Where Can My Degree Take Me?

Speaker: John Burkardt
Instructor: Catalin Trenchea
Math 1080: Numerical Linear Algebra
Thackeray 524, 10:00am-10:50am
Mathematics Department, University of Pittsburgh
https://people.sc.fsu.edu/~jburkardt/presentations/careers_2025_pitt.pdf

10 March 2025

Your Degree is a Passport

Your transcript

- The classes in your major should show a focus.
- Grades in your major are important.
- Supplementary classes in related areas give you breadth.
- Seek skill classes (programming, speaking, writing)

Your transcript gives only a general idea of your academic history.

The HR people who may see your transcript may not be able to translate your list of classes into a particular expertise.

Your resume should helpfully interpret the main theme of your transcript, such as “numerical mathematics” or “mathematical physics” or “number theory for encryption” or “biomathematics” or “data science”.

What Else Did You Do?

Achievements outside of class are important, and will show up as interesting items on your resume:

- Apply for scholarships.
- Attend workshops and conferences in your field.
- Take external courses at Coursera, EdX, OCW, Udacity;
- Short, enthusiastic recommendation letters are impressive.
- Tutoring, mentoring, and services count.
- Research projects with local faculty are a plus: https://www.asundergrad.pitt.edu/research:
- An REU (Research Experience for Undergraduates) offers training in a group project at a remote university;
- Internships give you experience, some income, and contacts;

REU Programs

The NSF maintains a list of the REU's it supports at

`https://new.nsf.gov/funding/initiatives/reu/search`

A few examples (from hundreds)

- Quantum Machine Learning Algorithm Design, Arizona State
- Algebra and Discrete Geometry, Auburn University
- Summer Scholars, Biology, Chemistry, Mathematics: CMU
- Number theory, aperiodic order, California State
- High Performance Computing, Clarkson
- Mathematical Biology, Clarkson

Local internships

Many Pittsburgh companies offer summer internships, which are short term, temporary jobs. You may be expected to have some basic skills, and get additional training. You are paid as a regular employee. If the job is closely related to your studies, you may make valuable contacts for a permanent job later. In any case, you should work hard to get a good letter of recommendation.

Because these jobs are local, you can easily stop by first, to get a feeling for the people and the job.

Companies with internships in the area include Aerotech, BNY Mellon, Chromalox, FedEx, Honeywell, KPMG, Microsoft, Pittsburgh Pirates, PNC, PPG, Quest Diagnostics, Tenaris, Williams.

Remote internships

SIAM maintains information about internships in industry, research institutions, and government labs:

`https://www.siam.org/programs-initiatives/professional-development/internships/`

You can also search for internships in job sites such as Glassdoor, Indeed, LinkedIn, ZipRecruiter.

You can go directly to the website of a company or lab such as Apple, Google, IBM, Meta, Microsoft, NASA, NCAR, NIH, NSA, Oak Ridge National Lab, Pfizer.

More opportunities

The Mathematics Department web site includes a section on research opportunities and careers at

`https://www.mathematics.pitt.edu/undergraduate/undergraduate-researchcareer-opportunities`

Some of these links are very extensive and you are sure to find something of interest that you did not know about.

What Happened to Other People?

The Mathematics Department Web Site lists the first jobs of some if its graduate students.

This tells you what companies are hiring, and what specialties they are interested in. You may even be able to contact one of these former Pitt people to ask for more information or help.

`www.mathematics.pitt.edu/graduate/graduate-employment`

Some of these graduates were hired by Limetree, American Economic Association, Wells Fargo, Blazen AI, Samsung, BNY Mellon, Indeed.com, Citigroup, Morgan Stanley, Discover Financial Services, Imandra R&D, Citibank, Equisoft.

Have an Idea of Your Options

SIAM (Society for Industrial and Applied Mathematics) has an online guide, and a booklet, suggesting how to prepare for your job search, and what kind of jobs you can expect.

Search on "SIAM CAREERS IN APPLIED MATHEMATICS" or take your chances on the following address:

`https://www.siam.org/programs-initiatives/professional-development/career-resources/careers-in-applied-mathematics/careers-brochure/`

Each page introduces a person with a specific job, what they studied in college, how they ended up getting the job, average pay, education requirements and other features.

A Page from SIAM Career Guide

Jesse Berwald

PRINCIPAL SOFTWARE ARCHITECT

“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.”

EMPLOYER
Quantum Computing, Inc.

DEPARTMENT
Engineering

LOCATION
Remote (I currently reside in Minneapolis, Minnesota, U.S.)

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

Grad School?

If you love what your are studying, and want to go ruther in your education before taking a job, you can look into graduate school.

Graduate school is not for everyone; you should find a current graduate student, offer to pay for lunch, and have them tell you their joys and woes.

After than, if it still seems like a good idea, get advice from faculty in your area about where to apply. Look online at the departments and try to identify professors, groups, or centers you would like to work with. If possible, visit the campus and meet the people you will be working with for the next two to five years.

After Grad School?

Be aware that most holders of graduate degrees do not go on to an academic position; even those who do often have to take several post-doc positions first. Check out `mathjobs` for listings.

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

The Career Center

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

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

`https://www.studentaffairs.pitt.edu/cdpa/`