

# Career Options

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University of Pittsburgh,

[https://people.sc.fsu.edu/~jburkardt/presentations/careers\\_2023\\_pitt.pdf](https://people.sc.fsu.edu/~jburkardt/presentations/careers_2023_pitt.pdf)

25 August 2023

As I address the incoming class of graduate students, I would like to set you at ease with a joke. When I tried this joke out on our graduate chair, he was horrified, and told me not to use it because it was too negative. The joke I was *going* to tell was something like this:

*Many movies about the college experience begin with the dean telling the students “Look left and right. Half of you won’t be here in four years. Of course, I’m exaggerating...”*

I managed to flip this quote over into a more positive version:

*The dean tells the students “Look left and right. Half of you will be here in four years. Of course, I’m exaggerating...”*


Despite my choice of jokes, it turns out it was too late for the graduate chair to replace me, so let’s get (somewhat prematurely!) into the question of the career options that lie on the other side of your graduate school experience.

## 1 The Mathematics Genealogy Page

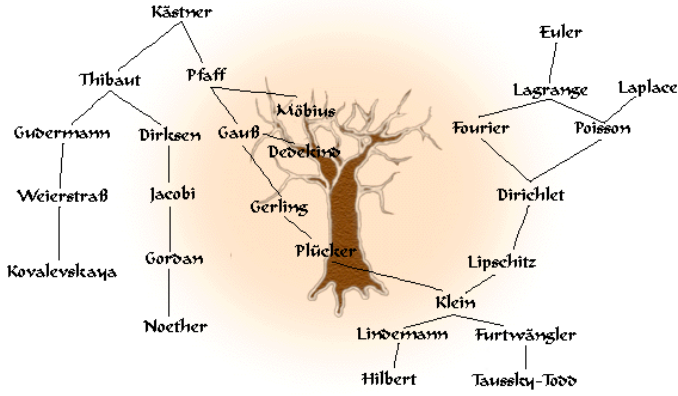
Presumably, you have all started graduate school here with the intention of attaining a PhD degree. You might not realize that the PhD degree in mathematics has a long, even ancient, history, which amounts to a kind of enormous family tree. It is (partially) recorded in the *Mathematics Genealogy Project*, available at:

<https://genealogy.math.ndsu.nodak.edu/>

which opens as follows:



## Mathematics Genealogy Project



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**295844 records as of 29 August 2023**

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Mathematics Genealogy Project  
 Department of Mathematics  
 North Dakota State University  
 P. O. Box 6050  
 Fargo, North Dakota 58108-6050

By typing a name into the search box, we can track down any person whose

PhD has been recorded.




## Mathematics Genealogy Project

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### Michael J. Neilan

[MathSciNet](#)

Ph.D. [University of Tennessee - Knoxville](#) 2009 

Dissertation: *Numerical Methods for Fully Nonlinear Second Order Partial Differential Equations*

Mathematics Subject Classification: 65—Numerical analysis

Advisor: [Xiaobing Feng](#)

Students:  
Click [here](#) to see the students listed in chronological order.

Name	School	Year	Descendants
<a href="#">Liu, Haoran</a>	University of Pittsburgh	2022	
<a href="#">Otus, Muharrem</a>	University of Pittsburgh	2022	
<a href="#">Sap, Duygu</a>	University of Pittsburgh	2017	
<a href="#">Wu, Mohan</a>	University of Pittsburgh	2019	
<a href="#">Zytoon, Ahmed</a>	University of Pittsburgh	2021	

According to our current on-line database, Michael Neilan has 5 [students](#) and 5 [descendants](#).

We welcome any additional information.

If you have additional information or corrections regarding this mathematician, please use the [update form](#). To submit students of this mathematician, please use the [new data form](#), noting this mathematician's MGP ID of 126095 for the advisor ID.

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Fargo, North Dakota 58108-6050

and now you can see where and when he got his PhD, the title of his thesis, the PhD students he advised, and the name of his own advisor. By clicking on that advisor's name, you can go back one generation. By repeatedly doing that, you can go back in time and you will run across some very famous names in mathematics.

In one sense, graduate school is about getting your name onto this same list, by choosing an advisor and a topic, and working hard to write a suitable thesis!

## 2 Where Are Pitt Math Graduates Employed?

So let's jump ahead and suppose you have gotten your PhD from the University of Pittsburgh, writing a dissertation in some area of mathematics. Where do our students go next? The Department maintains a record of the first job taken by PhD graduates. Take a look at it, to get a real surprise at the range of dissertation areas, the variety of companies that hired our graduates, and the way that a dissertation topic often seems to have little to do with the job that was found.

This job information is currently available at

University of Pittsburgh  
Department of Mathematics  
Graduate  
Graduate Employment

or

<https://www.mathematics.pitt.edu/graduate/graduate-employment>

## Graduate Employment

We take pride in our excellent job placement record. Our program trains students in quantitative skills that are in demand on the job market. Our graduates go on to diverse, fulfilling careers in academia and industry.

Year	Name	First Position Post-Graduation	Dissertation Title
2023	Tian Jing	University of Michigan - Post Doc	Interface Problems in Two-phase Magnetohydrodynamic Flows
2023	Jesse Han	CEO/Founder Blazen AI	Contributions to Neural Theorem Proving
2022	Luis Berloiz	National Autonomous University of Honduras - Head Professor Level 2	Hierarchical Representation of Terms from Large Mathematical Corpora
2022	Yujie Ding	Samsung Semiconductor (San Jose)	Wave Patterns in Networks of Coupled Oscillators
2022	Xiaoyu Duan	National Institute of Health - Post Doc	Parameter Identification and Estimation of Dynamical Systems from a Single Trajectory
2022	Henry Duran		Nonlinear Waves in Lattices and Metamaterials
2022	Mark Fincher	BNY Mellon	Canonical Decompositions of Hyperbolic 3-orbifolds
2022	Tyler Gaona	Indeed.com	On Hyperbolic 3-orbifolds of Small Volume
2022	Kiera Kean	Temple University - NSF Post Doc	Accuracy and Simplicity in One Equation Turbulence Models
2022	Haoran Liu	Citigroup	Unfitted Finite Element Methods for the Stokes Problem using the Scott-Vogelius Pair

Looking at this information, you will see that a large number of our graduates go to various banks and financial companies. (This suggests it's worth

while to look into courses in probability, statistics, financial math, or actuarial science.) Some others have gone to various technical companies (so that some programming experience might be useful). A minority of our students went into academic positions, and in most cases their first job was not as an assistant professor, but rather as a post-doctoral student. This is an intermediate position between graduate school and a professorial job, lasts from 1 to 3 years, and involves yet another job search at the conclusion. A post-doc is a typical step towards getting a professorship at a research university.

### 3 Non-academic or “Applied Math” jobs

Within the academic mathematics world, “applied math” has a particular meaning, but outside of academics, every mathematics job is considered to be an applied mathematics job, that is, mathematics applied to whatever it is our company wants you to do. Except for universities, there are essentially no companies that will pay you to sit in a room, drink coffee, and think your own thoughts.

You probably don’t realize the incredible variety of companies which hire mathematics professionals. SIAM (the Society for Industrial and Applied Mathematics) publishes a booklet *Careers in the Mathematical Sciences* which describes XX people working at various companies, gives their educational history, current salary, job title and duties, and allows them to speak about what it’s like to work there.

The booklet is currently available at

SIAM.org  
Careers  
Resources  
Careers in Math Sciences  
Careers Brochure

or

<https://www.siam.org/Portals/0/Student%20Programs/Thinking%20of%20a%20Career/Careers%20Brochure%202022.pdf>

Jesse Berwald  
**PRINCIPAL SOFTWARE ARCHITECT**

**EMPLOYER**  
Quantum Computing, Inc.  
**DEPARTMENT**  
Engineering  
**LOCATION**  
Remote (I currently reside in Minneapolis, Minnesota, U.S.)



“Something to be aware of is that you will use your mathematics skills in a general sense solving very interesting problems, but it’s unlikely that you will directly leverage your specialty.”

**EDUCATION**  
B.S. Honors Mathematics, University of Michigan  
Ph.D. Mathematics, Montana State University  
**CAREER STAGE:** Mid

**WHAT DO YOU DO?**

As a software architect I interact closely with many levels of the organization. I ensure that hardware engineering projects align with requirements from sales and marketing. It is essential that the senior leadership understands the scope of a product and how to prioritize where we can take it. One example of a recent interesting project was we released a software interface to a new hardware device, which allows customers to solve integer optimization problems on a quantum computing device.

**What types of skills do you use?**

My foundational skills as a mathematician have allowed me to learn new skills such as quantum computing with minimal pain and suffering. Mathematicians are keen generalizers, which is an important crossover skill in many jobs, including software engineering. Project planning and management is foundational: decompose a six-month block of work into smaller milestones and deliverables. Nevertheless, most days require a much larger dose of interpersonal skill than any other skill.

**How are applied mathematics and/or computational science important to what you do?**

Applied mathematics and computer science are foundational to my work. Quantum computing leverages a wide range of tools, from machine learning to quantum physics. Staying abreast of new research means that I set aside time to read relevant research papers, too. Currently, architecting software for quantum computing involves a larger-than-average portion of the stack: at one end, an understanding of the underlying physics is often required; at the other end, one is tasked with implementing these ideas as machine learning algorithms in the cloud.

**What are the pros and/or cons of your profession/job?**

**Pro:** In my current role at a start-up, we are all focused on essentially a single product, which really helps to guide one’s work.

**Con:** Start-ups can travel a nonlinear path at times, which might involve a sudden change in the company’s direction, which can lead to feelings of instability.

**Does your job offer flexibility?**

My job is very flexible in terms of working hours and location.

**CAREER PATH**

**What career path did you take to your current position?**

My career path has been very nonlinear. I dropped out of high school to pursue bike racing and ended up finishing my last two years of undergrad at University of Michigan. The next five years included graduate school in Connecticut, a software position at IBM in Massachusetts, serving coffee, framing houses in Montana, and lots of rock and ice climbing. I reentered graduate school in Bozeman, Montana and graduated with a Ph.D. in mathematics.

After my Ph.D. I spent two years as a postdoc at William & Mary, then a year at the Institute for Mathematics and its Applications at University of Minnesota. Both of these postdocs focused on dynamical systems and topological data analysis. In 2014, I left academia for a data science position at Target, and after three years I transitioned to a sales engineer role at D-Wave, a quantum computing company in Vancouver, which ended up having many interesting collaborations with industrial partners. Now I work for a small start-up in the quantum computing realm, but have transitioned in this job from a quantum algorithm engineer to a software architect.

**ADVICE**

**What advice would you give to someone pursuing a similar degree or profession?**

Reach out to people you know in industry, pursue summer internships at national labs or companies, and learn to code in a modern language such as Python. The need for mathematical reasoning shows up in many unexpected areas.

**Was there anything that surprised you when you started out in your career?**

The number of people and technologies I regularly work with always impresses me. Developing a new product often involves much more work than a large journal paper.

**SALARY**

\$150K–\$300K + bonus and stock options

Note that SIAM is hosting an online Career Fair on October 11, for SIAM members. The Mathematics Department can nominate a certain number of students for a free membership, and this is an excellent way to start investigating the future job market!

SIAM also maintains lists of internships, fellowships, and job opportunities.

The American Mathematical Society and the Mathematical Association of America also provide career information. There is a joint AMS/MAA meeting to be held in San Francisco January 3-6 which traditionally includes on site job interviews for many academic positions, often at smaller teaching universities, and particularly of interest for fresh PhD students.

## 4 Applying for academic jobs through mathjobs

The American Mathematical Society maintains the `mathjobs` program, which is used to post job announcements from universities, applications from job seekers, and recommendation letters from designated references. Except for smaller colleges and teaching schools, jobs at almost all levels will appear here. Most jobs announcements appear starting in September, and applicants are typically encouraged to apply, and supply all information, by the end of December. In January, committees often choose about three candidates, who are invited for interviews, and then an offer is made in early spring.

Even before you are ready to look for a position, it's useful to search `mathjobs` to see how many jobs are open, where they are, what levels and areas of specialization are of interest.

When you are ready to make an application, there are a number of items you will be asked for, including a cover letter, curriculum vita (CV), teaching, research, and diversity statements, and the names of people who will supply letters of reference. It's a good idea to start a CV now, so that you can gradually add new items to it as your graduate career proceeds, including awards, internships, fellowships, conference talks, papers, and other items whose details you might forget later.

To apply for a job requires creating an account, but anyone can look at the job postings immediately, by going to

`https://www.mathjobs.org/jobs`

and choosing

```
Login to MathJobs.org
...as a job applicant
View Jobs (appears at top of screen)
JobListings [by country/state]
```



At the top of the list you will see US states, with the number of jobs in parentheses.

The screenshot shows the top navigation bar of the MATHJOBS.ORG website. On the left, there is a logo for the American Mathematical Society (AMS) and the text 'MATHJOBS.ORG'. On the right, there are links for 'View Jobs', 'Registered Employers', 'Contact Us', 'Help', and 'Login'. Below the navigation bar, the main content area features the text 'Job Listings [URMs]' followed by a search box labeled 'Find by ID# or keywords' with a 'Go' button. Below the search box, there are several filter links: '[select by types]', '[by country/state]', '[sort alphabetically]', '[by postdate]', '[by enddate]', '[by deadline]', '[by startdate]', '[by distance]', and '[by status]'. There are also icons for RSS, a printer, and a social media link. At the bottom of the screenshot, a list of 'United States' is shown with the number of jobs in parentheses for each state: Alabama (3), Alaska (1), Arizona (4), Arkansas (1), California (59), Colorado (10), Connecticut (2), District of Columbia (11), Florida (7), Georgia (1), Idaho (3), Illinois (11), Indiana (4), Iowa (1), Kansas (2), Kentucky (3), Louisiana (3), Maryland (7), Massachusetts (19), Michigan (14), Minnesota (3), Mississippi (2), Missouri (5), Nebraska (2), New Hampshire (1), New Jersey (9), New Mexico (1), New York (23), NewHampshire (1), NewYork (2), North Carolina (5), Ohio (6), Oklahoma (1), Oregon (1), Pennsylvania (22), Rhode Island (6), Select... (1), Tennessee (3), Texas (20), Utah (7), Vermont (2), Virginia (6), Washington (7), Wisconsin (9). Below this, 'United Arab Emirates' is listed with 'Abu Dhabi (1), Sharjah (1)'.

Picking a state gives you the current list.

## Job Listings [\[URMs\]](#)

[\[select by types\]](#) [\[by country/state\]](#) » [\[sort alphabetically\]](#) [\[by postdate\]](#) [\[by enddate\]](#) [\[by deadline\]](#) [\[by startdate\]](#) [\[by distance\]](#) [\[by status\]](#) » [\[show map\]](#) »



United States:  
Pennsylvania (22)

### Allegheny College, Mathematics

1. [\[VAP\]](#) Mathematics, Visiting Assistant Professor of Mathematics ([Pennsylvania, US](#))

### Bryn Mawr College, Computer Science

1. [\[AP\]](#) Visiting Instructor/Visiting Assistant Professor of Computer Science ([Pennsylvania, US](#))

### Bucknell University, Mathematics

1. [\[TTA\]](#) Tenure Track position in Analysis ([Pennsylvania, US](#)) [Apply](#)
2. [\[TTM\]](#) Tenure Track position in Mathematics ([Pennsylvania, US](#)) [Apply](#)

### Lehigh University, Mathematics

1. [\[LEHIGHTAP23\]](#) Any area of Mathematics or Statistics, Teaching Assistant Professor ([search halted](#), [deadline 2023/03/17 11:59PM, Pennsylvania, US](#)) [Apply](#)

### Penn State Behrend, School of Sciences

1. [\[ATPLM\]](#) Assistant Teaching Professor or Lecturer of Mathematics (Fall 2023) ([Pennsylvania, US](#))
2. [\[LATPM\]](#) Lecturer/Assistant Teaching Professor of Mathematics (Starting Spring 2023) ([Pennsylvania, US](#))
3. [\[LATPM1\]](#) Lecturer or Assistant Teaching Professor of Mathematics (Fall 2023) ([Pennsylvania, US](#))

### Pennsylvania State University, Department of Mathematics

1. [\[CCMA\]](#) Mathematics, Postdoctoral ([Pennsylvania, US](#)) [Apply](#)
2. [\[NTLF\]](#) Mathematics, Non-Tenure Line Faculty ([filled, Pennsylvania, US](#))
3. [\[PD\]](#) Mathematics, Anatole Katok Center for Dynamical Systems and Geometry Research Assistant Professor ([Pennsylvania, US](#)) [Apply](#)
4. [\[POSTDOC\]](#) Mathematics, Postdoctoral Scholar ([Pennsylvania, US](#)) [Apply](#)
5. [\[POSTDOC1\]](#) Mathematics, Postdoctoral Scholar ([Pennsylvania, US](#)) [Apply](#)
6. [\[POSTDOC2\]](#) Mathematics, Postdoctoral Scholar ([Pennsylvania, US](#)) [Apply](#)
7. [\[PSTDC3\]](#) Mathematics, POSTDOC3 ([Pennsylvania, US](#)) [Apply](#)
8. [\[TF\]](#) Mathematics, Teaching Faculty ([Pennsylvania, US](#)) [Apply](#)

### Pennsylvania State University, Penn State Berks

1. [\[LATPM\]](#) Lecturer or Assistant Teaching Professor of Mathematics ([Pennsylvania, US](#))
2. [\[LATPM1\]](#) Lecturer or Assistant Teaching Professor of Mathematics ([Pennsylvania, US](#))


### Susquehanna International Group, Quantitative Research

1. [\[QRFT1\]](#) Quantitative Researcher – Graduate Hire ([Pennsylvania, US](#))
2. [\[QSFT1\]](#) Quantitative Strategist – Graduate Hire ([Pennsylvania, US](#))

### Temple University, Mathematics

1. [\[INSTRPROF\]](#) Assistant Professor of Instruction ([Pennsylvania, US](#)) [Apply](#)

### University of Pittsburgh, Mathematics

1.  [\[POSTDOC\]](#) Mathematics Research, Postdoctoral Associate in MRC (Math Research Center) ([Pennsylvania, US](#))

Clicking on any job abbreviation in square brackets will give you the full details about the job and what you have to do to apply.

Note that there are a number of universities in the Pittsburgh area, and it

might be easy to pick up a summer instructorship or find out about future job openings by stopping by. These include Carlow, Chatham, CMU, Duquesne, La Roche, Point Park, and Robert Morris, and of course Pitt. Note that both Pitt and Penn State have a number of nearby branch campuses, for example in New Kensington and Greensburg, which might also be worth looking into.

## 5 Applying for non-academic jobs

As you should guess from the graduate employment data we discussed earlier, a majority of Pitt mathematics PhD's do not go for an academic position, but instead seek a job with business, industry or government. In that case, there is no single marketplace like `mathjobs`, and so just finding out what jobs are available can be a task.

The Pitt Career Center is a good place to get some advice about how to start looking.

There are a number of career fairs you should look into. Employers set up tables, describe their current openings, collect resumes, look them over and offer interviews if they are interested. Career fairs can occur online, on campus, downtown, or at some of the bigger conferences. You should have several copies of an up-to-date CV with you.

There are a number of online systems designed to help jobseekers, including

- `CareerBuilder`;
- `indeed`;
- `linkedin`;
- `monster`;
- `usajobs` (jobs with the US government);
- `ziprecruiter`;

Typically, these systems ask you to supply information about yourself, and then let you search through job listings for good matches.

Note that there are a number of companies here in the Pittsburgh area that might have a job or an internship for a person with a mathematical background, including Bettis National Laboratory, BNY Mellon, Duolingo, Google, Govini, KPMG, Meta, PNC, SESCO, UPMC.

## 6 The CV and other documents

When you apply for a job, there are a number of documents you will be asked to supply, which might include some of the following:

- *a cover letter*
- *a curriculum vitae or "CV"*

- *a resume*: highlights of CV that apply to this job;
- *a research statement*
- *a teaching statement*
- *a diversity statement*
- *a list of reference letter writers*

It's too early to worry about most of these items, and when it's time to worry, you should go to Pitt's Career Center for help in putting them together.

Even so, a few things are worth mentioning.

- You will want to write a brief (3 paragraph) cover letter customized to each job; what job you want; why they should be interested in you why you are interested in them;
- For now, you can think of your CV as just a long itemized list of your graduate career, including classwork, research, teaching, papers, conferences, awards, internships, fellowships, and membership in professional societies. Get all this down on paper, keep it updated, and let the Career Center help you format it later.
- Your teaching statement isn't restricted to classes you taught. If you are looking for an academic job, you should try to document any work with undergraduates, including tutoring, giving a talk to an undergraduate club, or other projects.
- You need to "cultivate" people who will write you a letter of reference. Your advisor is a freebie, and you might have another faculty member who is familiar with your work and appreciates it. But it will be most helpful if you can list respected people from other institutions who have worked with you, through collaborations, internships, or other interactions. It takes time to build up such relationships, but start looking now!

A personal web page is another way to "advertise" yourself. You might list open problems you are interested in, research activities, computer programs you have written, talks you have given. Your web page is another way to try to communicate with the mathematical world; it can give a potential employer some extra insight beyond the usual formal documents involved in the hiring process.

Some additional information that should go in your CV includes any programming languages you are familiar with. You should take advantage of the short workshops offered by the Pitt Library on such topics as data visualization, data frames with R, R Studio, 3D scanning. These skills can help you in your class and research work, but may also interest a potential employer. If you are looking for a job in industry, you might want to highlight any experience or knowledge of actuarial science, financial mathematics, machine learning, probability, statistics, since these are specific topics that a company may be searching for.

## 7 Conferences, Internships and other Adventures

One thing that impresses employers is any early work experience or activity that you have already had.

For academic employment, your teaching activity will be looked at carefully. Were you a tutor, assistant, grader, or the principal instructor? If you were an instructor, did you get and report teaching evaluations? Were you involved with students in any other way, as an adviser, club president, or project leader? Did you teach a variety of classes, or higher level classes such as calculus III, or ODE's?

Research universities will want to know whether you have already had some productive work, as evidenced by talks you gave at conferences, and papers you co-authored. They will also consider whether you would be a good fit with their current research groups. A school with a heavy emphasis on pure mathematics may hesitate to hire an applied person who would have no one to work with.

Both universities and industry will be very interested in any internships you worked on. You obviously had to make an extra effort to apply for such a position, and you were good enough to get it. You had to move out of your comfort zone, learn a new environment, work with a group, and pick up some extra skills during that time. These facts make a hiring committee more comfortable in considering you as a new employee.

As a sort of mini-internship, you should consider taking, or at least sitting in on Professor Jeff Wheeler's "BIG Problems" course, where BIG is a common abbreviation for Business, Industry and Government. The students in his course essentially play the role of mathematics consultants, visiting various companies in the area, finding out some problem they have, and working on a solution. You may see some of the resulting posters in the hallway on the 6th floor. While you might hesitate to take an undergraduate course, this way of applying mathematics to real problems represents an extremely attractive skill to industry.

Many companies offer summer internships, but finding out what's available requires searching. Many internships are available through government labs, such as NASA, NIH, NSA. In particular, the Department of Energy has 17 lab sites (Los Alamos, Livermore, Oak Ridge, Fermi, ...) all over the country, and a variety of programs available that offer summer housing and pay, while you join an ongoing project for several months. Take a look at what's available at:

<https://www.energy.gov/jobs-national-labs>

## 8 Using the Pitt Career Center

The University offers a career planning service, located at 200 William Pitt Union, 11am-3pm, and available online at

<https://www.studentaffairs.pitt.edu/cdpa/>

The center offers information about career fairs, career programs, networking events, job and internship search, mock interviews, and help with resumes and cover letters.

You should visit the center, find out about the career fair schedule for this semester, print your current CV and ask for guidance. If you are close to the time of looking for jobs, you should also request help with a mock interview, to make you a little more comfortable with having to explain yourself to strangers.