Demystifying the Computer Science Ph.D. Admission in US Universities

A guide for Vietnamese and International Students

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Abstract

Having been involved in PhD admissions for many years and having numerous interaction with students, I've realized that *international* students, especially **Vietnamese**, 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 is difficult compared to CS PhD programs in other countries.

So I want to share my opinions and advice for those who are interested in applying for a **PhD in Computer Science in the US**. While I wrote this document for Vietnamese students interested in CS, it should be applicable to students in various countries. Moreover, while many examples given are for GMU, which is 32nd in the US according CSRankings (see §6.1), the writing should be generalize to most other R1[1] universities (though *very* top schools is much more selective, e.g., see the admission process at CMU).

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

If you have questions or comments, feel free to create a GitHub issue for discussion.

1   Should You Apply?

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. Moreover, depending on the university, you may even receive additional benefits such as summer salary and laptops. Note that funding is typically more available for PhD students than Masters and especially undergraduate studies, which typically have no funding. §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 think you have a chance at schools 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.

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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.

> Vu: One of the reasons I create this post is that several of my colleagues are interested in recruiting Vietnamese students and were surprised when seeing very few applications in Vietnam (e.g., our CS PhD program has on average 5-6 applications from Vietnam each year). In general the number of PhD applications from Vietnam to US universities is few and more would be very welcomed.

2 How is Your Application Evaluated?

After you submit your PhD application (usually in December), 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 your application will be reviewed by a **PhD admission committee** consisting of faculty members in CS. Each application is assigned to about *three* faculty members, who will evaluate your profile and try to reach a consensus about your case. Note that while in most cases the assigned reviewers will be the main ones deciding your application, every faculty will have access to your application and can give inputs on your profile.

In many cases, the admission committee can involve current students and 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.

> Vu: We usually decide that a 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 don't. In some rare cases, we may admit you without funding because you have funding on your own (e.g., you are supported by your government or have external grants). We also justify our decision with a summary about your application, where we list strengths (e.g., 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/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 is a research degree. To assess your research capability, 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 conferences or journals**. Having published good papers is a sign that the

applicant was involved in research.

It's important to aim for the top conferences in your field, which you can find on places such as CSRankings [2], designed specifically to help CS PhD applicants. 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 IEEE/ACM/USENIX confs/journals would suffice. But be sure to talk about it in your statement.

> Vu: Many international students mention Scopus Q1, which consists of diverse journals from IEEE, Elsevier, and many other publishers unfamiliar to me. Honestly, I don't know/recognize many of journals listed in Scopus Q1 and. So this might be something to be mindful of, as **CS** faculty might not be too familiar with Scopus or journals listed in 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 international research places, 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.

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 Letters of Recommendation (LORs)

Most CS PhD applications 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*.

Many students have letters written by the applicants themselves and signed by their professors. These have little values (we can easily recognize them) and will consider them weakness. Similarly, many professors write very generic letters for students (a common example is that 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 company where they did internship 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).

> Vu: Some letter writers ask the applicants to write their own letters so they can just sign. As mentioned, this will hurt the applicants (admission committee are actually quite good at determining this)! I was told that some people did this to ensure the applicants don't go abraod or only go to places where they want to the students to go to.

Vu: Sometimes students would go through great length just to get letters from well-known senior professors in their school, but the letters are generic and carry little value, in fact, red flags. Moreover, a top professor in Vietnam might not be well-known to US faculty (see more details in §3.4). So save the trouble and just get letters from *any* professors/supervisors who knows you well and can write a good letter about your research ability.

In short, 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.

3.3   Research or Personal Statement

While you might not have control over LORs where your go to school, you do over your statement! So write it well because we do take it seriously. 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 many guides on writing research statement, e.g., [1], so I will not talk too much about it. In short, discuss about your research 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.

Finally, this is something easy to do, but is missed by many applicants: **customize the statement** for the school you're applying to, e.g., why do you apply here? talk about a couple of professors who you're interested in working with (in many cases your application will be forwarded to them for evaluation). This shows that you're serious and have done homework on where you're applying to. Be careful not to send wrong statement to wrong school 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.

Vu: I always read the research statement first and then LORs. 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).

3.4   Your School

Graduating from top universities *that we recognize* helps. 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 (if your school is well-known, then it is *"top foreign"*, which is definitely a plus).

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

Vu: Sometime PhD admission committee will share a document such as this one, which lists the top schools in several countries. I have looked at Vietnamese applications (whether they are assigned to me or not) and provide input to the reviewers of those applications, 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, in general, unless your school is well-known, having top grades/ranks 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 ranking (and be overlooked by 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 statements give proper explanation). This is especially true if you have bad grades in relevant, e.g., CS and Math, courses.

GRE Most CS 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.

English Test Unless your degrees are from certain 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 choose from.

Vu: The minimum for 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, 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

This should be a summary of the accomplishments of the applicant. It should allow the reviewers to quickly scan to identify standout achievements (e.g., Publications, Programming Competition Awards, Teaching Experience).

3.7 Interview

Sometime a faculty wants to interview an applicant to make a decision. This means they are leaning toward admitting you (if we don't like your application, we will not bother doing the interview).

An interview lasts about 15–30 mins, and one implicit thing you will be evaluated on is whether you can communicate effectively (i.e., speak/understand English). You will also get chance to ask questions about the university so think of something to ask (just the same as you interview at a company).

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	TA, Uncertain	Research restriction, Uncertain	Competitive, limited

> 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 wants argue for admission, i.e., without the interview, that candidate is definitely rejected. In any case, getting interview means you have a very good chance of being admitted.

4 Getting Admitted and Choosing the Right School

Around March you should hear back from most PhD programs that you applied (if not, send email and ask). You will have to make your decision by around April 15. If you have offers, congratulations! Now you're at a different game because the schools that admit you will now try to get you to accept them!

Most schools will have an **Open House**, which is 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 short, if you can come to the Open House, do come. But if you're international student outside of the US, then likely you cannot come. So see if you can attend it virtually and ask to meet with individual faculty if you can.

> Vu: GMU has Virtual Open House, 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

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 the type of funding 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.

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 about stipend. First, the amount of stipend depends on the university, which in turns depend 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 for most source of income in the US, you will have to pay tax on your stipend. Finally, private universities might pay more for stipend.

> Vu: TA and RA at GMU have similar benefits in tuition waiving and insurance. For stipend, depending on the college and department, a 9-month graduate assistant stipend is set. TA and RA will usually be that amount (TA will definitely be that, RA might fluctuate a bit depending on the stage of the student and the prof.).

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 help professors with their classes (e.g., grading or teaching labs/recitation). Your TAship is paid through the 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 no school.

How to get TA? Unless you have other funding such as RA or Fellowships, TA is typically a default thing. 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.

> 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 have to give talks and tell people about your work. Note that GMU sometimes has classes that a more senior student can teach. In that case, you will be paid as a lecturer, which is higher than GTA. This is a good opportunity for students to get teaching experience and also get paid more.

5.2 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.

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.

> Vu: If you're lucky and 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 your application (unless your application has many red flags).

5.3 Fellowship/Scholarship

Fellowship is another type of funding that the student needs to 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, it often gives higher stipend (including summer) and opens doors for job opportunities (e.g., internship). For example, a student with a Microsoft fellowship will likely get an internship at Microsoft.

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 apply for them. The US government has many fellowships that would likely require US citizenship or residency. However, tech companies including Google, Microsoft, Facebook, IBM 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 Ph.D. students at top universities worldwide.

> At GMU, Ph.D. 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 Miscs and FAQs

1. What can you do to increase your admission chance?

   - Show something that makes you **stand out**, e.g., are you a female or a minority in CS (research for this on Google)? Do you participate in outreach activities that help increase diversity and inclusion in CS? All of these are important in CS in the US.

   - Even if you do not have formal research experience, you can talk about your personal projects. 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.

2. How to rank or select a CS program?

   - International students not familiar with US universities often put them into *two* bins: (i) very top school that they dream about such as Stanford, MIT, Princeton, Harvard and (ii) everything else. Sometimes they apply reputations of schools for non-CS programs,

e.g., medical or physics, to rank CS programs. In some cases they rank universities based on popular states they know in the US, e.g., California, New York, and Texas. Let's just say 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 X that you don't know much about has very strong research in your interested field Y. This is also a good way to learn about individual faculty (who works on what) and the well-known CS conferences[2].

> Dat: many Vietnamese students, even those from very top engineering schools, do not know about CSRankings. Only few applicants who worked at top research places such as VinAI might know about it.

- But more generally, rankings is superficial and you will want to do more research to be informed and make better decision. For example, if you get admissions to several places, you should contact profs. that you're interested in at those place and talk to them. They would be more willing to chat to 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.

3. Can I apply to PhD to CS if my undergrad was not in CS or any 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 leverage this to make your profile stand out.

4. Is an MS degree required for admission to PhD?

- 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.

5. How do I address a professor Firstname Lastname?

- If you don't know that professor (e.g., first email contact), then use **Prof. Lastname** or **Dr. Lastname**. I've seen many international students write **Prof.** or **Dr. Firstname Lastname**. Writing like that makes it like you copy and paste the names, so no need to do so, just Prof. or Dr. Lastname.
- If you don't know the prof., do not use Mr. or Mrs., or Firstname. To me it seems a bit disrespectful. As you know that prof. better and depends on their preference, you can call them by their Firstname.

> Vu: I've been called Dr. Vu and I find it a bit amusing but am totally fine with it.

6.1   Current 2023 Rankings of CS PhD programs in the U.S

Tab. 2 lists the top 50 CS programs in the US from CSRankings.org, a ranking system based on top CS conferences.

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

Tab. 2: Top 50 CS PhD programs in the U.S. (CSRankings, June 2023)

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

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