

# How to Start Your Story in Data Science

*Joe Tenini*

My experience working in business and more specifically in data science has not been like writing a proof. When you write a proof, you start with where you want to end. You start with the statement you will prove—the finished product. From there, you put in place all of the little lemmas, calculations, supporting observations, and relevant definitions until you’ve built a beautiful bridge from where you are, all the way to where you’d like to go. I even hear people talk about their careers like this: “I always knew I wanted to be an astronaut, so I spent my whole life going after it and here I am.” I suppose one big difference is that I didn’t grow up dreaming of being a data scientist wading through piles of messy data, trying to figure out how these eight lines of code could be so confusing, and casually asking life’s eternal question: “how early is too early to start lunch?” I didn’t grow up dreaming about being a data scientist because that wasn’t really a job when I was a kid. It’s also quite likely that the job I’ll be doing in twenty years does not exist now. So what can we do in times of such rapid change? How can we prepare ourselves for a career leveraging our technical skills outside of academia? I very likely don’t have a good answer to that, but I can give you my story of transitioning from algebraic geometry to applied data science. In this article, I’ll give my perspective on approaching a career in data science as well as five questions every aspiring data scientist should be able to answer for themselves about their new career. If you can answer these questions confidently when evaluating a new or current opportunity, then you will avoid many of the common pitfalls of the data science career track that I see.

## Where I Am and How I Got Here

My final semester of graduate school was a full one: I had twins, defended my thesis, and applied to jobs in a wide variety of industries. I dedicated a huge amount of effort to making my mathematical expertise seem relevant and tailor-made to each job I applied for. For a particular financial position, I even took the first two actuary exams. However, the job that excited me most was with a large medical software company—a job that didn’t necessarily match perfectly with my formal training. In fact, they didn’t really care about the math at all, but they did value my teaching experience. You see, they needed someone to teach their customers about how to leverage their vast databases of health records to improve patient care. I didn’t

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particularly know what a database was, but I suspected it was rather easier to understand than say gaining an intuition about Noetherian schemes. Moreover, I liked the people I interviewed with. They were curious and had fun brain teasers—so I joined up. I certainly had to scramble to learn enough to teach useful courses to our customers, but I also used my spare time to work on side projects that I thought would help the company. It started with some simple tricks to catch erroneous lab values entered in the chart. Slowly, I progressed to more complex pieces of R&D. By year three, I had led the development of an algorithm that notifies clinicians of early patient deterioration. It is currently in use in over 100 hospitals. Looking back on my work so far, I feel very proud and fulfilled, but I can still remember the puzzled expressions and nervous conversations when I told my professors that I would be using that fancy degree to ... teach database administration for a software company.

As is often said, the story arc of your career only makes sense looking back. It’s very difficult to construct a story and then bring it into existence in exactly the way you envision. That said, there are things you can do to shape your story into something that makes you feel proud. With that in mind, I will share five questions that I frequently ask myself as I navigate my data science career.

## Five Questions to Ask Yourself as You Transition from Academia to Business

### How will you show that you can connect the dots from business opportunity to abstract technical problem?

We’re all familiar with the trope of the mathematician with mismatched socks and her head in the clouds. Sure she’s brilliant, but she isn’t able to translate that brilliance into a meaningful contribution to the bottom line. She’s so focused on living on the cutting edge that she misses solutions that are simple, easy to build and maintain, and easy to integrate within the existing business process. I think the physical manifestations of this caricature are not as common as television would have us believe, but it is a real risk when it comes to landing a job—especially your first. The fact is, your degree presents a strong signal of technical proficiency, but also presents a risk of being seen as “not business savvy.” Luckily, it is easy to put your hiring committee at ease by stressing the importance of working with business stakeholders to understand the opportunity and how the technology meets it. Be prepared to provide examples of times your work had real impact—even better if you selected a simpler solution because it was a better fit for the process or users.

### How will you cover the “last mile” challenges from prototype to solution in production?

Many aspiring data scientists I meet from math PhD programs will have above average capabilities when it comes to problem solving and ability to work with algorithms. It is much more rare to meet such candidates that have the

industry skills to deploy and maintain the software that represents the final product of that reasoning and algorithmic magic. Such data scientists who can translate a business problem to a technical one, solve the technical problem, and then do the software development, deployment, and monitoring to provide consistent value are often referred to as “full-stack” data scientists. If you are not a full-stack data scientist, then you will likely need help in reaching the value delivery step of your projects. If you are not fluent in these technologies, you will want to ask—during the interview process—what support exists for the data science role within the company. You will likely be particularly interested in their development operations (commonly “devops”) and engineering support, without which you may be stuck with a great idea that is frustratingly difficult to implement. A great way to get at this question is to ask about the current pipeline and infrastructure for deploying solutions within the company.

#### Where do you sit in the company’s value chain and how will you grow?

My manager loves to do the exercise of pretending you have just invented the automobile. What sort of things need to be in place for this to be a valuable invention? That is, what needs to also exist, besides the automobile, for this invention to make the life of the consumer better? Let’s name a few: You need dealerships to market and sell the cars—so that you can buy one. You need someone to build a network of roads and gas stations so that you can get to your destination. You also need service shops to pop up to help when you need repairs. This network of moving pieces that add value to the consumer’s life is called a value chain. The point is that just because something is a great idea or an amazing achievement, it does not mean that it is immediately valuable to the consumer. Businesses exist because they play an important role in the global value chain, and within a business you—the employee—will serve a purpose within that chain. Generally, you will be valued more highly if that place in the chain requires your differentiated and unique skills. Also, your career will become more valuable if this chain allows you to develop more skills and take greater and greater responsibility within the chain. For example, if you work for Stitchfix, then a large portion of the value generated to the consumer is in recommending outfits that the client will love. If your role in the company is developing the recommender systems used to fuel this process, then this is a great sign. Moreover, if the company were to expand into recommending personal items like books or home decor, the responsibility of your recommender system would also grow. It’s even better if your expertise in these algorithms is rare and difficult to reproduce. All of this would mean that you are playing a central role in the value chain, and you are hard to replace. In your job you will need to demonstrate value and then take over more and more of the value chain.

#### How will you enjoy working with your manager?

In many roles, you may spend more time during the week with your manager than with your best friend. It’s very likely—though not universal—that you will meet your manager during your interview process. Managers that treat you with respect, are invested in your development, have skills to teach you, and will advocate for you are much more likely to lead to a happy day at work. However, also note that a great manager cannot help you find fulfillment in the work you do or make you feel proud of your contributions, but a poor manager can certainly ensure that you finish your day feeling frustrated and ready to head back onto the job market. When you’re being interviewed, it is also your chance to interview them. Be sure to ask about things like company culture (how people are treated), values, mentoring, and the expectations of managers.

#### Will your contributions be made by leveraging old skills or new ones?

When I finished my degree and headed into the workforce, I was very eager to “apply what I had learned.” I would sit down to think about the company’s biggest problems and say to myself “if only I could view this data as a sheaf, the interoperability question would be so natural to consider!” In short, I was a hammer in search of nails, seeking to apply my mastery of algebraic geometry to the problems in front of me. I became much more successful when I realized that my real skill was rigorously mastering new techniques—often known in the business world as “learning agility.” In my more recent work, I helped develop a personalization engine that optimizes traffic for a handful of high-volume websites. The solution required a great degree of familiarity with something called the contextual multi-armed bandit problem, which comes up in reinforcement learning. Prior to the project, I knew very little about this problem, but as researchers we are capable (and not afraid!) to dive deeply into the literature to get a feel for the problem, the available solutions, and generally what we should do to leverage this knowledge.

If you do elect to begin a career in data science, it’s very likely that the career will look quite different year to year. Capabilities that once elevated you above the competition are now commonplace. Resources that were once precious and expensive are now so cheap you don’t even count the cost. And sometimes the thing you worked so hard to develop was just released as a free service. No matter what comes your way, if you can answer the above five questions, you will be well on your way to being a happily employed practitioner of data science.



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