Chapter 1: The Assistant Prof Job

Welcome to *The CS Assistant Professor Handbook.* My assumption in this book is that you, dear reader, are an undergraduate or graduate student, who is interested in academia and wants to know more about the assistant professor job. If you are a postdoc or someone who just began an assistant professor position, you might find I'm presenting information that is rather well-known to you. Hold on, and later chapters should be of interest!

So let us start with the basics – what *is* a tenure-track assistant professor position?

We can broadly classify positions in academia into two kinds. Positions with indefinite tenure, or **tenured** positions in short, are those where the holder of the position cannot be fired unless there are extraordinary circumstances such as fraud or abuse. It is essentially a job for life, with a stable paycheck. **Positions without tenure** do not have this protection, in that the holder can be fired for causes such as bad economic conditions. For example, consider the Adjunct position, where the holder is typically on a multi-year contract that has to be renewed periodically. Teaching instructors also typically do not have tenure.

Why does tenure exist? There are a number of reasons. First, it is meant to encourage professors to work on multi-year high-risk, high-reward projects. Some research requires investing multiple years, and working on hard problems always comes with the risk it doesn't work out. If the professors are evaluated on a short time frame, they would naturally not work on such projects. Thus, tenure is meant to encourage such exploration.

Second, it is meant to protect academic freedom, to prevent the university management from firing a professor who has different political or academic views. As such, a tenured professor can publicly criticize the management without fear of immediate dismissal. This is a rare privilege, not accorded to many professions. For example, if a software engineer publicly criticizes his CEO, they can expect to get fired (especially under "at will" employment arrangements that are common in the USA).

Finally, it is meant to be a perk to entice professors to academia. In fields like engineering or computer science, a professor gets paid anywhere between 5 percent to 50 percent what their peers make in industry; the stability of tenure is a perk that cannot be found in industry. Even though most CS professionals can always find another job, nobody likes working with a sword hanging over their neck, especially in times of economic turmoil. For example, Microsoft in 2014 decided to suddenly shut down their highly regarded Silicon Valley research lab, firing everyone

except a handful of folks. Although everyone involved found new jobs quickly[1], there is no denying this was a stressful experience.

There is ongoing debate whether academic positions should have tenure. Opponents suggest that tenure leads to complacency, that tenure makes it harder to fire professors who engage in abusive behavior, and that since computer science is a lucrative field, that tenure does not have the same draw as in other sciences. Proponents say that it is vital for academic freedom, and that lack of tenure will stifle critical voices.

The academic ladder. For the tenure-track, the entry-level position is the Assistant Professor position. Sometimes, PhD holders fresh out of their grad school are hired as Assistant Professors; others work in industry for sometime before applying for the Assistant Professor position. In some fields such as theory, a postdoc might be expected before being hired into the Assistant Professor position.

Assistant Professors are evaluated after a certain number of years to see if they should be given tenure. The number of years varies from university to university: it is six years at UT Austin, but ten years at CMU. Sometimes Assistant Professors get promoted to Associate Professors with tenure; at other places, the promotion to Associate comes first, and later they are evaluated for tenure.

Associate professors are typically promoted to full professors after 6-8 years (again, this varies from place to place). Full professorships always come with tenure.

1.1 What does the job consist of?

The assistant professor job varies a lot depending upon the university where it is performed. There is a wide spectrum of universities, with [R1 research institutions](#) on one end, and teaching-focussed 4-year colleges on the other end. Your experience as an assistant professor at these two endpoints would be quite different, in terms of what is expected in research and teaching, the resources offered, and the time given to achieve expectations. For example, at an R1 institution, you might be teaching one course a semester. At a teaching institution, you might be expected to teach three. At some other places, you are expected to do research on top of teaching multiple courses!

In this book, I'm primarily going to be talking about the job at an R1 institution. At an R1 institution, the job consists of at least the following five parts (corresponding to each of the chapters in this book):

1) **Research**. You are expected to perform independent research and publish in your community's accepted venues. Each department will have different expectations regarding where it is acceptable to publish, and how much you are expected to publish.

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[1] Incidentally, a bunch of folks from MSR Silicon Valley got together and started the VMware Research group, where I did my postdoc and where I am doing my sabbatical

2) **Teaching**. You are expected to teach at least one course every fall and spring semester. Some universities require you to teach at least one undergraduate course every year.

3) **Students.** You are required to recruit, mentor, and train students to be independent researchers during the course of their PhD.

4) **Funding.** Closely related to #3 (but not always[2]), you are expected to raise funds via grant proposals to support your research group and your research agenda. This is primarily done through proposals to the National Science Foundation (NSF), the The Defense Advanced Research Projects Agency (DARPA), and other funding sources such as the Army. Yet another source of funding, not it is not as large as government sources, is industry.

5) **Service**. You are expected to serve on program committees, review journal papers, and in general, be a "good citizen" of both your research community, and your department. You can expect to serve on at least one committee each semester at your department – good departments will put new assistant professors on committees such as PhD admissions. You are expected to write letters of recommendation for your students (and eventually your peers).

Thus, the assistant professor job is a multi-faceted one, requiring you to learn and master several different aspects in a short time frame. It is similar to starting a company and being the CEO – you have to worry about funding, recruiting folks, getting the word out about your company etc. You have a lot to worry about, but you also have a lot of freedom. You don't have a "boss" per se, and you can determine what kind of research you want to do, and what kind of group you want to build.

Given how much the job expects of you, you might reasonably determine that it pays a lot. Let us talk about that next.

1.2 Financial aspects

How much do assistant professors get paid? It varies quite a bit based on the university. In general, private universities, such as Princeton, pay a lot more than public universities (which have strict rules regarding how much your salary can be).

You might be surprised to learn this: at R1 universities in the USA, **assistant professors are only paid for nine months of the year.** The other three months you have to support yourself on your grants. Therefore, if you don't have grants, you *don't get paid* for three months of the year (typically the summer). There are even schools that put restrictions on what kind of funds you can use for the summer – for example, they might prevent you from using your startup funds (funds given to kickstart your research program) for summer salary.

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[2] Some institutions do not care as long as you are able to fund your students. At other universities, you are expected to bring in a certain dollar amount via grants that goes towards a common pool that is used to fund research.

If you are thinking, this seems outrageous[3], welcome to academia (at least in the USA)! This is merely the tip of the iceberg (see [Pros and cons of the job]) .

Alright, with that being said, what do assistant professors make? The nine-month salary for assistant professors in CS typically tends to be in the $100K to $200K range. As you would expect, the higher end is private universities. So let us say you make $140K over nine months, you would get around $185K annually. You will get about 1%-4% raises every year, for cost of living adjustments.

How does this compare to salaries in industry? If you are a computer science PhD joining industry in 2022, you can expect to make about $160K in your base salary, with around $100-200K of stock (typically vesting over 4 years), and perhaps a $10-20K signing bonus. Note that is the lower end – I have heard of fresh PhDs getting million dollar packages (with stock vesting over 4 years). You can expect to get around 5-6% increments each year in industry, depending on your job performance.

So the difference in compensation between industry and academia is quite large, and tends to get wider and wider over time. About ten years after the PhD, a professor might be earning about $200-300K in salary, while his industrial peers might be getting 2x to 5x that much in total annual compensation.

This is not to say that professors cannot become wealthy. For example, Ion Stoica and Scott Shenker recently donated [$25M each to the Berkeley computer science department]. In most cases, such wealth is the result of co-founding a highly successful company. It is becoming more and more common for computer science professors to start-up companies based on their research and expertise. Startups aside (which you can also do in industry), typically, professors earn significantly less than their industry peers.

1.3 Consulting

One aspect of an assistant professor that helps professors earn more money is consulting. At most R1 universities, you are allowed to consult 1 day/week. Thus, you can supplement your income with the money from consulting. Consulting rates range from hundreds to thousands of dollars per hour (depending upon your expertise). Getting started with consulting is a little tricky, since there needs to be a match between your expertise and what the company is looking for. But such consulting relationships can be mutually beneficial once formed.

Unless you have prior connections, it is unlikely you will begin consulting when you start the assistant professor position. Thus, it is not a part of your income that you should take for granted. But with time and networking, it is possible to get some extra income from consulting.

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[3] Why do I find this outrageous? When the university gives you a 9-month offer, it is saying we agree "one hour of your time is worth X". But if you can't find external funding, the university can get away with paying you X*9/12 = X*3/4 for each hour of your work. The value of your time should not depend on external funding.

Consulting is a bit trickier if you are on a visa, though it is not impossible. It is possible to do consulting before obtaining permanent residency in the USA. I would recommend talking to a good immigration lawyer about this.

To talk about my own consulting experience, I have been consulting with VMware since I joined UT Austin. I had a prior relationship with VMware from my internships and post-doc. I had started [some projects as a post-doc](#) that I continued to work on as a consulting researcher. The consulting relationship has been super useful, both from a financial point of view, and being able to learn about problems engineers face within VMware.

One of the key things to remember when doing consulting work is to keep your university intellectual property (IP) and your consulting job IP separate. University resources cannot be used for your consulting job, and company resources cannot be used for your university research. It is best to have different projects that you work on, so that it is clear what hat you are currently wearing when working on a project.

1.4 Pros and cons of the job

Now that we have talked about what the job entails, let us chat briefly about the pros and cons of the job. Note that I am obviously biased, since I chose to go into academia. So take my opinions with a pinch of salt.

First, lets see the pros:

1. **Freedom.** You don't have a boss as an assistant professor. Nobody tells you what to work on at any given day. You can choose what topics you want to research, which students to hire, who to collaborate with. You can collaborate with different universities, and different companies. If you are interested in a new topic and want to work on it, nobody will stop you. It is hard to find such freedom outside of academia.

2. **Students.** There is a special joy in mentoring students and seeing them grow from strength to strength. You enjoy both longer-term relationships with your PhD students, and shorter term relationships with undergraduate students. If you have heard of the expression "being with students keeps you young at heart", it is definitely true. This is primarily why I became a professor.

3. **Flexibility**. Being a professor allows you to do so many things. You can write a book. You can give talks to the general public. You can create online courses. You can start a company. The sheer range is quite amazing.

4. **Time with family**. This might seem like a weird pro, but as a professor, I have much more control over my time than many other jobs. It lets me schedule my work so that I can spend more with my family. For example, when my first kid was born, my department gave me teaching time off so that I could spend time with him. I spent six months with

my son – irreplaceable time that is harder to get in many other jobs (this is especially true in the USA where paternity and maternity leave is minimal in many jobs).

Now for the cons:

1. **Responsibility.** With great freedom comes great responsibility. One of the perks of having a boss is that somebody tells you what to do – you don't have this as an assistant professor, and the burden of responsibility is quite high. Not only do you have to worry about your own career, your PhD students are entrusting their careers to you. So this job carries a lot of responsibility.

2. **Stress**. The first few years of being an assistant professor are stressful. You are learning different aspects of the job (for many of these aspects you would not have been trained formally) while under pressure. The good news is that it gets better after the first few years. This book is also an attempt to reduce stress by better preparing you for the job.

3. **Poor financial compensation**. If an assistant professor went into industry, they would easily make 50% to 2x more initially. Over time, being in academia means you are giving up sizable amounts of money. They say that the financial cost of a PhD is a house (about $500K). Well, I would say the financial cost of being a professor is a neighborhood (several million USD). While you will make enough to have a decent living, the opportunity cost is quite high. In some high-cost-of-living areas, you may not make enough as a professor to offset the high cost of daycare (especially true in the USA).

4. **Funding**. If every professor could magically get funds for their research without having to write proposals, I'm sure everyone could take that option. Pending that, we have to spend a lot of time and effort on making sure our research group is adequately funded. Adding to the problem is the fact that NSF funds only about [26% of the proposals it receives](#). So you might have to try multiple times to get a proposal funded.

A final con is something more general to academia in the USA as whole, and not specific to the assistant professor position: **a culture of relying on volunteering or unpaid labor.** As far I can see, US academia does not pay anybody (except perhaps the administrators) what their time and work is actually worth (instead, you get "prestige" or class credit or a line in your CV). This goes both for you, and your students. You will have to do a lot of unpaid labor in the name of service; your students will also be expected to volunteer and do unpaid work (not just things like reviewing, which are necessary in any research community, but things related to running a conference that should really be handled by professionals). I really wish this was different - this might change perhaps with time, but right now, this is an aspect you want to consider. Industry is much better at compensating folks fairly for their time.

Overall, I would say being an assistant professor is something you should choose after careful consideration. If you have the skills to be an assistant professor, you likely have the skills to be an entrepreneur or a business founder/owner – these typically pay more for the effort put in. Make sure that the pros outweigh the cons for you personally so that your motivation is strong.

1.5 Why I chose this job

This is a bit of a long story, but I figured I'd share:

I originally joined Wisconsin for a Masters degree. Remzi and Andrea Arpaci-Dusseau hired me as a graduate research assistant, despite no notable research experience. So I started doing research with Remzi and Andrea.

At that point, I was not looking to do a PhD or go into academia. My vision for life was pretty short-term: I wanted to get a high-paying job, buy a car, and enjoy life with my friends.

The research I worked on with Remzi and Andrea got published, and I traveled to Hong Kong to present it. I was super excited about my first conference talk! After weeks of preparation and thousands of miles of travel, there were *six* people in the audience for my talk (it was a multi-track conference). Of the six, two more were also presenting. At that point, I didn't really see the point in academia: I worked so hard for this?

So near the end of my Masters degree, I got a job at Microsoft and I told Remzi and Andrea. They asked me to consider staying six more months to try to see if a PhD was for me. It was actually my parents who encouraged me to pursue a PhD – I was actually getting extremely lucky to get Remzi and Andrea as advisors, but I was too dumb and un-informed at the time to know what a big deal this was. So I was lucky twice – to get amazing advisors, and to get amazing parents who encouraged me to pursue research rather than making money.

Anyway, I stayed for six months, and everything changed. My first paper got published at FAST, and I gave an amazing experience giving the talk to 500 people in the storage community. That led to the next paper, and that led to the next, and that's how I got my PhD.

Until the last two years of my PhD, I had no intention of becoming a prof. But over time, I noticed that Remzi and Andrea had so much fun at their job, and that a lot of the fun came from interacting with students. I mentored a few students myself, and really enjoyed the experience. I taught a class at Wisconsin, and found that I enjoyed doing that as well.

So when I graduated, I figured I would give the academic route a shot. I honestly did not expect any interview calls, much less offers. I wasn't working on anything glamorous – file systems are hardly a hot topic. My thinking was that at least I would have tried. I was fully prepared to go into industry, and I think I would have enjoyed my time there as well.

I was super lucky to get nine interviews, and five offers. I was astounded! I had a hard time deciding among my excellent offers, and finally chose to go to UT Austin (after a one-year postdoc at VMware Research).

Personally, I am quite happy to have chosen this path, and after six years, I am amazed at how well it worked out: it is a delight to work with students, I love teaching, and I love working on research with my group.

But what about the cons? Yes, there is stress and responsibility, but you learn how to handle it over time. Yes, I would have made more money if I had gone into industry. But our current income (from both my wife[4] and me) works for our family. Overall, we have an excellent quality of life in Austin!

1.6 Choosing between an asst prof position and other jobs

This is one of the questions I get asked on a regular basis, so I figured I would explain what I think the major differences between these jobs are. I am most familiar with (and get asked about) researcher and developer roles in industry, so that is what I have covered. But there are obviously other jobs such as going into government for policy work.

Choosing between two jobs always has a lot to do with the exact terms of the two jobs, location, your goals, your financial situation, etc. So it is impossible to give generic advice. But hopefully the following will help guide you in making your decision.

Asst prof vs researcher in an industrial lab. Let us assume you have an offer from an industrial lab such as Microsoft Research, VMware Research, or IBM Research (and also an offer for an assistant professor position). I would say the big high-level difference comes down to **teaching and students.** Though you will have interns and junior folks to mentor in a researcher position, it won't quite be the same as having your own students. In some cases, you might be able to teach as an adjunct while being a researcher, but it won't be part of your job per se. So if you love teaching and mentoring students and seeing them grow, I would recommend an academic position over one in industry.

Another thing that is meaningfully different as an industrial researcher is that for certain kinds of research (for example, datacenters), it is hard to do meaningful research in academia. On the other side though, there are also some kinds of research that is fundamentally impossible to do in industry – for example, see AI ethics research that is often critical of industry.

Funding also works differently – it is easier in some cases because your manager can authorize small-to-medium purchases easily, and harder because it might be tougher to convince the management to give you half a million dollars for a project that doesn't contribute directly to the company's bottom line.

Note that the research you can do in academia is also limited by whether you can get funding, so it is not as "free" as it seems. However, if you want to work on a project by yourself in academia (in other words, you don't need to secure funding for your students) that doesn't require any infrastructure investment (think theoretical research), there really isn't anything to stop you.

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[4] Everyone in academia needs strong support from their partners in various forms: sometimes financial, sometimes emotional. My academic journey would not have been this successful or this happy without strong support from my wife and my family. We should acknowledge this and provide support to our partners and family in turn!

One other related point I want to make is that my friends in industrial research labs are way less stressed and way better compensated for their time. I don't think this would be the determining factor, but it is something to also consider.

Asst prof vs developer in industry. Working in industry brings you a chance to make a direct impact on the lives of your customers, be better compensated for your time (like, wayyyy better), and have a better work-life balance. The downside is that most of these positions do not involve publishing papers, and you more or less leave the academic world.

I've known excellent CS PhDs get both academic offers and a job at Google/Amazon/Facebook/Netflix and take the latter. [Several](#) [excellent](#) professors have made the jump from academia to industry in the last decade. So this is definitely worth considering.

I would say it boils down to the kind of work you want to do. If you want to write code, build products, and directly affect the lives of users, this is the job for you. If you want to advance the state-of-the-art and influence how the field thinks about problems in your area, perhaps a researcher position is a better fit for you. If you want to mentor students and teach, consider an academic position.

Additional Resources

Check out this [excellent guide](#) to post-grad jobs from Wes Weimer, Claire Le Goues, and others. They cover finding jobs, preparing your application, interviewing, and making a decision.