Demystifying the Computer Science PhD Admission in US Universities

A Guide for International Students

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Abstract

Having been involved in PhD admissions for many years, I've realized that many **international students**, especially those from smaller countries like Vietnam, lack a clear understanding of the Computer Science PhD admission process at US universities. This confusion not only discourages students from applying but also creates the perception that getting admitted to a CS PhD program in the US is difficult compared to other countries.

So I want to share some details about the PhD admission process and advice for those who are interested in applying for a **PhD in Computer Science in the US**. While this document is primarily intended for students interested in CS, it may be relevant to students from various disciplines and should be Furthermore, although many examples are specifics for schools that I and other contributors of this document know about, the information should be generalizable to other R1[1] institutions in the US (though *very* top schools could be very selective, e.g., see the admission process at CMU).

In addition, this document can help **US faculty and admission committee** gain a better understanding of international students and their cultural differences. By recognizing and leveraging these differences, CS programs in the US can attract larger and more competitive application pools from international students.

I wish you the best of luck. And if you follow this guidance, you will at least have a good chance at GMU (see why you want to study at here). Happy school hunting!

The latest version of document is at https://nguyenthanhvuh.github.io/phd-cs-us/demystify.pdf and its LaTeX source is on Github. If you have questions or comments, feel free to create a GitHub issue for discussion.

Contents

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[1]An R1 institution in the US is a research-intensive university with a high level of research activity across various disciplines.

0 Summary

Here we summarize the main points of the document. This allows you to quickly skim through the document and decide which parts you want to read in detail.

1. Should you apply to a PhD in CS in the US?

   - *Yes, definitely.* CS PhD study in the US is fully funded and admission into good universities is not any harder than non-US schools (§1).

2. How is your application evaluated?

- Applications are evaluated by the *PhD Admission* committee and each application is reviewed by typically 3 faculty (§2).

- Individually faculty *cannot directly admit* a student—so do not email and ask if you have a chance. However, faculty can *advocate* for a student and therefore increase their admission chance—so contact and introduce yourself (§6.2.3).

- The committee will look at various factors, but the most important ones are research ability, e.g., publications, and recommendation letters.

- LORs are important, but only if they are personalized and talk about your research ability (§3.2).

- GRE *is not* required by most schools (§3.5).

- Grades are important, but only if your school is well-known (§3.5).

- Personal statement is very important. Write it in such a way that makes you *stand out* (§3.3 and §7.1)

3. What to do after getting admitted?

- Attend *Open House* to learn more about the place and *interview* profs—they would be much more willing to talk to you now (§4).

4. Funding

1   Should You Apply to do a PhD in CS in the US?

> Don't make fun of graduate students.
> They just made a terrible life choice.
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> ———————————————————————
>
> The Simpsons

First, I want to emphasize that PhD students in Computer Science *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* to support your study, including tuition, health insurance, and stipend (monthly salary). Moreover, depending on the university, you may even receive additional benefits such as summer pay, laptops, (conference/workshop) traveling. §5 provides more details on funding.

Second, I believe that applying to a good US university *should not* be any harder than at schools in other countries. If you believe you have a chance in other countries, e.g., South Korea, Singapore, Germany, UK, Japan and Australia, then you will surely have a chance in the US as well[2].

> **Vu:**   One of the reasons I create this document is that my colleagues at GMU are interested in recruiting Vietnamese students and are surprised when seeing very few applications in Vietnam (e.g., each year our CS program receives more than 350 PhD applications, most of which are international but only 3–4 are from Vietnam). In general the number of CS PhD applications from Vietnam to US universities is low and more would be welcomed.

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[2]§7.5 compares CS PhD study in the US to other countries.

2 How is Your Application Evaluated?

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

After you submit your PhD application (usually December 15), it will be first screened for general requirements, e.g., did you submit your transcripts and standard scores? did your reference writers submit their letters?

Then, applications are reviewed by a **PhD admission committee** that consists of faculty members in CS (in some cases the committee can involve affiliated faculty from different disciplines). These faculty have a wide-range of expertise and background to ensure diverse perspectives in the evaluation process. The size and the review load of the committee depends on the department size. At GMU, the PhD committee typically has 15–20 faculty, and each committee member is assigned from 25–30 applications. Note that GMU, UMass, and probably many other schools, have separate committees for MS programs.

Each application is then assigned to about *three* faculty members, who will evaluate your profile and reach a consensus. Note that while the assigned reviewers are likely the main ones deciding your application, *every* faculty in the department will have access to your application and can provide inputs and opinions on your profile.

In many cases, the PhD admission committee involves assistant professors in the department. This provides junior faculty the opportunities to recruit students. The chair of the committee will be a senior professor, but they likely 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.

At GMU, we usually decide that a full-time PhD candidate is either (i) admit with funding (TA or RA) or (ii) rejected. In other words, in most cases, we either admit you with full funding, or we 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 grants). We also justify our decision with a summary of your application, where we list strengths (e.g., a well-known school) and weaknesses (e.g., weak LORs).

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.

Why we do not waive application fee? This 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.

In my opinion, requiring applicants to pay the fee helps ensure their seriousness, as it filters out non-serious candidates. Also, if the application process were free for everyone, we would receive an overwhelming number of applications to review.

3   Application

The primary focus of the admissions committee is to **evaluate your background and interest in research** since a PhD in Computer Science and determine if you would **fit into** the program. To evaluate your profile, we consider the following key indicators, listed in order of importance.

3.1   Research Ability

The most effective evidence of research ability is having **published papers in reputable international journals or conferences**. Having published good papers is a sign that the applicant has successfully involved in research.

It's important to aim for the top venues in your field. You can find top CS conferences at places such as CSRankings, which ranks CS programs based on how their faculty publish at top *conferences* (see more in §9). Local conferences and non-English journals or conferences do not carry as much weight since their quality is often unknown to US faculty.

However, I understand that many international students do not have the opportunities to publish in top places, so general confs/journals would suffice. But be sure to upload your papers with your application and talk about them in your statement (see §3.3).

> **Vu:**   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 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 sometime in your statement to discuss the significance of your papers.

> **Craig:**   GMU and many other universities allow you to upload your published papers and other writing samples. 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.

Additionally, **work experiences at renowned research laboratories**, such as Microsoft Research, can significantly strengthen your application. Unfortunately, many good research places in your countries, e.g., VinAI in Vietnam, remain relatively unknown to most universities in the US. So you should explicit say something about them in your statement.

> **Hung:**   The reputation of VinAI has been increasing steadily over the past few years; many of my colleagues heard about VinAI.

Finally, **participating internationally recognized competitions** can also 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" stuff, e.g., software analysis.

3.2   Letter of Recommendation (LOR)

CS PhD programs will require at least **two LORs**. Having a letter from an internationally recognized researcher can greatly strengthen your application. However, obtaining such letters can be challenging for international students, who might not have much interactions with such experts. So it is acceptable to have a letter from professors that know you well enough to talk about *your specific research experience and capabilities.*

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Many students have letters written by themselves and signed by their professors. These have little values. We can recognize them and will consider them weakness. Similarly, many professors write generic letters for students, e.g., the students didn't do any research or make any impression for the professor to write about. These letters are also not useful and considered weak.

Many students get letters from supervisors from companies where they did internships or are working at. It is OK as long as it is a research-based personalized letter (once again, we are talking about PhD applications, not MS).

For Vietnamese students, it's worth mentioning about the VEF2.0 program, which has helped many good students in gaining acceptance to top PhD programs in the US. VEF2.0 follows an interesting model where US faculty members from leading institutions are invited to conduct rigorous interviews with VEF students and subsequently provide reference letters on their behalf. Despite the limited interaction between the interviewer and the interviewee (primarily confined to the interview itself), the impact of these reference letters can be positive as they have helped many students getting into top PhD programs in the US.

> **Didier** *Should letter writers have PhDs?* In Rwanda, a lot of students interact more with teaching faculty who might not have PhD.
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> **Vu**: In general, at least one writer should have PhD to properly evaluate your research ability. However, I think this is an interesting and useful detail that US faculty might not be aware of and students should mention about this in their statements.

3.3 Research or Personal Statement

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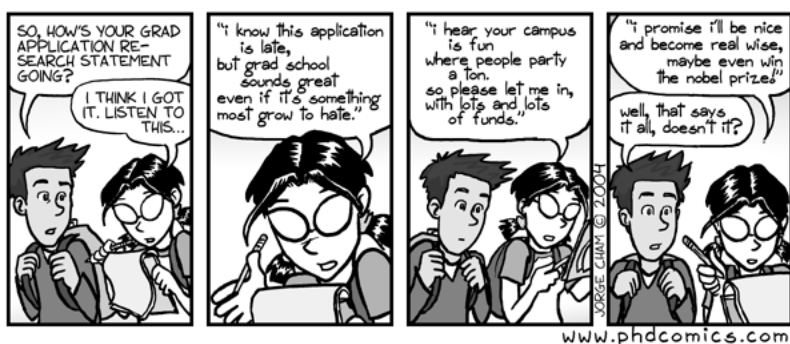
While you might not have control over LORs or where your go to school, you do over your statement! So write it well because it could make a big difference. In your statement, you have the opportunity to make make your application stand out and unique, which can make you *fit* the CS program you're applying to, even if you don't have very strong research experience. A well-written LOR 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 §5).

There are various guides on writing statement, e.g., [1], and many example statements are available. So I will not talk too much about statements. In short, talk about your research goal and vision, and convince us that you can achieve it through your experience, e.g., published papers, or if you work on some projects by yourself, talk about it. Also, use the statement to talk about stuff that admission committee members might not know about, e.g., your Github project with 1K+ stars or your regular contributions to well-known open-source projects. Finally, talk about what makes you different than the other 1000 applicants that we are reviewing (e.g., see §7.1 for increasing your admission chance).

> **Hung:** I think asking for a "research vision" from a Ph.D. applicant is too much. Even people graduated with a Ph.D. have a great difficulty in explicating their researh vision. In my opinion, you should focus on showing (not telling) your research passion (if you do have).

Finally, this is something easy to do, but is neglected by many applicants: **customize the statement** for the school you're applying to, e.g., why do you apply *here*? provide names of professors who you're interested in (in many cases your application will be forwarded to them for

evaluation). This shows that you're serious and have done homework on places you're applying to. Admission committee will look for this part at the end of the statement, so do not skip it.

> **Vu:** I often read the research statement (and the LORs) first. If I am persuaded by then, I would skim over other factors and advocate for admission (unless I see red flags in other parts). If I am not convinced, then I will likely recommend rejection (unless I see something standout in other parts).
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> Do careful research on professors, don't mention *emeritus* or adjunct faculty. Also, be careful not to send statements to wrong schools or mixing facts (e.g., talking about school X but mentioned about working with profs. at school Y; and definitely do not talk about George Washington when applying to George Mason). I have seen such statements more time that I should.

3.4 Your School

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

So what can you do about this? several things including asking your CS dept to put itself on CSRankings (it's the easiest way to get CS people to know about the school and its CS faculty) and explaining about your school in your statement (ask your LOR writer to do that too). Of course, if you're interested in working with Vietnamese, consider CS PhD programs in the US that have Vietnamese professors.

> **Vu:** Sometime PhD admission committee in the US will share a document such as this one, which lists the top schools in several countries. In some cases we ask other faculty and students if we think they know about the place. For example, when I was a postdoc at UMD, people in admission committee ask 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 provide 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.

3.5 Grades/GREs

Having good grades is important, but unless your school is well-known, having top grades or rankings usually will not help. This is simply because we cannot evaluate them.

This can be an issue for students in many top international universities where the competition is so high that very good students students can still have low rankings from these schools (and be overlooked by the admission committee). So what to do with this? well, same as before, e.g., put a note about this in your statement and ask your LoR writers to talk about it.

Note that while having good grades at unknown school might not help, having very bad grades will be red flag (unless your LORs or statement give a proper explanation). This is especially true if you have bad grades in relevant courses (e.g., Math and CS).

> **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, an 3.5 GPA students from such talented programs are typically much better than a 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 economical universities. These make gaining admission in the US difficult as US faculty are not familiar with these issues.
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> **Vu**: Vietnamese students and even faculty often lament how this competitive/low-grading system hurts Vietnamese students when applying abroad. One way to mitigate this is making these issues known to admission committee in your statement. 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.

GRE Most good CS PhD programs in the US **no longer require GREs**, so you don't need to take them. However, they might be useful for international students from programs we are not familiar with. If you have good GRE scores then you should include them in your application.

English Test Unless your degrees are from specific countries such as these, you will need to take standardized English test. Just do well enough to pass minimum requirement set by the university, which nowadays has many options for you to select from.

> **Vu:** The minimum for GMU (being above this might not mean much, but below is a red flag).
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> - GPA: ≥ 3.0 in your undergrad (but we also consider the rank/prestige of your school)
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> - GRE: not required, though it can help boost your profile
>
> - English requirement tests (one of the below)
>
>   - TOEF: 88 pts in total AND ≥ 20 points in each subsection OR
>   - IELTS: ≥ 6.5 OR
>   - DuoLingo Graduate English: ≥ 120 OR
>   - Pearson Test of Academic English: ≥ 67

3.6   CV/Resume

The CV/Resume should provide a summary of the applicant's achievements. It should allow the reviewers to quickly scan to identify standout achievements (e.g., Publications, Programming Competition Awards, Teaching Experience).

3.7   Interview

Sometimes a faculty wants to interview an applicant to make a decision. Typically, this means that they are considering admitting you. If they are not interested in your application, they will not proceed with an interview.

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. In addition, during the interview, you will have the opportunity to ask questions about the university. It's essential to prepare some thoughtful questions, similar to a job interview.

> **Vu:** At GMU, we 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 potentials and want to advocate for their admission. Without the interview, such applications may be more likely to be rejected. Overall, being selected for interview means a very good chance of being admitted.

4   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 March you should hear back from most PhD programs you applied to . If you haven't heard back, reach out via email and ask about the status of your application. 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! You will have to make your decision by around April 15.

Most schools will have **Open House** events, which are a great resource to learn about the school, department, faculty, research, living, etc. During the Open House, you get a chance to talk to individual faculty and current students. Take notes of faculty who make you excited, count those that are taking in new students (if they meet you, likely they are considering new students!). Talk to students about their advisors, the dept, the area, funding situation etc. Ask about anything you want to determine that they deserve *you*.

In summary, if possible, attend the Open House. Even if you can't come in person, you still can attend virtually and meet with individual faculty.

> **Vu:** GMU has *Virtual* Open House (VOH), e.g., https://cs-gmu.github.io/cs-phd-voh-s23/, which I've co-organized in the last two years. 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.

5   Funding

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

As mentioned, 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 PhD 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 department for you to help with teaching. Finally, fellowship is an independent funding that can come from a school, a company, or an organization. Tab. 1 summarizes the differences.

Tab. 1: Different types of PhD funding

	TA	**RA**	**Fellowship**
From	School	Profs.	School/External
For	Teaching Assistant	Research	Research
Tuition/Ins./Stipend	Yes	Yes	Yes
Cover Summer?	No	Maybe	Yes
Pros	Research Freedom	Get to do research	Research Freedom
Cons	Teaching Duties, Uncertain	Research Restriction, Uncertain	Competitive, Limited

Note that funding is typically more available for PhD students than Masters. Undergraduates typically have no funding and also have to pay international tuition, which is very expensive!.

5.1   Graduating Assistantship (TA/RA)

The most common type of funding is **graduate assistanship**, 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), and most importantly, your stipend (i.e., your salary). Some universities also pay insurance for spouse/children (or give very good discount).

Several things about stipends. First, the amount of stipend depends on the university, which in turn depends on various factors such as location (e.g., a stipend in Washington DC is likely higher than in Lincoln, Nebraska due to higher living cost). Second, a school year is typically 9-month in the US, so stipend is for 9 months (so divide by 9 for each month). Third, like most source of income in the US, you will have to pay tax on your stipend. Fourth, CS department typically has higher stipend comparing to other study fields. Finally, private universities might pay more for stipend (but they could have higher "activity" or some other hidden fee, or you may be required to pay fees for each credit hour).

Students often complain their stipend being too low, but it is actually not bad and you can live comfortably with it. In many cases, it is enough to support your spouse and kids (many CS PhD students have their spouse and kids with them). So don't worry too much about stipend. If you're admitted to a good CS PhD program, you will be fine. A good school would know that it has to be competitive, otherwise it will loose good students to other schools. For example, at GMU, every year we discuss about improving the benefits, and especially stipend, for our graduate students.

For a full breakdown of how much a graduate student costs, see §7.7.

Vu: TA and RA at GMU have similar benefits in tuition waiving and insurance. The college and department will set the rate for 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 stage of the student (1st year vs ABD[a]) and the prof.

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[a]All but dissertation: really close to graduate.

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

5.1.1 Teaching Assistant (TA)

TA is common in the beginning when you haven't found your advisor who would pay you RA. As a TA, you spend up to 20 hrs/week and help professors with their classes (e.g., grading or teaching labs/recitation). Your TA is paid through the school/department, i.e., they hire you to help teach. During a semester, a TA might work with several courses and professors (not necessary their advisor). TA funding typically is not available during the summer, which has much fewer courses.

How to get TA? Unless you have other funding such as RA or Fellowships, TA is typically a default thing for good CS PhD programs. When you apply to be a full-time student, state that you need financial assistant. It is common that the PhD committee will either admit you and give you GTA, or reject you; i.e., we do not admit a student without supporting them.

> **Vu:** At GMU CS, students admitted with TA have 4 years of GTA guaranteed and also receive stipend for the **first** summer.

Even if you have other funding and do not need TA, you still should do TA at least once. This allows you to see what teaching is like, which is especially helpful for 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 also get paid more (as a lecturer).

5.1.2 Research Assistant (RA)

RA is provided through a professor through their own 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. §7.7 gives more details on RA budget.

How to get RA? When a professor recruits you, they will likely give you RA right away (e.g., when you apply). A common scenario is that you first get admitted with TA, and then after a year or two find an advisor to support you with RA. See how to contact a prof. in §6.2.3 for research opportunities.

> **Vu:** If you got recruited by a prof., who would give you RA right away, it's very likely you will get admitted. For example, if a prof., even if not in PhD admission committee, wants to work with and funds you, the PhD admission committee will respect that decision and admit you (unless your application has many red flags).

5.2 Fellowship/Scholarship

Fellowship is another type of funding that students can apply for (e.g., from school, industries, government). Fellowships are typically competitive and generous, and gives pretty much all benefits tuition/insurance that a TA/RA has. Moreover, they often give higher stipend (including summer) and open doors for job opportunities (e.g., internship).

In general, fellowship is prestigious, and you will stand out if you get one. Every PhD student has pubs, but only superstars have NSF grad or Microsoft fellowship. In fact, these are so prestigious that even if you didn't get it but make it to the final round, school will still mention you on their website and you still should put it on your CV.

How to get Fellowship? You need to apply for them. The US government has many fellowships, though they would likely require US citizenship or residency. However, tech companies

including Google, Microsoft, Facebook have fellowships that international students can apply for.

Prestigious fellowships typically require a clear and good research plan, so it is a good idea to wait until at least 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.

> **Vu:** At GMU, PhD applicants 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 are not depending on any prof. or TA duties). PhD admission committee members nominate applicants for this fellowship and the committee will vote and give the fellowship to the top 2.

6 Choosing Schools and Professors

Choosing a school and an advisor is clearly one of the most important things in your mind when you apply to and especially when you get admitted. This is further complicated due to cultural differences and unfamiliarity of international students to the US higher education system. This section aims to mitigate some confusions and help you make informed decision.

6.1 Universities

We will first discuss about universities in the US that offer PhD in CS.

6.1.1 Schools that offer PhD in CS

Most universities the US will have CS programs. However, while many universities offer PhD in their CS programs, many do not. These universities might offer just Bachelor degrees (e.g., BS) and no graduate studies (i.e., no MS or Ph.D degrees), or they just offer MS programs (but no PhD). For example, Penn State in University Park has Ph.D. 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, multiplication locations of the University of Texas, e.g., Austin, Dallas, Arlington, all have PhDs in CS.

Thus, if your goal is Ph.D. 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. All schools listed in §9 have PhD studies in CS, so you can start there.

6.1.2 Selecting and Ranking Schools for CS

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International students not familiar with US universities often put them into *two* bins: (i) very top schools that they dream about, and (ii) everything else. In many cases, they use resources such

as rankings from US News, which are not very transparent and *highly* questionable[3]. Sometimes these students evaluate CS programs using the reputations non-CS programs such as medical, math, or physics. They even rank universities based on popular states they know in the US, e.g., California and New York. Clearly, there are so many thing wrong with these methods.

You can learn about CS programs and research expertise of faculty using resources such as CSRankings.org, which is designed specifically to help prospective PhD students in Computer Science! You will be very surprised to learn that a school that you didn't know much about can have very strong research in your interested 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 (who works on what) and well-known CS conferences[4]. §9 gives the top 50 CS programs in the US according to CSRankings.

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

However, in general, rankings can be superficial and you need to do more research to be informed and make better decision. For example, if you get admissions to several places, you should consider attending Open Houses and contact profs. that you're interested in at those place and talk to them. They would be more willing to chat with you now that you have been admitted. Ask them questions about their work, how they manage students, their expectations. You can even ask to contact their students. See more in §4 on what to do after getting admitted.

> **Hung:** I always encourage the students I admitted 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 professor'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 USNews rankings when selecting their Ph.D. universities (I did that, too, when I was applying for Ph.D. positions). Now that I am a professor, I find it to be the least promising way. The reason is that USNews does not provide a good metric for evaluating the quality of the Ph.D. 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 Ph.D. 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.

6.2 Choosing a Professor

Now we discuss about finding advisors.

6.2.1 Tenured, Tenure Track, Teaching, Assistant Profs., Associate Profs

There are several types of faculty in a university that has a CS PhD program. You might hear about tenured, tenure track, teaching faculty. You might also things such as assistant, associate, full, adjunct, emeritus, teaching, research professors. Here is a primer on these terminologies.

Tenure-line and teaching faculty Tenure line faculty, consisting of tenured and tenured-track profs., focus on research, which includes publishing papers, obtaining grants, mentoring Ph.D students. They often have very low teaching load (e.g., 1 per semester). *Tenured* faculty are professors

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

[4]In CS (and probably only in CS), conferences, not journals, are often the main venue to publish research finding.

who have been promoted to have a permanent position (informally, very hard to fire them). *Tenure-track* faculty are (more likely young) professors who are on the track to get tenure. Both tenure and tenured track faculty can serve as a formal advisor of Ph.D. students . This is very important because you need to have a tenure line faculty as your main PhD advisor. §6.2.2 talks more about choosing between tenure and tenured-track professor as your advisor.

In contrast, *teaching* (or instructional faculty or professor of practice) mainly focus on teaching. They typically teach 3-4 classes per semester and *do not* have research responsibilities (e.g., they do not have to worry much about publishing papers, obtaining grants). They can mentor Ph.D. students but they typically cannot serve as a formal advisor of Ph.D. students (i.e., they *cannot graduate* PhD students).

Rankings Faculty have ranking, e.g., assistant, associate, full, regardless if they are tenure line or teaching. Assistant means new faculty, associate means they have been promoted, and full means they are senior. A tenure track faculty starts with being an assistant professor and then gets tenure and promoted to associate (typically after 6 years) and then full (time varies, some become full within 3-4 years, some 10+ years, some remain associate).

Adjunct means they are not full-time faculty, e.g., they might be working in industry and teach a class or two. Emeritus means they are retired but still have some affiliation with the university. Research faculty (or scientist) are typically non-tenure line faculty who focus on research. Due to their roles, adjunct, emeritus, and research faculty typically do not serve as a formal advisor of Ph.D. students.

6.2.2   Tenured or tenure-track faculty? Who do you choose?

The short answer is that tenure-track faculty such as assistant professors are more likely to be young and active in research (they have to, in order to get tenure). Thus, they will likely have more time to work with you and push you to do research and publish. However, they may not have as much experience in managing students and may not have as much funding (yet).

Tenured faculty, e.g., 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 (they don't have to, they already got tenure). They might also expect you to figure things out yourself, i.e., so you

need to be very independent. Some tenured faculty are also no longer active in research and more involved with administrative responsibilities or with their startup companies (this means they will likely not take new students).

You can learn about faculty and their level of research activity through the faculty's website or even from CSRankings. Ultimately, choose one that fits you the most by communicating with them, meeting them, asking them questions, and even talking to their current students.

Thanh: In my opinion, having a well-suited advisor 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**: §6.2.3 shows how to contact a professor for research opportunities.

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

6.2.3   Should you contact a professor? What to do to get a desired reply?

Faculty received many "cold" e-mails from international students seeking for admission, TA, and RA. Most of the time, we ignore these emails, but in some rare occasions we do answer them. So how to write an email that can get 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 and ask them if your paper has a chance.

So what to do if you want someone to look at your profile and give input? You could ask your professors, collaborators, or those who have previously applied. For these kind of feedback, don't ask strangers like random profs., instead ask someone you have personal connection with.

If you want to contact a prof. to ask about *research opportunities*, or *GTA/GRA* support, then *yes*, I believe you should—it is *worth it*. However, you need to do it the *right way*.

First, read the prof's website, see if they say something about contacting them. Many profs. explicitly indicate how prospective students should contact them (e.g., using specific email subjects). In general, 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. Then send them an email talking how/why their work would match yours. 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), you will not get a response.

Below is a good example that I would reply to.

> **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.
> 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 small paper at conference/workshop C and a project on symbolic execution at Github G.
> ...
> This is a good example because it is clearly written just for me. It shows that the student knows about my work on invariant generation and has related background (paper C and project G).

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!).

> **Xiaokuan** Applying for Ph.D. and contacting a potential Ph.D. advisor 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 to do your homework, the chance of getting a reply is close to zero.

6.2.4   PhD in other related fields: CE, IST, Cybersecurity

In many cases you do not have to do a PhD in CS to work in your area of interested. For example, in addition to a traditional CS department, GMU has IST and Cybersecurity departments, which have faculty with PhD in CS and work on CS topics (e.g., AI, Security, Robotics). So it is totally possible that you still get to 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 CS PhD in a non-CS department as well as faculty with non-CS PhD in CS department.

However, if your intention is a PhD in CS, then you likely need to be in the CS dept *and* advised by a CS faculty. In fact, if a faculty is not in CS, it is unlikely that they can be the *main* advisor of a CS PhD student—they may *co-advise* or be in the PhD dissertation committee, but your main advisor will need to be a tenured or tenure-track faculty in CS. If in doubt, you should check with the CS department for their requirements. For this specific reason, CSRankings includes only tenured or tenured track faculty who can advise CS PhD students. I also have compiled a list of Vietnamese faculty who can advise PhD students.

7   Miscs and FAQs

> "I want to share something with you – the three little sentences that will get you through life; number 1: Cover for me, number 2: Oh, good idea, Boss, and number 3: It was like that when I got here."
>
> ———————————————
> THE SIMPSONS

7.1 What can you do to increase your admission chance?

Show something that makes you **stand out**, e.g., do you have a degree or background in *dance* or *music* and want to integrate them with CS? are you a female or a minority in CS (research for "URM minority in CS in the US" on Google)? Do you participate in outreach activities that help increase diversity and inclusion in CS? All of these are unique and would get noticed from reviewers.

Even if you do not have research experience, you can talk about your personal projects, as long as they can help show you can do research. For example, if you have an open-source project on Github that is used by many people, has lots of stars in Github, do talk about it. If you write technical, research-like blogs, talk about them too.

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.

7.2 Can I apply to CS PhD if my undergrad was not in CS or related areas?

Yes, *as long as* you can demonstrate you are ready for CS PhD research through research experiences, LoRs, statements, etc as mentioned. You might be even able to leverage this to make your profile stand out as mentioned in §7.1.

One main concern for non-CS or non-STEM students is if you have the sufficient technical background, typically obtained through core CS courses. So you will want to show that you have such knowledge through your coursework, projects, or research. For example, if you have taken a course on Algorithms, even online ones like Coursera, you can talk about it in your statement. If you have done a project or have a professional certification (e.g., A+) through work that requires knowledge of OS, you can talk about it in your statement. If you have done research that requires knowledge of Discrete Maths, you can talk about it in your statement. You can also ask your LoR writers to talk about your technical background. In summary, in your application, convince us that you have the technical background to do CS PhD research. Note that many online courses teaching about AI does not really help much as these are not core CS knowledge.

In short, you *do not need* to formally taking CS courses, you just need to show that you have these essential knowledge through ways as mentioned. 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 4 bridge courses (Data Structure and Algorithm, Computer Systems, Discrete Maths, and Programming Foundation) that incoming students can take to catch up on their CS knowledge.

> **Vu:** I would strongly advocate to admit a student with a non-STEM background (e.g., business, English major) but can show 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 background who are very successful in CS PhD. In fact, I 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.

7.3   Is an MS degree required for admission to PhD in CS?

No. In fact, student with BS can get MS degree "along the way" to PhD. However, MS can help if it gives research experience or is from a more well-known school than your undergrad institution.

If you have an MS then some course work *might be* transferred for course credits, which save a bit of time. But overall don't count on this, especially if your MS is not from the US.

7.4   How long does it take to complete the CS PhD program?
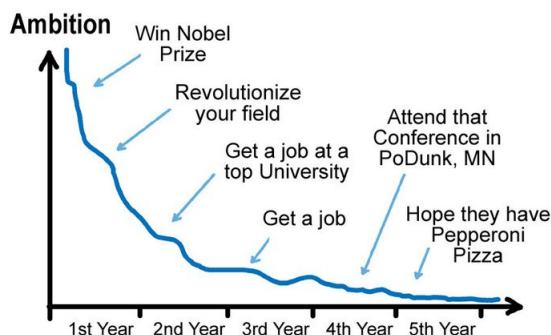
Typically, it takes 5–7 years for CS PhD in the US. This can be longer than CS PhDs in other countries, which might require MS first (recall that US PhD programs do not require MS and you can get MS along the way to PhD). Within these 5–7 years, CS PhD students often take a "leave of absence" for 1–2 semesters to do internship at companies and research labs.

The first 2 years you typically take coursework (somewhat equivalent to an MS study), find an adviser, learn how to do research. The next 2–3 years you focus on your research, form dissertation topic, and get results published. The last 1-2 years you continue to publish, write and defend your dissertation, and look for job. In many cases you might take a summer or two off to do internship to get additional research opportunities. The PhDComics figure on top shows the "ambition" level of a PhD student over their years of study (they miss the 6–7th year where the ambition is *"Just let me graduate"*).

7.5   Difference between PhD in the US and other countries

Here we summarize the main differences between CS PhD in the US and other countries. This is based on my experience and what I heard from others who did PhD in other countries.

MS Degree requirement: as mentioned in §7.3 and 7.4, US PhD programs do not require MS degree. In contrast, many other countries do require 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 advisor *during* the application process (e.g., you write a proposal to a potential advisor). In the US, you often start your PhD without a project and advisor and find them later. This is also why US PhD programs are longer.

Course work: in the US you will spend the first couple of years taking classes and explore potential advisor and research topics. In other countries, you often do not do course work and start your research right away, e.g., you immediately work on the research project you propose with the advisor you chose. In the US you also have to pass a series of "exams", e.g., qualifying exam, comprehensive exam, thesis proposal defense. In other countries, you do not have to do these exams or only do few of them. For example, ABD (all but dissertation) is used in the US to refer to a PhD candidate who have finished all course work and exams and only need to write and defend their dissertation.

Funding: In Europe, stipend (salary) comes from the university or from gov't research organizations and often have a fixed duration (e.g., 3 years). In the US, stipend (e.g., RA) comes directly from your advisor (no fixed duration). There are also fewer TA opportunities in the European universities compared to the US.

Faculty position after PhD: In other countries, PhD graduates typically apply for research positions at research labs, i.e., postdocs, and then consider faculty position. In the US, PhD graduates interested in academia can apply directly for faculty position. This is why US PhD programs are longer and more focused on research.

Work-life balance: PhD students are often overworked in the US (seriously!) 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 work for the dept. In contrast, PhD students in other countries are often paid through fellowships, which do not require them to do TA work.

7.6   How do I address a professor?
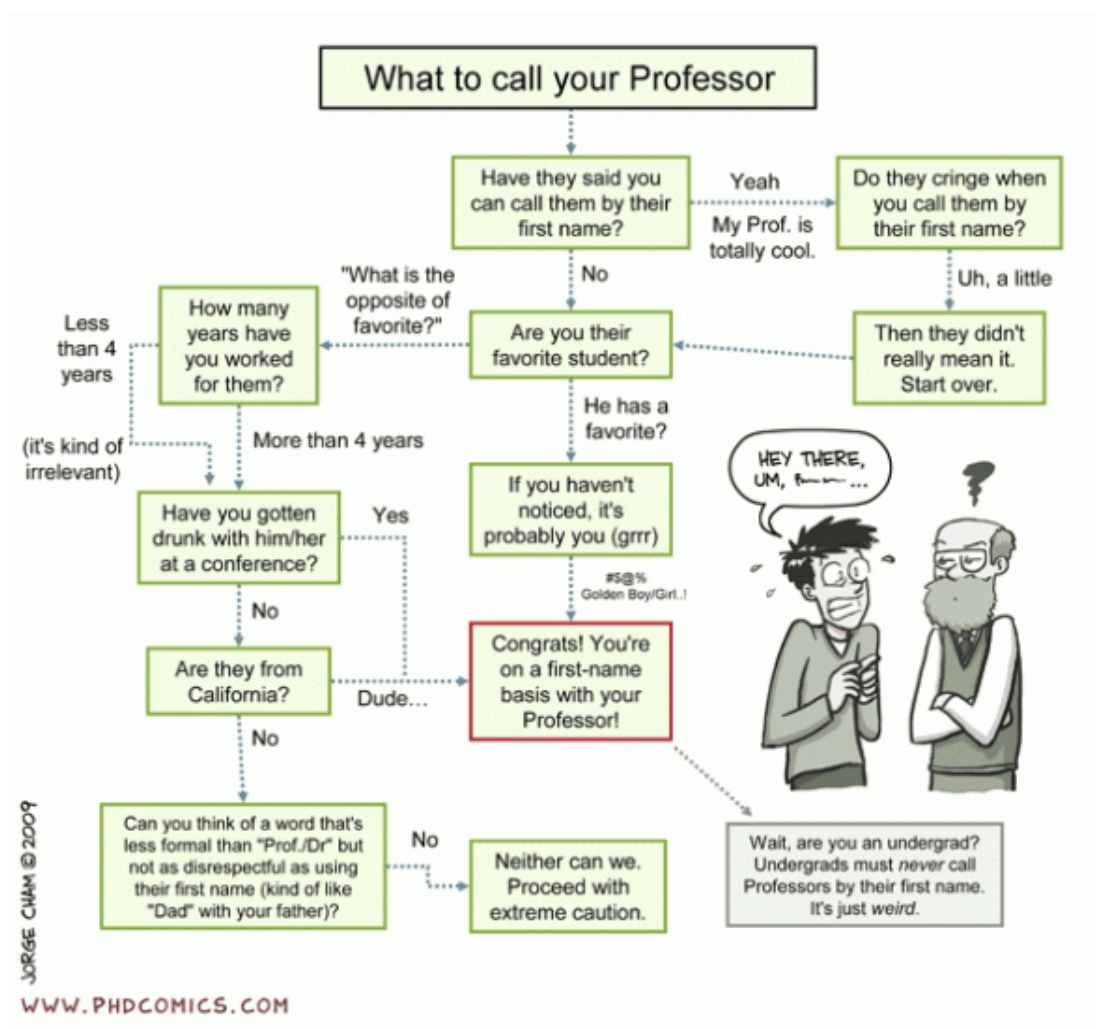
If you're reaching out to a professor for the first time, address them as either Prof. Lastname or Dr. Lastname. Many international students use Prof. or Dr. FirstName LastName, but this can come across as if you're simply copying and pasting names. It's not necessary, so stick with Prof. or Dr. Lastname.

Furthermore, avoid using Mr. or Mrs., or the professor's first name if you're not acquainted with them yet. 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 colleague call me Vu. Some students call me *Dr. Vu*, which I find a bit amusing but am totally fine with it.

Note that in some universities the formal title Dr. Lastname is preferred. You just need to observe and follow the conventions at your particular institution. Additionally, be aware that not all faculty members may hold a Ph.D., in which case using Prof. Lastname is a suitable alternative.

Referring to professors you know   Because you are already familiar with these individuals, you can just informally use their firstname 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"*.

Tab. 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)	27K	
GRA (summer)	9K	3-month, 20hrs/week
Total Salary	36K	
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	57K	Salary + Travel + Health + Tuition
F & A (MTDC)	21K	Direct Cost - GRA Salary
Total Indirect Cost	12K	58.9% of MTDC
Total (Direct + Indirect)	69K	Budget for a GRA

Do not include ranking (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 differences that you may encounter and will gradually adapt to. More on cultural differences in §8.

7.7 How much do *you* cost?

PhD students often ask why their salary is so low compared to ludicrous grants their advisors get. They also wonder why their offer letters sometime mentioned that their benefits appear better than what they actually receive (i.e., stipend). This section aims to shed some light to these questions.

Tab. 2 shows the budget breakdown for a GRA per year (this level of details is what faculty actually uses when applying for grants). 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 $27000 (GMU actually pays more) and therefore a 3-month summer of $9000. I will also use GMU tuition rate of about $15,000/year for full-time study (which is quite cheap compared to private universities, e.g., MIT charges around $50K) and a 58.9% rate on *indirect cost*, which is what GMU charges for overhead or administrative costs (yes, after all, universities are businesses!). Finally, I assume the student take two conference trips per year, one domestic and one international (conf. registration, airline tickets, taxi, meals, etc are all included).

At the end, the total budget comes out to be $69K/year to support a PhD student. *The summary is that over your 5-6 year of your PhD, you cost about $350K–400K, and while you're paid X, your advisor probably pays 2X for you.*

7.8 Will I be miserable during my a PhD?

Many posts from VietPhD, a Facebook group for Vietnamese PhD students, are about how PhD students are mistreated, stressed, and miserable. Indeed there are issues with PhD and academic in general, but then there are also issues with jobs, family, and life. Certainly there are bad relationships with professors, co-authors, and officemates, and toxic working environment, feeling left out or discriminated (e.g., because you're an international student), and it is good to be aware of those. However, in reality there are many good mentors, supportive labmates and department, happy students, etc. So don't let social media make you feel pessimistic and destroy your quest to advance knowledge.

8 Cultural Differences and Other Issues

This section lists various cultural issues that international students should pay attention to.

Diversity US universities prioritize diversity and inclusion. Students need to respect and appreciate varied opinions, backgrounds, and cultures. Unlike some countries where certain voices are marginalized, in the US, all perspectives are valued equally (especially at universities). Racism or discrimination will have serious consequences, including academic and disciplinary actions.

Academic Integrity Plagiarism and cheating (e.g., exams, coding) is a BIG no-no in the US. If you're caught cheating, you will face very heavy consequence 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 is the typically steps: (i) a faculty suspecting a cheating case will report it to the Office of Academic Integrity (OAI) at the university; (ii) OAI will take over and investigate the case; and finally (iii) OAI will make the final decision. It is important to note that after receiving the report from your prof., OAI *completely* takes over and makes decision. This means begging your professor will not help because they simply are no longer involved in the case.

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 (e.g., those given by your department or advisor). 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 advisor being sued for a large sum of money, and it is *you* who caused it. If you need software, ask your advisor or the department.

9 Ranking of CS PhD programs in the U.S

Tab. 3 lists the top 50 CS programs in the US from CSRankings.org, a ranking system based on top CS conferences.

Tab. 3: Top 50 CS PhD programs in the U.S. (CSRankings, June 2023). * indicates that the university has Vietnamese prof. that can advise CS PhD students.

1	Carnegie Mellon	26	Univ. of California - Irvine
2	Univ. of Illinois at Urbana-Champaign*	27	Duke University
3	Univ. of California-San Diego	28	Rutgers University*
4	MIT	29	Univ. of California - Riverside
5	Georgia Institute of Technology	30	Northwestern University
6	Stanford University	31	Pennsylvania State University
7	University of Michigan - Ann Arbor*	32	George Mason University*
8	University of Washington	33	Harvard University
9	Univ. of California - Berkeley	34	Univ. of California - Santa Cruz
10	Cornell University	35	Yale University
11	University of Maryland - College Park	36	Brown University
12	Northeastern University*	37	Ohio State University
13	University of Wisconsin - Madison*	38	Texas A&M University*
14	Columbia University	39	Boston University
15	Purdue University	40	North Carolina State University
16	University of Texas at Austin	41	University of Utah
17	University of Pennsylvania*	42	University at Buffalo*
18	Princeton University	43	Rice University
19	University of Massachusetts-Amherst*	44	University of Colorado-Boulder
20	New York University	45	University of Illinois at Chicago
21	Univ. of California - Los Angeles	46	Virginia Tech*
22	University of Southern California	47	Arizona State University*
23	Stony Brook University*	48	University of Minnesota
24	University of Chicago	49	University of Virginia
25	Univ. of California - Santa Barbara	50	University of North Carolina*

10 History and Acknowledgement

History   This document was conceived during a lunch with Craig Yu at GMU. We talked on about why GMU were 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 §9). We wished there were a way for international students to know about the US PhD programs (as well as for US faculty to understand more about international students and therefore have better chance of recruiting and working with them). I was also a member of the large VietPhD group on Facebook and saw many questions from students about PhD programs. However, most active participant are students in non-CS fields or not in US. Like ChatGPT, their answers to CS PhD program in the US could be informative and helpful, but unfortunately not always accurate and sometimes leading to more confusion. So I thought it would be useful to have a document that is specific to CS PhD programs in the US from an insider prospective.

I started writing this document in May 2023 and have been updating it since then (mostly around deadline time when I tend to procrastinate, i.e., *productive procrastination*!). I have put the source code of this document on GitHub so that anyone can contribute to it.

Acknowledgement   Many people have contributed to this document. Profs. Craig Yu (GMU), Hakan Aydin (GMU), Xiaokuan Zhang (GMU), and Hung Le (UMass) provided valuable input in the early version. Other GMU faculty members also have provided feedback and contributions. Many students including Didier (GMU), Thanh (Melbourne), and Dat (Melbourne) have contributed valuable questions and feedback. **Thank you!**

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