



Scaling new heights of financial services through machine learning

Sean Durkin, Head of Data Science for Barclays' Technology Division shares his insights on how data science allows providers to exponentially magnify their decision-making processes.

Though it's an institution that traces its origins back almost 330 years, make no mistake: Barclays is very much invested in exploring the future of digitally empowered financial services. Among the work the bank is doing these days, it is actively engaged in the use of machine learning technologies such as neural networks to assist in a variety of operations, from customer service to fraud detection and prevention.

To gain an inside look at how Barclays is leveraging advances in artificial intelligence, Refinitiv's Global Head of Innovation, Amanda West, spoke at length with Sean Durkin, the Head of Data Science for Barclays' Technology Division. A physicist by academic background, Sean has led data science functions over the years within e-commerce, mobile gaming, social media, and most recently, financial services, and is helping enable Barclays to leverage a variety of data-driven technologies.

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AMANDA WEST: How does Barclays look at AI opportunities? Are you looking for opportunities to essentially take out costs or are you at the end of the spectrum that's looking for opportunities that are much more about identifying new revenue streams?

SEAN DURKIN: We're not looking to cut costs. We are looking to get even more out of what we have. For organizations like Barclays, what can have an impact to our bottom line is making sure we are fully compliant and have no downtime nor provide any negative impact on our customers. A large focus of our work is on the customer experience. That, for us, is the chief focus. The revenue benefits to that are secondary. If we experience no downtime and we react to problems with technology and things like that before they happen, that's the chief focus for us.

WEST: How do you see AI-related machine learning technologies impacting the strategic direction of banks such as Barclays?

DURKIN: Profoundly. I would liken the advent of artificial intelligence and machine learning to the dawn of online banking, in how much it will be a paradigm shift for both financial services providers and customers. It's going to offer a level of scrutiny and scale never before seen, and really cut to the chase with regard to efficient and scientific decision making. That's an extremely

desirable position within financial services. It provides a lever to counter a lot of the barriers or challenges to scale that have been present in this industry for a long time.

Those benefits would propagate directly to the consumers' financial services products, too. I think we're going to see an ever-increasing pace of adoption, while at the same time, navigating the slightly unfamiliar territory of using very new techniques in regulated and audited environments. That would bring some interesting ethical questions with it, which will have to be navigated. You can imagine a scenario where if a person is or is not granted access to a financial services product on the basis of a decision made by an AI, that's one of the points of recourse that needs an explanation or appeal, as compared to if they have been dealing with a human.

It's my belief that at least some of that is going to need to be addressed at a higher level than financial services because this is by no means the only industry foraging into the space. There may be similar things in medicine, the Internet of Things and even crime prevention. Any organization wishing to employ techniques like this may be held accountable to satisfy some kind of AI standard or regulation at a societal level.

WEST: What are you doing at Barclays around the explainability question? That's a very hot topic today. How easy is it to explain how AI is being employed in businesses, and explain how you are using it to your consumers?

DURKIN: There are situations where an AI has evaluated a colossal number of permutations of variables and potential scenarios and found with statistical significance that one of these is the right one, the right link between cause and effect. It might not easily be explained why that particular permutation works the way it does, but it's an empirical result. It's a scientifically empirical result, and the numbers don't lie. We don't consider it in scope to go back and unpick that, and try to understand what are the rules behind that.

It is an effective result. The approach we take is that the proof of the pudding is in the eating. The first thing we do is get far away from the theoretical, and put it through rigorous tests. The way we do that, (and this is fairly industry standard) is that we effectively send the AI back in time. Imagine if, for example, six months ago was the present and everything after that you're oblivious to.

Obviously, when you're human, that's very difficult to do. With an AI, it's very easy to do by just denying the availability of data after that point, and then you put it to the challenge of, "What would you do in that six-month period?" With the benefit of hindsight that we effectively have, here's how good or bad the outcome would have been compared to where we really are today. That's how we get a measure of the accuracy of our AI and machine learning techniques. That's how we confirm buy-in and gain that trust.

WEST: What are some of the main use cases that you are putting machine learning or natural language processing to at the bank? Are you more focused in the retail space or the institutional, or a little bit of both?

DURKIN: We have long-standing functions in what you'd call traditional financial services use cases around things like fraud detection, predicting the likelihood of defaults on loans, etc. and they are at the very forefront of development in this field. But what is a huge, huge application for us is in capturing the decision-making process of humans in certain scenarios and replicating that at arbitrarily large scale.

The reason why that's huge for us is that it switches away from the numbers; it's more that a lot of what happens in financial services involves a subject-matter expert in the form of a human examining a piece of information or a document. It might take the form of a loan application or even a pitch for investment or records of adherence to a process, and a human makes a decision on a course of action.

What we're doing is using a machine learning construct called a neural network to replicate that human decision-making process. You get into really interesting situations here where, effectively, what you can have is a single artificial intelligence which is the aggregation of multiple human intelligences on a given matter. You consolidate your knowledge base into one single decision-making engine. That puts you in an extremely desirable position with regard to removing any subjectivity or external factors and reducing the amount of risk, too. Your intellectual property then is aggregated in an AI.

WEST: Can you give me some examples of the thinking on decisions that the machine is now able to assist with?

DURKIN: We have all kinds as you can imagine, such as regulatory and auditory requirements that we have to satisfy with everything we do. It's all tightly controlled, and it's all extremely complicated. This is exactly where the ability of an AI to monitor vast numbers of variables simultaneously and ensure that those conditions are being met is paramount to us. We've got a level of control within the bank that we've never had before.

WEST: Is it mostly in the area of risk management that you're applying it?

DURKIN: Every single process within Barclays has strict controls and standards as to the way that anything is done. If someone examines the current state of the system and does an audit trail of exactly what's happened to it and why to ensure that it meets the standards, that audit trail is then evaluated as to whether it did or did not meet these standards. That's where we're leveraging AI, not just retrospectively, but in real time to ensure compliance to those things which gives us far-increased confidence in the number of things we can examine at any one time. It's consistent and quick decision making, and it puts us in a great position from a regulatory point of view as well.

WEST: You've talked about the opportunities with robotics process automation (RPA). How do you see this evolving in the wealth management space over the next few years?

DURKIN: I think the best and most innovative use cases for AI and machine learning won't even have been thought of yet. They are going to be discovered during that time frame (if not sooner) when people realize the art of the possible. They will do exactly the exercise that we're going through now, through financial services and wealth management subject-matter experts and data scientists joining forces on a more than surface level and realizing mutually that art of the possible to collaborate on problems. I think that's how that strategy is going to be shaped.

The next three to five years is an interesting timeline because during that time the key enabler (which has resulted in this advent of data science and machine learning) will not be mathematics or the analytical side, it will be technology. That's the reason this is happening now. Though the algorithms underpinning these techniques are beautiful things, it's technology that has been the point of the breakthrough. The breakthrough has happened because it's now within the reach of more or less any business to have fast data storage and fast data computation resources at their fingertips cheaply and immediately.

I think that's why this is happening now. It's things like the cloud that have really unleashed this. The level of infrastructure you needed to do this work even 10 years ago was siloed within the limits of only the biggest tech companies. That's where innovation and creativity was almost forced to take place in this space. Now it's not. It's federated and democratized and that's a great thing for financial services and for data scientists. It's a wider field because the ecosystem you have now within everyone's grasp is extremely conducive to creativity, experimentation and agility. The wealth management space is a prime area for that creativity.

WEST: Barclays has numerous data science teams across the different parts of the business. What are you doing to ensure that those teams maximize their opportunities to work directly with the business and collaborate?

DURKIN: There are horizontal bank-wide forums of data scientists for exactly this purpose. All of the data science leaders within Barclays across all business units globally get together on a regular basis to discuss those opportunities for collaboration, knowledge sharing, agreeing on best practices and agreeing on a common set of tools and techniques to employ. The idea is that if I were to go and look at a data science team in our fraud prevention department, it won't be like going to a different business. It is still Barclays, and it's an area in which my own team could potentially add value with not much overhead and vice versa.

That's true not only for data science, but also for all of the disciplines within the bank. It results in a well-defined global strategy which is the aggregation of a lot of collected experience across the entire firm. You get the best of both worlds in that individual teams are empowered to own their own processes and their ways of doing things according to what works for them.

Additionally, what you tend to find is people working within this space are very passionate, very enthusiastic. They live and breathe data science and new developments in the field.

To that end, we have a good culture of getting together to do things like show and tell every so often in an informal setting. Different teams from disparate areas in the business can come together and talk about what they've been working on recently. While it may not be a formal intersection of remits, it's really great for ideation. The feedback you get is one of the big reasons that I'm working here with great people, in what is already a good science culture within the bank.

WEST: If you've got your crystal ball out and you could look three years hence, what do you think the biggest material changes will be in financial services for the consumer?

DURKIN: For the consumer, that's a very interesting one. I think that for a lot of their interactions from all touch points (the high street in retail banks, the phone, online), an increasing level of automation and AI will be present there. I think the efficiency that brings will propagate directly to consumers, and I think a lot of the anecdotes about the time taken to do such and such tasks will be eradicated.

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WEST: That will be good for the consumer. In the institutional space, do you think it will be different? Do you think there will be a different endgame three years out?

DURKIN: I think it will change the strategy in the institutional space. I think more and more people will frame their propositions in the first place knowing that this is how decisions are being made and this is how they are going to be evaluated. That's not to say that people will seek to game the system because to an extent it can't be gamed, but there will be an awareness of optimizing the way you do things to make it easy for an algorithm to pick out whatever it might need to pick out.

WEST: You've come to financial services from other industries. Obviously, AI has been the bedrock of certain big tech companies. It's the way that they run their business. What do you think are the one or two big learnings or takeaways? Things that financial services really needs to consider based on the learnings of the big techs who've businesses that are built off AI.

DURKIN: Barclays is an organization comprising on the order of 100,000 people. My previous organization was a tech business with 100 people, and getting things done in that business was extremely different to getting things done in Barclays. I think the biggest consideration within financial services is that it is not enough to satisfy yourself that your model works and that it's making good decisions. In previous organizations, if I could satisfy the people who'd get the phone call if something went wrong (and we were starting from a greenfield position in that regard), any improvement was a good improvement.

That was enough to get things out into production and out into the world. At Barclays, it is a global regulated and audited environment, so any model has to comply with all the various standards that underpin technology work here. All of the systems that I've mentioned are incredibly well supported and controlled all the way through the life cycle of data science, from getting access to the data in the first place, to model building and evaluation, to slotting this piece into an already complex system, so that the level of testing and fail-safe mechanisms that need to be done are unprecedented. It goes the extra mile once the formal data science piece has been finished.

It's like installing a new component into a complex machine (an engine if you will), and you can't turn it off while you're doing it. You can't even really do it at a quiet time. Such is the nature of this enterprise. It always needs to be on. Fortunately, we have teams of incredibly skilled people, the best people in the world, whose job it is to make sure that everything goes off without a hitch and they are a real pleasure to work with. Ultimately, these systems are fulfilling a task which is fundamental to the operation of society, and no one is more aware of that than us.

We always keep our customers in mind who are consuming this service down the line, but no matter how seemingly abstract the machine learning task at hand is, everything has an impact. Everything flows downstream in these systems. That's been the biggest paradigm shift for me personally. It's exhilarating because it makes you realize that what you're doing here is massive and it matters.

WEST: I agree, and so my final question which I have to ask is, how important is the quality, readiness and availability of the content to the actual task in hand?

DURKIN: It is paramount. There's an adage in data science, "garbage in, garbage out." Fortunately, we are helped in that regard and Barclays' processes are already constrained to be high quality. We're looking into an interesting stage now where the value of these techniques is being evidenced. That in itself can be a business case for enriching data. We can go and fill in X% more records because we need some more training days with the AI. That's a good investment of time. We're actively driving that. We're not passive. There are, in some cases, active efforts to enrich and generate data from experts just to train the AIs.