A Different Path (From Mathematics to Startups)

Daniel Krasner

During my days as a graduate student in mathematics, I heard very little about career options outside of academia. Every year, a few students would graduate and head into the private sector, mostly Wall Street, but they were seldom heard from afterward nor their career choices discussed. The professors I had contact with never spoke of other opportunities, and, on the whole, the subject had the aura of taboo. The path I took from the university into the private sector has taught me a lot and came with surprises. I would like to describe this journey to you and share what I have learned along the way.

More and more companies, in hopes of keeping their market edge, are actively seeking mathematically minded individuals who have problem-solving skills and can quickly assimilate new information and knowledge. The world of technological, data-driven startups has matured sufficiently in recent years to require more sophisticated techniques, much of this in the realm of data mining and statistical analysis. This is true in such diverse areas as e-commerce, business intelligence and consulting, medical consulting, medical sciences, national defense, marketing, and many others. The number of interesting and challenging problems in this world that can be addressed with mathematical techniques is constantly increasing. Moreover, many people out there revere anyone who can "do math", and this ability can command a lot of respect. Startup companies see a mathematician as a person who can do something that no one else can do and can learn anything that anyone else has learned.

Your mathematical skills can open quite a few doors and create viable options that you might not have thought of outside of academia. The path from academic mathematics to startups is only now beginning to be paved, the opportunities are as diverse as the problems, and the community is vibrant and expanding.

In short, it is worth looking into.

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My Academic Path

As a graduate student at Columbia University, I knew that a Ph.D. would only increase the number of future opportunities, and I never saw any immediate motivation or reason to abandon the program prematurely. However, I was never completely sure that the career of an academic mathematician was for me. Whether that uncertainty was tucked away or out in the open mainly depended on my mood. Looking back at that time, I can say that a number of circumstances prevented, or rather delayed, my decision to leave. Chief among these was the fact that I really loved my life as a graduate student. I was living in New York, a place where I had always wanted to study, and had met some amazing people. I was pretty much completely free, was materially satisfied, and in many ways really enjoyed doing mathematics. I was living the academic life and thought it too grand simply to walk away. There was also a good deal of determination at play. In the back of my mind, leaving academia would have been like admitting defeat in the face of something inherently difficult. Moreover, I continually envisioned a situation in which I would be forced to leave due to lack of a job, which would absolve me of any real decision making. But that never occurred.

After defending my dissertation and securing a stint at a satellite campus of Stony Brook University, I was offered a postdoctoral position at MSRI for the duration of a one-semester program. Anyone who has been there knows it is a wonderful place to spend your days and to work. In addition, the program was absolutely stellar, making the opportunity even harder to pass up. Shortly after my MSRI arrival I received a very enticing offer for a postdoctoral position at UCLA. This led to an uncomfortable week in which I struggled to make the "right" decision. In the end I was convinced, or convinced myself, that UCLA was worth a try.

Despite my inherent love of the lifestyle, I had a number of qualms about academia, many of which are beyond the scope of this article. In particular, I felt that my energy could be used to do something more tangible with greater impact on the world. In addition, the geographic constraints that mathematics was putting on me were also having their toll. My life was in New York City, but I was working in Los Angeles. Faced with the reality that, in the academic path, it would take me years to settle somewhere permanently, and that even then the choices might not be inviting, I decided to actively seek other opportunities. Next came the immediate question of how realistic my options were outside the academic cocoon.

My situation was not unique. Although they might not be willing to discuss such matters openly, a significant number of academics struggle at some point in their careers with the kinds of issues that prompted my departure. I believe it an unfortunate side effect of the atmosphere created in the "ivory tower" culture that other options are not discussed openly and that it is considered best to keep such thoughts private. This does not have to be the case. Better-informed individuals would make better decisions and lead more rewarding lives whether in or out of academia. This is the main reason that prompted my writing this article.

So, how did I arrive at a startup?

My (New) Career Path

For some time now, Wall Street has been the beaten path for quantitative scientists looking to leave academia. However, before attempting this option, I did look into others. Consulting had left a sour taste in my mouth from an interview I randomly had during grad school, and none of my forays into educational policy or curriculum development were panning out. I knew a number of people who ended up with financial careers, and while I can't say that any of them encouraged my pursuit, they were certainly helpful and very informative. Shortly after I started interviewing, I quickly realized that Wall Street wasn't running around with blank checks looking for mathematicians without experience in the field. In addition, the interview process—with recruiters, silly puzzles, and long days—was for the most part rather unpleasant. I do have to admit that only a few of my Wall Street interviews were classically horrific, but it doesn't take many to ruin your appetite. Soon I had an offer from a large bank that I turned down because morale there seemed incredibly low. Nevertheless, I learned quite a bit during this time and met a number of smart and interesting people (some of whom I am still in regular contact with). In any case, about two weeks after I officially resigned from UCLA, my search for a finance job was cut short by an email, rapidly followed by a phone call and an in-person interview which landed me in an industry I had never even considered.

The thought of working in a startup did not cross my mind, simply because I was not aware the option existed. But when I was called and asked whether I would consider taking a role in data mining and analytics, my response was an unqualified yes. The interview process was so much faster and more agreeable than what I had seen in finance that I could only call it a relief. While the hiring process in financial firms tends to be long and drawn out, the situation here was completely different. After one phone call I was asked to come in the next day, had a pleasant, although intense, conversation with the head of the analytics group about the company and my interests, and with minimal delay received an offer. The whole thing felt like it fell out of the sky and landed right on my plate—seasoned, cooked, and garnished. The small group of mentors who were guiding me in the job search immediately endorsed the idea, and even the finance guys who were "promising" to bring me on board in the coming weeks wholeheartedly suggested I take the offer. I quickly accepted, and my job search was over.

The Startup Environment

The experiences I describe below are mine mixed with those of others I have met since my arrival approximately seven months ago, and although the picture is very basic, I do hope it will give you a glimpse into the startup world.

Startups, like dogs who grow up to mirror their owners, reflect the personality of their founders and come in all shapes and sizes. With that said, there are certain cultural similarities and trends prevalent in the community. Since "survival" is the general status quo of many startups, a lot of emphasis is put on productivity and, in short, doing whatever is most pressing as quickly and effectively as possible. It is not uncommon to find yourself filling roles or participating in decisions that were not part of your original job description. The role of data mining and analytics might very well involve talking to clients, understanding their questions or concerns, crashing through what is essentially a course in business school, product development, coding, or whatever other task is at hand. This can be fun, frustrating, nerve-racking, and exciting all at the same time.

If you are looking for a standard workweek, where all company-related thoughts are confined to set hours, then many startups will not be the place for you. Although it is common to have some flexibility in setting your schedule, it is also common that the liberty you take is reciprocal, in the sense that, with pressing issues, your work can spill into your "free time" on a regular basis. On the other hand, it is not uncommon that the option to choose your personal schedule comes

along with arrangements by which some work time is split between home and office. Obviously, all of this depends on the people who run the company and the type of culture they are trying to create. If you desire to escape the fluidity of academic life, don't be surprised to find yourself in a similar arrangement.

Of course, in almost any job, and in direct contrast to an academic post, you will have a boss, and this can be a blessing or a curse depending on the situation (sometimes a bit of both). Moreover, there will be an immediate demand on you to produce results and carry out certain tasks, and the freedom to set your schedule will disappear, or at least diminish, as you enter the business world. You will have to adapt to a different environment and forgo perks such as extended vacation. This can mean very little time off, with most places offering somewhere between two to three weeks per year. But, in general, startups tend to approximate an academic atmosphere, avoiding the rigidity and bureaucracy of the more established corporate world.

The success of a startup is not defined by an individual's effort. Working as a team becomes an integral part of life, and, in contrast to academia and finance, this fosters a highly noncompetitive environment. In addition, most of the technical people I have met in startups have an overwhelming desire to build things, to take an idea and try to turn it into something concrete—whether this be software, a website, or new models. Both of these are extremely important traits to have, and startup founders care deeply about them when looking at potential candidates. People in startups are there to build a product and then to launch it. I have found it truly inspiring to be surrounded by such individuals. Never before have I encountered, in such a short span of time, an equivalently high concentration of intelligent and interesting people.

This motivation is supported by the fact that it is common for employees to be financially invested in the success of the company, which only increases personal involvement. In contrast, rarely in an established venture are employees given a stake in the company. This essentially unique feature of the startup world couples the desire to produce good work with the ability to have direct influence on the company itself and, hence, on the bet you undertake by accepting a combination of salary and equity.

The Daily Grind

The desire or willingness to absorb subjects that might be outside the scope of your expertise or, at first, might not even sound that interesting, is a definite must. I would never have considered going to business school, but I have found it fascinating to watch in action the intricacies, insights, and skills necessary to make a business successful. Quickly picking up whatever requisite technical knowledge is needed for a problem at hand is a regular feature of startup life. It is common to learn certain bits of a subject that are necessary to provide an immediate answer or solve a given problem, while leaving a more comprehensive understanding for a later date. In contrast to academic pursuits, the effectiveness and usefulness of any scientific contribution is much more valued than its inherent elegance, so the readiness to accept "working" solutions that might seem awkward or even trivial becomes a fact of life. You might end up creating very beautiful models that are new and unique, or you might be simply tweaking well-developed machinery and applying standard tools to solve the problems at hand; chances are it will be a bit of both and much more of the latter. In the last year I have delved deeply into the fields of statistical inference, signal processing, Bayesian analysis, optimization, and data processing, as well as the requisite technical tools required to solve the problems at hand. I have learned about online recommendation models, business intelligence, e-commerce, application service providers, database architecture and related systems, and much, much more.

Regardless of the particulars of the data analysis or modeling that you will be doing, at least half of your time will be spent coding. A pretty common breakdown of your work is: 50 percent writing code, 30 percent modeling, and 20 percent logistics (meetings, clients, project plans, etc.). Data cleaning and preparation is an integral part of the modeling process itself and cannot be avoided. Writing such scripts can take a majority of the hours you spend coding, and, depending on the types of problems and data at hand, that initial 50 percent can increase drastically. You will need to become proficient with a number of different types of tools, and these can be anything from open source low-level languages to proprietary statistical analysis software. Chances are you will be using a number of such tools simultaneously, and it will take a good amount of work to reach a level of competency. I have found it incredibly satisfying to write code and run models, mainly because of the immediate feedback. Acquiring both the mathematical and technical knowledge has been challenging but also really fun, as has the application of these skills to real-world problems.

Well, how do you go about finding a job in a startup?

The Startup Job Search

I landed my startup job completely by chance, after answering an ad that seemed little connected with my immediate skills. Another ex-academic mathematician I know, who spent a number of years working in finance before briskly abandoning that world, had a similar story when she saw a job post asking for a data scientist. She found

the ad simply by cross-searching "quantitative" and "NYC" on LinkedIn. Immediately, she sent an email essentially stating that she was seeking an environment as far away as possible from that of Wall Street. Five minutes after sending the email she was called back, went in for an interview the same day, and was given an offer that night. Despite the fact that all of this seems haphazard, there are good ways to look for a job.

There is no lack of abundance or variety in the startup world—companies are being created (and also being acquired or winding down) all the time, and the key is finding out as much as you can about a particular venture. Information about the founders and the general experience level of the people working at a given place can provide insight as to whether this company will exist in six months. One obvious method of getting noticed is to blast your resume to different startups that sound like they are doing good things. If you are interested in flight search, a place like Kayak could be great; if you want to work on recommendation, perhaps try Amazon, Netflix, or one of the many other e-commerce sites out there. If you think shortened URLs and tracking is the wave of the future, then bit.ly is a place to look into.

If a full-time job is not an immediate necessity and you find yourself interested in a company in which there are no appropriate openings, you might consider working as an intern or volunteering to help out on a particular problem. This could be a great way to gain experience and build a relationship with the community, as well as to create a portfolio that you can discuss at interviews and that can increase your visibility. I have also been told, by internal startup recruiters, that personal websites provide a lot of information about a potential candidate. If you decide to undertake coding, data mining, statistical analysis, or whatever other projects that you think might be relevant to the private sector, it is a good idea to document those on the Web.[1] Another method is to post your resume on a site such as `monster.com` with lots of key words like "data mining" and "analytics" floating around—this can also bring results.

Of course, as is the case in most fields, the best or easiest way to land a job is to meet the right people. In recent months, startup fairs have been growing consistently in both regularity and size. These events provide a good opportunity to gain concentrated information, as opposed to sporadic searches online. They are usually free or very inexpensive and tend to be fairly well organized. In addition, there are dozens of different types of technical meets and seminars related to R, Python, data mining, and other technical areas that are organized by like-minded people who are eager to learn and share their knowledge. These events are a great way to meet others, to gather insight into job opportunities, and also to hear interesting talk about what kinds of things people are working on, in and out of the private sector. These types of events are becoming standard in many metropolitan areas and are worth seeking out. Recruiting firms specializing in startups, such as `hackruiter.com`, are also beginning to emerge. Incidentally, these are startups themselves, run by technically competent people who understand the industry—in stark contrast to many in the world of financial recruiting.

To wrap up, I'll mention a few things about job stability. A solid network of startup professionals could act as a safety net, allowing for a smooth transition from a sinking ship to one with a steadier course. Hence, in case you are not able to cash in your stocks on that ever-awaited Google buyout, another nearby place will be waiting to catch you. Such a network can also provide a lot of information about other companies, as well as technical and business directions that are being pursued. This can bring consulting opportunities or maybe even inspire you to create a startup of your own. In addition, if you go the route of data mining and analytics, the skills you pick up will prove useful in another technical field, including but not limited to finance—that is, if you ever decide to leave the startup community.

[1] *If you are thinking that the world of data mining and related analytics might be for you, the first step is to start working with data. You should become comfortable with cleaning, analyzing, and visualizing data sets, as well as get a feeling for the mathematics involved. For a continually growing list of resources, books, ideas, and related discussion, visit* `http://notjustmath.wordpress.com/`.