

Translatable Skills from Academic Training

At Stripe, my data science colleagues have a wide variety of different technical backgrounds: biology, physics, epidemiology, etc. While I currently work under a general Data Scientist title, the problems I've worked on in industry are mostly related to core concepts from my graduate training in Operations Research: algorithms, spatial optimization, decision making over time, stochastic processes, queuing, statistics, concepts about robustness and quantifying performance, and so on.

Outside of my technical familiarity with certain topics, a lot of the value I bring to my team is connected to habits of mind from my mathematical training. First, in both pure and applied math research, one of the great pleasures is inventing language to formalize initially fuzzy ideas. The right language, or even, the right evocative name, can set off a cascade of useful reasoning, exposing paths forward that were initially invisible. This is absolutely a phenomenon in industry as well. Inventing the right language can accelerate iteration towards the most meaningful questions and can unblock teams.

Second, to listen to mathematics talks productively, you often can't rely on understanding each detail in linear order: instead you have to practice a kind of "modular ingestion." In real-time this involves listening for the high level structure of the reasoning, and being able to fluently black-box and un-black-box various sub-modules to investigate details after the fact. These listening habits are incredibly powerful in trying to ingest messy real world settings from experts who know countless corner cases, caveats, and lurking hazards. Another listening skill is habitually building an expanding survey of "typical approaches" used to reason about major classes of problems. Almost every academic I know does this in the background: being sensitive to when you are encountering a new mode of reasoning or when a problem fits a mode of reasoning you recognize is a huge asset in an industry setting.

Finally, in certain ways, the intense specialization of mathematical training can be quite good preparation to navigate life as a generalist. Mathematical arguments often contain long sequences of logical implications. Mathematicians build up strength in an unusual muscle: the ability to peel back 80% of their own mental model and rebuild implications very quickly based on the introduction of a new assumption, or in response to a flaw exposed early in the chain of reasoning. In industry, and particularly at fast-growing tech companies, data scientists often meet new problems, features, and obstacles weekly: the ability to quickly iterate and pivot your mental model (and to bring others along with you) is like a super power!

Exploration vs. Exploitation

Every career path offers a different collection of rewards. To say that we often face large decisions without the benefit of full information is an understatement. For me, a really

successful strategy has been to pay close attention to what I find personally engaging on a daily basis. If you don't have access to direct experience about a future direction you are considering (e.g., an internship), how could you start to gather evidence? Seeking out others who have taken paths that you are considering (and reading articles online...) is a great place to start. Asking concrete questions about how someone spent their last 40 hours at work can be illuminating. Don't worry if you aren't already sure what path is right for you: learning your own preferences and forming a vision of the type of exercise you'd like to be giving your brain in 2–3 years is a serious investment.



Gwen Spencer

Credits

Author photo is courtesy of Gwen Spencer.

Academia Trained Me for a BIG Career

Peter D. Horn

I am honored to share some career advice with the young and mathematically inclined. When I fit that description, I felt a lack of diversity in the opinions and advice I was hearing from my mentors. This wasn't their fault, but mine. Classic case of selection bias, as I only sought advice from my professors. My first recommendation is to connect with many math folks who have walked a variety of paths to get a sense of what is out there (reading the posts on <https://bigmathnetwork.org> is a great first step!).

When I was finishing up my math major, I felt there was more math for me to learn, and I went on to get a PhD in low-dimensional topology. As a grad student, I was encouraged to pursue a postdoc. By the time I was deep into my postdoc, I had a tenure-track job in my sights. It wasn't until my third year into a tenure-track position that I

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evaluated my career choice and realized I would be happier doing something else.

I reached out to a few friends from grad school who went into government and industry, as well as a couple former academics who transferred to tech and finance jobs. I did a little research to see what was out there, and found “data science” to be a broad enough field to entertain my intellectual curiosities (e.g. machine learning algorithms) while providing plenty of opportunities. My first post-academic role was data scientist at a non-profit doing R&D for various federal agencies. In my first year there, I worked on research projects involving machine learning and agent-based models to drive policy analysis, and I prototyped a web-based simulation tool to explore workforce strategies for the VA. Since then I have pivoted towards software engineering. Currently I lead a team of software developers at Indeed.com, where we are building data analytics and pipeline tools used within the company. There are many industry roles that are good fits for mathematicians, and it is possible to change roles.

While in the transition to industry, I realized that much of my academic training and some of my hobbies positioned me to be an attractive candidate. As a math major/PhD candidate/professor, I had accrued a ton of experience teaching myself complex, abstract concepts. Employers seek out job candidates who can demonstrate the ability to pick up new things quickly. Working in help centers/recitations/lectures, I had accrued a ton of experience explaining deep, technical material to non-technical audiences. Employers like to hire teachers because they can put you in front of customers or use you to mentor young staff. As a mathematician, you have surely gained similar experience. Find a way to brag about your superpowers!

You’re going to need programming skills. In my journey, I was lucky to have learned to code. In college, I learned a bit of Java in CS 101. In grad school, the math department hired me by the hour to maintain their website. I chose to write up my homework in LaTeX. Frequently, I would need to do some computations in Mathematica, Maple, Matlab, or Sage. As a postdoc, I got bored one summer and wrote a couple of card games in Objective-C. For a research paper, I needed to diagonalize some matrices over a non-commutative base ring, and I wrote the code to do this from scratch in Python. Before I had even heard of data science, I had ten programming/markup languages under my belt, and I put all of them on my resumé to show employers that I am comfortable writing code. If you don’t have experience programming, I recommend you pick up Python. It’s a good general purpose language. Pick a project and use Python to attack it (e.g., implement matrix multiplication from scratch).

The last piece of advice I have is to acquire domain knowledge and to network. The biggest hurdle I had in my journey was learning to communicate with potential employers. I decided to take online courses in data analytics

and machine learning, and these courses taught me what people in industry care about, how they talk, and what tools they use. I also participated in some coding and data science competitions online. Since I had a noticeable lack of business experience, these competitions were something I could point to as proof that I could do data science. I would also recommend attending meetups in your area. In my experience, meetup people are very friendly and helpful.

Transitioning out of academia was scary, but it has been one of my best decisions. At first I was worried I wouldn’t be what employers were looking for, but I learned that many employers want to build companies with people from diverse backgrounds. Don’t worry about trying to fit the mold. Reach out to friends, former classmates, and friends of friends, and you will find all the support you need.



Peter D. Horn

Credits

Author photo is courtesy of Peter D. Horn.

Threefold Advice: Making the Jump from Geometric Group Theorist to Computer Vision Specialist

Lucas Sabalka

I began my mathematical career as a research mathematician, but now I work in industry even though my degree is not in an applied area. With so few academic jobs available recently, transitioning to industry is becoming more common for mathematics PhDs. So to help any mathematicians thinking about that transition, let me tell you how I got where I am.

I had always planned on being a professor as I pursued my PhD. That’s what I became: after two postdocs and a

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