SDS PODCAST EPISODE 155 WITH FRANCESCO COREA

Show Notes: http://www.superdatascience.com/155

Kirill Eremenko: This is episode number 155 with complexity scientist Francesco Corea. Welcome to the Super Data Science Podcast. My name is Kirill Eremenko, data science coach and lifestyle entrepreneur. Each week we bring you inspiring people and ideas to help you build your successful career in data science. Thanks for being here today and now let's make the complex simple.

Kirill Eremenko: Welcome back to the Super Data Science Podcast. Ladies and gentlemen, super excited to have you on board, and today we've got another exciting episode. I literally just got off the phone or actually called, nobody uses phones for these things anymore. I literally just got off the call with Francesco Corea. What you need to know about Francesco is, he's a very driven and knowledgeable expert in the space of artificial intelligence, data science machine learning, and even blockchain. He's worked on a broad range of projects in this space, ranging from artificial intelligence start ups to portfolio construction for venture capital funds, from fraud detection to data strategy, and much, much more. In this podcast we dive straight into it from the very beginning ,and we talk about what it means and what it feels like to be a data scientist across many different industries, many different types of problems. Francesco makes the case for any data scientist to actually strive towards that, to look for opportunities to broaden your application of data science to different industries and different challenges. He also explains what benefits that has and what synergies that might bring for your career.

Kirill Eremenko: So that's a very interesting part, and then after that, we don't stop there, we dive into Francesco's recent article on the convergence of artificial intelligence and blockchain. As we all know, those are the two major disruptive technologies changing the world right now. In his article on Medium, which we'll link to on the show notes, he describes what they mean for each other, how they can boost each other, and how those two technologies might end up working together. That's exactly what we're going to discuss in this podcast. Brace yourselves for a very fun ride. This is going to be exciting and worldview changing. Can't wait to dive straight into it, and without further adieu, I bring to you Francesco Corea, complexity scientist.

Kirill Eremenko: Welcome ladies and gentleman to the Super Data Science Podcast. Today I've got a exciting guest, a visionary in the space of data science, AI, and blockchain, Francesco Corea. Francesco, welcome to the show, how are you doing today?

Francesco Corea: Hi Kirill, thank you for having me here. All good, thank you. What about you?

Kirill Eremenko: I'm good as well, thanks. Very excited to meet you on the show. For our listeners, the way I came across Francesco's work was when I was doing research for the blockchain course, and I came across some articles on Medium. Francesco actually has quite a few there, and one that I found very, very interesting, it's on the convergence of AI and blockchain. What's the deal? I'm very excited to talk about that. Before we jump into that, Francesco, could you give us a quick

intro to who you are and how you got into the space of artificial intelligence and blockchain in the first place?

Francesco Corea: Yeah, sure. Well first of all, thanks for reading that article, I think that it was actually one of the articles that was probably one of the most read on Medium for a week or so, so thank you anyway for just having a look.

Kirill Eremenko: Thank you for sharing.

Francesco Corea: Basically, just about me. Let me give you the three minute stand up pitch. How do I get into AI? Quick answer, by chance. I did my PhD a few years ago. My PhD was in traditional economics, let's put it in that way. As many times happens during a PhD, things don't really work out as you expected when you started. What happened to me is that I started doing econometrics work. So I eventually get into data science, still by chance, and eventually into AI working on apply ... Well, honestly, into machine learning. As you perfectly know, machine learning and AI are not perfectly the same thing. There are stuff that are AI which is not machine learning. Of course, it's not true the other way around, because everything that is machine learning is also AI, right? So I got into machine learning a bit by chance. At first developing software for people and building models, specific models for specific applications.

Francesco Corea: What happened eventually is that I was living in London. I got involved with a venture fund there, and I started working with venture capitalists and startups. What I'm doing right now and where the conversation already becomes a bit embarrassing because I don't

really have a title, I would like to call myself a complexity scientist, but I'm not even sure that it capture what I really am. What I do is probably better ... A better description of my own functional title, which is basically ... I do help company's growing, whatever that means. I [inaudible 00:05:54] from a venture perspective or from an advisory perspective or simply from a consultant perspective, that it really varies depending on the guys or the companies I'm talking to, but that's the bottom line of what I do on a daily basis.

Kirill Eremenko: So you help companies grow through applying technology, is that correct?

Francesco Corea: Correct. Usually they are early stage companies. It's really, really hard nowadays that I would be working with big companies. Especially because the field is progressing in a variety of different ways, and unless you're really highly specialized in a few specific techniques or technologies or domain, am I actually be better serving different type of people, let's put it in that way. So, yes.

Kirill Eremenko: Gotcha, gotcha. So if you don't mind, just to add to that point, I'll read out a couple of things that you've done recently, which you've shared with us, information for this podcast. Francesco's advised an AI startup on behavioral science, machine learning and algorithms in the health sector. He's advised a capitol venture fund on the portfolio construction. You've advised an AI startup on product strategy fundraising and other things. You've developed a sentiment analysis tool for small investment managing firm, and

you created a fraud detection tool. So a very broad spectrum of services. Are those all artificial intelligence related? Or is that still a mix of AI and machine learning?

Francesco Corea: Still a mix of AI and machine learning. Actually, well, that really depends. Some of the stuff you mentioned were slightly old. Back then, we wouldn't even call it AI or machine learning. It was still data science work. As we all know, all this terminology evolved through time, even if there was something that five years ago was called data science, today it's called everything machine learning. The reality's that some of the work was more on pure data science work. Some of that was machine learning, and some of that was pure AI, more or less pure AI. Some of the stuff you mentioned, as you correctly mentioned, it was simply advising companies. Especially I was working with a company back in Italy that was trying to develop a virtual agent to sell insurance policies, which was actually a very cool, an interesting project. Back then, I did work on fraud detection as you correctly mentioned. I did work on sentiment analysis. Yeah, I would probably say that one of the best things that I could say about me is that I put my hands on different project which are not really related, that made me a non-expert in multiple things, which honestly, for a data scientist, I think it's a good selling point to have, because unless you have mostly -

Kirill Eremenko: What why would you say it's a good selling point?

Francesco Corea: Ah, okay. Why? Because actually, for at least a couple reasons. The first one is that you don't really know

how the both the field of data science and AI as well as the different domain expertise move, so the more you can actually use your specific knowledge on the better it is, because you never actually know whether something that is paying off today, it won't pay off tomorrow in the same way. And at the same time, as a complexity scientist, I can tell you that knowing something for a field and getting that stuff and apply that to a completely different field, sometime it works brilliant, and you couldn't even expect in the first place, and you couldn't even do that in the first place if you wouldn't have done it before. That it's a nice word playing just to say that sometime, I actually say that with the fraud detection too, right?

Francesco Corea: For instance, when I was working on fraud detection, I didn't really know what I was working on, honestly. This happens a lot of the time. You start something without having a clear view, or even how to solve it. But the reality is that it was a great learning exercise, and I couldn't hide that I use some of that process and some of that techniques later on in my career as an advisor, just to help people developing completely different systems. You never know. It's a wide world. It's a complicated world. I guess that the more you know, at least at the beginning, the more you know about different things, the better it is. Eventually if you want to specialize in something, there's time.

Kirill Eremenko: Gotcha. It's kind of like when you're transferring your skills into a brand new industry from somewhere else, it helps you think outside the box. If you're constantly in fraud detection all the time, then you might not

even consider applying a certain, I don't know, a logistic regression algorithm. Whereas if you're moving in from, let's say marketing, and you go into fraud detection, the first thing on your mind is logistic regression, 'cause that's all you've been doing for the past five years or whatever, five months. And then that's the first thing you apply, it might give you crazy results that are not expected by even experts in the field. Is that about right, to sum it up?

Francesco Corea: Yep. Yep. It's completely right.

Kirill Eremenko: Gotcha, okay. That's a very inspiring comment. I think people listening to this podcast should take that into account, having a broad experience in data science across multiple industries can and will pay off, because it has synergies, because the things you learn in one place can be applied in another, and the more you learn ... It's not linear, it's a non-linear effect. If you learn how to apply data science in five industries, you're not gonna benefit 5x, you're gonna benefit like 25x. So my question to you though would be, what would your recommendation be to those of our listeners who have a full time job, who don't have the luxury of being a consultant and working with many different industries and different companies, who are applying data science in a specific way and specific setting, industry, and company, what would your recommendation be for them? How can they get out of that box while still preserving their job? What can they do to get exposure to those additional projects and different industries?

Francesco Corea: Listen, that's a great question, and I think that we are living in a very lucky time where we are not really missing the resources for doing that, right? Except time, which is probably the most important one. Basically the advice for those type of people would be simply experimenting with whatever you have. That means just try to go on Kaggle and play, or if you are interested in something specific, try to follow your interest and start experimenting with something, right? So build things. Try to build as many things as possible. Try to make things working. Try to fail as fast as possible and in as many thing as possible. At the end of the day, it's simply a game where the more you do, the more you try, eventually every single effort will pay off in like five years, ten years, whatever the timeline is. As you correctly were identifying before, it's not that it's going to simply paying off like 5x. It's paying off 15, 20x, 25x. The only suggestion I have is, try to get as much information as you can from internet, blog posts, free courses, Coursera, Udemy, all these kind of platform, right? And then try to get your hands dirty as much as possible, trying to experimenting with data and new libraries, new platforms, new software, whatever.

Kirill Eremenko: Gotcha, gotcha. Probably another interesting point. I like that advice, and it's very pragmatic. It's very logical. It makes sense. It's structured advice. However, the next question would be, is emotional, right? Have you personally ever encountered fear that you are good at something you've worked with, I don't know, like say fraud detection, and you've gotten good at it. Why would you ... Internally, you logically

understand that you can get value from other industries and from getting exposures to other industries, but at the same time, it's a big step to make, to get out of your comfort zone. Have you experienced that fear, and if you have, then how did you go about overcoming it?

Francesco Corea: (laughs) That's probably even a better question, and t he answer is everyday.

Kirill Eremenko: Everyday, wow.

Francesco Corea: (laughs) Well, not everyday, but it happens a lot. Especially ... Well, when you work in data science overall, or in AI, call it whatever you feel like, this sense of fear I think that, if you are conscious enough of what is happening in the world, it never actually leave you, because you know that there are people out there which are rock stars in this field. Everything that you're doing today seems like you're doing it pretty good, and if you actually want to change, you are leaving a well known road for something that you don't really know, right? But that's the reality for every career or everything that you want to do in life. I don't see any specific difference in data science respect to doing a transition career from accounting to whatever, I don't know, research. Or anything else. In that sense, I don't really think there is any structural difference. The interesting thing is that on the other side, I don't know if you know a guy from Facebook called Brandon Rohrer, I think?

Kirill Eremenko: Yeah, yeah. I just actually, I just emailed him four hours ago, no kidding!

Francesco Corea: Wow, okay. That's brilliant, that's brilliant, that's brilliant. Because actually the guy wrote a beautiful post on something that he called the imposter syndrome or something like that.

Kirill Eremenko: Oh, I haven't seen that yet.

Francesco Corea: Yeah, you should actually look for that. I think it was him, but he did write this post on why he's not a data scientist, well, we all know that he actually is, but basically he play arounds the fact that he doesn't really know TensorFlow, or this specific libraries and packages. But the reality is that, and this is a different emotional component for data scientists and AI researcher, is that there is not a single way to be a data scientist. And that's a different point. So when it comes to fear, you might have the fear that changing your career or jumping it into a different domain or vertical might scare you off. And, well, fair enough. It's incredibly hard to take that fear off of your shoulder. But at the same time, you still have the fear that for everything you do, you are not doing it in the right way, or that you are not a real data scientist as people that you read about are. You're not Andrew Ng you're not like all these big guys. You're not Kirill.

Kirill Eremenko: (laughs) No. Not Francesco.

Francesco Corea: But eventually they realize there are many different ways to be data scientist or to be a researcher. I guess that you simply need to find yours.

Kirill Eremenko: Yep, yep. I love that advice. Don't compare. The only person you're competing, is my favorite approach. The only person you're competing with is yourself. If you

are tomorrow better than you are today, you're winning. You don't have to be comparing yourself to Andrew Ng or anyone else. As long as you're happy and comfortable with what you're doing, that's the right approach. Okay. Next one I want to talk to you is, you've mentioned a couple times the term complexity scientist. I've never heard it before. Is this something that you've coined yourself, and what does it mean? What meaning do you put into that term?

Francesco Corea: Uh, no. I didn't really invent it myself. I would like to, but I didn't. Complexity science and complexity systems overall was something that people are studying for decades now, I guess. Basically there are different ways to define them, but a very simple one, at least my simple one is, it's a field of study that investigates non-linear relationship between phenomena. At the same time it uses things belonging to different fields to solve problem that usually are not solved with that specific technique or with that specific approach. In some sense, it has many similarities and many point of contacts with AI or data science overall. If you think about it, what complex science is, in a very basic term, it's a study of a complex system, right? Nothing is more complex than the type of life that we have today, and every type of data science problem that we want to solve, or every type of AI problem that we want to solve, they are [freakingly 00:19:48] complex, so that's the thing.

Kirill Eremenko: Gotcha, gotcha. No, that makes total sense. It's a type of science that solves non-linear relationships between phenomena and using approaches that you wouldn't

normally think of. That's a pretty cool summary, and, yeah, interesting. Thank you for that. Okay. Now I'd like to proceed to the next phase, which as I understood, correct me if I'm wrong, but as I understood, you've entered just recently, and you're starting to explore for yourself, which is blockchain. My first question here would naturally be, what made you get into blockchain and expand your knowledge of data science and artificial intelligent expertise in those areas, and now to include blockchain in what your expertise is?

Francesco Corea: Yeah, you're right. I'm actually getting into blockchain right now. I started doing like six months ago, probably a bit earlier. Why did I do that? Well, probably I was kind of forced to in the sense that if you open whatever website today, or whatever journals or anything basically, whatever you read, it might be Medium or it might be a podcast that you listen to, everyone is speaking about these two big things, right? AI and blockchain. I was comfortable enough to understand what people were saying in AI, but at the same time I didn't really know whether what they were saying in blockchain was completely true or not. Of course there was all the crypto frenzy of Bitcoin's skyrocket and you know, the kind of things ... So honestly, I simply wanted to understand more.

Francesco Corea: If you had a look at my blog posts in the past, you know that usually, especially in the last year or so, I'm not blogging that much in terms of frequency, but I usually take small time to explore specific topics in how AI integrates or relates to specific technologies or

industry. So I just took a few months off, and I like, digging into blockchain and AI, and I found very, I would say very interesting things, especially from the fact that there are a ton of people talking about things, but I'm not even sure that everyone is really understanding what is going on there, and I'm not claiming that I am, which is probably the most important thing. But I do have the sense and the feeling that there is something going on, and there is something that will happen in the next five years, especially when it comes to integrating those two technologies. Whatever it will come out, which, it's not clear what it's gonna look like, but whatever it will come out is gonna be extremely powerful.

Kirill Eremenko: Yeah, yeah. Totally agree with you. If you don't mind, what I wanted to do now is to go through the main points that you highlight in your article, and I'll just announce them, and if you would like, you can give some comments on those. Does that sound good?

Francesco Corea: Sounds perfect.

Kirill Eremenko: Okay. We'll skip the part where you introduce blockchain, and we'll leave it up to our listeners to read that on their own. I liked how you ... When I was reading it, I was expecting some intertwining solution between AI and blockchain, but you outlined in separate parts specific bullet points. Our readers will understand, listeners will understand exactly what this implies just in a second. The first part of paragraph two in your article is, "How AI can change blockchain." And then paragraph three is, "How blockchain can change AI." And I like that approach,

that there is a symbiose between them. So let's start with paragraph two, "How AI can change blockchain." The first component that you mentioned was energy consumption. So mining is an incredibly energy-consuming task, so what would your comments be about how AI can improve that side of blockchain?

Francesco Corea: Well that's actually something that I will probably write a bit more on that in the future, especially because I'm trying to focus on energy right now. That's a very relevant topic. But basically the idea behind this bullet point is we all know that mining whatever cryptocurrencies you want to mine, it takes time, money, and especially it takes money that accrues on your energy bills. Well there are lots of reason for that. I don't want to get too much into details now, but basically the idea is that AI, it's been already to be used in a very efficient way in different contexts, especially by, for instance, DeepMind, right?

Francesco Corea: In optimizing energy consumption, so the main objection, the main reflection there was, there might be a way for using AI in order to optimize as well the mining consumption, or at least the energy consumption for mining. The way in which you can do that, it might be either optimizing the algorithm behind it, or it might also be optimizing the hardware. That's another interesting thing, well, I will probably mention it about this later, but something that is happening is that there are a lot of, well, not a lot of, but a few big companies in mining, that are basically their own hardware into AI hardware. Anything that was used before to mine cryptocurrencies is now used

for AI. Which is a very interesting shift [crosstalk 00:25:55] the way. Especially because even in hardware, it's not clear which approach will pay off in the future, whether it's gonna be like GPU's or ASIC or FPGA or whatever it is, right? But there are people that are starting using same thing, so the same type of hardware for different purposes, and the first one was mining and eventually it becomes AI. That's something that I guess might allow you to reach a new degree of optimized consumption.

Kirill Eremenko: Mm-hmm (affirmative). Gotcha. Very, very, very interesting point. The next one I would like to skip to is security. You mention that blockchain, while it's impossible to hack, further layers of applications on top of blockchain and a great example which you give is the DOW and the attack on the DAO, which happens, I think it was 2016, mid-2016, May, June?

Francesco Corea: Yeah, I think a couple of years ago.

Kirill Eremenko: Yeah. Like 150 million were stolen for Ethereum from the DAO, the first decentralized autonomous organization created by Vitalik Buterin. You're right, there is a lot of, even though it's impossible to hack, there are security issues, so how do you think AI will help blockchain become more secure?

Francesco Corea: This is actually something that would intersect with the cybersecurity field, right? And the reality is that, well, it's a bit cybersecurity, it's a bit network theory, but the basic idea behind it is, let's assume that you have your own house which is not really protected. Anyone, a thief, or anyone that want to try to get in, would just need to study it enough and find a way to

crack in, which might be hard, because I mean your house, it's already like, you have a huge wall or whatever it is, and they just need to find the right tool and the right time to eventually get in, which is what happened with DAO, which is what happened with Mt. Gox or Bitfinex or basically any type of hacking in the last two years. If you look at whatever what is happening in cybersecurity and machine learning, you might notice that AI counter defensive measures are often more effective than human's ones. The idea behind it is, let's assume that you can create a sort of AI sentinel or a group of AI agents that just go around and check that everything is safe and perfectly functioning at all time. Of course that would be a great ally as I was saying, and at the same time, if something that happened they would have more speed to react and probably they could adapt in a way that the same type of attack won't happen a second time.

Kirill Eremenko: Mm-hmm (affirmative). Mm-hmm (affirmative). Gotcha. And the AI naturally would be better at that because of the learning capabilities inherent to artificial intelligence?

Francesco Corea: Yeah. Right.

Kirill Eremenko: Gotcha. Okay. And the final one from this part, just for the purpose of our listeners, there's actually quite a few more, I think there's like five, no seven or ten of them, but we'll skip straight to data gates. I found this one quite interesting. You are advising that in the future, artificial intelligence, and correct me if my understanding is wrong here, that artificial intelligence

will help humans decide who gets access to their data in the blockchain.

Kirill Eremenko: So basically, in the future, for instance, one of the applications of blockchain is healthcare, and the data will be stored in decentralized locations somewhere on the, maybe even in one centralized location in one healthcare facility, but the keys to access to this data and the pointers to this data will be on a decentralized healthcare blockchain which every patient, for instance, or every citizen let's say in the US, will have their own private access to. Then they can provide any healthcare professional with a public key or private key to their data, and they'll be able to that way view it. Basically that'll make it very easy to move around between hospitals and not have to request your data and wait for months. The point I think that you're making here is that artificial intelligence will help humans make those decisions who should get access and who shouldn't get access to the data and be a data governance body on top of the data that we store on blockchains. Is that about right? Could you elaborate on that a little bit please?

Francesco Corea: Yeah, you're right. Actually, you're right. I would just need to add something else that requires a bit of a leap of faith, let's put it in that way. Because what I was thinking when I was writing that specific bullet point was very close to what you just said, but also slightly different. So I was simply thinking, let's assume a future where we are ... Well we know that these days especially, everyone is talking about data privacy and how much our personal data worth and should we sell

or should we be paid for our data, all these type of questions, right? But there are already companies that are trying to do that for years. There are a few companies, they are trying to gather personal data about individual and sell or at least empower the individual to sell his own data to companies out there.

Francesco Corea: Let's assume that actually that's become the norm, that's become the standards, and then eventually in five years or in ten years, we will be able to ... Well, everyone will have full access that he produces, right? And he could decide what to do with those data, and eventually you of course want to keep giving your data to either Amazon or Facebook or Google just to improve the services that they offer you. At the same time, there might be something else that you want to sell your data to, or there might be someone else as you were saying, the healthcare professionals that you want to give your data, simply to know whether you are good or not. Whether your are healthy or not. Try to stop for one second and think about your day if you need to give your personal key or your private key or an authorization or something to anyone that wanna access your data in a single 24 hours. That would be completely overwhelming. That would be over blowing your day basically. You can't stand in front of a laptop all day just to say yes or no to people or to an organization that want to access your data.

Francesco Corea: So the point that I was trying to make there is if we are able to set an AI in a correct way, well it doesn't really have the general capabilities to do that all the time. It might be a different groups of different AI agents, but

the idea behind it is, let's assume that there is one AI that can manage all these for you, and that already knows that if an advertising company is asking for your data, the answer there would be no, or if you've been to the doctor the day before, because that was on your calendar, and then the same doctor ask you for personal data, well the answer might be, "Yes, I want to share my data," or at the same time, if you're not using Facebook for six months, it might assume that you're not an active Facebook user, and if Facebook asks for your data to improve the services, you might want to say no. The idea behind this data gate as we call it here is simply something that, an agent that can help you managing all the incoming requests for your data and eventually get back some money if needed. There might also be the chance that you might get paid for your data eventually.

Kirill Eremenko: Mm-hmm (affirmative). Gotcha. Okay. Thank you for expanding on that. It makes total sense. Very interesting application as well. Okay. So let's jump over to how blockchain can change AI. The first point you make is, I found this one very insightful, and I like this idea as well. The title here is, "Help artificial intelligence in explaining itself." In brackets, "making us believe it." Can you tell us a bit about that? What did you mean there?

Francesco Corea: One of the major problem that AI has today, and I think that we all know about it, whether we want to admit it or not, is that it's still a black box, right? There are things that it does that we're not even sure how they're made. Sometimes this is pretty fine. I don't

honestly care about knowing the why of every single thing. But of course there are, especially if you process yourself a specific application where I want to know why the algorithm reach a specific decision. Of course, examples are healthcare [inaudible 00:35:12] decisions or credit scoring, we all know this story, right? But basically the idea is that, if we are able to track every single step than an AI does on the blockchain so in such a way they can not be modified by anyone, that would be incredibly useful if we want to try to trace it backward and understand if something goes wrong for instance, why did it go wrong or what simply happened at specific point in time. So you can actually have a clear audit trail that can give you a full history of the process from one end.

Francesco Corea: At the same time, and this is actually the second point I was doing there, and which was making us believe it, we still have today a strong adversion towards algorithm and toward AI, which is actually a real phenomenon that is called algorithmic adversion, you can look for that. It's a real problem that people are experiencing. People don't trust machines. That's the reality. Not all of us, but there is some of us that doesn't really trust machines. So the idea is, what if you can actually see everything behind the curtain, behind the scene? Or what if, if something goes wrong, or even if something goes good, goes perfectly as you were expecting, you can go backward and actually look what happened in detail. My sense is that this might improve drastically the trustworthiness that we have towards data models and AI overall. So that's the point.

Kirill Eremenko: Gotcha, gotcha. And speaking of trust, you make another valuable point here that this blockchain will help increase artificial trust, meaning the trust between two different bots, like if an AI is interacting with another AI on our behalf, because they both have blockchain supporting them or tracing, creating an audit trace of everything they're doing, it means there's more transparency and therefore there is more trust between the artificial intelligence applications themselves. That's quite a philosophical one to think about for our listeners.

Francesco Corea: Yeah, you're right. It's a bit philosophical, a bit sci-fi in some sense, in the sense that the idea about increasing artificial trust is still a leap of faith, a jump in the future where we live in a world where we don't really need to do many things that we are doing today. For instance, buying groceries or cleaning the house or paying the bills or all these menial tasks that every single person on Earth is forced to do today. But the reality is that, think if your Alexa or your Google might be charge over of the entire house, and they can actually take care of everything, right? So ordering groceries from Amazon.

Francesco Corea: Eventually, I'm not even sure that on the Amazon side there would be someone on the other line taking the order. But it would be a different machine, a different bot. In Amazon factories, there will be another bot that can actually go to the shelf, take what you need, put it in the box, and send 'em out. The reality is that there might be an entire supply chain which is simply a bot to bot to bot, or a machine to machine to machine

interaction, which is something that, as I was saying in the article, the guys from Alliance Ventures, I think they were one of the first one to try to think in terms of machine to machine interaction, and they were, by the way, the guys that created the word convergence for AI and blockchain in the first place. I would actually to read their initial report. I think that there is in the article, there is also the reference somewhere at the end.

Francesco Corea: Basically the idea behind this increasing in artificial trust is if I would be a bot, and I would need to trust another bot, I would still need to ask him, "Just give me some way to identify yourself, or just give me some way so that I'm sure that you're ordering groceries for Kirill or for Francesco, for anyone else." That's an interesting problem that we're not experiencing today because we're not there yet, but I'm simply feeling and guessing that eventually that might easily be solved by blockchain, because if another bot can just go and check that in the last 20 days the same bot did that grocery order 15 times, they might be pretty much safe and reliable.

Kirill Eremenko: Yep. Gotcha. Totally understand then. Yeah. It was interesting to listen to you mention the whole bot to bot to bot to bot transactions. I just hope that in the future somewhere there'll still be a human at one of the ends at least, otherwise –

Francesco Corea: Yeah, everyone hopes so.

Kirill Eremenko: (laughs) Yeah. Alright, well, I know you have to go soon, so in the interest of time, I would like to ask you just to summarize all of this. Timelines. When do you

think, for our listeners, who are listening to this podcast and are probably also fascinated by this world of AI and blockchain and how the potential that is there. What would your recommendation be? When is it the right time to start learning about either of these technologies? AI or blockchain or both? Is it maybe worth to wait a little bit to see what happens? Or is it already obvious that you need to, everybody's who's interested in this should jump into it now?

Francesco Corea: Let's put it in that way. There is a very famous I think Chinese proverb, or way to say that sounds like, the best time to start planting a tree was 20 years ago. The second best time is today. If you ask me about when people should start getting into this field, I would say now, immediately. Just shut up this podcast, go out there and learn whatever you can learn.

Francesco Corea: Whether everything will pay out, I'm not sure honestly. Especially when it comes ... Well, I don't know enough about blockchain or specific blockchain protocols to tell you, well, this is something that for sure will be a leader in the next five years, but the reality is that, especially when it comes to AI, deep learning, for example, is something that is going really over-hyped and over-rated because it's really working. I'm very happy that it's working, but the reality is also that we don't really know what it does, the approach that will pay in the future, right? We might actually find out in two years that deep learning is working only because it's a specific, a specification of a more general approach. Or maybe a more neuroscientific or neuroscience related approach might pay off better.

Francesco Corea: The field is in some sense so young that it's incredibly hard to predict what is gonna happen. Coming back to your question. Try to start as soon as possible, because the more you wait, the harder it becomes for you to learn this stuff. That's the reality. And I can tell you that for experience, because I can actually tell you that I saw the first deep learning paper that it was five years ago in 2013. I was still a PhD student, and my advisor who was an extremely brilliant guy, told me, "You should just try to have a look at this stuff, because it sounds cool." And for more than six months, it was on my desk. I didn't even look at that, because I was saying, "Okay, that's something that will fade away at some point." But eventually it didn't. I'm not saying that my life would have been drastically different, but I'm simply saying that we have all the needs in the world, we have the resources, so we have actually no excuses to not start learning everything about AI and blockchain. Whether you will be using it in the future, not sure about it.

Kirill Eremenko: Yep. Gotcha. Love it. That's a wonderful summary. Thank you and great inspiration to all of our listeners to look into these topics, AI and blockchain, and start learning them now. Thank you very much Francesco. Just quickly, can you tell us where our listeners can find you, contact you, get in touch, follow your career so that they know what next is coming up for you, and maybe read some of your upcoming articles.

Francesco Corea: Definitely Medium. This is where I post most of my thoughts, well, at least the structured one. I'm also of course on Twitter and LinkedIn, but Twitter I'm not a

super active user in the sense that I tweet a lot, but I simply tweet about articles and things I read. I don't really express my thoughts on Twitter. I don't know why I'm not really Twitter-friendly, let's put it that way.

Kirill Eremenko: (laughs)

Francesco Corea: LinkedIn for sure. So if someone wants to connect, just try to connect on LinkedIn. Please send me a message, when you want to connect, say why you want to connect. Well LinkedIn is probably one of the things that I use the most, so -

Kirill Eremenko: Yep, gotcha. Alright. We'll definitely include all those links in the show notes. So guys listening to this, you can find them there. Once again, Francesco, thank you so much for coming on the show. Really appreciate your time. I look forward to hearing about what comes up next in your life. What kind of projects you work on and what articles you write.

Francesco Corea: Thank you very much Kirill. I really enjoyed to be in the podcast.

Kirill Eremenko: So there you have it. That was Francesco Corea, complexity scientist, talking about the convergence of blockchain and artificial intelligence, and of course, let's not forget the advice that Francesco shared at the start about building a career in data science and broadening your horizons. It would be interesting to hear what your favorite part of the podcast was. For me personally, I really enjoyed everything as usual, but my favorite part was that conversation about fears in data science and how we all have the opportunity to broaden our horizons, but sometimes fears prevent us

from doing that. It was refreshing to hear that even a person like Francesco, who has worked on so many different projects still experiences that feeling occasionally, but he is able to overcome it. That means that we can all associate or relate to that, and we can also all overcome our fears and broaden our horizons and knowledge in data science. Artificial intelligence, blockchain, whatever we're deciding to build our careers around. So there we go.

Kirill Eremenko: As usual you can get all the links to resources mentioned on this episode at www.superdatascience.com/155. There you will find all of the show notes for this episode, including a transcript and Francesco's social media URL's. Make sure to connect to Francesco at least on LinkedIn, and I highly recommend following him on Medium as well so you can get updated with his recent articles and read the one we discussed today. If you are building a career in data science or learning AI and blockchain, I'm sure it'll be interesting and exciting for you to know what's happening in Francesco's world and what he's working on next. At the same time, if you are an executive or a director or you have your own business and you might need some help in the space of AI or blockchain, then I highly encourage you to reach out to Francesco, connect. You never know when you will need a person like him on board or giving you some advice. Because at the end of the day, just a little advice, a little bit of a change in your data strategy can mean a huge, huge change down the track, whether it's a year away or five years away.

Kirill Eremenko: And on that note I hope you enjoyed today's episode. If you did, then we'd really appreciate a rating or review on iTunes, because that would help us reach more people and spread the word about data science, AI, blockchain, and all these exciting technologies. I look forward to seeing you back here next time, and until then, happy analyzing!