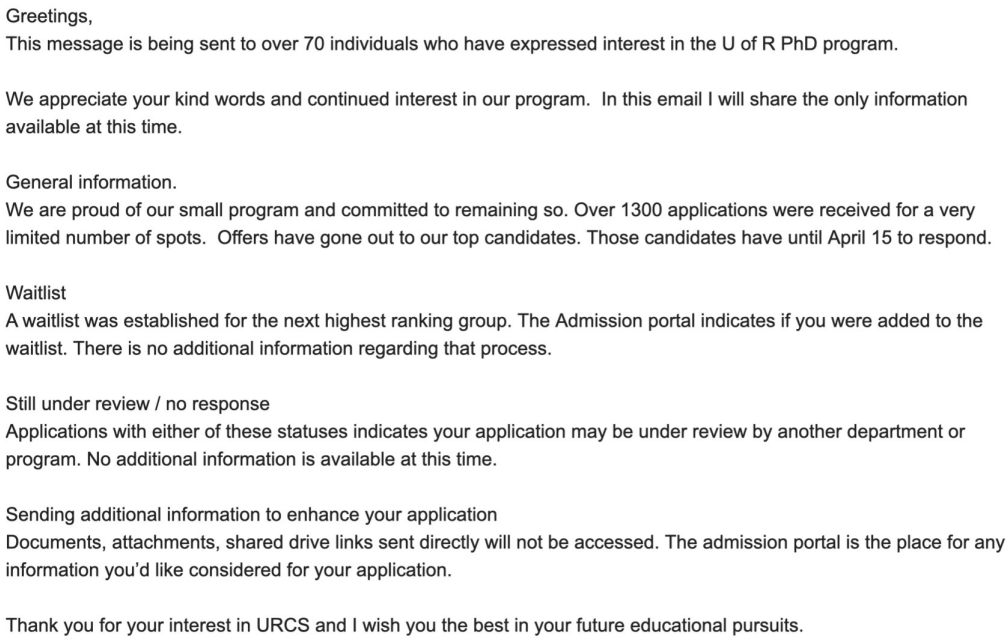
Follow-Up Emails If you had an interview and have not heard back, you can email to ask about the status of your application. See §10.1 for how to check status and follow-up emails.

Updating your profile If you have new top publications or other big achievements, you can ask the CS dept to update your application (though no guarantee that they will consider them). However, in general, you should not send emails to update your profile.

9.2 Not Getting Interviews

While it is generally good to get an interview, not getting one *does not* mean you're out. Many programs do not have the tradition of interviewing applicants. For example, at GMU, most admitted students with TA (§12.1.1) do not go through interviews.

However, no interviews mean that you will not likely get an RA (§12.1.2), which is offered by an individual faculty (if they want you to do research for them, then they likely will interview you first). If you have no interviews, your application (and TA/fellowship funding) is decided by the adcom.



Greetings,
This message is being sent to over 70 individuals who have expressed interest in the U of R PhD program.

We appreciate your kind words and continued interest in our program. In this email I will share the only information available at this time.

General information.
We are proud of our small program and committed to remaining so. Over 1300 applications were received for a very limited number of spots. Offers have gone out to our top candidates. Those candidates have until April 15 to respond.

Waitlist
A waitlist was established for the next highest ranking group. The Admission portal indicates if you were added to the waitlist. There is no additional information regarding that process.

Still under review / no response
Applications with either of these statuses indicates your application may be under review by another department or program. No additional information is available at this time.

Sending additional information to enhance your application
Documents, attachments, shared drive links sent directly will not be accessed. The admission portal is the place for any information you'd like considered for your application.

Thank you for your interest in URCS and I wish you the best in your future educational pursuits.

Fig. 9.1: Email from the University of Rochester about sending offers and waitlist.

9.3 Notification Timeline: Why rejection letters are sent so late?

Some schools send out admission letters in batches, some do rolling admission, and some do not send anything out, e.g., because you're on their waitlist. You should hear back from most schools by mid-March, though rejection can come out much later.

Not much you can do other than to be patient and wait. Do not send emails asking about interviews or status; unless you have interviewed specifically with someone then you can ask that person for status updates and other questions (§10.1). You can, though not recommended, send an email to the CS dept to ask about your status, but likely they will not reply (in addition to being busy, they do not want to give you false hope or inaccurate information), or they can send a generic reply such as *"we are still reviewing applications"* or *"you will hear in two weeks"*. Fig. 9.1 shows an email from the University of Rochester about their admission process.

Acceptance Letters Universities prioritize sending out acceptance letters first. This allows the admitted students to make decisions and plan for their studies. Read carefully on the acceptance letter for terms and conditions, e.g., funding and other benefits (§10.3).

Some universities have rolling admission. Others have a specific date when they

send out the first round of acceptance letters.

Response Deadlines Accepted students are usually given a deadline to make decisions on their offers, often around **April 15** in the US. After this date, CS programs can gauge how many slots remain unfilled.

Waitlist Most CS programs have a limited number of slots for PhD students, and thus put many good students on a waitlist. If accepted students decline the offer, then offers are sent to students on the waitlist. So if you see people getting accepted, that does not mean you are out yet.

Also, do not feel embarrassed or discouraged if you are on the waitlist. Many students are on the waitlist, and there is a good chance that you will get an offer later.

Rejection Letters Schools typically start sending out rejection letters to remaining applicants *after they have finalized their admissions decisions.* Thus, rejection letters are often sent out late (e.g., after April 15th or even much later).

Not much you can do here. You can try to contact the school to ask about your status, but they might not reply, they might say they are still reviewing applications, or give you inaccurate information (e.g., you will hear in two weeks). In short, you just have to be patient and wait, and also beware that some schools do not send out rejection letters at all.

Chapter 10

Getting Admitted

"Oh... and how is education supposed to make me feel smarter? Besides, every time I learn something new, it pushes some old stuff out of my brain. Remember when I took that home wine-making course and I forgot how to drive?"

THE SIMPSONS

By around mid-March you should hear back from most PhD programs that want to admit you. But you likely won't hear back from schools that do not want to admit you (§9.3), e.g., you're on their wait list.

If you receive offers, congratulations! Now you're at a different game because the schools that have admitted you will try to get you to accept them! Look carefully at the offer letters (§10.3) for the terms and conditions of the offers. Other important factors to consider include the reputation of schools and professors (**??**), and funding availability (§12). You will have to make your decision (§10.1) by a certain deadline, e.g., April 15.

Open House Most schools have *Open House* or *Visit Day* events, which are a great resource to learn about the school, department, faculty, research, living, etc.

Even if you can't come in person, you should attend virtually and meet with individual faculty. During the event, you get a chance to learn more about the program, and talk to individual faculty and current students. Take notes of faculty who make you excited, and count those taking in new students (if they meet you, likely they are considering new students!). Talk to students about their advisers, the dept, the area, and the funding situation. Ask about anything you want to determine that they deserve *you*.

GMU has *Virtual* Open House (VOH), e.g., https://cs-GMU.github.io/cs-phd-voh-s23/. We invite all admitted PhD students to the VOH through Zoom to learn about the CS program, the department, GMU, and the DC area in general. Students also get opportunities to chat with professors and current students.

What's next? Make a decision, accept, reject, or defer the offers (§10.1). Ask to meet with potential advisers (e.g., through Open House or separately) and even their students. Ask about computer equipment and software, office space, and other resources; in many cases these will be provided for free by your adviser or department (§10.4).

Also, do not forget to update and thank LoR writers and others who have supported you through this process (§3.2.4).

10.1 Checking Status, Accepting, Postponing, and Decline Offers

Students often ask about what to do after they get an interview or an offer from a professor, e.g., if they can followup to find out about their status, or is it OK to postpone or accept/reject offers?, and most importantly, how to do so without offending anyone.

Checking your application status and following up emails If you have interviewed and not heard back from a professor after a few weeks or especially around the time when universities send out their admission decisions (around late Feb– mid-Mar), you can email to check. You can follow up the interview invitation and say: *"Thanks for chatting with me. I am very excited about the opportunity to work with you. Could you please let me know if you have made a decision or if you need more information from me?"*. If you have new updates, e.g., new publications or new fellowship awards, or even new offers from other professors or schools, you can also mention that.

Profs. are often very busy, especially during admission time when they have to many reviews and interviews. They might not have time to respond to every email. If you do not hear back after a week, you can send another email to check again. If you still do not hear back, you can assume that you are not selected.

Accepting an offer If you decide to accept an offer, you can say: *"Thank you for the offer. I would like to accept it and look forward to working with you. Could you please send me more details about the offer and what to do next?"*. The prof. will likely send you more details about the offer and what to do next. If you decide to accept an offer, do so quickly.

Postponing an offer If you need more time to decide, you can ask for more time: *"Thank you for the offer. I am very excited about it. However, I am still waiting for other offers and need more time to decide. Would it be possible to postpone the decision for a few weeks?"*. This is perfectly fine and professors will understand and might even appreciate your honesty. They will likely give you a few weeks to decide. If you need more time, you can ask for more time. But do not ask for too much time, e.g., more than a month. You also should not postpone the offer multiple times, which will annoy people.

Declining an offer If you decide to decline or reject an offer, you can say: *"Thank you for the offer. However, I have decided to accept another offer. I appreciate your time and consideration. I hope we can work together in the future."* Professors will understand and wish you luck. If you decide to reject an offer, do so quickly.

Accepting an offer and later rejecting it

I've seen many students, especially international, face a dilemma when they *commit* to a graduate offer but then receive another—potentiall better—one. Advice given in online forums is often along the line that it's okay to switch, using reasons like you haven't yet had a strong relationship with the prof. or you should prioritize your personal benefit.

In my opinion, these reasons are not strong enough to justify retracting an acceptance. A more valid reason is using the April 15 resolution, in which many universities participate. Among various things, this resolution states that students are free to accept a new offer from a different institution until 4/15, even if they have already accepted an offer elsewhere.

However, in general, retracting an acceptance can have ethical implications. When you accept an offer, you are committing to work with that prof, who then might stop looking for other students. So by retracting your offer, you are breaking your commitment and also causing a great deal of inconvenience to the prof and also taking away the opportunity from other students. Ultimately, this choice is personal and involves a balance between personal benefit and ethical considerations.

10.2 Negotiating PhD offer (e.g., having multiple offers)?

Negotiating a TA stipend is unlikely, as it is determined by the university (§12.1.1). For RA (§12.1.2), advisers have more leeway as it is funded by their grants. However, they will likely do not negotiate RA stipend as they have to be fair to other students and also have to follow departmental standards. Note that the university typically automatically increases these stipends each year by a small amount. Typically, the most wiggle room is funding in the summer (§12.3.2) where the prof. might be able to pay you more from their grants. However, they typically only do this after you have been with them for a year or so and they see your potential.

For a specific start date or TA assignment (e.g., TA'ing a particular course), you can ask for it. Also, there is typically no moving allowance for PhD students. In short, standard things set by the university or department are unlikely negotiable. However, you can ask for things such as books and computer equipment (§10.4).

10.3 Offer Letters and Terms

Your admission notification will likely come with an offer letter (in some cases it might come separately). This letter is essentially a contract between you and the school, and lists the terms of the offer, including stipend, tuition waiver, health insurance, and other benefits. The letter might also have some conditions, e.g., maintaining a certain GPA, etc. You will likely need to sign and return the letter to accept the offer, e.g., by April 15–the deadline for many schools.

Fig. 10.1 shows an example of a GRA offer letter from GMU. It shows the 9-month stipend[1], the funding source (i.e., the prof. who provided the RA), tuition waivers (9-credit, which is full time for grad student), and health insurance.

It is *unlikely* that you can negotiate things like stipend and such, as it is standard across all students. However, you might ask your prof. for computer equipments and others (§10.2).

You might receive "informal" offer from the prof., e.g., through email or verbally. This is typically as the profs. are excited to have you and want to give you important details such as stipend. You can "informally" accept the offer, but you will still need to sign the official offer letter to make it official.

10.4 Buying Computer Equipment

Students understandably get excited about their upcoming PhD journey and want to buy new computer equipment and electronics to prepare. However, you should first check with your professor. They might have funding to buy you computers and other equipment (e.g., software, books, keyboards, headphones, tablets, etc). Many CS programs also provide budget or computer equipment—such as a laptop—to incoming PhD students. Keep in mind that these computers and equipment would be university property, which might be monitored and have certain restrictions, e.g., do not install illegal software on them (§J.2). You will likely need to return them when you graduate.

However, do not assume that your prof. will automatically provide you a new laptop and other equipments. Check with them first. Some professors have grants or

[1]Note RAs often get additional summer funding from their prof. (§12.3.2), but this is not shown in the offer letter.

College of Engineering and Computing
Office of the Dean
Nguyen Engineering Building, Suite 5100
4400 University Drive, MS 4A3, Fairfax, Virginia 22030
Phone: 703-993-1500; Fax: 703-993-1734

Jul [redacted]

Dear [redacted]:

It is my pleasure to offer you the position of Graduate Research Assistant. I believe you will find George Mason University an exciting and rewarding environment in which to work, and a place where the contributions of graduate students are valued.

This offer is subject to the terms and conditions of the "Graduate Appointment Terms and Conditions of Employment", attached hereto as "Attachment A", which is incorporated herein by reference.

The terms of this offer are as follows:

- Term: August 25, 2024 through May 24, 2025
- Appointment: Graduate Research Assistant
- Stipend: $29,000 paid over 18 pay periods
- Level: PhD
- Assignment: You are assigned to the Department of CS, within CEC, and will report to Professo [redacted]. You will work 20 hours per week.
- Tuition Benefit: Up to 9 credits of tuition per semester at the in-state tuition rate and the mandatory student fee.
  Contingent upon arrival prior to the first day of class
- Health Insurance: Upon acceptance of this offer and the meeting of all eligibility requirements, University paid health insurance through Aetna Student Health will be available to you. Please visit https://universitypolicy.gmu.edu/policies/health-insurance-for-graduate-students/for a listing of eligibility requirements and for further details. (Contingent upon arrival prior to first day of classes)
- Other Terms: Qualification for subsidized student health insurance, in-state tuition rates, tuition grant or waiver.

PhD students are provided full tuition, up to the maximum of nine credit hours. Tuition waivers are applicable only to tuition and the mandatory fee. Additional fees incurred relating to registration and course related fees are not covered by tuition waivers and are the responsibility of the student. Additionally, credit to the student's account will only be granted for the amount of the student's tuition and will be applied only after other scholarships or fellowships are processed to the student's account. Students must be registered in order for the tuition wavier to be applied to their account.

Fig. 10.1: An example of a GRA offer letter.

discretionary funds to do this, but it's not a guarantee. Some prefer that you have been with them for a while before they buy some powerful hardware.

Chapter 11

Dealing with Rejection

"You tried your best and you failed miserably. The lesson is: never try."

THE SIMPSONS

Rejection is a common part of the PhD application process. In fact, rejection is part of academia (e.g., you will get rejected for papers, grants, jobs, etc). Don't take rejection personally and to learn from it.

11.1 Try Again!

If you do not get admitted to any schools or don't want to go to the ones that admit you, try again next year! Grad. admission can involve randomness and noise. In the meantime, you can work on improving your profile, e.g., get more research experiences, publish more papers, improve your connections for stronger LoRs, etc. See rejection reasons (§11.2) and additional advice to improve your chance (§11.3).

I got rejected from 12/13 CS PhD programs in 2007. While I believe I have strong research profile—multiple publications—I did not know much about the admission process and made many mistakes. But in any case, I did get into one school, which is UNM. I decided to just take it instead of waiting for another year. I felt that was the best decision at that time (and in restropect, it made me who I am today).

So it is not the end of the world if you get rejected. If you didn't get into your top choices but into some other schools, you can do like me and just take it – and do really well there, which is better than being a mediocre student at a top school. You can also try again next year or go to a different school.

You can consider applying to MS programs, which are typically easier to get in; but you likely need to pay (§D.2). A university that rejected you for PhD might accept you for MS. If you get into an MS program at a school of your choice, you can contact professors to work with them. If you do well, you can ask the professor

to support you to convert to PhD. You will likely need to apply again, but you will have a much better chance because you have the direct support of a professor there.

Should I ask for feedback? No, don't bother. You will likely not get any useful feedback. We are not willing (sometimes not allowed) to reveal your evaluation results or give you feedback on how to improve your profile. *So just move on.* If you really want advice, ask your professors, collaborators, ref writers, or those who have previously applied.

11.2 Why did you get rejected?

Many students lament that they get no interviews or are rejected and that the admission process seems random. However, while it is true that the process can involve some luck and randomness, it is not completely random. There are many reasons why you might get rejected, e.g., your profile is not as strong as you *think* it is (§11.2.1). Even if your profile is strong, you still can get rejected, e.g., aim too high (§11.2.3), not a good fit, overqualified, having red flags, etc.

11.2.1 Your profile is not as strong as you think

I have seen multiple cases where students think they have a strong profile, but they do not. Here are some common examples.

Your *LoRs* (§3.1) might not be as strong as you think. Your ref. writers—who might be very well-known within your institution—might not be very well-known internationally, or they might not be very active in research, or even know how to write a good letter.

Your *school* (§6) might not be as good as you think. It might be the "top" in your country (or in your own definition), but we do not know about it, e.g., most wel-known schools in Vietnam are not well-known outside of Vietnam.

Your *research* (§4) might not be as strong as you think. Doing research does not mean much (or anything) if there is no results, e.g,. publications (§4.1). Moreover, publications might not have much value if they were published locally or through unknown places. Even papers at top venues might not be as good as you think, e.g., many AI/ML/NLP faculty are not too interested in "dataset" work, even if they appear at top venues like NeurIPS as shown in Fig. 11.1.

11.2.2 Other Common Reasons for Rejection

Even with strong profile (e.g., research potential, GPA, LoRs, SOP, interviews), you can still get rejected for various other reasons as follows.

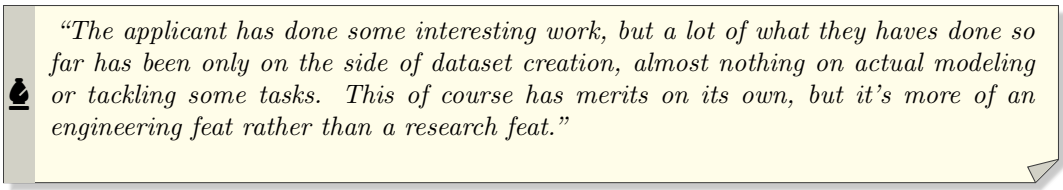


Fig. 11.1: Comment from an NLP researcher on an applicant with multiple NeurIPS papers.

You aim too high You have applied to schools that are *way too high* for your profile (§11.2.1 and §13.2). Many students simply just go for very top schools—for example top 10 CS programs—and are surprised when they are rejected to all of them, in multiple years, and completely get shut out for obvious reason. An analogy is a person who has never hike but wants to climb Mt. Everest (which btw if you could, you might have a better admission chance as mentioned in §11.3).

While being ambitious and aiming high is good, you should understand how PhD admission works (e.g., by reading *this* handbook and realizing things such as having a good GPA (§6.2) or GRE (§7.1) doesn't mean much to top programs), that in the US there are many good schools, and just be realistic.

Not a Good Fit and Bad luck You could have an excellent profile (e.g., strong research and LoRs), but if you are interested in a research area that the program does not have, you will not be admitted. Similarly, if no faculty is willing to advise you (e.g., they are on sabbatical or personal leave, do not have sufficient funding, or already have too many students), you will not be admitted. This is actually good for you, as you don't want to be in a program where no one can advise you.

Related to this is that you just have bad luck and apply at the wrong time. For example, since 2024 there has been a huge surge in students interested in AI and NLP (thanks, ChatGPT!). Consequently, AI/NLP faculty might be overwhelmed and cannot consider many candidates, even those with excellent profiles.

Before applying, you should talk to your professors and ask them to give you an honest opinion on where you should apply. To increase their chances, many students apply to a range of schools, including "safety" ones.

Overqualified or Lack Interest This might be paradoxical and is the opposite of aiming too high. However if adcom believes that you are likely to get admitted and go to a better program, they might not be so enthusiastic to admit you and want to save the spot for someone else.

A related reason is that you did not show enough interest in the program. For example, you did not respond to professors interested in interviewing you (which might be considered unprofessional and burn bridges), or during the interview you showed little knowledge, interest, or enthusiasm in the profs or program (because it

is your safety).

Low English exam scores (e.g., IELTS or TOEFL) Profs. might not care much about these, but the college or the university often sets a minimum that you need to pass to be considered, especially for TA funding (a low English score causes concern that you might not be able to communicate well with students as a TA). Thus, while profs. are willing to argue for your case, they might be reluctant to go against the requirement of the university.

Red flags Various types of red flags can cause concern to the adcom. Common examples include many STEM courses with low or withdrawn grades, plagiarism, cheating, or other academic dishonesty. Another one is that you have a history of jumping from one program to another. Adcom members might have contacts in other programs and heard about your stories, or your LoRs might mention them.

If you think you have these issues, you should address them in your SOP or ask your letter writers to do so. In general, these things are rare, but they do happen and cause concern to the adcom.

11.2.3 "Chance me" on Getting into T10 Programs

Many international students aim for very top schools such as Stanford and MIT, and Ivy League. Every year Reddit and other forums have numerous students asking for evaluation of their chances of getting into these schools (the so called *"chance me"* or *"roast my CV/profile"* posts) and then later posts on being *"ghosted and rejected everywhere"*. Here's my take on this:

You are unlikely to get in these schools While being ambitious is good, you also need to be realistic, and the harsh reality is that it is very unlikely that you will get in MIT or Harvard unless you are very exceptional (in which case you would not be asking about your chances on Reddit).

People who do get in these schools often were explicitly encouraged by their mentors and LoR writers, who themselves might be alumni of these schools or are academic celebrities who've sent many of their students there. If you are not in this category (doubt you are, because you're asking random people on the internet instead of your trusted LoR writers), then you're likely not going to get in, and MIT and Stanford would glady take your application money.

"Your" top might not really top in CS Harvard and the Ivies? yes good for many things but usually not coding marathon and typically MIA at top CS confs (ok, they are still good, but a school somewhere in Maryland, Wisconsin, or Urbana Champaign cornfield would likely beat them by far in CS). MIT and Stanford? yes, they are top, but many are equivalent, and there could be CS areas where they are

not as strong as other schools. Caltech and John Hopkins? Are you confused CS with Physics and Medicine?

You're missing out some serious CS PhD programs: UCSD, UW, UMD, Michigan, Purdue, Stony brook. These all have super strong CS programs but rarely get mentioned. Utah, Rutgers, Buffalo, Penn State, UVA, Ohio, UC Riverside, GMU ... any of them rings a bell? These might not ranked very high on QS or US News and are not household names to you, your friends, mom and dad, but they are excellent CS schools where graduating students from your dream schools often apply for faculty positions (e.g., see GMU stats). You can go to these places and be superstar there—be the big fish in a small pond, instead of a small fish in a big pond.

You don't need to be top Top schools will open doors to more opportunities. In countries like Vietnam, there are few top schools, and if you don't get into them, you are doomed (or so you think). But that is not the case in the US. There are many good schools, and it is not a binary choice between top X or nothing. In fact, "equity" is emphasized in the US and "smaller" schools are often given more resources and attention to help students succeed.

Don't aim for just the moon and the stars, also try the sky, clouds, or even just the trees. You might find much happiness and success there, which then can catapult you places beyond the moon and the stars. This is the American dream, which is strongly embodied in the its higher education system.

Note that what said above might not apply to BS or even MS degrees, which often do not involve research and thus are more about the school name and your grades. For PhD, it is all about the research.

11.3 Increasing your admission chance

Given the high number of quality applicants and a limited number of spots, in addition to having a good application profile, you want to show something that makes you *stand out*. For example, even if you do not have research experience, you can talk about your personal projects, as long as they show you can do research. If you have an open-source project that has lots of stars in Github, mention it. If you often write technical, research-like blogs with many viewers, talk about them too.

There are other things you might not think are important but can make you stand out. For example, if you have a strong background in a non-CS field that can be integrated with CS, e.g., you have a degree or background in *dance* or *music* and want to integrate them with CS, do talk about it. If you have reported numerous bugs in Knuth's The Art of Computer Programming and received several reward checks from Knuth himself, mention it—this shows exceptional attention to detail and a goood understanding of algorithms.

In his post, Matt Might was initially unsure about an application. However, upon learning that the applicant had led a 100km hike in the Himalayas, he decided to accept the applicant. This is a good example of being *stand out*, and I would also advocate for that student as this shows they have the persistence and determination required for research.

Part IV

Funding, Schools, and Profs.

Chapter 12

Funding

"Bart, with $10,000, we'd be millionaires! We could buy all kinds of useful things like ... love!"

THE SIMPSONS

If you're admitted to a *good* CS PhD program, you should not have to worry about funding! In the US, the common types of funding for PhDs are *graduate teaching assistant* (GTA or TA), *graduate research assistant* (GRA or RA), and *Fellowship*. RA is paid by a prof. for you to do their research. TA is paid by the dept. for you to help with teaching. Finally, fellowship is independent funding that can come from a school, a company, or an organization.

Tab. 12.1 summarizes the differences. Note that funding is typically more available for PhD students than MS (§D.2.3).

12.1 Graduate Assistantship (TA/RA)

The most common type of funding is **graduate assistantship**, which is either TA or RA. Both TA and RA come with tuition waiving (you don't have to pay tuition), health insurance (this takes care of your insurance, which is a must-have in the US),

Tab. 12.1: Different types of PhD funding. All cover tuition, insurance, and stipend.

	TA	**RA**	**Fellowship**
From	School	Profs.	School/External
For	Teaching Assist.	Research	Research
Cover All?	Yes	Yes	Yes
Summer?	No	Maybe	Likely
Pros	Research Freedom	Get to do research	Research Freedom
Cons	Teaching Duties	Research Restriction	Competitive, Limited

and most importantly, your stipend (i.e., your salary). Some universities also give significant discounts or pay insurance for spouses/children.

Several things about stipends. First, the amount of stipend *varies* and depends on factors such as location (e.g., a stipend in the DC area is likely higher than in Lincoln, Nebraska due to higher living costs). Second, an academic year (AY) is typically *9-month* in the US, so the stipend is for 9 months. Third, you might get paid over the summer (§12.3.2) through funding from your professor or fellowship (typically no TA over the summer). Fourth, like most sources of income in the US, you will have to *pay tax* on your stipend. Finally, private universities might pay more for stipends, but they could have extra activity fees or some other hidden ones (e.g., you may need to pay some fees for each credit hour).

TA and RA at GMU have similar benefits in tuition waiving and insurance. The college and department will set the rate for a 9-month graduate assistant stipend. TA, which is paid by the department, will likely be that amount but RA might be higher depending on the prof and the stage of the student (1st year vs ABD[a]).

At GMU, CS TA/RA is paid the highest. First, CS is under the College of Engineering and Computing (CEC), which already has a higher TA stipend than other colleges. Second, CS is the largest department in the college, and has the higher TA stipend than what CEC suggests. Finally, it is a tradition that CS faculty pay their RAs more than the department's TA rate. So a winning combination for CS PhD students.

[a] acrlongABD: close to graduate.

Having health insurance is required at many US universities. Do not assume that you're young and healthy and ignore insurance (§J.6). At GMU, and most CS PhD programs, your GTA or GRA comes with full insurance. In fact, at GMU your spouse/children will get a significant discount rate for health insurance. So you will never have to worry much about health issues for you or your family here.

12.1.1 Teaching Assistant (TA)

TA is common in the beginning when you haven't found an adviser who would pay you RA. It is also common to sandwich between TA and RA (e.g., when your prof. does not have sufficient funding or you want to try the TA experience).

Your TA is paid through the school or department, i.e., they hire you to help teach. As a TA, you spend up to 20 hrs/week and help with classes (e.g., grading or teaching labs/recitation). During a semester, a TA might work with several courses and professors (not necessarily their adviser). TA funding is *not* typically available during the summer (§12.3.2), which has few courses.

How to get TA? Unless you have other funding such as RA or fellowships, TA is typically the default for CS PhD programs. In your application, just simply indicate

that you need financial assistance. Typically, adcom will either admit you and give you TA, or reject you. We do not admit a student without supporting them (§2.5).

TA is decided by the department, so you do not need to worry about it. However, if you have a strong preference for a specific course or professor, you can mention that after being offered an TA. This would allow you to work with a professor you like or in an area that interests you. In many cases, professors can request specific TAs for their courses (e.g., students who have taken their courses and done well).

At GMU CS, admitted PhD students have 4 years of GTA guaranteed, and also receive a stipend for the first summer (§12.3.2).

Even if you have other funding and do not need a TA, you still should do TA at least once. This allows you to see what teaching is like, which is especially helpful for a research career where you often give talks and tell people about your work. GMU sometimes has classes that a more senior student can teach. In that case, you will be paid as GTA or even sometimes as a lecturer. This is a good opportunity for students to get teaching experience and you might even get paid a bit more.

Where do TA funding come from? Typically, the department, depends on their enrollment and budget, gets TA funding from the college, which then distributes it to the departments. The department then assigns TAs to courses based on their needs and the students' qualifications. For example, a department such as CS typically have many TAs due to high enrollment and many courses. In contrast, a department such as Math might have fewer TAs due to lower enrollment and fewer courses.

12.1.2 Research Assistant (RA)

RA is provided through a professor through their funding so you can work on their project. You do not need to teach as an RA, so you can focus on your research. Depending on the professor, RA may be available during the summer. §12.3.3 gives more details on RA budget.

How to get RA? When a professor recruits you, they might offer you an RA right away (so you start with an RA). However, a more common scenario is that you first get admitted with TA, and then after a year or two find an adviser to support you with RA.

It is important to note that RA is *never guaranteed* as it depends on the funding situation of the prof. So you should also pay attention to TA, which is a good backup plan (remember, typically TA and RA have quite similar benefits). This means you should also check if TA is readily available for PhD students in the program.

If you got recruited and offered an RA by a prof., you will likely get admitted. For example, if a prof., even if not in PhD adcom, wants to fund you, adcom will likely respect that decision and admit you.

Where do RA funding come from? Professors apply for funding to support students from various sources, such as government grants (e.g., NSF, NIH, DoD), industry grants (e.g., Google, Microsoft), or internal university funds. The most common funding source for CS profs. is from NSF grants, which are designed to support graduate students as RAs. Recently hired professors—such as new assistant professors—often have start-up funds, which are provided by the university to help them establish their research lab.

Typically, each grant can support one or at most two students each year and each student costs up to about $70,000 per year (§12.3.3), so professors need to apply for multiple grants to support multiple students. This is the reason why professors often do not have the time to directly involve in research, e.g., doing experiments or writing papers, but instead mentor their students to do that. If a professor no longer has funding—a quite common situation, they might not be able to support you as an RA, in which case you would become TA (but still work with the same prof).

12.2 Fellowships/Scholarships

Fellowship is another type of funding that students can get from the university, industries, or government. Fellowships are typically competitive and generous, giving pretty much all benefits tuition/insurance that a TA/RA has. They might even give higher stipends (including summer) and open doors for job opportunities such as internships.

How to get Fellowship? Many schools provide fellowships to attract students. You likely will not need to do anything and adcom will recommend such fellowships to strong students. Some schools automatically offer a fellowship to all accepted students, while others only award it to a limited number of admitted students, such as the top percentile.

If you're aiming for external fellowships—whether from the U.S. government (like NSF GRFP or DoD NDSEG, see §G) or from major tech companies like Google, Microsoft, and Facebook—you'll need to apply on your own. Such major fellowships typically require a clear and good research plan (the GRFP also requires broader impacts discussion). So it might be a good idea to wait until your second year to have research experience and even publication before applying. Remember, you're competing with the top PhD students at top universities worldwide.

PhD applicants at GMU are automatically eligible for a *Presidential Fellowship*. It is at least as good as GTA but the most important thing is that as a fellowship it is truly free money (i.e., you do not depend on any prof. or TA). Adcom members nominate applicants for this fellowship and the whole committee will decide.

In general, external fellowships are highly competitive and prestigious—you will stand out if you get one. Every PhD student has pubs, but only a few would have

the NSF GRFP[1] or Microsoft fellowships. In fact, these are so prestigious that even if you didn't get it but make it to the final round or even *"honorable mentioning"* you should put it on your CV. §G discusses the evaluation processes of the NSF GRFP and DoD NDSEG.

12.3 Funding Miscs

12.3.1 Low Stipend?

Students often think their stipend is too low and not enough to live on. For example, if you look at the stipend at GMU, which is around $30K for 9-month, and then compare it to the cost of living in Fairfax, VA, which says you need $70K to live in a 1-bed apartment, then you might be in a panic.

However, in almost all cases, the stipend is enough to live on. You might not be able to live in a 1-bed apartment by yourself, but you can live in a shared apartment or house with other students (most grad students shared apt). You might not be able to buy a new car, but you get a good, used one (most students do this) or use public transportation. In short, while the stipend is not high, it is not bad, and you can live comfortably with it.

In fact, it might be enough to support your spouse and kids. Many CS PhD students have their families with them (a student of mine lives with his wife and 1 kid in a 1-bed apartment and they are doing fine with just his stipend). So don't worry too much about the stipend. A good school would know that it has to be competitive to attract students. For example, at GMU, every year we try to improve the benefits, and especially stipend, for our graduate students.

For a full breakdown of how much a graduate student costs, see §12.3.3.

12.3.2 Funding in the Summer

Students often get confused about summer funding, e.g., if they will get paid during the summer. This is a good question because PhD students have no classes over the summer and so are often more productive and produce good research. However, summer salary is largely depending on your funding source.

First, recall that an academic year (AY)—consisting of Fall and Spring semesters—is typically 9 months, thus your stipend is for 9 months and do not cover the three summer month (and many places allow you to *spread* it over 12 months, so you get paid monthly over 12 months, but the total amount is still the same).

If your funding source is TA (§12.1.1), you typically do not get paid over the summer because there are no classes to teach. Some CS departments offer summer funding, but it is not guaranteed and might not be a lot. For example, at GMU, we

[1] `https://www.alexhunterlang.com/nsf-fellowship` is a good starting place for the GRFP with lots of proposal examples.

offer summer funding for 1st-year PhD TA students. The amount over the 3-month summer is similar to their monthly stipend (i.e., their 9-month stipend divided by 3 for the 3 summer months).

For RA (§12.1.1), your summer funding depends on your prof. and their funding. When writing grant proposals, profs. typically include summer funding for their students (§12.3.3). However, funding is never guaranteed, e.g., the prof might not get the grant.

For my students, I have been fortunate to have funding to support them over the summer. Over the 3-summer months, I typically pay them 1/3 of their 9-month stipend. I prioritize summer funding for my students because GMU has very good TA resources so they never have to worry about funding during the AY.

Finally, for fellowships (§12.2) you might get paid over the summer depending on your fellowship (§12.2). Good ones, e.g., from NSF, Google, and Microsoft, will pay you the whole year.

12.3.3 How much do YOU cost?

PhD students often ask why their salary is low compared to the large grants their advisers get. They also wonder why their offer letters sometimes show that their benefits are higher than what they receive (i.e., stipend).

Tab. 12.2 shows the budget breakdown for a GRA per year. These numbers are based on my experience at public universities in the US. Private universities may have different numbers. For simplicity, I will assume the department has a 9-month stipend of \$30K and a 3-month summer of \$10K (a third of the 9-month stipend). I will also use GMU tuition rate of about \$15K/year for full-time study (which is quite cheap compared to private universities, e.g., Univ. of Chicago is a whooping \$70K) and a 58.9% rate on *indirect cost*, which is a typical rate charged for overhead or administrative costs (yes, after all, universities are businesses!). Finally, I assume the students take two conference trips per year, one domestic and one international (conf. registration, airline tickets, taxi, meals, etc are all included).

Tab. 12.2: GRA cost breakdown. F & A is Facilities & Administrative Cost Base and MTDC is Modified Total Direct Cost. These are things that the university can charge overhead to.

Budget	**Cost $**	**Notes**
GRA (9-month)	30K	
GRA (summer)	10	3-month, 20hrs/week
Total Salary	40K	
Health Insurance	3K	full year
Tuition (In-State)	15K	($680/ Credit + $150/Student Fee/ Credit)* 9 credits = $7470 ($6120 + $1350) per semester
Total Tuition & Insurance	18K	Full year tuition + insurance
Conference Registration	500	
International Travel	1800	
Domestic Travel	700	
Total Travel	3K	
Total Direct Cost	61K	Salary + Travel + Health + Tuition
F & A (MTDC)	21K	Direct Cost - GRA Salary
Total Indirect Cost	12K	58.9% of MTDC
Total (Direct + Indirect)	73K	Budget for a GRA

In the end, the total budget comes out to be $73K/year to support a PhD student. *The summary is that over your 5–6 years of your PhD, you cost about $400K, and while your stipend is X, your adviser probably pays 2X for you.* But of course, the nicest thing is that you do not have to pay for any of this! You get to gain the knowledge, do research, travel, and also get paid!

Chapter 13

Choosing Schools

"It's not the school you go to, it's what you do while you're there!"

THE SIMPSONS

Choosing a school and an adviser (§14) is clearly among the most important and difficult tasks when you apply and especially when you get admitted. This is further complicated due to cultural differences (§J) and the unfamiliarity of international students with the US higher education system. This section aims to mitigate some confusion and help you make informed decisions.

We will first discuss universities in the US that offer PhD in CS. Then we will talk about how to select them.

13.1 Schools offering PhD in CS

Most US universities have CS programs, but many of them do not have a CS *PhD* program. These universities might offer just Bachelor's degrees (e.g., BS) and no graduate studies (i.e., no MS or PhD degrees), or they just offer MS programs (but no PhD). For example, Penn State in University Park has PhD in CS, but Penn State in Harrisburg only has BS and MS in CS, and Penn State in York only has BS in CS. On the other hand, multiple locations of the University of Texas, e.g., Austin, Dallas, and Arlington, have PhDs in CS.

Thus, if your goal is PhD in CS, you have to aim only for schools offering such a degree. While this can be confusing due to the large number of universities in the US, a little research, e.g., searching for PhD in CS from the school website, will help you find out. Schools listed in §K have PhD programs in CS, so you can start there.

13.2 Selecting and Ranking Schools

Many students put universities into two bins: (i) top schools that they dream about, and (ii) everything else. They often use rankings from US News, which is not transparent and questionable (§K). Sometimes they evaluate based on the reputation of the school's undergrad program or the reputation of the school's non-CS programs such as medical, math, or physics. Many international students rank universities based on popular places they know in the US, e.g., California, Texas, and New York.

Instead of these superficial criteria, you should specifically consider the CS program and the research interests of faculty members (§H). You can learn about these using resources such as CSRankings.org (§K). You will be very surprised to learn that a school that you didn't know much about can have very strong research in your topic (and vice versa, a school you thought highly about might have no faculty working in the research field you're interested in). This is also a good way to learn about individual faculty, e.g., who works on what, and well-known CS conferences[1].

Dat: Most Vietnamese students, including those from top schools, **do not know** about CSRankings. Maybe applicants who worked at top research places such as VinAI would know about it.

What matters to you? While many find CSRankings useful, it is still superficial as every other ranking (§K). You should not just look at the number of papers or the number of faculty in your area. You should also consider the quality of the faculty, e.g., how many of them are tenured, well-known in their field, and have a good publication record. You can find this information from their CVs or their homepages. You can also check their Google Scholar profiles to see their h-index and i10-index. See §14 and §H for more details on how to find and evaluate faculty.

You should also consider other factors that matter to you. You might prefer schools that give stable funding (§12) and good stipend (§12.3.3). You might like

[1] In CS (and probably only in CS), conferences, not journals, are often the main venue to publish research findings (see why here).

areas with a large community from your country—Northern Virginia, for example, is very diverse and has a large population of Vietnamese. You might want to be near high-tech industrial hubs like Seattle or Silicon Valley, or places with plenty of outdoor activities such as hiking and skiing. Weather can also be important—*"PhD can be depressing, so would you rather be depressed in California or New York?"*. Finally, don't forget about things like cost of living—certain areas in California and New York are way more expensive than in Nebraska. Safety is another factor; however, while some universities might be in a high-crime city, the campus itself is very safe—like John Hopkins in Baltimore.

If you get admission to several places, you should consider attending Open Houses (§10) and contact profs. that you're interested in at those places and talk to them. They would be more willing to chat with you now that you have been admitted. Ask questions about their work, how they manage students, and their expectations. You can even ask to contact their students.

Hung: I always encourage the students I admit to talk with my students and the students of other faculty in other schools who admitted them. You will unlikely hear straight-out complaints from current students in a prof's group. But sometimes what is important are things that they (current students) don't tell you. Pay attention to their "level of excitement" being in the group.

Xiaokuan: Chinese students often only look at US News rankings when selecting their PhD universities (I did that, too, when I was applying for PhD positions). Now that I am a professor, I find it to be the least promising way. The reason is that US News does not provide a good metric for evaluating the quality of the PhD program. If you want to do great research, CSRankings is the best way to find good and active professors (which did not exist when I was applying), since it solely focuses on publications at top-tier CS conferences. Also, I think PhD is not only about research; you need to also consider your daily life there since you will (probably) stay for at least five years. You might regret it if you did not consider this seriously before applying.

13.3 PhD in other Related Fields: CE, IST, Cybersecurity

You *do not* need to do a PhD in CS to work in CS areas. For example, in addition to a traditional CS department, GMU has IST and Cybersecurity departments, both of which have faculty with PhD in CS and work on CS topics (e.g., AI, Security, Robotics). So you still can do CS research and publish in CS-focused venues even if you're not in a traditional CS program. It is common to see faculty with PhD in CS in a non-CS department as well as faculty with non-CS PhD in a CS department.

However, if your goal is a PhD in CS, then you need to be in the CS dept. *and* advised by a CS faculty. A non-CS faculty can serve in the PhD dissertation

committee (common) or *co-advise* (less common, but possible), but your main PhD adviser will likely be a tenure-line faculty in CS (§14.2). For example, a prof. in Stats or Math might be able to serve as a co-adviser, but not as a sole adviser of a student in a CS PhD program. If in doubt, check with the CS dept. for their requirements.

It is possible to transfer between departments (and universities). However, this can be complicated and often requires re-applying to the new department and taking additional coursework or exams required by the new place. Moreover, your advisor may not be able to supervise you in the new department (they can co-advise or server in the commit, but unlikely are allowed by the new department to be your main adviser). Usually, transfers happen because the current advisor moves to a new department or university, and the student wants to stay with them.

For this specific reason, CSRankings includes only faculty who can advise CS PhD students. I also have compiled a list of Vietnamese faculty who can advise PhD students. §14.2 talks more about who can serve as your PhD adviser.

13.4 University Hierarchy

Adcom has direct influence over admissions decisions (§2.1), but they operate within a larger university hierarchy that can impact those decisions. For example, enrollment and funding levels may lead to changes in admissions criteria or the number of students accepted (e.g., TA reduction). Fig. 13.1 illustrates the typical hierarchy in a US university and how different entities influence CS PhD admissions.

13.4.1 Top Governance and Executive Administration

At the very top is the **Board of Visitors** in public schools or Board of Trustees in private schools. This body is appointed (or self-perpetuating) and has the ultimate authority over the university, approving budgets, tuition levels, new colleges and schools, and presidential hires and firings.

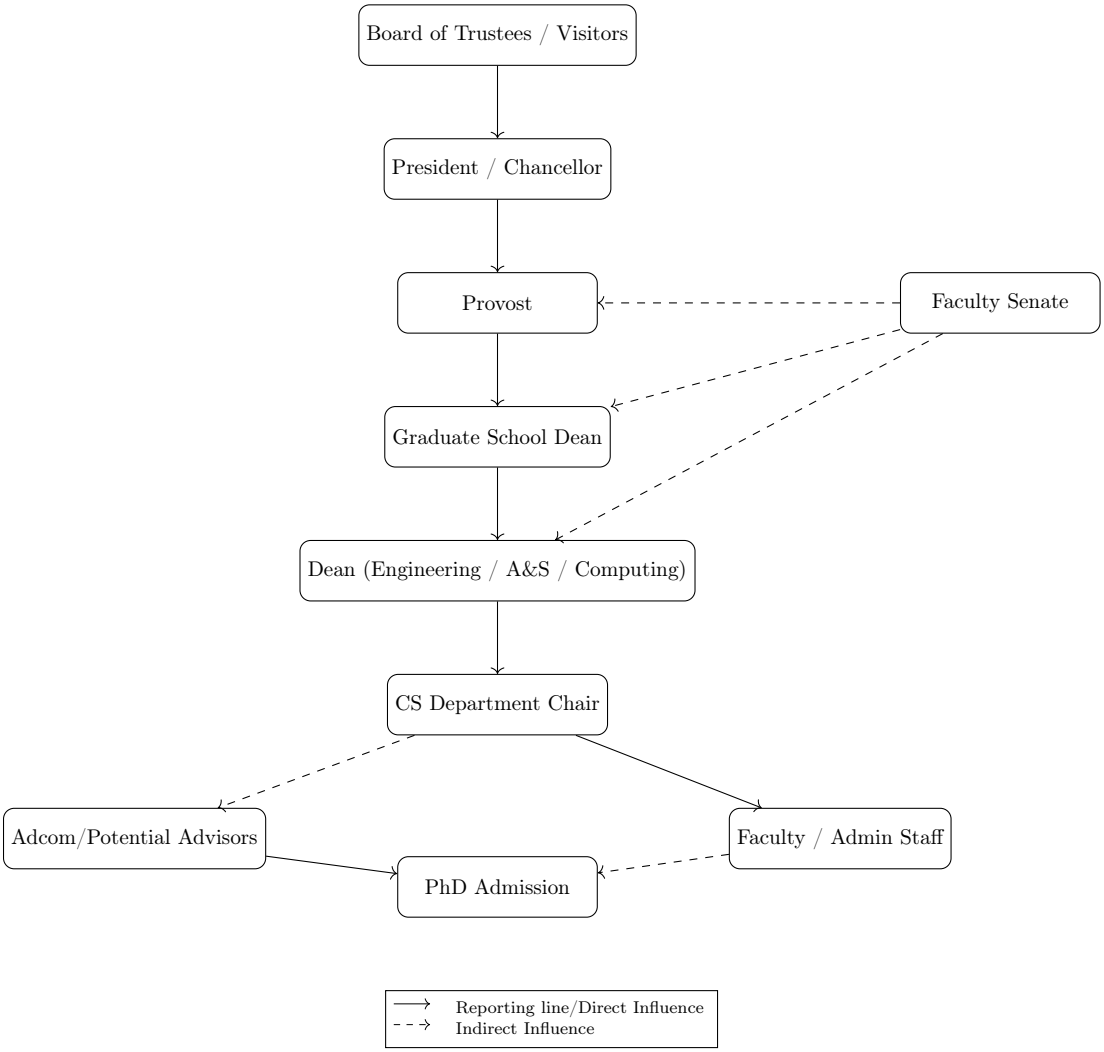
They will not decide how many PhD students a CS department admits, but their decisions—such as approving the creation of a new College of Computing or cutting budgets—can significantly change the environment you enter.

The **President** (or **Chancellor**) is the "CEO" of the university and reports directly to the Board. Below them is the **Provost**, the Chief Academic Officer who oversees all colleges and deans. The Provost's office approves tenure policies, new faculty lines, and graduate school rules; all these decisions shape the direction and operations of the CS department.

13.4.2 Shared Governance

Alongside the administration is the **Faculty Senate**, an elected body of professors that represents the faculty's collective voice. Depending on the university, the Senate

Fig. 13.1: University Hierarchy and Influence on CS PhD Admissions



may be mostly advisory (do not make decisions) or have real power to approve or block changes in curriculum, tenure standards, and academic freedom policies. Thus, Senate decisions can indirectly affect CS students by changing graduate requirements or faculty hiring standards.

The Senate acts as an independent check on the administration. They can question decisions (e.g., of the Board and the President), propose resolutions, and advocate for faculty interests. Even though they are not part of the executive chain, they are the *voice* of the faculty, and thus the Board and President will typically listen to them.

At GMU, the Faculty Senate serves as an advisory body to administration. It does not have administrative power, but can propose resolutions and advocate for faculty interests. The Senate has various committees that touch on all aspects of university life, including research, teaching, student affairs, and even its athletic aspects. The Senate has representatives from each college, and I am one of the senators from CEC.

13.5 College/School

Under the top administration are the various colleges or schools that house different academic departments. Common examples include the College of Engineering, College of Arts and Sciences, and increasingly, a separate College of Computing (e.g., like at Georgia Tech). Schools are typically under a college, e.g., the School of Computing within the College of Engineering at UNL. But in some universities, the School is a standalone unit, e.g., the School of Computer Science at CMU.

At GMU, CS is under School of Computing (SoC), which is under College of Engineering and Computing (CEC). The SoC has its own Dean, who reports to the Dean of CEC, who then reports to the Provost.

GMU SoC consists of CS, IST, Stats. CEC consists of SoC and other engineering departments such as Electrical and Computing Engineering (ECE), Biomedical Engineering (BME), and Mechanical Engineering (ME). CEC is one of the largest colleges at GMU, and CS is the largest department in CEC.

Each college and school is led by a **Dean**, who reports to the Provost. The Dean, together with their *associate* deans, who are responsible for specific areas such as research, teaching, or student affairs, oversees all departments within the college, managing budgets, faculty hiring, and strategic planning. The deans also advocate for their college's needs to the Provost and President.

Due to their roles, the deans have influence over CS admissions by setting college-wide policies on funding, enrollment targets, and interdisciplinary initiatives. For example, if the Dean prioritizes growth in computing, they may push for more CS faculty hiring and PhD admissions (e.g., through increased TA funding or new program initiatives).

13.6 Department

Inside the department, the **Chair** (or Head) manages financial and personnel matters, including faculty hiring, promotions, resource allocation, and enrollment and admissions processes. Supporting them are *associate chairs* of graduate and undergraduate studies and *directors* of various programs. In addition, the Chair forms various committees to handle specific tasks, e.g., admissions, curriculum, and faculty hiring (search). The Chair reports to the Dean and is responsible for implementing college policies at the department level.

While department chairs do not usually get involved in PhD admissions decisions (see how decisions are made in §2.3), they set the overall direction and priorities that shape how many students are admitted and what resources are available to them.

13.7 Faculty, and Staff

In many cases adcom consults with faculty members who are potential advisers to get their input on applicants (§2.2). Thus general faculty can influence admissions by recommending students they want to advise. In addition, a CS department has various **administrative staff** who handle day-to-day operations, e.g., contacting applicants, processing applications, and managing student records. While staff do not make admissions decisions, they ensure the process runs smoothly and efficiently — a critical behind-the-scenes role.

Chapter 14

Choosing an Adviser

"It's not easy being a mentor. But it sure is funny to watch other people screw up."

THE SIMPSONS

There is no one-size-fits-all answer to finding an adviser. The best adviser is the one that you can work well with and has the ability to help you succeed. But how do you find such a person?

Fortunately, while some non-US programs require finding an adviser and research topic before starting the PhD (§1.7), CS PhD programs in the US will typically give you a couple of years to "shop" for advisers and research topics. This is especially true if you're admitted with TA (§12.1.1), which gives you time to explore and find an adviser.

14.1 Finding an Adviser

Assuming you're not familiar with any particular one, then first search for profs. that share similar research interests. For example, in CSRankings, if you want to work with PL, you can search for those published in PL conferences. If you want to work with SE *and* AI, you can search for faculty who work in both SE and AI.

After that, you can research about that prof. by going to their website, looking at their research achievements and awards (§H), checking their research lab and group, seeing if they have recent publications, and reading their papers. Sometimes they would explicitly say they are looking for students. If you find a prof. that you like, you can reach out to them (§14.5).

Xiaokuan: Whether the student's research interest matches that of the adviser is very important; if there is a mismatch, either the student or the adviser has to make compromises, which often leads to disagreements or conflicts. IMO, the adviser should be the one who *guides* students to do research while allowing students to pursue their own interests, instead of *dictating* their research.

Another way is taking graduate-level courses in the topics you are interested in. Many profs teach *special topics courses* and *research seminars*, and they might be recruiting students. Do well in the class, answer questions, talk to the prof. after classes, etc—being stand out. Many profs, including myself, prefer taking in new students this way. It gives both the prof and student more time, e.g., a whole semester, to work and evaluate the relationship before making any commitment (sounds like a marriage!).

You can also ask to do an independent study or research with a prof. This can be informal (no credits) and takes place during the summer or winter break. For example, I do this with several students, some of whom are undergrads. Many will drop out because they find they don't like my research, but some find that they like the work.

Ultimately, choose a prof. that fits you by communicating with them, taking their courses, meeting and asking them questions, and talking to their current students. It will take time and effort, but since you will be working with this person for 5+ years, it is important to try to find the right one.

Thanh: In my opinion, having a well-suited adviser is crucial for a successful PhD and research career. One effective approach to finding a suitable professor is by working with a professor during your undergraduate studies. An exemplary instance is VinAI's residency program, where residents collaborate with professors from the US for two years before applying to PhD programs. Many VinAI residents have achieved remarkable results and gained admission to prestigious US universities. Unfortunately, VinAI's resident program is limited to AI research.
In other fields, e.g. Software Engineering, Vietnamese students face challenges in reaching US professors. Do you have any tips for Vietnamese students who want to connect with US professors and work as research assistants?

Vu: §14.5 shows how to contact a professor for research opportunities. Many will say no (or do not reply) as they do not have the bandwidth to take on random students, but some may say yes if they see a potential fit.

14.2 Types of Faculty: Who can serve as a PhD adviser?

Not every faculty can serve as your official PhD adviser. Understanding the different types of faculty roles will help you avoid common mistakes—like contacting the wrong person (§14.5) for research opportunities or listing in your SOP (§5) someone who can't actually supervise PhD students.

You'll encounter terms like tenured, tenure-track, teaching, research, adjunct, and emeritus professors. Here's a quick guide to what these roles mean, and which faculty you should focus on when applying to PhD programs.

14.2.1 Faculty Types

At most research-intensive (R1) universities, faculty generally fall into two categories:

- Tenure-line faculty (tenured or tenure-track)
- Non-tenure-line faculty (e.g., teaching, adjunct, or research faculty)

The key distinction is in their responsibilities—whether they are expected to do research, get funding, and supervise PhD students.

Tenure-Line Faculty These faculty members are expected to perform research, publish in top venues, get funding (§12.1.2), and mentor PhD students. They typically teach fewer courses-often just one per semester—and are the *main group eligible to serve as primary PhD advisers.* Tenure-line faculty consist of two subcategories:

- Tenure-track faculty are on the path to tenure and are often actively recruiting students.
- Tenured faculty have already earned permanent status and might be less active in building their research group.

If you're reaching out to professors about potential advising, focus on tenure-line faculty. These are the faculty that most likely to have funding, institutional authority, and the capacity to take on new PhD students. See §14.3 for more on choosing between tenured and tenure-track faculty as advisers.

Teaching Faculty Teaching faculty (also called instructional faculty, professors of practice, or lecturers) primarily focus on teaching. They often teach three to four courses per semester and are not typically expected to conduct research, publish papers, or apply for funding.

Thus they usually do not have the resources or institutional role to advise PhD students, especially as the main adviser. In some universities, they may co-advise a PhD student alongside a tenure-line faculty member, but this is rare and varies by institution.

Do not contact teaching faculty to ask about PhD or research positions in their lab. They're usually not involved in PhD admissions, and such emails can be annoying to them.

Although teaching faculty are not typically involved in PhD admissions or research, some actively mentor undergrad students in research—especially during the summer. So if you're an undergrad (§E) and want to try research, you can contact them (usually after taking their class and doing well).

Research Faculty and Scientists Some universities have research faculty or research scientists (e.g., postdocs are sometimes called research faculty), who focus almost entirely on research and often have little or no teaching duties. These faculty members can apply for grants, publish regularly, and, in some rare cases, are allowed to serve as advisers for PhD students. In many cases, they are required to co-advise with a tenure-line faculty member.

Adjunct and Emeritus Faculty These faculty members are typically not involved in research or PhD advising. Adjunct faculty are usually part-time instructors who may have full time job outside academia. Emeritus faculty are retired professors and are usually no longer active in research or advising. Because of their limited roles, adjunct and emeritus faculty do not serve as PhD advisers. So, do not contact them to ask about research openings.

This Reddit thread shares an example of a student being rejected after listing emeritus professors in their SOP. This was a sign that the applicant did not do their homework and thus was not a good fit for the program. This is a common mistake, especially for international students who are not familiar with the US system.

Faculty from Other Departments Most universities also restrict who can advise PhD students based on departmental affiliation. For example, even a tenured faculty member in another department (e.g., Electrical Engineering or Math) may not be allowed to serve as the primary adviser for a CS PhD student unless they have a formal joint appointment (§13.3).

14.2.2 Ranks (Assistant, Associate, Full, and More)

Regardless of type (tenure-track or teaching), faculty are generally assigned one of three academic ranks:

1. Assistant: typically an early-career faculty member
2. Associate: mid-career, often after tenure or promotion
3. Full: senior, often with a strong record of achievement

Tenure-line faculty generally start as assistant prof. (unless they have strong research record, e.g., from the industrial research lab), undergo a rigorous review around year six, and if successful are promoted to associate prof. with tenure. Note

that getting tenure is a huge deal, and it might change the way they work with students (§14.3).

The timeline for becoming a full prof. varies widely; some do it within a few years after tenure, others take a decade or more, and some become emeritus faculty without ever reaching full prof. status. Teaching and research faculty may also progress through these ranks, though the promotion criteria and timelines differ.

In addition to these ranks, some faculty hold special titles such as

- Endowed Chair and Named Prof.: funded by a private donor; typically awarded to highly accomplished faculty or to attract junior faculty.
- Distinguished Prof.: recognized by the university for exceptional achievement
- University Prof.: a title reserved for a small number of faculty with extraordinary impact

Professors with these titles are often tenure-line faculty, and therefore can advise PhD students. However, they may not be as available, especially if they are in high demand or have administrative responsibilities. For example, most department chairs are endowed chairs or distinguished professors, and they might not be too active in research or advising students.

14.3 Tenured or tenure-track faculty?

Now that you know a bit about tenured and tenure-track faculty (§14.2). Which one should you choose as your adviser? Either can be a good adviser, but they

have different strengths and weaknesses. The below gives some ideas, however the best indicator of their research productivity and impact is their publication and recognition record (§H).

Tenure-track faculty—like assistant professors–are typically young and active in research (they have to, to get tenure). Thus, they will devote more time to work with you and push you to do research and publish. However, you might not be too independent when you graduate because they have been too hands-on with you. Also, they may not have as much experience in managing students and may not have as much funding (yet).

Tenured faculty—associate and full profs—are likely older, more well-known, and have more experience in managing students. However, they might not push you as hard and expect you to figure things out yourself, i.e., you need to be independent. Some tenured faculty are also no longer active in research and are more involved with administrative responsibilities or with their startup companies (this means they will likely not take new students).

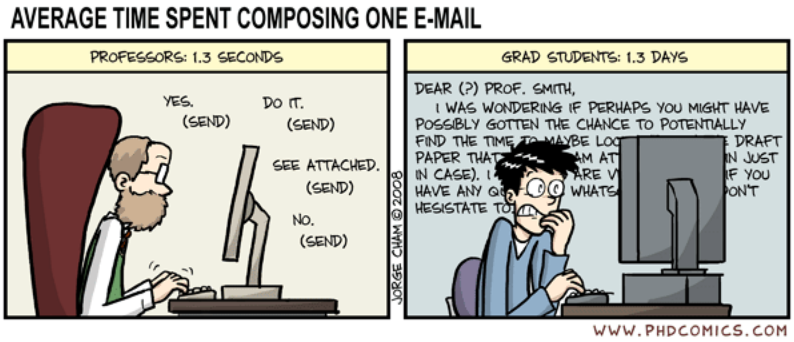
14.4 Faculty from Your Country

Understandably many students prefer to work with faculty whom came from their own country. You feel more comfortable as they share the same language and culture, understanding your schools and background, and that they "get" you. So it is perfectly fine to start with faculty from your country (e.g., a list of Vietnamese CS faculty in the US.)

However, this should not the main reason for choosing a faculty, and you should expand your search to include faculty from other countries. Research and higher education in general encourage exploration, e.g., students often go to different grad schools than their undergrad schools, and switching fields (and even advisors) is more common than you think. It also won't be fun to be in a lab with all Vietnamese with similar background and all speak Vietnamese all the time, you will not learn much from each other.

While my group has many Vietnamese, I also have many non-Vietnamese students, e.g., from China, Romania, Rwanda, and most of my undergrads are domestic US students (§C). It is more fun this way—they get to learn from each other and share different perspectives, and of course get to try exotic food and their history from different countries (it amazes me on how knowledgeable and enthusiam students have on food!).

14.5 Should I Contact a Prof. Before Applying? How to Get a Positive Reply?



Faculty often receive "cold" e-mails from prospective students. Most of the time, we ignore these emails (§14.5.3), but on some rare occasions, we do answer them. So how to write an email that gets our attention?

First, if you want to contact a prof. to *ask about your admission chance*, please **don't**. We don't know and can't answer because as explained in §2, we don't make individual decisions and might not even be assigned to evaluate your application. It is the same as sending a paper draft to a journal editor or progarm chair and asking them if your paper has a chance.

So how to get someone to look at your profile and give input? You could ask your professors, LoR writers, collaborators, or those who have previously applied. For this kind of feedback, ask someone you have a personal connection with.

On the other hand, if you want to contact a prof. to ask about *research opportunities*, or *GTA/GRA* support (§12.1), then *yes*, I believe you should. It is still a long shot (you might not get a reply), but it is *worth trying* (and I say this even though I do not reply to most of these emails, see §14.5.1 for why). However, you really need to put effort into it and do it the *right way*.

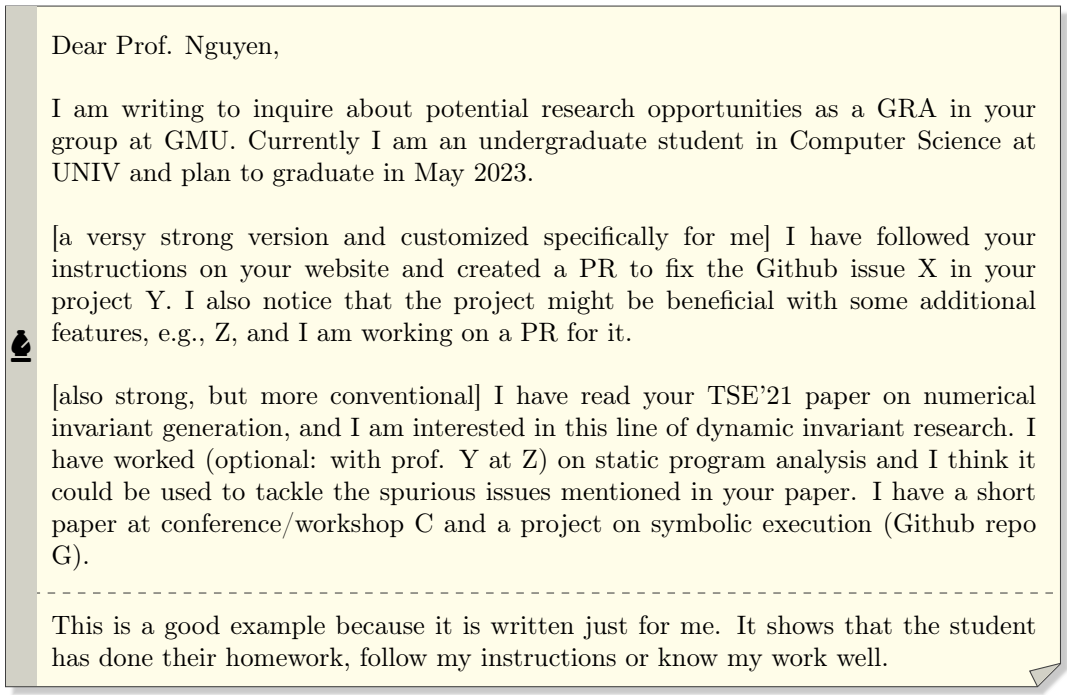
The best way to catch the prof.'s attention is to *customize your email* for them. For example, read their papers, know what they work on, and see if you are interested in their research. Many profs. explicitly state on their website how prospective students should (or should not) contact them, e.g., using specific email subjects and additional information (e.g., read specific papers, etc).

On my lab website, I have a section on *Prospective Students* that lists how to contact me and what information to include or exclude in the email.

More recently, I ask that they contribute a bit to one of my projects, e.g., create a pull request to fix a bug or add a feature. This shows that they have done their homework and are genuinely interested in my work. This effectively filters out those who are not serious or not interested. I do this for both graduate and undergraduate students.

In general your email should talk about how/why their work would match yours, how you have follow their work and did what they ask from their website (if they have any). In contrast, if you write a generic email that can be sent to multiple professors (e.g., if you just change some names and keywords in the email or copy and paste paper titles), you will not get a response.

Below is a good example:



Dear Prof. Nguyen,

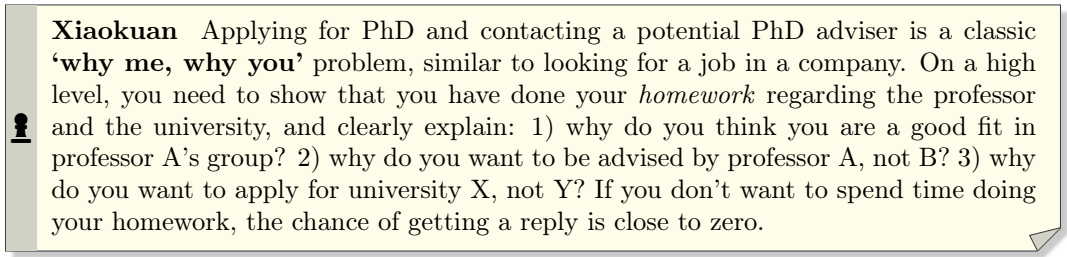
I am writing to inquire about potential research opportunities as a GRA in your group at GMU. Currently I am an undergraduate student in Computer Science at UNIV and plan to graduate in May 2023.

[a versy strong version and customized specifically for me] I have followed your instructions on your website and created a PR to fix the Github issue X in your project Y. I also notice that the project might be beneficial with some additional features, e.g., Z, and I am working on a PR for it.

[also strong, but more conventional] I have read your TSE'21 paper on numerical invariant generation, and I am interested in this line of dynamic invariant research. I have worked (optional: with prof. Y at Z) on static program analysis and I think it could be used to tackle the spurious issues mentioned in your paper. I have a short paper at conference/workshop C and a project on symbolic execution (Github repo G).

This is a good example because it is written just for me. It shows that the student has done their homework, follow my instructions or know my work well.

Finally, profs. are very busy so don't take it personally if you don't get anything from them (though I would be very surprised if such thoughtful emails get no replies!). See §14.5.1 for common mistakes in emails and §14.5.2 for interpreting replies.



Xiaokuan Applying for PhD and contacting a potential PhD adviser is a classic **'why me, why you'** problem, similar to looking for a job in a company. On a high level, you need to show that you have done your *homework* regarding the professor and the university, and clearly explain: 1) why do you think you are a good fit in professor A's group? 2) why do you want to be advised by professor A, not B? 3) why do you want to apply for university X, not Y? If you don't want to spend time doing your homework, the chance of getting a reply is close to zero.

Deepak: In my view, cold emails are not welcome by most faculty members and should be avoided. However, if one is already admitted to a program in some department, by all means, email the faculty you may be interested in working with, but do mention right at the beginning that you are already admitted to the program as well as several other universities. State specific areas (preferably specific topics-ML, robotics instead of AI).

14.5.1 Kiss of Death in Emails

- **Send emails to the wrong prof.**. Many students do not pay attention or know about this, but a very common reason why you don't get a reply is that you send email to profs. who do not / cannot advise CS PhD students (e.g., adjunct, emeritus, teaching, non-CS). See §14.2 for details. While these profs. might be able to co-advise, they typically do not have the bandwidth, funding, and the desire to mentor students for research (they are already overloaded with teaching and other service duties).

  So do some homework before sending emails, e.g., most CS profs. who are active in research will have a website with their work (publications) and students; some also have lab website dedicated to their group. Most teaching and adjunct profs. do not have a research group or students listed on their website.

- **Generic**. You should already know this! A copy and paste kind of email or those that can be sent to multiple people with very little modifications show the lack of interest and will be treated as spam. Most likely we will not reply to these emails.

- **Self-focus**. Focusing too much about you and your achievements but not why you are interested in the prof.'s work (§14.5). Mention why you're interested in their work and how your background can contribute.

- **Too long**. Keep it to about 3–4 short paragraphs. Less is more and too long emails are often not read and discarded. Don't attach course transcript or test scores in the first email. If they are interested they will ask for them. Attaching CV is OK. Sample papers (§8.2) and links to your Arxiv papers or GitHub projects are also OK if they are relevant.

- **Flowery greetings and language**. Don't use "Dear esteemed professor". Do not call the prof. by their first name in the first email (some don't care but you don't want to take the risk – you don't know them that well yet). Do not use Mr., Mrs., etc. To be safe, use Prof. Lastname or Dr. Lastname (§J.5).

- **Ignoring the Prof's guideline** and asking questions that are already answered on their website. Many profs. put very specific information on how to contact them on their website (e.g., email subject, what to include). Following this helps you stand out and increase your chance of getting a reply.

- **Mass emails**. I've seen it many times when a student mass emails all profs in a department, e.g., through CC or even BCC. This will result in no reply or a very harsh one on how unprofessional you are.
- **Do Not Call**. Not related to email but sometimes students get desperate and call the prof. This is a big no-no, especially for CS ppl who often prefer email over phone calls.
- **Fancy format**. Do not use colors, fancy fonts or formats, e.g., bold. While not really a kiss of death, it is very annoying, especially for people in CS (and probably many other fields) who often prefer plain email messages.

14.5.2 Interpreting Response

Even if you avoid the kiss of death emails (§14.5.1), you might still not get a reply. There are many reasons why you might not get a reply, e.g., the prof. is not interested, they are too busy (§14.5.3), they are not taking students, they are on vacation, etc. Here are some common responses and what they mean:

Some generic responses are:

- **No reply**. This is by far the most common response (see why in §14.5.3). It means they are not interested. You might try again in a few weeks or months, but don't expect a reply. And after a couple of tries, you should move on. It simply means they are not interested.
- **Not taking students but encourage you to apply**. Polite way of saying not interested and referring you to the admission process. Note that this does not in any way mean that they think you have a good chance of getting admitted.
- **Not taken student this year (but encourage you to apply next year)**. Polite but generic response. And like the previous one, encouragement to apply does not mean they think you have a good chance of getting admitted.
- **Come talk to me after you're admitted**. Generic. Refer you to the admission process. But if you get admitted then you can reply to them and say you're admitted and would like to talk.
- **Cannot admit you directly. Need to go through admission process**. Generic. They are not interested and refer you to the admission process.
- **I am not taking students but I co-advise/can serve on your committee.** While this might sound good, it's still generic because it says *once you're admitted and have an adviser*, then contact me again.

- **I am not taking student but Prof. X might be**. Not common as most profs. do not refer you to their colleagues. However, this is better than the previous responses. While they cannot take you, they think you are a good fit for X. So follow up with a thank you and say you'll contact X. And then contact X and say that Y referred you to them.

In short, all of these replies mean the prof. is not interested. The best positive response is that they want more information from you, e.g., your CV, transcript, paper, or a chat, which is like an interview (§9.1).

14.5.3 Are Profs. So Busy That They Completely Ignore Emails?

Profs. are busy. We have many deadlines, meetings, and emails, many of which are from prospective students looking for research opportunities or asking for application results. We also have a life outside of work, e.g., family, hobbies, etc.

However, this is *not* why we "ghost" you and provide no response (§14.5.2). One main reason is because we want to avoid misunderstandings. A response, no matter how clear we think it is, might be misinterpreted by the student. For example, if we say we are not taking students but still (strongly) encourage to apply, then the student might take it as a positive sign of admission. If we say we are not interested, the student might take it as a personal rejection and not apply at all. So it is not because we are too busy to reply, but because we do not want misunderstandings and have to deal with them later.

But of course, we do respond to well-written emails (§14.5) that show the student has done their homework and is genuinely interested in our work. So it is worth trying, but don't take it personally if you don't get a reply.

I skim through *every email* sent by students for admission and research opportunities (many of which are from undergrads and highschool students). So that means I do read your emails, and they rarely go to my spam or trash folder. However, I only reply to those that I think are a good fit and ask them to chat with me.

Part V

Appendices

Appendix A

Glossary and Acronyms

Glossary

adcom chair The faculty member who leads the admission committee. This person is often not involved in individual admission decisions but oversees the process (e.g., resolve disputes, ensure fairness) (§2). 12

adcom members Faculty members who are part of the admission committee. People who review applications and make admission decisions (§2). ii, 12

adviser/superviser A faculty member who guides and mentors a PhD student throughout their research. This person typically plays a crucial role in a student's academic journey. In the US, the term "adviser" is more commonly used than "supervisor". 9,

April 15 The deadline for most US universities to accept or decline offers of admission. This date, set by the Council of Graduate Schools (CGS), states that students are not required to accept offers before this date. Note that, some universities might not follow this deadline, so check with the university you are applying to. v, 45, 46, 49

cohort A group of students who start a program at the same time and take classes together. You should get to know your cohort as they will be your colleagues and friends during your PhD. See selecting and ranking schools in §13.2.

fields or areas of research Specific areas of study or research. Fields within CS include Machine Learning, Computer Vision, Software Engineering (§1.2). 3, 28

In-state vs. Out-of-state In-state tuition is the tuition rate for students who are residents of the state where the university is located. Out-of-state tuition is the tuition rate for students who are not residents of that state. In-state tuition is typically much lower than out-of-state tuition. PhD students typically do not have to pay tuition as it is covered by their funding, but this might be important for MS students.

International vs. Domestic students International students are loosely defined as those who would need a visa to study in the US (§B). Domestic students (§C) are those who do not need a visa, typically US citizens or permanent residents. , 92

Ivy League A group of eight private universities in the US known for their academic excellence and social prestige. The Ivy League schools are Brown, Columbia, Cornell, Dartmouth, Harvard, the UPenn, Princeton, and Yale. These schools are typically known for their undergraduate programs more than their graduate programs. Moreover, most top CS programs such as CMU, UIUC, UCSD, UWash, MIT, Stanford, are not in the Ivy League.. 55

Major A student's primary field of study, e.g., Computer Science, Electrical Engineering, Mathematics, etc. Often used in the context of undergraduate studies (e.g., "what was your major in undergrad?").

Open House An event where admitted students visit the university to meet faculty, students, and staff, and learn more about the program. This is a great opportunity to get a feel for the university and the department and decide if it is a good fit for you. Open house can be in-person or virtual §10.

R1 Research 1 (R1) universities are universities with the highest level of research activity across various disciplines. Currently, 146 (out of 4000) US universities are classified as R1. R2 universities also have a high level of research activity but not as high as R1 universities. R1 universities are typically larger, and have more funding and resources for research. R2 universities are also good but might have fewer resources and funding. ix, 14, 72, 128

Research Lab A group of researchers (profs. and students) working on a common research area, e.g., a Software Engineering Lab. Typically a lab is led by a single professor, but sometimes it can be co-led by multiple professors. For example, my lab DynaROARS focuses on my own research area (software verification), but I am also part of the more general SWE group at GMU with other faculty in Software Engineering.

rolling admission Applications are reviewed as they are received (instead of all at once after the deadline), and decisions are made throughout the admission cycle. Rolling admission is more common for MS programs and less common for PhD programs (e.g., at GMU, MS is rolling and PhD is not. 45, 95

stipend A fixed regular sum paid to students as part of their funding package (i.e., salary). This is typically paid monthly or bi-weekly. Stipend is typically paid to PhD students and not MS students. 3

top-tier conferences and journals These are the most prestigious venues for publishing research in CS. For example, in Software Engineering, top-tier conferences include ICSE, FSE, and ASE and top-tier journals include TSE and TOSEM. Publishing in these venues is highly competitive and prestigious, and can significantly improve your chances of getting admitted to a good PhD program. 68, 87

Acronyms

Admission Committee (adcom) The group of faculty members who review applications and make admission decisions (§2.1). ii, 6, 11, 18,

All But Dissertation (ABD) A PhD candidate who has finished all course work and exams and only needs to write and defend their dissertation. 60,

Doctor of Philosophy (PhD) A doctoral degree that represents the highest level of academic achievement in a particular field of study. In CS it typically requires original research and a dissertation.

Graduate Record Examination (GRE) A standardized test that is an admissions requirement for many graduate schools in the US. However, it is not required for most CS PhD programs (§7.1). Thus unless it is explicitly required, don't worry about it. iv, 37,

Letter of Recommendation (LoR) A letter written by a professor or supervisor that assesses your qualifications and potential for graduate study (§3).

National Science Foundation (NSF) A US government agency that supports research and education in science and engineering. NSF is a major source of funding for RAs in CS research. There are other agencies that support RAs but they might require US citizenship or permanent residency. , 100

Principal Investigator (PI) lead researcher on a grant or research project, e.g., a PI on an NSF grant. Prospective students often use this term to refer to a professor they are interested in working with. However, we do not use it this way in academia, e.g., "who is your PI?" might only make sense to fellow Reddit applicants, but might not be understood by others, "who is your adviser?" is what you want to use.

Research Assistantship (RA) A main type of PhD funding where you work on a research project for a professor (§12.1.2).

Research Experience for Undergraduates (REU) A program funded by the NSF to provide research opportunities for undergraduate students. , 93, 100

Science Technology Engineering and Mathematics (STEM) Fields in or related to these areas are considered STEM fields. CS is a STEM field. ix,

Scopus Q1 Journals (Q1) Commonly mentioned by international students to refer to top-tier journals in CS. Q1 is very well-known in CS in the US (also CS often focuses on confs. rather than journals), and many CS faculty in the US might not know what it means. If you want to refer to top-tier journals, you should mention the specific journals, e.g., TSE in Software Engineering. 29,

Statement of Purpose (SOP) A document written by yourself to explains your research interests, background, and reasons for applying to a PhD program (§5).

Teaching Assistantship (TA) A main type of PhD funding where you help a a professor with teaching, e.g., grading assignments (§12.1.1).

Deferred Admission An option allowing admitted students to postpone their start date, typically by one year.

Appendix B

Visa for International Students

"I didn't do it. Nobody saw me do it. You can't prove anything!"

The Simpsons

As defined in §A, international students are those who would need a visa to study in the US. In most cases, **F-1** is the main visa needed to study full-time at an accredited institution. Here are some key points about F-1:

- **Employment:** You are allowed to work on-campus for up to **20 hours per week during the academic year** (because you still need to take classes) and **full-time** (typically 40 hrs) during official school breaks (e.g., summer and winter breaks). Off-campus employment requires authorization, which can be obtained through CPT and OPT programs described below.
- **Curricular Practical Training (CPT):** CPT allows you to participate in internships or practical training that is an integral part of their academic curriculum. CPT must be related to your field of study and can be full-time or part-time. It requires prior authorization from your university and must be completed before graduation.
- **Optional Practical Training (OPT):** OPT provides up to 12 months of work authorization for students before or after completing their degree. For students in STEM fields, there is an additional 24-month extension available. OPT requires prior application and approval from USCIS.
- **Full-time Enrollment:** You must maintain full-time enrollment status during the academic year. This means taking a minimum number of credits each semester, as defined by your program. Dropping below full-time status can result in loss of visa status.

Immigration comics present:

THE F-1 STUDENT VISA PROCESS EXPLAINED

STEP →

WWW.PHDCOMICS.COM

1 DREAM OF STUDYING IN AMERICA, LAND OF OPPORTUNITY!

2 FIND OUT HOW MUCH OPPORTUNITY COSTS

3 FUTILELY WRITE TO PROFESSORS

4 TAKE STANDARDIZED ENGLISH TEST (years of listening to American Pop culture finally pay off!)

5 TRUST YOUR FUTURE IN HANDS OF QUESTIONABLE LOCAL MAIL SYSTEM

6 GET ACCEPTED!

7 WAKE UP AT 4am, FORM LINE AT U.S. CONSULATE

8 GET IN, WAIT IN ANOTHER LINE

9 GET INTERVIEWED

10 WAIT SOME MORE

11 VISA GRANTED!

12 SAY GOODBYE TO RELATIVES (THE ONES YOU LIKE)

13 GET EYE SCANNED, FINGERPRINTED, SUBTLY INTERROGATED

14 FIND OUT UNIVERSITY IS ACTUALLY IN THE MIDDLE OF NOWHERE.

15 GET USED TO CULTURE, PAY TAXES, ESTABLISH FRIENDSHIPS

16 FACE FACT YOU ARE NOW OVER-QUALIFIED FOR MOST JOBS IN YOUR HOME COUNTRY

17 GRAPPLE WITH IDENTITY ISSUES.

18 REALIZE THE PLACE YOU NOW CALL HOME DOESN'T FEEL THE SAME WAY ABOUT YOU

B.1 For Spouses and Children

The spouses and children of F-1 visa holders can enter the US under the F-2 visa status. The F-2 visa allows family members to live in the US with the following conditions:

For Spouse:

- **Work Restrictions:** F-2 spouses are not permitted to work in the US.
- **Education:** They can study part-time but cannot enroll in full-time degree programs.

For Children:

- **Education:** F-2 children can attend K-12 schools but cannot pursue higher education full-time.
- **Work Restrictions:** Like F-2 spouses, children are not allowed to work under any circumstances.

F-2 visa holders must leave the US if the primary F-1 student visa holder loses status or completes their program.

Appendix C

Domestic Students

"I'm not a bad guy! I work hard, and I love my kids. So why should I spend half my Sunday hearing about how I'm going to Hell?"

THE SIMPSONS

Most of what is written in this handbook applies to both domestic[1] and international students. However, there are some differences and benefits that domestic students should be aware of and can leverage to improve their chances of admission.

Standing out §11.3 There are *few* domestic applications compared to international ones (one reason is that many domestic students go to the workforce after their undergraduate degree). Many US universities thus want to increase the number of domestic students in their programs. So if you're a domestic student, you already *stand out* from the crowd.

Fee Waiving §2.6 Some schools might offer application fee waivers for domestic students. You should check with the school you're applying to.

School §6 Adcom already knows about your school, which is a plus. You are also more familiar with the US education system and academic culture (§J).

Standard Tests §7 You do not need to take TOEFL or IELTS (§7.2) because you already did your undergrad (or MS) at a US university. You might also be more comfortable communicating in English, e.g., contacting professors (§14.5).

[1] As mentioned in §A, domestic means you do not require a visa to study in the US.

Transcripts You do not need to get your transcripts evaluated/translated (which can be a hassle and inaccurate). You can just send your official transcripts directly to the school you're applying to.

Funding §12 You have more opportunities for funding, e.g., through government scholarships for US citizens and permanent residents. You can also apply to specific programs *before* you start your PhD, e.g., NSF Graduate Research Fellowship Program (GRFP) and Hertz Foundation Fellowship. These fellowships are very competitive (§G) and can significantly improve your admission chances.

Research Experience §E You might have many opportunities to do research as an undergraduate, e.g., through REU programs and internships at your undergrad university. Highlight such experience in your application.

Open House §10 It is easier for you to attend open house events in person. This can help you make a better decision on which school to attend.

Appendix D

MS Admission

While both MS and PhD programs are graduate degrees, they are *very different* in terms of objective, admission requirements, course requirements, duration, and funding. This section discusses the differences and provides guidance on applying to MS programs.

D.1 Differences between PhD and MS

Tab. D.1 summarizes the main differences between MS and PhD programs:

- Objective: an MS is typically to prepare you for *industry*, while a PhD is to prepare you for research and academia. Some MS has thesis option but in general research is not a focus in MS programs.
- Admission requirements (§D.2): MS also requires a good GPA, LoRs, SOP, and test scores, but research experience is not required. PhD requires all of these, but research experience is a must.
- Course requirements: MS has a specific number of courses that typically can be done in 2 years. You graduate with an MS when you're done with the courses. PhD also has coursework requirements, which are typically taken in your first 2

Tab. D.1: MS vs. PhD

	MS	**PhD**
Objective	Industry	Research
Admission Req	No research experience	Research experience
Coursework Req	Yes	Yes (but research is much more important)
Duration	2 years	5–7 years
Adviser Req	No	Yes
Funding	No	Yes

years (§1.3). However, after (and also during) coursework, you focus mainly on research. You graduate with a PhD when you have done enough research and written a dissertation, which usually takes much longer time than coursework.

- Duration: an MS typically takes 2 years while a PhD takes 5–7 years (or even longer). Many students get an MS along the way to a PhD, e.g., after finishing the 2-year course work.
- Adviser: MS students typically do not have an adviser (if you do thesis option then you will have one), while PhD students need an adviser who guides them in their research.
- Funding: MS is typically *not funded*, while PhD is (§12). See §D.2.3 for more details on MS funding.

D.2 MS Admission

In most cases MS CS programs are much less competitive than PhD programs, i.e., you're likely to get in if you can afford it. Many think of MS programs as a *cash cow* because students are often not funded and have to pay tuition.

While admission requirements are similar to PhD programs (e.g., GPA, SOP, LORs), research is not a focus in MS programs. Often, the main requirements are just that you have sufficient background in CS, e.g., through your undergrad degree. This does not mean MS programs are easy to get admitted, but the requirements are much lower compared to PhD programs.

D.2.1 Admission Committee

MS admission also involves an adcom that reviews applications and makes admission decisions. However, MS admission is typically rolling, i.e., applications are reviewed as they come in and decisions are made throughout the admission cycle.

Moreover, unlike PhD that has multiple reviewers for each application, an MS application typically involves only one reviewer and does require much time to review compared to a PhD application (§2.5).

Finally, MS adcom can involve teaching faculty (§14.2), who are not necessarily doing research. This is because MS programs are often geared towards working professionals and do not focus on research.

GMU has a large the number of MS students in CS (800 MS vs 200 PhDs). In contrast, other similar size universities often have much smaller MS CS programs (or none). Location plays an important role as GMU is close to DC with many developer professionals who want to get an MS, which are often covered by their employers. Our MS program is geared towards working professionals, e.g., all of our MS courses are offered in the evening and online.

GMU CS has three separate committees for MS admission: MS in CS (the traditional one, which is the largest), MS in Software Engineering (SWE), and MS in Information System. Each committee has its own chair and members. For example, I often serve in the MS SWE adcom, which has about 4 adcom members (including the chair who also does the review).

D.2.2 Application Materials

You will submit similar materials as in a PhD application, e.g., transcripts, LoRs, SOP, and test scores. However, research experience is not required, and LoRs can be from anyone who can speak about your academic or working abilities. Moreover, your SOP should focus on your academic and work background, why you want to get an MS, and how the program fits your goals. As with PhDs, GREs are often not required. Some MS programs do not even require LoRs or SOPs.

Undergrad Background and GPA Since research is not required, your undergrad background is more important in an MS application. You should have a strong background in CS, e.g., through your undergrad degree. GPA is also important, as it is often used as a filter for MS applications.

SOP Your SOP should explain why you want to get an MS, how the program fits your goals, and why you're a good fit for the program. You don't need to mention about working with specific professors unless you want to do a thesis option. You still need to customize it for each school (e.g., you picked GMU due to its strong SWE program or the DC area has many job opportunities).

LoRs Unlike PhDs, your LoRs do not need to be from professors or talk about research experience. Many MS programs do not even require LoRs.

Test Scores Unlike PhDs, which often do not require GREs, MS programs often require GREs. However, some schools do make them optional, and you should check with the school you're applying to. If you have a low GPA, a high GRE score can help offset that.

As with PhD, English proficiency tests (TOEFL/IELTS) are required for international students (but just passing the minimum requirement is often enough §7.2).

Note that just as with PhD, English tests are are waived if you did your undergrad at a US university.

D.2.3 Funding (Why MS Students Are Typically Not Funded?)

Unlike PhD programs, which often have funding (§12), MS students are typically *not* funded. This is because MS students do not focus on research and thus are not funded through RA and PhD students have priority for TA positions.

RA Profs. are not willing to take MS students as RAs because they are not around long enough to be productive. It can take a while for a student to get used to research and start being productive, and by that time (1–2 years), they are about to graduate. Moreover, the goal of most MS students is to get a job, not to do research, so they are not as motivated to do research.

TA MS students are typically not given TA positions because PhDs are given priority as they will stay much longer (§1.3). Many depts. do not have enough TAs for PhD students and so they cannot afford to give them to MS students.

Exceptions While MS students are typically not funded and do not focus on research, there are always exceptions. Some MS programs are fully funded, e.g., those that are research-oriented and have a strong research component. Moreover, some schools have TAs for MS students, and you can apply for these positions. For example, GMU CS has quite a few TAs for MS students, and my courses in the past two years have MS TAs. Finally, if you have a strong background and can demonstrate that you can be productive in research, then a prof. might be willing to take you as their RA. Some of these students convert to PhD students after having this research experience.

D.3 Selecting and Ranking Schools

Because of the differences between MS and PhD programs (§D.1), you should consider different factors when selecting and ranking MS programs (see §13 for selecting PhD programs). For example, you might want to consider factors such as location, industry connections, and job placement instead of research areas and advisers (§14).

- **Location:** In addition to living in a place you like (e.g., warm weather, historical city, etc.), you should also consider the job opportunities in the area. For tech industry, consider MS programs in tech hubs like the Bay Area and Seattle. For government jobs, look at schools in the DC area. For example, many students at GMU work for the government or defense contractors in the DC area and take classes in the evening or online.

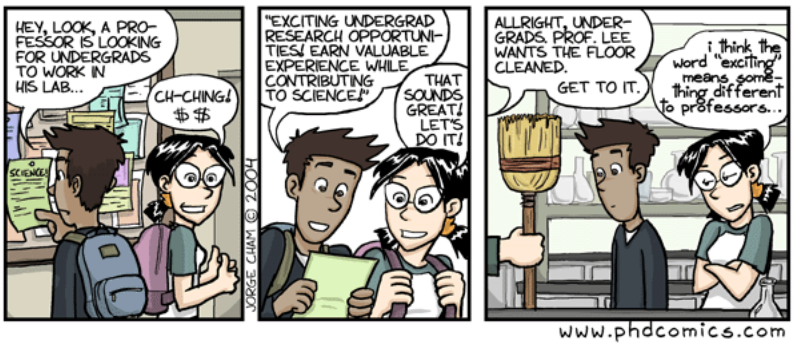
- **Industry Connections:** Universities often have strong connections with local companies and can help you get internships and jobs. For example, Microsoft and Amazon look for students in the Washington area while Google and Facebook recruit those in the Bay Area. Due to its location, GMU students naturally get jobs from the government, defense contractors, and Amazon, whose 2nd HQ is in Arlington.
- **Ranking:** Unlike PhD programs where the adviser and research are likely the most important factor, in MS programs the ranking of the school is typically more important. Thus, you should consider the ranking of the school in CS, especially in the specific area you're interested in. For example, if you're interested in software engineering, you might want to consider schools with strong SWE programs.
- **Living Cost:** MS students are typically not funded (§D.2.3), so living cost can be a big factor. You should consider the tuition and living expenses of the area. Note that sometimes living costs, e.g., renting, seem scary at first but students often find way to make it work, e.g., by sharing an apartment with other students.

Appendix E

Research Opportunities

"Kids, you tried your best and you failed miserably. The lesson is: never try."

The Simpsons



As discussed in §4, having a successful research experience can greatly strengthen a PhD application. Research experience gives you opportunities to try out research, determine what research area you're interested in, publish papers (§4), connect with researchers, and get strong LoRs (§3). This section provides some guidance on how to gain research experience as an undergraduate student or student at a smaller college where research opportunities might be limited.

E.1 Locally

Start looking for research opportunities at your institution. If you did well or liked a class, you can check with the professor of that class for research opportunities. You can also go to the department directory and then professors' websites and see

if they are looking for undergraduate researchers. Even if they say they are looking for graduate students, you can still contact them and ask.

Many universities have programs to encourage undergraduate research. For example, GMU has the OSCAR program, UNL has UCARE, and NSF has REU's (for US citizens and permanent residents).

You can also take honor thesis or independent study courses with a professor. This is a good way to get research experience and also get a LoR from the professor. You can also ask your academic adviser or other faculty members for suggestions. Finally, you can also ask your peers who are already doing research. Use the method described in §14.5 to contact professors

I enjoy working with undergrads and always open to mentoring them. I get undergraduates through my classes, e.g., asking students who did well in my class if they are interested in research. Occasionally I was introduced to students by other students or faculty. Sometimes I directly email students who I think are good and ask if they are interested in research.

While most undergrads are understandably not productive in research, some are and I have published multiple papers with them—like with Kimhao and Stefania. I also have written LoRs for them and have helped them get into good PhD programs.

E.2 Open Source Contributions

Places such as GitHub offer many research opportunities, even though they might not appear so. In many cases, professors or research labs put their projects on GitHub. For example, my research group, Roars, has many open-source projects that undergrads can contribute to.

By contributing code, fixing bugs, implementing new features, or providing documentation, students can gain practical research experience and interact with experienced developers and researchers in the field. Not only you gain research experience, but you might be able to get a LoR from the project maintainer, and you should write about this experience in your SOP (§5.)

E.3 Virtual Research Opportunities

This is less common but several places offer virtual internships and research programs aimed at providing hands-on research experience. These programs often involve working remotely under the guidance of experienced mentors and collaborating with a team of fellow researchers. For instance, UIUC+ Summer Undergraduate Research in Software Engineering offers an unpaid remote internship for software engineering students all over the world to collaborate with mentors from University of Illinois at Urbana Champaign.

Appendix F

Publication Authorship

Having a publication shows your research potential and can significantly improve your admission chances (§4.1). Moreover, LOR writers often refer to your publications to support their claims about your research abilities (§3). Likewise, you should also describe your work that has been published in your SOP (§5). Of course all of these are only true if you are a significant contributor to the work.

New researchers, especially students, often have questions about contributions and authorship, which arguably is one of the most sensitive and important aspects of academic publishing. If not handled properly, disputes over authorship can lead to misunderstandings and conflicts, changing from a positive experience to a negative one and damaging reputations and relationships.

F.1 Contributions in the Work

A typical CS research project involves the following tasks leading to a publication:

- **Idea**: This involves identifying a research problem, knowing the related work, and proposing a solution or approach. For most new researchers, this part is often done by the adviser or senior researchers. For example, your mentor suggests a problem to work on and ask you to try some specific approach. Typicaly the problem and approach are vague and you need to refine them, e.g., by reading more related work and trying out different ideas.

- **Implementation**: This involves implementing the proposed approach. You might need to try different methods, algorithms, data structures, and optimizations to make the prototype work. In system fields such as software, implementation involves coding and building a prototype. In other fields, such as theory, it might involve developing mathematical models and proving theorems. In other fields, such as HCI, it might involve user studies and qualitative analysis. Regardless, this part is often the most time-consuming and challenging part of the work.

The person doing the implementation understand the most about the approach and its strengths and weaknesses. It is very rare that the mentor or adviser would get involved in the implementation as they often want to manage at a high level and give the student freedom to explore and learn. The student would regularly update the mentor on the progress and discuss any issues. The mentor would provide high-level guidance, e.g., suggesting different algorithms or optimizations to try, but would not do the implementation themselves.

- **Evaluation**: Once implementation is done (often determined by the adviser), you need to design the experiments to evaluate the approach. This involves forming research questions and hypotheses (e.g., does the approach improve performance? how does it compare to the state-of-the-art?). These research questions then determine how the experiments are designed, e.g., what datasets to use, what baselines to compare against, what metrics to measure.

  This part is often shared by both the student and the advisor, where the adviser provides high-level guidance and the student does the details. Moreover, this part often requires multiple iterations, e.g., the initial experiments might not work well and you need to refine the research questions and experiment design.

- **Collecting and Analyzing data**: This involves running the experiments, collecting data, and analyzing the results. This part is often done by the student, who needs to ensure that the experiments are run correctly and the data is collected accurately. The student also needs to analyze the data and draw conclusions from the results.

  In most cases, the student doing the implementation would also do this part, as they understand the approach and its strengths and weaknesses the most, and can easily update the implementation and refine the experiments as needed. Like the implementation part, the adviser does not get involved in this part but would provide high-level guidance and discuss the results with the student. In many projects, this part also involve other people, e.g., undergraduate students, who help run the experiments and collect data.

- **Writing**: Once you get promising experimental results, your adviser would ask you to write a draft of the paper to a target conference or journal (this helps determine the format and audience of the work). Writing is often the hardest part for new researchers as it requires a different skill set (e.g., you could be very good with technical work but not good at writing). You can learn from looking at other papers, e.g., from your own group and other papers published in the target conference or journal.

  In most cases, the student would provide the first draft of the manuscript. Other contributors, e.g., those who helped with the experiments, might also contribute to the writing, e.g., by writing specific sections and give feedback on the draft.

Once a draft is ready, the student would share it with the adviser and co-authors for feedback. This part is often done through multiple iterations, where the student revises the draft based on feedback from the adviser and co-authors. In many cases, during the writing process the student might find issues with the approach and experiments, and need to go back to the implementation and experiment design parts to refine them.

After the manuscript is ready, it is time to submit the work. At this point the author list and order should be finalized! While there are other parts involved, e.g., rebuttal or response to reviewers' comments, and revisions, these should not affect the author list and order—in many cases the venue would not allow changes to the author list after submission. Note that for journal where significant revisions are often needed (or a conference paper being rejected and resubmit), the author list and order can be changed during the revision process, e.g., additional contributors can be added.

Appendix G

Fellowship Applications

"You mean those leagues where parents push their kids into vicious competition to compensate for their own failed dreams of glory?"

The Simpsons

Having an external and major fellowship can significantly relieve the financial burden of your PhD and improve your chances of getting into a good PhD program (§12.2). Among the most wel-known and prestigious fellowships for CS PhD students who are US citizens or permanent residents (§C) are the National Science Foundation Graduate Research Fellowship Program (NSF GRFP) and the Department of Defense National Defense Science and Engineering Graduate Fellowship (DoD NDSEG). These fellowships provide multiple years of full financial support, including tuition, stipend, and health insurance.

The GRFP and NDSEG websites have detailed information on the application process and eligibility requirements. The NSF GRFP FAQ has many useful tips and resources. You can also find articles written by previous winners offering tips on writing a strong application (see the link section on this book's website). However, keep in mind that while these writers were successful in securing the fellowship, they often have no insight into how their applications were actually evaluated or what the reviewers want to see.

This chapter focuses on how your application is evaluated, what reviewers look for, and tips on improving your application. Note that while these are specific GRFP and NDSEG, the given advice should be applicable to other major fellowships—including those for international students.

G.1 NSF GRFP

The NSF GRFP is a prestigious fellowship for US citizens, nationals, and permanent residents who are in the *early stages* of their graduate study in STEM fields, including both MS and PhD students. The GRFP is highly competitive, with many applicants from top schools, with strong LoRs and research experience. In many cases, even an *"honorable mention"*—meaning you did not get the fellowship but were considered a strong candidate—can help you get into a good PhD program (so make sure to mention it in your CV and application).

G.1.1 How Applications are Evaluated

- Each applicant is assigned to *about 3 reviewers* who have expertise in the applicant's research field (e.g., if your topic is in PL, your reviewers will likely be in PL). This means reviewers are quite knowledgeable in your field and your work, your LoR writers and their work, and thus can evaluate your application quite in depth. This is different from PhD applications where adcom reviewers (§2.1) might not be in your field.

- Reviewers might not be research-focused faculty members (e.g., tenure-line), they can be teaching faculty (§14.2). In fact, I believe many reviewers are teaching faculty. So this means they may not be familiar to the latest related work or trend in your field. So make your research plan easy to understand and well-motivated (see §G.1.3).

- Reviewers typically try to compare applicants *within their cohort level*. This means that we do not compare an undergrad, who is still applying to grad school, to a 2nd year PhD student who already has an adviser and published multiple papers. This ensures that each applicant is evaluated fairly based on their level.

- Unlike CS PhD applications that focus on research potentials in which papers, research experience, and LoRs are important, NSF GRFP looks at both *research potential* and *broader impacts*, e.g., how you can help society or mentor others. It is *not expected* that you have published papers or have a lot of research experience (recall that students applying for MS are also eligible). Instead, you need to convince the reviewers that you have the *potential* to be a good researcher (technical merits) and that you can help society (broader impacts). More in §G.1.2.

G.1.2 Intellectual Merit and Broader Impacts

Your application will be evaluated based on two criteria: Intellectual Merit (IM) and Broader Impacts (BI).

Intellectual merit (IM) IM evaluates your research potential, e.g., your research experience, your potential to do research, and how you can contribute to the field. Unlike a normal project or research proposal, in which the evaluation is entirely based on the merits of the proposed work, in the GRFP, the evaluation is *not* entirely about the research plan. Reviewers are repeatedly reminded to not focus too much on the research plan as many applicants are still applying for PhD programs and might not even get into the field or work with a prof. that fit their research plan.

Instead, the evaluation is based on your *potential* of being a good researcher using various criteria, e.g., your research experience, what others think of you (LoRs), research plan, etc. This also means that even if you have very little research experience, you can still get the fellowship if you can convince the reviewers that you have the potential to be a good researcher. Vice versa, if you have a lot of research experience and in very top places but cannot convince the reviewers that you have the potential to be a good researcher, you will not get the fellowship.

Broader impacts (BM) BM is a common and important component in NSF application. It is about how you and your research can *benefit society*. Many students just mention how their research is cross-discipline and thus has broader impacts (e.g., improve software quality and thus help society). This is too common and not enough. You also want to talk about how you, as a grad student with your research, can help society, e.g., through outreach, mentoring, etc. As mentioned below, you will want to be specific and concrete, e.g., *"I will work with highschool students .."* is not as convincing as *"I have had experience in mentoring highschool students X and will continue to do so through Y,Z ..."*.

Writing BM is often difficult, not only for students but also new faculty. You should ask someone who has experience writing NSF proposals to review your BM.

G.1.3 Common Pitfalls and Tips

These are common pitfalls that many applicants make in their GRFP applications and tips on how to avoid them. Many of these can be avoided and fixed by asking someone who has experience writing NSF proposals to review your application. You should also ask your LoR writers to review your research plan and SOP.

- **Too Technical or Narrow.** Remember that you're writing to a general audience in CS, not experts in your field. While NSF tries to match reviewers with your field, CS is simply too broad and you might get a reviewer in your field but not in your specific area or familiar with the research topics you're working on (see meanings of fields, areas, and topics in §1.2). For example, a person working in PL might not be familiar of all its areas, e.g., program synthesis, verification, or type inference. So avoid technical jargon, explain things in simple terms, and motivate your work well. If the reviewer cannot understand your research plan, they will likely give you a low score.

- **Preliminary Work.** Your research plan should have some preliminary work to convince reviewers that you have thought about the problem and have some initial results. It does not have to a lot, e.g., you don't need published results or an implementation, a small experiment done by hand on some small examples would suffice. Moreover, it should be concrete and convincing, e.g., *"When being applied to the program in Fig 1. of the paper published PLDI'19 that approach X failed, my idea worked and was able to ..."*. This will set you apart from others who just have a plan but no results.

- **Related Work and Challenges.** Many research plans motivate the problem well but do not discuss limitations of existing work, making it questionable if the problem is important or if you are aware of the challenges. Thus, you should do a thorough literature review and discuss what people have done and their limitations. Your research plan should then talk about how you plan to address these limitations, i.e., fill the gap in the literature.

- **Do not BS.** Many research plans include technical details or proposed work that are vauge, unrealistic, or even impossible. This is similar to a student taking an exam and write a lot of nonsense and hope for partial credits. As mentioned, reviewers are often chosen based on their expertise in your field and can detect B.S. Again, do your homework and ask someone who knows the field, e.g., your advisor or LoR writer, to review your research plan.

- **Overexaggeration Lors.** Many GRFP applicants have ref. letters from professors that are very good at writing LoRs. However, they often use flowery language and overrate their students. Reviewers can sense this overexaggeration and might not trust the LoRs. This is similar to overclaiming research conributions when writing papers—so ask your LoR writers to tone down their enthusiam and be specific with concrete examples to demonstrate why you're *"the best"*.

G.2 DoD NDSEG

The NDSEG is another prestigious fellowship supporting *U.S. citizens* pursuing advanced degrees in STEM fields *critical to national defense* (such as CS). NDSEG has several differences from NSF GRFP, e.g., it focuses more on application to DoD and redacts more information about you and your application materials.

G.2.1 Evaluation

Redacted info. Unlike the NSF GRFP, reviewers only see *redacted versions* of your submitted materials (applicants are asked to provide full and redacted versions of your research plan, CV, and other materials). Thus, we do not know what schools

your went to, where you did your internships, your publications or research experience. We also *do not* see your LoRs, i.e., we do not know who wrote them or what they wrote!

Reviewers mainly get to know you and evaluate your application by reading your research plan and personal essays. This is for *fairness and avoiding bias* based on the school you went to, places you published at, your LoR writers, etc. Nonethless, I felt I am missing too much information. However, it could be that external reviewers like myself help with the first cut based on the redacted materials, and then there are internal reviewers who makes the final decision based on the full materials.

Non-expert NDSEG reviewers hold advanced degrees in STEM fields. However, NDSEG reviewers are more general and might not be in your specific field. For example, in GRFP I mostly review applications in PL, while in NDSEG it seems that I review applications in all fields of CS and even non-CS. Thus, you should make your research plan *more accessible to a general audience*.

I find a bit difficult to evaluate NDSEG applications because I do not have the full picture. For example, a student mentioned that they have published in the topic they proposed but redacted all information about the publication, so I have no idea where they published, what the paper is about, etc. It is also difficult to evaluate the academic background of the student, e.g., some student just started grad school and so their transcript is essentially blank. It is also annoying to see CVs with so many blanked out information (they might as well should just submit a blank CV).

In the beginning I find it surprising that I don't get to see the LoRs, but I understand the reasoning behind it and gradually think it is a good idea. As mentioned above, LoR writers for NSF GRFP (§G.1.3), especially those from top schools, often overrate their students and thus can bias the evaluation. So I don't find I am missing much by not seeing the LoRs.

G.2.2 Common Pitfalls and Tips

These are some common pitfalls I see in NDSEG applications and tips to avoid them. Some of these are similar to NSF GRFP (§G.1.3) while some are specific to NDSEG.

- **Customize your research to DoD** by doing some research to find specific projects from DARPA or ONR and explicitly mention them—like in the introduction or in its own section. This is different from NSF GRFP where you want broader impacts to society.
- **Unclear research plan.** You should aim to have (i) clear problem statement, (ii) why it is important (esp. to DoD), (iii) what has been done and their challenges/limitations, and (iv) what you plan to do to address the challenges. Moreover, research is often quite technical and ambitious, so you want to show

some preliminary work, e.g., a small experiment by hand on some small examples, to convince reviewers that you have thought about the problem and have some initial results.

Unlike GRFP where we have more contents to evaluate, in NDSEG we mainly evaluate based on personally essays and especially research plan. So you should do proper research on what you propose and make it clear and convincing.

- **Personal stories and essays should be unique and interesting**. Many essays and stories I read are quite generic and do not tell much about the student. For example, involving in a robotics club or mentoring students are quite common and do not tell much.

  You should pick a few thing and provide concrete examples and details. For example, talk about what you have accomplished in your robotics club, e.g., you built a robot that won a competition. Just a small, interesting detail can make your essay stand out.

- **Not using all allowed pages**. Many research plans use only 1/2 or 2/3 of the number of allowed pages, which themselves are already quite short. Such documents are often not detailed enough and do not provide enough information for reviewers to understand and evaluate the research plan. So use all allowed pages to provide enough details about your research plan. This is especially important as we do not know much about you due to redacted materials.

G.3 Common Tips for Both Fellowships

- **Use LaTeX to write your research plan and essays** (§I). This is the standard in CS and engineering and will make your application look professional. Moreover, do not use the default Word settings, e.g., left justification, as it is not standard in CS and engineering and difficult to read.

- **Ask your LoR writers and adviser to look at your writing/essays** (this is very important so I keep repeating it). You are new to the field and research writing, and your ideas might not be accurate or have already been explored. It's better that they tell you now than for you to find out later from reviewers.

G.4 My experience as a reviewer

I find the GRFP more familiar compared to NDSEG, which redacts most applicant information as mentioned above. I also spent more time reviewing GRFP applications—mainly because NDSEG doesn't provide much info to work with.

I also find GRFP applicants have stronger *research plans*. GRFP applicants often already have good research experience, with many have top tier publications. They also tend to come from well-known institutions with "fancy" LoRs. In contrast, NDSEG applicants come from a broader range of schools and backgrounds. Interestingly, I find the *personal statements* in NDSEG applications more appealling, largely due to their personal stories and varied experiences.

A quick note on compensation: GRFP reviewers, like other NSF panelists, receive a modest honorarium ($200 total; I probably spent several full days reviewing over 10 applications). NDSEG reviewers aren't officially paid, though I did receive some compensation, e.g., $50 Amercian Express gift card—but for whatever reason never worked when I tried to use it. So, not much for compensation (days of reviewing and writing comments for a couple of hundred dollars), but I really enjoy the experience and would do it for free!

Appendix H

Faculty Research Activities and Achievements

"Homer: Oh, why won't anyone give me an award?
Lisa Simpson: You won a Grammy.
Homer: I mean an award that's worth winning."

THE SIMPSONS

When exploring potential advisors, students often look at faculty websites to learn about their research and achievements. Common indiciators of research productivity include publications and involvement in research community. However, beyond these, CS has certain prestigious and meaningful achievements that researchers aim for, but that are not as well-known to prospective students.

This chapter first looks at the common research activities and then discusses the "big" research achievements that faculty often highlight on their websites, CVs, or departmental news and awards pages (e.g., at GMU and UWash).

H.1 Common Research Activities

Publications and involvement in the research community are common indicators of research productivity. These are the *"bread and butter"* of research and lacking in these areas can mean that the faculty is not active in research.

H.1.1 Publications in Top-Tier Venues

Publications in top-tier venues are the most reliable factor to measure the productivity of a faculty. They give visibility to the faculty's work and help establish their reputation in the area. For tenure-track faculty (§14.2), especially at top CS programs, publications at top-tier conferences and journals are often the most important

factor for tenure.

Conferences. Unlike many STEM disciplines like Maths and Physics (§1.2) that prefer journals, most CS fields focus on publising at *conferences*. One of the main reasons is that CS is a very fast moving and journals are often too slow—taking 1–2 years to publish—by which time the results may already be outdated. In contrast, conferences have a much faster review process, typically taking 3–6 months from submission to publication.

Each CS field (§1.2) has its own "top" conferences—usually around 2–4 per area. For example, NeurIPS, ICLR, and ICML are considered top conferences in AI/ML, while ICSE and FSE are among the the tops in Software Engineering. These conferences have very rigorous review process, and only a small percentage of papers are accepted.

As mentioned in §4, having a paper accepted at a top-tier conference is a big deal and makes you stand out from other prospective students. CSrankings (§K) gives the top conferences in each area and rank departments based on their publications in these conferences.

Journals. While journals are not as popular in CS, they exist and serve a different purpose—to publish more mature and complete work. Many CS areas do not have journals but some do. For example, TSE (Transactions on Software Engineering) is a top journal in SE and has exceptionally high impact-factors (higher than many top conferences)—but this is a rare exception.

Note that some CS areas, such as PL and SE, are beginning to publish conference papers as journals, which among other reasons allow for for longer papers and to be consistent with other disciplines such as math and physics. For example, papers in well-known PL conferences including POPL and OOPSLA are now published as special issues in the PACMPL (Proceedings of the ACM on Programming Languages) journal. However, despite this publishing technicality, these are still considered conferences and has the benefits of conferences such as fast review and publication process. Most researchers would treat them exactly as conference papers.

Best Paper Awards Conferences often give out best or distinguished paper awards to a small set of accepted papers (e.g., 10% of accepted papers at ICSE) to recognize that they hae high-quality and potential impact. AI/ML conferences often have many papers and so select a few for "oral" presentations, and thus are equivalent to traditional best papers.

These awards are determined by the program committee and presented to the authors at the conference. Note that these are not the same as the "test-of-time' 'paper awards discussed in §H.2.2.

Citations Citation counts, e.g., through Google Scholar, are often used to measure the impact of a researcher's work—how many people have cited their work. Google Scholar also has other metrics such as h-index and i10-index. The h-index is the

number of papers with at least h citations, while the i10-index is the number of papers with at least 10 citations.

However, citation-based metrics can be inaccurate and misleading because this strongly depends on the areas. For example, AI/ML papers often have very high citation counts—even when they are *not* published and just appear on arXiv. There are also numerous stories of "gaming" the system, e.g., paying others for citations. Thus take citations with a grain of salt when it comes to selecting advisors. For example, new faculty often have low citation counts, but this does not mean they are not good researchers or not productive.

H.1.2 Involvement in the Research Community

Faculty have various activities within their research community. These are mostly voluntary, but they are important for establishing and maintaining their reputation and visibility.

Being a PC member—reviewer for papers—of a top conference is the most common. Just as publishing in top conferences, this gives visibility and establish reputation. New faculty aims to be on the PC of a top conference in their area, and for more leadership roles as they become more well-known. PC chairs of top conferences are often senior and well-known reseachers.

Similar to PC member, faculty also serve as reviewers for journals such as being on the *editorial board* of major SE journals like TSE, JSS, and TOSEM. However, being a journal reviewer is less visible than being a PC member because the journals do not list their reviewers as conferences do with PC members. Moreover, due to the focus of conferences in CS, many faculty do not publish in journals and therefore do not review for them.

Another service—specific to researchers in the US— is reviewing proposals for funding agencies like the NSF. In addition to shaping the landscape of research directions (e.g., by deciding which proposals to fund), being on an *NSF review panel* provides insights into good proposal writing and opportunities to connect with program officers and peers. However, being an NSF panelist is not as common as being a PC member (many faculty never got invited), and it is often seen as a "bonus" rather than a requirement for tenure.

H.2 Research Achievements and Awards

Activities listed in §H.1—publishing papers and involving in research community—are common and expected for all research faculty. After all, you rarely see departments celebrating someone's paper acceptance, but they will spotlight certain awards and honors that are genuinely exceptional and give more meaningful insights into a researcher's impact and standing in the field.

Fig. H.1: Adademic Awards.

H.2.1 Early-Career Funding Awards

These refer to prestigious grants and fellowships for early-career faculty such as assistant professors who have not yet received tenure (§14.2). In addition to coming with major funding, these awards are highly valued and can significantly boost the tenure case and career of the recipient.

- **NSF CAREER Award** A very popular and prestigious award for junior faculty with research *and* educational excellence. It comes with a 5-year research grant, which is substantial for early-career researchers.

  Given its impact on tenure review, some junior faculty consider the CAREER award so important that they may prioritize it over other major life events such as having children. In some cases, faculty may consider moving to a better school after getting this award.

  - **NSF CRII (CISE Research Initiation Initiative)** A "mini" version of CAREER for junior faculty in CISE (Computer and Information Science and Engineering) directorate. It comes with a 2-year grant and many faculty use this as a stepping stone to apply for the CAREER. Note that this seems to be phasing out and might not be available in the future.
  - **PECASE** (Presidential Early Career Award for Scientists and Engineers) A small number of CAREER awardees are selected for this recognition and therefore highly prestigious. PECASE is given by the White House

and is the highest honor given to early-career scientists and engineers. See an example of a PECASE awardee from MIT.

- **YIP (Young Investigator Program)** Given by defense agencies such as the DoD, DARPA, ONR and have the similar goals as CAREER but strictly for US citizen or permanent residents. They are not as popular as CAREER, focus on very restricted topics (e.g., only in DoD's interest areas), and have a shorter duration—3 years instead of 5. YIP recipients can also be considered for the mentioned PECASE recognition.

- **Sloan Fellowship** Comes with a $75K research grant over 2 years for junior faculty with exceptional potential in their field. Unlike the CAREER or YIP, these are nominated by their institutions and are not open to self-application.

Other awards that junior faculty can get include the *ACM Dissertation Awards* and early career awards from the industry. The ACM SIGs (Special Interest Groups) such as SIGPLAN (programming languages) and SIGARCH (architecture) have dissertation awards for best PhD dissertation in different areas of CS. These are typically given *after* the student has graduated and thus are given very junior faculty who recently graduated. Some industry labs—like Google and ~~Mierosoft~~ (used to)—have fellowship programs for early-career faculty. These are very competitive and come with funding for one or two years.

H.2.2 Research Awards

These refer to awards given to more senior researchers for their outstanding contributions to their field. These can be (i) lifetime achievements in the field—such as ACM or IEEE Fellows, and (ii) specific work that were published 10+ years ago and that have made significant impact.

Lifetime Achievements

- **ACM and IEEE Fellows** are for researchers with long-term contributions and leadership in computing fields. These are typically given to very senior researchers (e.g., full professors). Note that there are also ACM and IEEE Senior Members, which are a step below Fellows and can be self-applied (see news examples of an IEEE Fellow at UIUC and Senior Member at Waterloo).

- **McArthur Fellowship** are also known as the *"Genius Grant"* and given to individuals who have shown exceptional creativity in their work and the promise for more in the future.

- **Turing Award** is the *highest honor* in CS for lifetime achievements and contributions to the computing community. It comes with a $1M prize and is often called the *"Nobel Prize of Computing."*.

"It is highly noteworthy that [redacted] has earned two 10-year test-of-time awards for [redacted] papers [redacted]. Senior computer scientists count themselves fortunate to earn even one such award at some point in their careers, but it is highly unusual and commendable that [redacted] has earned two of these awards already, less than ten years after completing [redacted] PhD ..."

Fig. H.2: LoR for a junior faculty written by an ACM and IEEE Fellow (some texts endacted for anonymity).

CSRankings (§K) also highlights if an individual is an ACM Fellow or Turing Award winner. Note that these individuals might no longer be active in research and therefore do not have many recent publications.

Influential Paper Awards *Test of Time, Most Influential, and Impact Awards* are given to papers that were published 10+ years ago at a top venue and made a lasting contribution to their area of research. In other words, the work described in these papers have stood the *test of time*. Typically, these papers are highly cited and have inspired many follow-up works. Note that these paper awards are different than Distinguished or Best Paper awards, which are given at the conference and therefore might not be as well-known or influential.

Note that while typically given to senior researchers, some junior faculty have received these highly prestigious awards for their work as shown in Fig. H.2.

H.2.3 Industrial and Other Awards

CS faculty also aim to win awards from industry, which can be a sign of their impact on real-world applications and industry relevance. Some well-known ones include:

- **Amazon Research Award (ARA)** Typically open twice a year for a wide-range of research areas. It also comes as a gift of up to $80K but is highly competitive as it is open to all researchers (not just junior faculty in the US, like the NSF CAREERs).
- **Google Scholar Award** This award is given once a year for a wide-range of research areas in CS . It is only for junior faculty (within X years of their PhD) and is given as a gift.

There are also many awards from others companies and organization but only in specific areas relevant to their business, e.g., Sony, Samsung, Comcast, Ethereum Foundation. There are also awards given to a specific list of universities selected by a company or organization (e.g., faculty awards from Intel and Qualcomm, and Packard Fellowships). While these awards are not open to all researchers and face

less competition (e.g., compared to the ARA from Amazon which attracts a huge number of applicants from all over the world), they still show the faculty's impact and connections in the industry.

Appendix I

Writing in LaTeX

"Coming to the book fair sure was a great idea. 'Cause you can't write if you don't know what the competition is up to."

The Simpsons

When you're applying for PhD programs or fellowships (§G.1) such as the NSF GRFP or DOD NDSEG, you will need to write a personal statement, research statement, and CV. Instead of MS Word, you should strongly consider writing your statements (and even CV) in LaTeX (and compiled to pdf's, which are then uploaded to the application system). In CS and many other STEM fields, LaTeX is the de facto standard for writing documents—papers, proposals, dissertations, and letters. This book, for example, is written in LaTeX.

Most CS faculty are used to seeing formatting that LaTeX produces, and many find Word's default left-aligned, uneven layout distracting. While reviewers will not penalize you for using Word, subtle irritations can affect how they read your writing—after reading dozen of applications, these small things add up. Given that LaTeX is free and easy to use (e.g., see Overleaf), it is worth the effort to learn. This is a small, easily fixable detail that indicates that you understand and respect the academic and technical culture you're trying to enter. Paying attention to these details can only help your application!

Listing I.1 is a very basic example of a LaTeX document with 11pt font and 1-inch margins. You can start with this and modify it.

Listing I.1: A simple LaTeX document.

```
\documentclass[11pt]{article}
\usepackage[margin=1in]{geometry}
\begin{document}
...
\end{document}
```

Appendix J

Academic and Cultural Differences

"As intelligent as you are, you have to learn to appreciate other points of view."

THE SIMPSONS

This section lists some general academic and cultural issues that students, especially international ones, might want to pay attention to.

J.1 Academic Integrity (Cheating and Plagiarism)

Plagiarism and cheating (e.g., exams and assignments) are a BIG no-no in the US. If you're caught cheating, you will face serious consequences and likely be expelled from the university (e.g., after the second time at GMU). This is quite different from many international countries where cheating is common and often tolerated. Faculty is extremely good at detecting cheating (we have been dealing with these situations so many times over so many years), and *will* report cheating cases. In short, whatever you do, don't cheat—not worth it!

Here are the typical steps that will happen if you are caught cheating (e.g., on an exam or assignment): (i) a faculty suspecting a cheating case will report it to the Office of Academic Integrity (OAI) at the university—the report often has supporting evidence, e.g., a copy of the exam or assignment; (ii) OAI will investigate the case, e.g., by interviewing the student and faculty, and checking the evidence; (iii) OAI will make a decision, e.g., whether the student is guilty or not; and (iv) if guilty, OAI will decide on the punishment, e.g., a failing grade for the assignment or exam, a failing grade for the course, or even expulsion from the university, especially for repeat offenders.

It is important to note that *after* receiving the report from your prof., OAI *completely* takes over and makes its decision. This means begging your professor will not help because they simply are no longer involved in the case and cannot do anything. This is because OAI is an independent office above your prof and

depatment that handles all academic integrity cases at the university, and they have their own procedures and policies. If you are found guilty, you can appeal to OAI, but not to your prof. or department.

J.2 Illegal Software

Using illegal/cracked software is very common in many countries (and even in the US). However, *do not* install or use them on university computers, even those given to you by your adviser. It is unlikely that the university will track you down, but it is the *software company* that will. They have very sophisticated tools to detect illegal software and will sue your university/department. Imagine your department or adviser being sued for a large sum of money, and it is *you* who caused it. If you need to purchase software, ask your adviser or the department (§10.4).

J.3 Costly Gifts

In many countries, it is customary to give professors costly gifts—such as fancy liquors, jewelry, or even an envelope stuff with cash during the holidays or special occastions. It's meant to show respect and appreciation (or let's be honest, an attempt to get better grades or recommendations). Understandbly this is a cultural norm in many countries, and professors and students are used to it. However, in the US, this is can be considered *widly inappropriate* and strongly discouraged. Given your profs. these gifts will make them feel very uncomfortable and in many cases they are required to report them to the university.

However, that doesn't mean you can't show your appreciation. In fact, small, personal tokens, like small souvenir from your country, a fridge magnet, keychain from your hometown, or even just simple thank-you hand-written card, are very welcomed. Some professors proudly display their gifts, which can come from students and colleagues (e.g., when they travel to their home countries or conferences). In summary, small gifts are fine, but avoid anything that might make your professors uncomfortable.

J.4 Maintaining Good Relationships with Your Profs.

There's a misconception that in the US it's all business, with professors as bosses who pay students for their work and that lab mates are just work colleagues; and that doing nice things means expecting something in return.

However, the reality is quite the opposite. While people can be straightforward and appear "cold", they are also informal, friendly, and very caring (in ways that might surprise you). With lab mates and colleagues, you will often work and go to lunch together, confide in each other, help each other navigate the academic journey,

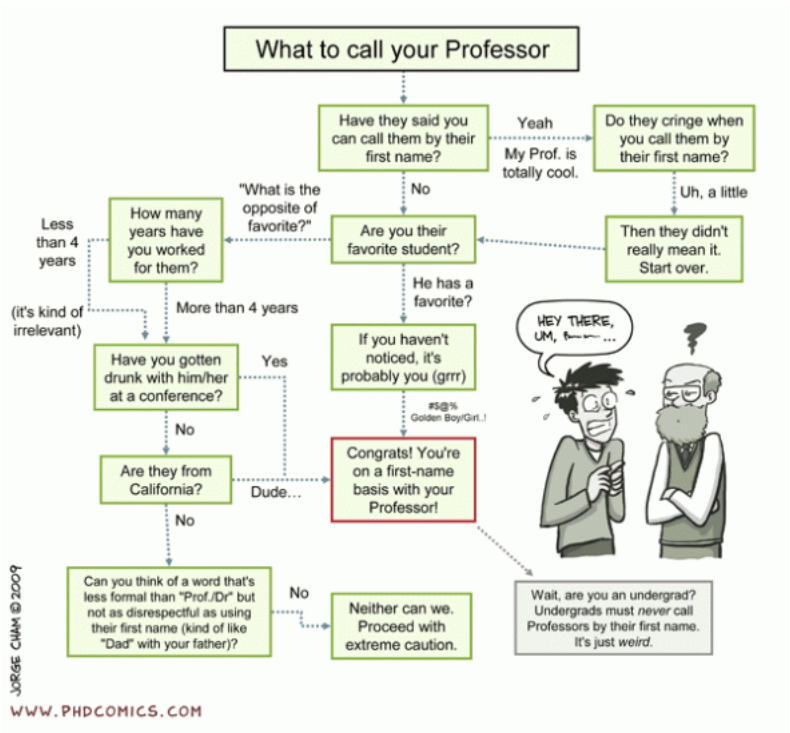
and often become lifelong friends. With your professors, you can call them by their first name (§J.5), disagree with them and argue (and gain respect doing so), seek their help (even on personal matters), come to their houses for parties or gathering (e.g., my lab always come to my house for Thanksgiving), and give them small thoughtful gifts that they proudly put on their desks (§J.3). Many people maintain lifelong relationships with their professors and colleagues, staying in touch through cards, emails, and visits, even after they no longer work together.

I maintain a close relationship with my former professors and mentors. When there is a new event in my life (or theirs), I often email them or call them, e.g., when I get married, have a new baby, new job, etc. I think this does not bother them a bit; they are genuinely interested in knowing and helping solve these "dramas" in my life.

I also visit my former professors when I am in their area. I meet Thang Bui (my MS adviser) at least once a year when I come back to Harrisburg to visit my parents. When Steph was in DC for a meeting, I invited her to give a research talk at GMU. I have also collaborated with them after I graduated e.g., I recently got an NSF grant with Deepak.

In short, while I am a bit closer to my former advisers and mentors than most people (e.g., I still keep in touch with my middle school teacher), it is always a good idea to maintain a good relationship with people who have helped or worked well with you. A simple, short email or text once in a while (e.g., a *"Hi X, I heard you just got promoted ... Congrats!"*) would suffice. They will appreciate it, and you never know when you might need their help.

J.5 How to Call or Address a Professor?



If you're reaching out to a professor for the first time, address them as Prof. or Dr. Lastname (if they do not have a PhD, then use Prof.). Many international students use Prof. or Dr. FirstName LastName, but this can come across as if you're simply copying and pasting names. So just stick with Prof. or Dr. Lastname. Using Prof. is generally the safest option.

Furthermore, do not use Mr., Mrs., Ms, or Miss. This rarely happens, but I have seen new students (e.g., undergraduate freshmen in the US) sometimes use these, which are used in K-12 schools but not in higher education.

Moreover, do not call the prof. by their first name at first. As you become more familiar with your prof and depending on their preferences, you may transition to addressing them by their first name. For example, I prefer that my students and colleagues call me Vu. Some students call me *Dr. Vu*, which I find a bit amusing but am totally fine with it.

Kapur: I was amused to read this as if I recall correctly, you never called me by my first name when you were at UNM. You always called me Prof. And, many times, I would jokingly call you back as Prof. Vu.

Vu: Yes, for some reason I enjoy calling you "Professor" (without appending a last or first name). The use of Prof. Vu may have foreshadowed my future in academia.

Note that in some universities the formal title Dr. Lastname is preferred over Prof. Lastname. Moreover, be aware that not all faculty members hold a PhD[1], in which case using Prof. Lastname is a suitable alternative. You just need to observe and follow the conventions at your particular institution. One way to determine how to address a prof. is to observe how they sign their emails or how they introduce themselves in class. For example, I introduce myself as "Vu" in class but I do not sign my emails. You will get used to it after a while!.

Referring to Professors You Know When referring or talking about a prof (e.g., your mentor) that you know, you can just informally use their names if they are OK with it as mentioned above (or Dr./Prof., if you want to be formal). You can also include their institution if it makes it more precise. For example, I can say: *"I did my postdoc with Jeff Foster at Univ. of Maryland"*.

Do not include ranking (§14.2), e.g., Assistant, Associate, Scientist, ..., when referring to someone. I see many international students include a lengthy title of people they know, e.g., *I am advised by Asst. Prof. X, and I also collaborate with Distinguished Scientist Y.*

This is *not necessary* and makes it look like you're trying to show off your connections. These nuances represent some cultural and academic differences in the US that you may encounter but will gradually adapt to.

J.6 Miscs

Here are some other common surprises for international students in the US. Note that I skip topics involving politics, religion, tax, and racism as these happen in many countries and are not unique to the US.

Small talks People often engage in small talks, e.g., about the weather, sports, or weekend plans. This is a way to start a conversation and how social interaction starts in the US.

However, avoid asking personal questions, e.g., about salary, age, relationship status, or health, as these are considered private. Talking about kids' activities or

[1] At many places, including Mason, the requirement for adjunct faculty (§14.2) is a PhD or an MS with significant industry experience.

schools are OK. Also, do not talk about politics or religion. In fact, we often do not talk about these subjects with our family and friends to avoid conflicts.

Sometimes foreigners are surprised by how Americans do not talk about their personal lives, e.g., sharing details about their families, health, or relationships, and that their conversations are often not very "deep" or "mind-provoking". This is just a cultural norm about privacy and personal space.

Healthcare System You (and your spouse) will need health insurance! Otherwise you will be charged a lot for healthcare services when you need them. However, as mentioned in §12, your TA/RA (and fellowships) will cover health insurance. Your spouse/children also get health insurance or significant discounts under your plan.

Note that even with insurance, heathcare services might still be expensive. So you should know what your insurance covers and be prepared for unexpected costs. Moreover, healthcare system has many confusing jargons such as HMO, PPO, deductibles, co-pays, and coinsurance (try take a look at the Explanation of Benefits or EoB statement you received from your insurance company). It's arguably the most complicated system in the US and even Americans often do not understand it (and politicians often exploit this to their advantage). Do not hesitate to ask your HR or the insurance company for help.

Tipping Culture Unlike many other countries, tipping is expected for various services, especially in restaurant. So adding an extra 15–20% to your bills is common, especially in restaurants.

You should also tip other services, e.g., Uber, taxi, haircuts, and hotel services. The minimum wage for tipped employees is lower than the standard minimum wage, so tips are an important part of their income.

Car Dependency Most places in the US are highly car-dependent. If you do not have a car, you will need to rely on friends, Uber, or public transportation, which can be inconvenient and time-consuming. Many international students end up getting a driver's license, which is highly convenient and replaces many documents (e.g., ID, passport), and eventually buying a car.

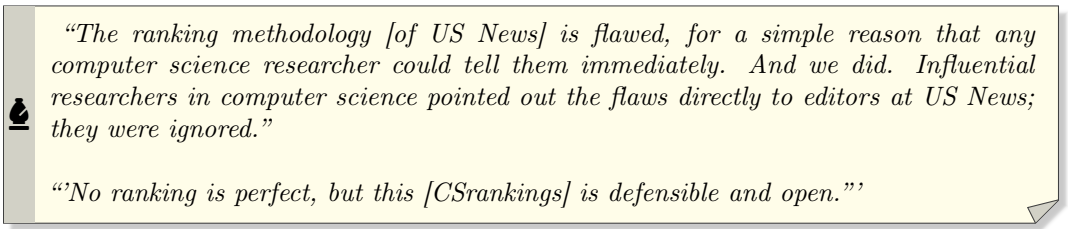
Appendix K

CSRankings: Rankings of CS PhD programs

"The whole damn system is wrong!"

THE SIMPSONS

When researching where to do a CS PhD, many students use rankings like the U.S. News & World Report. However, these widely publicized rankings are often criticized by CS researchers (e.g.,Fig. K.1) for their lack of transparency and relevance. In contrast, data-driven open source ones such as CSRankings.org are increasingly used by faculty and PhD students to assess the true research strengths of CS depts.



"The ranking methodology [of US News] is flawed, for a simple reason that any computer science researcher could tell them immediately. And we did. Influential researchers in computer science pointed out the flaws directly to editors at US News; they were ignored."

"'No ranking is perfect, but this [CSrankings] is defensible and open."'

Fig. K.1: https://www.theexclusive.org/2017/11/cs-rankings.html, Charles Sutton (Google Deepmind).

K.1 What's Wrong with Popular CS Rankings

Popular college rankings such as the U.S. News & World Report or QS World University Rankings are often based on subjective criteria—such as reputation, faculty credentials, and student satisfaction—and are not transparent—how scores are calculated is often not disclosed. CS research community has long questioned and discouraged the use of these rankings. For example, the Computing Research Asso-

ciation (CRA)—a highly respected organization in CS—issued a sharp critique of the U.S. News & World Report's global rankings for CS depts, calling the methodology *"deeply flawed and misleading"*[1]. Among many issues, the CRA highlighted that the rankings rely heavily on journal publications indexed by the Web of Science, ignoring conference publications—despite conferences being the primary venue for publishing top-tier CS research (§H.1.1).

In short, rankings from sources like US News are mainly used high school and undergraduate students (or their parents) who are not familiar with CS research or PhD study. Those who know the field best—CS PhD students and faculty and researchers—largely discard them.

K.2 CSRankings.org

Instead of traditional school rankings, many PhD students and faculty use CSRankings.org, which is a ranking system based on faculty publications at top CS conferences. The metrics and ranking calculation are transparent and ranking results are updated automatically (after the conference proceedings are indexed in DBLP). Because the approach is entirely data-driven, it is not influenced by any subjective opinions or biases, and very difficult to manipulate. The number of Github pull requests by CS faculty (in fact, even non-CS faculty) to be included in the rankings is a good indicator of the impact of the rankings.

Geometric Mean CSRankings uses the *geometric mean* to summarize the performance of a department across multiple disciplines. The score for each department is calculated as follows:

$$\text{averageCount} = \sqrt[N]{\prod_{i=1}^{N}(\text{adjustedCounts}_i + 1)}$$

where N is the number of fields (e.g., OS, Cryptography, ML, PL) selected, and $\texttt{adjustedCounts}_i$ is the number of papers published by faculty of that department in a field i. CSRankings thus favors departments that publish in multiple fields. For example, a department that has 10 papers in each of the 10 fields will have a higher `averageCount` ($\sqrt[10]{11^{10}} = 11$) than a department that has 100 papers in one field and 0 in the others ($\sqrt[10]{101 \cdot 1^9} = 1.59$). This is because the geometric mean is designed to favor departments that have a balanced distribution of publications across multiple fields, rather than excelling in just one field.

Note that CSRankings allows users to select the fields they are interested in, so the `averageCount` can be calculated based on a subset of fields. For example, if the student is only interested in field X, then the `averageCount` will be $\sqrt[1]{101} = 101$. More details and justfication for this metric can be found in the CSRankings FAQ.

[1] https://cra.org/cra-statement-us-news-world-report-rankings-computer-science-universities/

Tab. K.1: The top 50 CS programs in the US (CSRankings.org, Jan. 2025). * indicates that the university has Vietnamese prof. that can advise CS PhD students.

1	Carnegie Mellon	26	Northwestern University
2	Univ. of Illinois at Urbana-Champaign*	27	Pennsylvania State University
3	Univ. of California-San Diego	27	Univ. of California - Riverside
4	Georgia Institute of Technology	29	Univ. of California - Santa Barbara
5	MIT	30	Duke University
6	University of Michigan - Ann Arbor*	30	Rutgers University*
7	University of Washington	32	University of Utah
8	Univ. of California - Berkeley	33	George Mason University*
9	Cornell University	34	Texas A&M University*
10	University of Maryland - College Park	34	Univ. of California - Santa Cruz
11	Stanford University	36	North Carolina State University
12	Northeastern University*	37	Ohio State
13	Purdue University	37	University of Virginia
14	New York University	37	Yale University
14	University of Texas at Austin	40	Boston University
16	Princeton University*	41	Univ. Of California - Davis
16	University of Pennsylvania	42	Brown University
18	Columbia University*	42	Harvard
19	Univ. of California - Los Angeles	42	University of Illinois at Chicago
20	University of Wisconsin - Madison*	45	Arizona State University*
21	University of Southern California	45	University at Buffalo*
22	University of Massachusetts-Amherst*	45	University of North Carolina*
23	University of Chicago	48	Oregon State University*
24	Stony Brook University*	48	Rice University
25	Univ. of California - Irvine	48	University of Colorado-Boulder
		48	University of Minnesota

Selecting Faculty Another useful feature of CSRankings is that you can filter faculty by research areas to find who are active in your area of interest. For example, if you are interested in ML, you can select ML and see departments and faculty members active in ML. You can also see the number of papers published by each faculty in that area, and their publication counts in recent years (e.g., 2020–2024). This is useful for finding faculty publish frequently in your area of interest and gauge their productivity (§H).

K.3 Top CS Programs in the US

Tab. K.1 lists the top 50 CS programs from CSRankings. For the most up-to-date rankings, visit the website directly.

Appendix L

About

L.1 About This Book

History This book was conceived during a lunch with a faculty at GMU. We talked about why GMU was not able to attract good Vietnamese and other international students, despite having a much stronger CS program than many schools that these students want to go to (part of the reason is described in §13.2). We wish there were a way for international students to know about PhD programs in the US.

I am also a member of the large VietPhD group on Facebook and often browse Internet forums (e.g., Reddit/gradadmission and GradCafe). There I saw many questions from students about PhD programs. However, most participants are students, many of whom in non-CS fields or not in the US, and their answers are typically not accurate and often lead to more confusion. So I thought it would be useful to have a handbook that is specific to CS PhD programs in the US from an insider perspective.

I started writing this book in May 2023 and have been updating it since then (mostly around deadline time when I procrastinate, i.e., *productive procrastination*!). The book was initially intended for international students but has been updated to include domestic students (§C and §G).

L.1.1 Who Is This Book For?

While this book can be useful for all students, it would most benefit *international students* from *smaller countries and less well-known universities*. It is also useful for *domestic students* from small US universities with no PhD programs or limited research opportunities (§E).

Students from top schools with strong research programs and experience might already know some of the information in this book. They likely have received guidance from their professors or grad students who have gone through the process. Students from smaller schools or countries, however, might not have access to such

resources and know where to start. My goal is thus to level the playing field by providing info that is not readily available to less privileged students. *I hope to encourage more students with such backgrounds to apply and succeed.*

I was a first-generation PhD student and was very much on my own navigating the admission process—there was no one to ask for help, no Reddit or Facebook. This book is my way of helping students who are in the same situation.

Fun fact: I was the first PhD student in my family and my extended family. My parents were war refugee and did not finish their high school (though my dad eventually got his GED). I was the first one to go to college (Penn State), and then grad schools. I think this inspires my cousins and in total our family have 15+ Nittany Lions, several MS, 2 PhDs (me in CS and the other in Finance), and 1 MD. So, be the first and create a path for others to follow!

L.1.2 Why This Book (Instead Of Others)?

This book aims to be a comprehensive guide to the CS PhD admission process in the US. It is based on my and other contributors' experiences. I also try to explain *the reasons behind the admission process.* While there are numerous resources online that tell you *"what"* to do, few explain the *"why"*—why LoRs matter so much, why you should not draft your own LoR, why you should contact professors, etc. Understanding the reason and mindset of the adcom and profs. can help you prepare better.

This book is a also *personal project* that I continuously update and refine, especially during the admission season. I also work on it when I procrastinate from research or other tasks—it's my way of telling myself that I am still productive! Writing is a relaxing process for me, and I enjoy experimenting with new things in LaTeX (§I). Because of these reasons, this book is thus an ever-evolving project!

Finally, this book is highly *opinionated* and *subjective*, which is both a strength and a weakness (see §L.3).

L.1.3 How to Read This Book?

This book is designed to be read in any order. So you can start with any chapter that fit your current needs and stage in the application process. For example, if you are still in undergrad, then you might be interested in getting research experience (§E). If you are ready to apply, you can read on how your application is evaluated (§2) or funding opportunities (§12). If you are a domestic student, you can look at advice (§C) and fellowships (§G) specifically for you.

Tab. L.1: Chess-based icon system for annotation types

Icon	Label	Description
♟	Comment	Pawns are plentiful; used for comments and side notes
♞	Insight	Knights move in unexpected ways; used for surprising info.
♝	Examples	Bishops are long-range pieces; used for examples and illustrations.
♜	QA	Rooks are straightforward; used for questions/answers
♛	Key Ideas	Queens are powerful; used for summary or key ideas.
♚	Warnings	King is often under attack; used for warnings and cautions.

♟ The angelfish on the cover, wearing a PhD cap, symbolizes the spirit of this book and its message. In an aquarium, the angelfish fish is considered the centerpiece of the tank and stands out from the rest—an important factor for a successful CS PhD applicant in a crowded and competitive pool of prospective students.

I also have angelfish in my aquarium, and they are my favorite. They live the longest and very resilient (e.g., to water quality)—which makes them a good metaphor for PhD prospective students. I also like O'Reilly's books with their animal covers, so I thought it would be fun to have an animal cover for this book.

Notation Tab. L.1 summarizes the notation and icons, inspired by chess pieces, used throughout the book.

L.1.4 Contributing and Supporting This Book

This book will *always be free* and *open source* at

https://roars.dev/phd-cs-us/demystify.pdf

If you spot an error, have a different experience, or want to suggest something, open an issue on the GitHub repo. Community input helps keep this resource current and useful.

Supporting this book You can support this book in many ways. The best way is to *share it with others* who might find it useful, e.g., your friends, colleagues, or students. You can also *link to it* from your website or social media accounts. I was very happy to hear that it has helped many students, especially those from smaller countries—which is the main reason I wrote it.

You can also: (i) leave a review on Amazon and send me a *"Thank you"* note and let me know how it helped you (those messages make my day!), (ii) give it a star on its GitHub repo, (iii) share it with friends, or (iv) buy the book on Amazon—so that I can brag about having a book on Amazon (priced at $7.77—Unix 777 permission and the open nature of the book).

L.2 About Me

I am an associate professor in the CS dept at George Mason University (GMU). Before GMU, I was at the University of Nebraska-Lincoln (UNL). Both UNL and GMU are R1 research universities in the US and have many international students in their CS graduate programs. I work in Software Engineering and Formal Mehods. My research lab website is at roars.dev.

I have been involved the PhD admission process at GMU and UNL for many years. This allows me to have a good understanding of the process, the challenges students face, and what faculty are looking for. Currently I am the program director of the MS program in Software Engineering at GMU (thus also have experience with MS admission, which is quite different than PhD as discussed in §D). I also have served in the panels of PhD fellowships including NSF GRFP and DoD NDSEG, which allows me to provide some insights on external fellowhip applications (§G).

Though I was not an international student, many of my students and collaborators are/were. I also mentor students from Vietnam and have close colleagues and friends who were once international students. I hope to capture the diverse challenges and experiences they've faced in this book so that it can be a valuable resource for prospective international students. Finally, my upbringing in the US provides a perspective aligned with American culture, allowing me to shed light on various issues, particularly those related to cultural differences (§J).

L.3 Disclaimer

This book is inherently *subjective* and *opinionated* based on my experience in PhD adcoms and student advising (§L.2). Such a candid approach is beneficial, because overly neutral advice often fails to address the specific challenges faced by students.

Moreover, since PhD admission varies significantly across institutions, there's rarely a universal "correct" way, and too many choices often lead to confusion. Clear and direct guidance—even if opinionated—can provide practical pathways to help students like yourself to navigate the PhD admissions process better.

L.4 Acknowledgement

Many people have contributed to this work. Profs. Craig Yu (GMU), Hakan Aydin (GMU), Xiaokuan Zhang (GMU), Hung Le (UMass), and Deepak Kapur (UNM) provided valuable input in the early version. Many students including Didier (GMU), Thanh (Melbourne), and Dat (Melbourne) have contributed valuable questions and feedback (§L.1.4).

Also thanks to NSF for encouraging faculty to be creative in research and education, which allows me to work on this book.

Finally, thanks to my wife and kids for always supporting me and putting up with my long hours of work and writing.

September 22, 2025