

SDS PODCAST EPISODE 139 WITH HADELIN DE PONTEVES



- Kirill: This is episode number 139 with the one and only Hadelin de Ponteves.
- Kirill: Welcome to the SuperDataScience 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. Now, let's make the complex simple.
- Kirill: Welcome everybody to the SuperDataScience podcast. This is episode number 139, with your favorite guest, Hadelin de Ponteves. Welcome mate.
- Hadelin: Hi guys, so happy to be here again.
- Kirill: It's so cool how you waved. Today, we're back together with ... Is this like your fourth episode?
- Hadelin: Yes, yes, this is my fourth episode.
- Kirill: Fantastic.
- Hadelin: This time, it is about block chain.
- Kirill: First, where are we today?
- Hadelin: We are in Switzerland. Each time, it's funny, we are at different places right?
- Kirill: Yeah, yeah.
- Hadelin: :So, first time, I was in France, you were in Australia, second time, same, third time Portugal and now Switzerland.
- Kirill: Yeah. We are in Switzerland because we've got something exciting we're working on. We started an AI consulting business and we're here for our very first client. I will not give away any details but it's something exciting that were working on and we're here.



- Hadelin: Very exciting and notice, it is still about AI data science. So, we have a lot of interesting things coming up.
- Kirill: Yeah, for sure. Today, we're talking about blockchain because we've got a kick starter for blockchain running, which you probably have seen somewhere pop up in your newsfeed somewhere and we've been super pumped, right?
- Hadelin: Yes. I think this was one of the projects I was most excited to work on because, all of this is fascinating for sure, but also, we were learning. We learning so much about this and we saw all the opportunities. We have a lot to share with you. So, building this new product right now, I'm on a huge wave of excitement, passion, inspiration and to be honest, this is one of the courses I've been the most excited to make.
- Kirill: Yeah for sure. How long have we been learning this stuff?
- Hadelin: Three months, right?
- Kirill: Probably from December.
- Hadelin: December yes, so about a little more than three months. We've been learning so much every day, right?
- Kirill: It's crazy, it's crazy. I remember walking into it, I had no clue what a blockchain was. I actually found recently, because I was moving my stuff out from an apartment as I always do, like these moves are just crazy all the time. I found my paper, and I wrote down on a piece of paper, the questions I had initially going into the world of Bitcoin and blockchain, just to understand. There were questions like, do non-mining nodes get rewarded for verifying transactions and things like that?
- Hadelin: Mm-hmm (affirmative).



- Kirill: For me, those were legit questions at the start. Then, when I found that paper, because I was just throwing stuff away, I looked at it and I read it, I was like, "This is such basic things." It's so interesting how deep you can go in a couple of months or even weeks, going into a certain topic.
- Hadelin: That's right. You will see that this will happen the same for you. Right now, I don't know, which level you'll be starting with, but in very few times, you'll see that you will get an expertise much stronger than you thought it would.
- Kirill: Yeah, yeah, for sure.
- Hadelin: We've been learning for about three months, about blockchain and I think that's a very good thing to make a course. We get through all the process of getting the details, we see what's important to understand, what's hard to catch at first, when you get first into it, and therefore, we are making those course right now. We are redoing the process of learning but teaching at the same time. That's very different from teaching a subject when you're an expert, because sometimes you can miss the important details of comprehension for the new learners. This time, we didn't miss any detail and we got the most important details.
- Kirill: Exactly. We know we're still very fresh, we've just been through that process of learning it ourselves. So, we know where all the difficult parts are, all the underwater stones are, and what to look out for. That's what we focus on in the explanations.
- Hadelin: That raises an important point about education. Why do teachers have to have so much experience in the subject, so much expertise? Because sometimes yes, it's what I said about the details, sometimes they can miss the important tiny

detail that is so obvious for them, to share this to newbies in the subject. So, yes, that raises an important point why do the teachers always have to be such, with a great expertise.

Kirill: Well, before we go too far into all of the education, let's get back to blockchain. The question is like, we've been hearing about blockchain all over the place. Like Bitcoin, cryptocurrencies are on the rise and so many projects are starting with blockchain, it's always in the news. The main question is, why would somebody need to learn blockchain right now? Why is it an important invest of your time? Mostly time, because online, you can learn things so cheap. It's mostly the investment of your time and focus. Why is it such an important thing right now? What do you think?

Hadelin: Well, two things. First, blockchain is going to be all around the world. It's going to be present all around us. So, you need to understand it, otherwise, you won't understand what's happening around you. That's the first thing. Then, it's because it's crazy how many opportunities there are in the blockchain world. You can apply it ... We'll see, we will talk about this further in the podcast but you can basically apply blockchain to a lot of industry, nearly all the industries. You can find an idea that combines the industry and blockchain. For this reason, you have plenty of opportunities. You can apply blockchain to your passion, to what you want to work on as business, you can start a business. You can leverage blockchain for your actual business in your company, and make a huge impact on it. So, I think it would be a shame to miss this opportunity because there is a lot to do.

Kirill: Yeah. I like your, you constantly say, like the wild west, can you say that?



- Hadelin: Yes. It's my favorite phrase about blockchain right now. Blockchain is the new wild west. It's like the internet in '93. You have a lot going on, it's not set 100% for sure, you have several moves to make right now, it's the wild west and some are good moves, some are bad moves, but I think that definitely a good move, is to educate yourself. The more you educate yourself, the more you will have a chance to make the right move.
- Kirill: Yeah, exactly. To follow on what Hadelin said about the different places where you can apply it, there is just a couple of examples. You can apply in logistics, real estate, food, transportation, health, finance, insurance, electricity, energy, pretty much anywhere. We'll go through some case studies, put it down at the end of the podcast. We've looked some up, some that we like ourselves, and we'd like to show a few guys. It's a very, very exciting world out there.
- Kirill: I think to your point on how it's like the internet in '93, what I like also about blockchain is that unlike artificial intelligence, there is nothing super complex about it. The thing is, there's lots and lots of little things that constitute blockchain. There's lots of different inventions or lots of different concepts that go into blockchain. But, none of them are extremely complex to understand. None of them have super complicated mathematics. So, essentially, anybody can get into that space. If you dedicate the right amount of time, like for us, it took three months. Once we have this course put together, it will be much faster for somebody, and that's our goal, to get people all around the world into this space. It will be much faster to get into it. Then, you don't have to have a super difficult mathematical apparatus to apply these

things. You just need ideas, and you just need to execute on it. So, that's what I like about it.

Hadelin: Absolutely. You absolutely do not need mathematics, you just need some good sense. With this, you can go really, really far with blockchain. In our previous courses, we had some math for example to cover the newer networks. But, this time, it's really, really different. There is absolutely non-technical math. So, therefore, anybody can make successful business into blockchain or make a successful blockchain transformation.

Kirill: All right, well having said that, let's get started. What is blockchain? What's the definition of a blockchain? We hear the word, we kind of understand a little bit that it's like a series of blocks one after the other, but let's just dive into a bit more detail. Do you want to start?

Hadelin: Sure, okay. So, before blockchain existed, you could store information like transactions into a book or into a file, like a file that you have, a database that you have any computer. The problem with this is that the database could be modified, it was not 100% secured, you could hack it, or whatever. So, blockchain was invented in order to store these transactions, so that they cannot be modified, they're secured and that nobody can hack them. That's why you have this trust component in blockchain, in the sense that, your information, the transactions that happen before, are totally secure.

Hadelin: So, let's take the most famous example of blockchain, Bitcoin. That's basically where blockchain is from. Well, in Bitcoin, you have the transactions between a sender, the one that sends some Bitcoin, and the receiver, the one that receives the Bitcoin. All these transactions are stored into some blocks that are added one after the other. The way the blockchain is

made, you will understand the secret of how the blockchain works, but, the way it is made is that, you cannot change the history of the transactions happening over time.

Kirill: Yeah, exactly. The way that that works is through a cryptographic path. This is probably the key for blockchain. As soon as you understand this component, everything else becomes much easier. A cryptographic hash is like a digital fingerprint of any collection of data. So, for instance, you could take your name and calculate a cryptographic hash. Well, if you take the [inaudible 00:11:19] 256# function, then it's always going to be 64 digits long, 64 hexadecimal digits long. So, it's basically just a number, a 64 digit long number, which is not in the decimal system, but in the hexadecimal system. So that's the way to think, it's a big, long number. So, you can take your name and you can calculate the hash of your 64 digit number.

Kirill: You can take the whole contents of war and peace, and calculate the hash, it will be a 64 digit number. You can calculate the hash of a video, of an audio of podcast, you can calculate the hash, because ultimately this podcast for instance, is in a collection of 1s and 0s. So, as soon as you put them through that cryptographic hash functioning, you get this digital fingerprint, which is a 64 digit number. So, the key here is that, any collection of data, has its own unique ... Again, Unique is a bit of a stretch. It's not fully unique but it's almost unique, collect fingerprints. People consider themselves to have unique fingerprints but one in 60 million people will have matching fingerprints. So, basically, any collection of data will have its own digital fingerprint, which is called a hash.

- Kirill: So, the way the blockchain works is that, you have data in these blocks. So, it's basically, I think of a block as ... You can think of a block as just a file but they're all linked with each other. So, every next block has its hash but it also references the hash of the previous block. So, basically references the fingerprint of the previous block. Therefore, if you change anything in any given block, any data, then first of all, its hash will change because you tampered with the data, and therefore, the hash will be different, the fingerprint will be different. Also, what will happen is, the next block's hash will change because it is linked to the previous block's hash. Then, the next block's hash will change, and then the next block's hash.
- Kirill: So, the deeper you are in the chain, and the deeper in the chain you try to make a change, the more consequences there will be in for the blocks and therefore the harder it will be to make the change.
- Hadelin: That's right.
- Kirill: Then on top of that, you've got the whole distributed situation where, this chain, a copy of this chain is stored on every single computer of every single person participating in the chain. So, if you have a million people on the chain, you have a million copies. So, in order to hack the chain, you wouldn't just have to hack one chain and then fix all the blocks after the one that you changed, you'd have to do that on at least like half of those computers. You would have to do it on at least like 500,000 computers all at the same time.
- Hadelin: So, it's basically impossible?
- Kirill: It's basically impossible. That's the essence of blockchain. That's why it's so secure. It's not because it has a super secure

algorithm behind it. No. It's security is through numbers. It's like safety in numbers because there are so many participants. The more participants there are, the harder it is to hack it because everybody has a copy and they're always synced with each other. So, as soon as you hack one, it syncs with everything else within like a split second and it erases the hacked copy and replaces it with a copy that's correct. So, basically, it's a very simple, system with very direct hashing algorithm, which you can look up online, but, which is distributed across millions of nodes. Therefore, that gives it, its security. That's how it works.

Hadelin: That's why we said that blockchain is a distributed, decentralized ledger. The ledger is the fact that it stores the information data transaction, all around the globe.

Kirill: Exactly, exactly. That's pretty much all we need to know about how the blockchain works.

Hadelin: What you said about hash cryptographic, hash and the fact that it's decentralized distributed, leads to the miners. They are really a subject of conversations when we talk about blockchain. What are the miners? What do they do? What does that mean that a miner mines a new block to get some Bitcoins? These are like secret people that live very far from us, but we don't know exactly who they are and what they do. Do you want to say a few words on this?

Kirill: Yes. It's one of my favorite topics.

Hadelin: Yes, me too, pretty fascinating.

Kirill: I was always like that, thinking, how do these miners work, why is it such a big deal. Then once I found the truth, I was like, "Whoa! This is so simple." So, basically, the way it works is that, inside a block inside any individual block, you have

the block number, you have the data that's stored on the block, which can be transactional data or any other data, even Bitcoin is a transactional data, and also you have the hash of the previous block. So, that's three components. Once you take all those three components and you put them into the hashing function, you will get the hash of the current block, so, that's the fourth component.

Kirill: Basically, mining is about calculating that hash, but it's not that simple, because if it was that simple, we'd be like, "What's it all about? We just need to calculate a hash function, which takes like half a second to do that. That's all there is." But in reality, there's actually another component. There's a fifth component inside every block, and it's called the nonce. Nonce stands for numbers used only once. It's basically a number, which doesn't mean anything, it's a number that you're allowed to change as a miner, you can change it. That essentially changes the contents of that block. So, you cannot change the block number, you cannot change the block data, you cannot change the previous hash, but you can change the nonce. By changing the nonce, you're effectively modifying the content of the block, because you are modifying the nonce.

Kirill: So, all of those four components go into the hash function, and that's how the new hash for the current block is calculated. The goal of mining is to find a nonce, which will generate a hash, that starts with a certain number of zeros. So, it's either four, like we could take four zeros right now, in Bitcoin, it's the first 18 numbers have to be zeros for that number to be accepted. So, basically, in short, what's happening is, miners are iterating this little number, the nonce basically, they're going through millions and millions and millions and millions iterations of that nonce, in order to

find such a nonce, which is called a golden nonce. There's multiple different golden nonces that would be acceptable, but they're just looking for one, that will generate a hash for the current block, which is small enough.

Kirill: Why is that done? The only reason why that's done is to create this cryptographic hash puzzle that miners need to solve, in order to be given the right to add that block to the network. As the network grows, you have more and more miners, and how do you decide who gets the right to add the next block. Well, it's done through this hash puzzle, so, whoever has more computational power, will win this race. So, it's basically like a lottery. They just keep picking it up.

Hadelin: Speaking of computational power, we must specify that if you want to become a miner, you will need not only one super powerful computer, but several of them. There are actually some warehouses of like tens of computers, that all connect with each other to mine a new block and get some whatever cryptographic currency. So, that's crazy power that is required.

Kirill: Yeah. The way they create this super power, is not by taking a super computer. The way they create a super power in hashing, is by taking lots and lots and lots of machines, which are just dedicated for mining.

Hadelin: Yes, in a warehouse for example, yes it's crazy what they have. So, it's important to know how mining works and we talk about this in our course. So, actually what you said about the zeros that must start, they are called the leading zeros and that's what we'll implement in the modules in simple activities.

Kirill: Oh yeah, you're doing that in the coding side of things.



Hadelin: Yes.

Kirill: That's really cool. You're doing four zeros?

Hadelin: Four zeros, yes, so that everybody can mine it.

Kirill: Yeah, so it's not too difficult.

Hadelin: No.

Kirill: So, the more leading zeros you require, the harder it is.

Hadelin: Absolutely.

Kirill: That's how the Bitcoin monetary policy was.

Hadelin: 18? You said 18?

Kirill: 18 right now, when I checked last.

Hadelin: Yes.

Kirill: Okay, well, so, that's like a quick taste for what blockchain is. If you feel that it's a bit unclear still, there's lots of resources that are available, apart from this of course, course that we're creating. If you just want to find out about mining, I'm also hoping to publish a blog on media very soon, I'm writing down one now actually, specifically about mining because it's such an interesting topic. Let's move on from technicalities, let's move on to why blockchain is so powerful. Which one did you mention? You mentioned trust, right?

Hadelin: Mm-hmm (affirmative).

Kirill: So, it allows people to trust each other. Another one is intermediaries. So, let's talk about that. You want to talk about it?

Hadelin: Yes. It's funny, not funny, but when someone asks me what is blockchain, I always start by saying that the principle is

the blockchain is that it removes an intermediary. Let's take the Bitcoin example again, for example, when you exchange Bitcoin, you do not actually need a bank to check if the sender sends Bitcoin to receiver and vice versa. So, the principle of the blockchain is that, you remove the intermediary in the process. Therefore, in the blockchain system for Bitcoin, there is not any bank or intermediary checking the transaction. So, that's the important component of blockchain, which is called dis-intermediation. Did I say it correctly? Dis-intermediation. So, that's an important point to get.

Kirill: Yeah, that's a good point. I'd like to take that example further to exchange of products and goods. So, for instance, if you take eBay, eBay is an intermediary that sits in between buyers and sellers. Why does eBay exist? Why can't we just buy and sell to each other? Why can't we post stuff on a ... Why does eBay take a fee? That's the main thing. Why couldn't eBay just exist as a place where we say like we have this, I want to sell this and somebody wants to buy this? Well, the main reason why eBay takes a fee is because, they take some of the risk. The risk is that, if you send money to somebody and then they don't send you the product, then eBay is there to deal with that. So, they will either follow up with that person or they will refund you your money and so on. So, they're taking a fee for being that intermediary, which guarantees that trust. You can't just trust anybody on the internet. You can't just go and buy something from somebody you don't know. That's why eBay is there.

Kirill: Well, with blockchain, you can replace that because what you could do is, you could write up a smart contract, type of an Escrow thing on blockchain. If like somebody wants to buy a product, then the money goes into an Escrow first and then,

only once the product is shipped, after a certain condition is met, then the money will be released and blockchain can facilitate something like that. So, you could disrupt eBay or Amazon, with blockchain. Why would it be more lucrative for buyers and sellers? Because, it wouldn't require any fees. It would just happen. It would just run in a decentralized manner on everybody's computer around the world, like collectively making a world super computer rather than on Amazon or eBay servers.

Hadelin: What's important to understand also about intermediaries is that, this particular component solves the double spending problem. It's the fact that, when you send an object by email or like a document to another person, you have actually a copy of that document created. But with money, if you want to send money to someone, you cannot create a copy of that money, otherwise, you would get double spending from both sides. This blockchain intermediary component solves that problem with all this technology.

Kirill: Yeah, because it's very clear, it's an immutable ledger, nobody can change. It's very clear who did what. As soon as a transaction's posted, that's it. It's clear that money went from here and then therefore, that person no longer has that money. All right, cool.

Hadelin: Then, we have a third component, very important to understand as a pillar of blockchain, it's transparency. So, Kirill already mentioned or explained why there is this transparency component. It's because, all the nonce in the blockchain system that is decentralized, can see the blockchain. The blockchain is publicly available for all the nonce in the system, so that everybody can see it. Actually,



everybody can get the Bitcoin blockchain on their computer, which is actually right now 2 Gigabytes.

Kirill: Somewhere on there, yeah.

Hadelin: Somewhere around that, so that they can all see the transaction. So, this is publicly available and therefore, there is 100% transparency in the system.

Kirill: So basically, whatever data goes on blockchain, everybody has access to it and that increases that or guarantees that transparency of the network. Another one is security, but we already talked about that. That there is no way to change anything on the blockchain because you'd have to hack into like millions of computers worldwide.

Hadelin: You would need to have an infinitely powerful computer in order to hack the blockchain system.

Kirill: Exactly. Also, another cool one is, it's permissionless or borderless. Those two come hand in hand basically. You don't need anybody's permission to send money for instance on Bitcoin, to somebody else. You can send it to anybody around the globe, without actually checking with the bank on how to send it, can you send it, and maybe there are some restrictions on where funds can go and where your bank can make the transaction or can make a transaction with low fees and so on. You don't need anybody's permission. It's because it works rather than on servers, it works through a ledger that everybody in the world has, or like lots and lots of people in the world have.

Kirill: It's borderless is the same thing. There is no borders for blockchain, projects running on blockchain, because they are running on computers of people around the world.



- Hadelin: Yes and you don't have your bank in a specific country from which you send money to another person. This is all around the system, in the decentralized system, and that's why it's borderless.
- Kirill: All right. So, as we can see, there's a lot of really cool advantages that blockchain has over traditional system such as servers and stuff like that. The way people look at it is that, we had internet version 1.0, that's when just we had basics like website and you had like some texts in it, maybe some images and some hyperlinks. Then, with advances in JavaScript, what happened is, now we have web 2.0. Now we have all these flashy websites, where it's very interactive, very clicky, you can talk to people like on chats as soon as you go on a website. It's very, very different to what the web was in the '90s or even at the start of the 2000s.
- Kirill: With blockchain, we're moving to a new web, which is considered to be web 3.0, where websites are going to be on the blockchain. For instance, like Twitter, what we see right now is the client server type of interface, where people are accessing websites like Twitter or there's Amazon, or even Facebook, you're accessing them, what are we doing? We're opening up our browser or our computer and we're going to a server, which hosts that page or hosts that information, which is a Facebook server or a Twitter server. We're getting all that data from there and we're interacting with them. Well, that's web 2.0.
- Kirill: In web 3.0, none of that is going to exist. Like if this blockchain phenomenon really takes off as it is now, as it is promising now, what will happen is, all the information, all of your Facebook information, all of your Twitter information and all these things, they don't need centralized servers



anymore. They will be using the world's super computer, which comprises of individual people's laptops. Through the blockchain technology, that will all be linked up. Everything will be happening on blockchain, so, there won't be a company that holds these centralized servers where they have control over everything and that's why they can advertise to you and make a lot of money from your activities on whatever it is, Facebook or Twitter or LinkedIn. If it is all hosted on blockchain, then it all belongs to people. Therefore, we can have zero fees and make everything free also. We cannot have any advertising and so on, and have control over our own data and our own systems that we create like that.

Hadelin: Yes. By just what you said, we can see tons of opportunities because you just mentioned an example of a centralized system that is about to be decentralized, in which it will be internet 3.0. But, we realize there are other tons of centralized systems or centralized processes in diverse industries. Therefore, if you apply that same reasoning to these other industries processes that are centralized, well using blockchain, you can decentralize them and make them even more efficient. That's why there are tons of application and opportunities in blockchain.

Kirill: Yeah, yeah, totally. Do you want to go through a couple of them?

Hadelin: Yeah, sure.

Kirill: Okay. So, we've got that example, we've got one in depth example we want to walk through with you guys, which is real estate, and then we've got a couple of specific case studies of how blockchain has been used. Where do you want to start?

- Hadelin: Well, let's start for example with real estate. So, today, when you want to buy property, a house, an apartment, well, you will put that information of the fact that you are buying the property and the property becomes yours. You're going to store that information somewhere. It will be in city hall or city council or something like that. Therefore, this information is not only centralized, it's somewhere and you can still modify it. If a hacker manages to delete that information somewhere, well, that house won't be yours. You will lose the ownership of the house. With blockchain, you can apply blockchain to real estate in the sense that you can store securely, this information, the fact that you bought this new property, in a way that you will always own the house because this information won't ever be deleted because it will be secured, safe, in a block, in the blockchain.
- Kirill: Yeah exactly. It's funny because, with these councils and these government facilities where they record who owns which property, still, a lot of the time, it's not just the database that you need to hack into, which is still possible, or delete something on the website, still, some of the use papers. They use like a book.
- Hadelin: Yeah, a book yes that they put safe somewhere, but still, it's not very safe. It's much less safe than-
- Kirill: Yeah, it could burn or something.
- Hadelin: Yes, it could burn and many things could happen to it. You could tear the page that contains the information, the specific information that you bought the property and then yes, you no longer own the property. So, that's not the safest way to record this kind of information.

- Kirill: I've heard crazy stories that, for instance, in Fiji, because of all of the hurricanes and all of the national disasters that they have there, these records, these databases have been so damaged that it's really hard to tell whose property you're living on, or whose house it belongs to. Like in South America, I don't remember exactly which country, don't quote me on this number, but I remember, there's a huge percentage like as far as around like more than 50% of a certain place, of properties, that don't have the correct titles. So, people think they own property but they actually don't.
- Kirill: One of my favorite examples is, during the GFC, the Global Financial Crisis, the Bank of America would walk up to properties to do a foreclosure, to close it down, to get the money, to take all the property and so on, they'd walk up to properties that they actually didn't give a mortgage for. So, they had no right to do it. But, because these records are so insecure or unsecure and non-tamper proof, that happens.
- Hadelin: Yes. That's a great story. Do you know how many transactions of properties over 40,000 pounds happen in the UK every day?
- Kirill: Tell me.
- Hadelin: It's around 100,000.
- Kirill: Per month?
- Hadelin: Per month, yes. So, imagine, with this ... That's over 3,000 transactions per day. Imagine with that number of transactions happening per day, imagine the number of mistakes that they've made.
- Kirill: Crazy.
- Hadelin: It must be pretty, pretty high I think. So, this blockchain system applied to real estate in the UK, would definitely



decrease the number of mistakes and we would not have these kinds of problems ever.

Kirill: Yeah. I think I actually read a paper, that, they're trying it in Sweden. They're trying it in Sweden.

Hadelin: Already?

Kirill: Yeah. It just makes sense.

Hadelin: Yes, absolutely.

Kirill: It's so secure and tamper proof, that's the main thing. So, hopefully that puts it into perspective like how blockchain can disrupt a centralized industry, which isn't like even commercial. It's not like Amazon or Facebook. It's just a government facility where all this happens, so, as an example of physical, something you see on the physical world, which is centralized. Let's talk about some case studies of how blockchain has already or is already being used in certain places, right?

Hadelin: Yes.

Kirill: We've got what? We've got four?

Hadelin: Mm-hmm (affirmative).

Kirill: We've got a medical example, we've got a file hosting example, we've got a supply chain example, we've got an energy example. So, very diverse industries. Sit tight, grab a coffee or tea if you're not in the car or on your bicycle, and let's go through it. So this one, probably this one? You suggested this one?

Hadelin: Yeah, let's start with the health industry. So, you have this very good blockchain, I think potentially.



- Kirill: Oh yeah, a disclaimer first, right?
- Hadelin: Disclaimer first.
- Kirill: The ones we're discussing here, they're supported by cryptopay tokens right?
- Hadelin: Mm-hmm (affirmative).
- Kirill: So, ICOs and stuff like that. We're not discussing them for those reasons at all, and we're just looking at the best case study. So, we're not promoting for you to invest into these tokens whatsoever. Moreover, we encourage everybody to be careful, right?
- Hadelin: Very careful. It's very risky. It's actually even riskier to invest in an ICO than to buy some cryptocurrencies. So, be careful. We're just thinking, which blockchains could have some potential and, which ones are a good idea to be applied in diverse industries.
- Kirill: Yeah, all right.
- Hadelin: Okay. So, do you want to start with the health industry?
- Kirill: Yeah, let's go.
- Hadelin: So, there is this blockchain called Medical Chain, that consists of leveraging the blockchain system to record all the information of patients, so that doctors can access them in a much more efficient way than the way it happens today. So, for example, you can have this app, which can connect from long distance, a patient with a doctor. Using this blockchain technology that will secure all the information of the patient, they can exchange and they can consult a doctor from a long distance. Again, it uses all the pillars of the blockchain we mentioned. It uses security. Of course, the information of the

patient has to be secured. You have some very private information. There is where there is trust, of course, transparency, no. Not everybody will ... So this is interesting yes.

Kirill: This is an interesting one.

Hadelin: You don't need to have all the pillars in every blockchain.

Kirill: Yes, and also very important, these people that create these projects, they really have to think through how to do it. So, you're probably sitting there and thinking, "Wait a second, why would I put my medical information on a blockchain if it's transparent and everybody has a copy of it?" Well, in reality, what would happen, and like one of the solutions to this situation is, you don't actually put the medical information on the blockchain. The medical information is still stored in the centralized database. But what happens, what the blockchain is used for, is it will have pointers to your medical information. So, you will have cryptographically secured pointers, towards your information. What the blockchain will record, is who you provide the key to this information.

Kirill: So, basically, if you choose a certain doctor in a certain hospital, and you say, "I want that doctor to see my medical information," then the blockchain will record that from this moment on, the doctor has been given your key to access the information, and they will have access to it. Then, if you decide to take away the key, then again, there will be a record down in the blockchain, which will take away the key. That's what the blockchain will guarantee security of, those permissions, yes and no permissions for people to access.

- Kirill: As I've mentioned, it's really great, it's really cool that it allows doctors to remotely access your information. But even think about it, if you are in one hospital, and you're treated in one hospital for like five years or a clinic, and then you move to a different location, different city and you went to a different clinic, how hard is it to move all your medical files? Really hard in this case.
- Hadelin: It's really hard.
- Kirill: So, with a blockchain solution like that, it's just a matter of scanning one barcode and all of a sudden, all these other doctors have access to your information.
- Hadelin: Mm-hmm (affirmative), yeah, that's a great point. Then, we have another industry, which is ... Well, not an industry exactly, but file hosting, file hosting. Well, you explained how we're going to go from internet 2.0 to internet 3.0 by going from a centralized system to a decentralized system. Well, the same thing can happen with file hosting. Right now, the files are hosted in a centralized system, in some servers somewhere. Using decentralization and using the other pillars of the blockchain, you can have a much more efficient way to host the files and store them, and again, they will be secure.
- Hadelin: Some files are absolutely confidential and cannot be shared, well, thanks to the security and trust pillars of the blockchain system, you will not only host your files in a much more efficient way, than in a much more secured way, where you can trust the system. So, the name of the blockchain for this is called, SEER. I don't know, do you want to say a few words about this?
- Kirill: Yeah very interesting. I read a blog post by the founder of SEER on medium, and he's got an interesting perspective on



things. The idea behind it is, it's kind of like Uber, but for your hard drive. How many computers out there, how many laptops exist out there? Millions, probably hundreds of millions. How many of these laptops have ... In aggregates, what is the total unused storage capacity on a hard drive and someone's stay drives across these laptops? It's petabytes. It's thousands of terabytes of data just sitting there. Like if you look at your laptop right now, just go to settings and see how much you're using. I think I have like 20 Gigabytes free on my laptop. What if I allocate one of 5 gigabytes of that to a system like SEER, and I say, "Well, anybody can store some of their files here and I'll get a fee for it. I'll get a tiny little fee paid for it." That way, we can store data like that.

Kirill:

Again, the challenge in front of the blockchain developers or designers or the people with the idea is, how to use blockchain. Obviously, I don't want a virus on my computer. Obviously, I don't want anything illegal stored on my computer. So, what they have to do is come up with a way that maybe the file gets split up into three separate parts, and these parts get stored on different computers. Also, they have to come up with a fairly safe system that like what if my laptop crashes, there has to be additional copies of that data on other laptops. So, it's really interesting. Blockchain is like a framework, is a foundational part. Then, on top of that, you have an idea of how to apply it, and in the medical space, you apply it in one way, in the file hosting space, you apply it another way and the cooler your solution, the more so through it is, the more people will back it, support it, and the higher the chance that it'll take off.

- Hadelin: Absolutely. Then, there is this other idea, which I absolutely love, because it's about supply chain. I've worked so much on supply chain in my engineering school and I know-
- Kirill: Really?
- Hadelin: Yes.
- Kirill: What did you do? I didn't know that.
- Hadelin: Well, in France, you study every subject and supply chain is a big field of engineering. Therefore, you have to study it in case one day you have to optimize something that is related to supply chain. There's a lot of work actually, to doing supply chain and it's all about optimization. So, that's the problem. You have to optimize that path of a process. The way to do this is absolutely impactful with blockchain, thanks to blockchain. So, I'll give you an example and I'll give this example of blockchain that is having a great idea to optimize this kind of process. It's Provenance. So, why Provenance? Provenance means, where does a product come from?
- Kirill: Oh really? I didn't know that.
- Hadelin: You didn't know? Yeah. It's actually a French word that they use.
- Kirill: That's why they called it Provenance.
- Hadelin: That's why they called it Provenance. You know how today when you buy a product, for example fruit, an apple or some coffee, you don't always know the provenance.
- Kirill: Where it came from.
- Hadelin: Yeah, you don't always know where it comes from. That's because you don't have this history of the process of how the components were added to each other, where they come from,

exactly. So, we can directly understand now how blockchain can make an impact on this because, since blockchain consists of storing the information, the transactions of a process or a flow or a path in the industry, well we can directly see where exactly the components come from. So, if you go to the Provenance website and if you look at the process before and after, you will see that the customers are closely connected to the manufacturers. Then, there needs to be a certificate verified between some of the manufacturers, before it gets to the final consumers. So, that was before. That's the actual process.

Kirill: It's what's happening now.

Hadelin: Exactly, it's what's happening now and therefore, it's not an optimized process because, if you manage to connect the first customer to another manufacturer without having to follow this unique path, checking the certification of the product, where it's coming from, well, you can optimize the process of getting the product and getting the information of where the components of the product come from.

Kirill: So, blockchain basically will give more transparency to this whole system.

Hadelin: Absolutely. You will be able to see the provenance of the components of the product you're consuming.

Kirill: Yeah, it's like living in a world where people are more and more concerned with is this an organic food or is this the coffee from the country that it says it's from or is this cotton my shirt is made from, is it ... Was this shirt made in a sweatshop where people are working for very low wages, or was it made in a proper shop where people are respected for

their labor? In a world like that, this is a really cool application. People are more conscious about these things.

Hadelin: You can check the health of your products because again, the health industry has a lot to be improved and, it can directly be improved with this solution.

Kirill: Yeah, yeah exactly. So, our final example. Final example is, Power Ledger, a blockchain used to disrupt the energy market. So, solar panels, we've all seen these solar panels. By having solar panels on your roof, you can produce electricity for yourself. But, what if you have extra electricity? Why can't you just sell it back to the network, or even better, sell it to your neighbors and create your own little economy in your neighborhood where some people produce more electricity on certain days and less on others, and people sharing electricity with each other and they do it by exchanging electricity for funds. All of that can also be collated into a blockchain.

Hadelin: Absolutely. There's again this pillar of intermediaries that comes into place because, when you consume some energy where an industry has to generate this energy for you, this electricity, and it actually goes with an intermediary. So, as you said, if we're able to sell the energy directly without coming through an intermediary, again, it will be more efficient and that will save a lot on the cost of energy, which we must do because there are some environmental concerns about this, and this would help a lot.

Kirill: Oh, then, you could combine Provenance with Power Ledger.

Hadelin: Oh yes.

Kirill: You could come up with ... Listening to this podcast, you could come up with a blockchain that certifies where the energy came from. How about that?

- Hadelin: Absolutely yes, that's a great idea.
- Kirill: Is it nuclear energy, is it coal energy, is it green energy, is it solar, is it water?
- Hadelin: Yes, yes. Soon enough, we will have a team of blockchains.
- Kirill: Let's go create this.
- Hadelin: That sounds like a genius idea.
- Kirill: Yeah. Sorry, you were saying soon we will have a team of what?
- Hadelin: Yes, soon, we'll have not only one blockchain but a team of blockchains, making a super powerful system that really optimizes things.
- Kirill: Yeah, so we use ... In the course, you're coding on Ethereum right?
- Hadelin: Mm-hmm (affirmative).
- Kirill: In Solidity?
- Hadelin: Mm-hmm (affirmative).
- Kirill: So, that's the whole idea behind Ethereum right? To create this world super computer, which all these applications are now based on blockchain. Therefore, it's an attempt to empower or facilitate this infrastructure for internet 3.0. So, tell us, how does it feel coding on Solidity and Ethereum.
- Hadelin: It feels so amazing for two reasons. The first one is that, it's actually easy. It's actually very inspiring to see that everybody will be able to do it. Everybody will be able to code blockchain, whatever the experience, the prior experience is. That's what we are realizing right now at the time we were making this course. It's that, a big difference between our previous courses

is that, you don't actually need some complex theory to implement what you're building, that is, all the things that are on blockchain. Therefore, that gives us the opportunity to really follow the logical path of creating a blockchain because we can focus our comprehension of what we're doing while coding, onto the blockchain. That's really, really inspiring because everybody will be happy to see that they can build a blockchain even if they don't like or even if they don't have experience in coding.

Kirill: And the second reason?

Hadelin: The second reason is that, okay sorry. I got lost. What was the question?

Kirill: You said there's two reasons why it's so exciting.

Hadelin: Yeah, yeah, why it's so exciting. The second reason why is that?

Kirill: It's like that saying that, in order to be successful, there's two rules to be successful. Rule number one, never gibe away all your secrets and rule number two, they just leave it empty because of rule number one, you shouldn't give away rule number two.

Hadelin: Yes.

Kirill: All right. Well, what I'll say then about blockchain developers, why I think it is exciting, so, I'll fill number two, if you don't mind, is because it's growing so fast. Right now, if you go on upwork.com, which is the biggest marketplace for freelance work in the world, blockchain had a growth of, I think it was like 5000% over the past year. It's one of the fastest growing, in terms of demand, one of the fastest growing, what are they called, professions there. So, more and more people are

moving into blockchain, becoming blockchain developers in order to accommodate this demand, in order to help organizations that are looking for blockchain developers. I think it's a great time if you're looking to learn a new skill, blockchain developer on your resume will be very highly rated. If this trend continues, blockchain developer will be very highly rated in the years to come.

Hadelin: The second reason why it's very exciting-

Kirill: You remembered.

Hadelin: I certainly remembered, yes, is that, you can really see what you're implementing because you have a lot of user friendly interfaces that allows you to see what you built in a concrete way. We highlight this in the course. We really make a demo of what we're building so that you can really have a look at what you build. Sometimes you cannot do this because it's abstract or it's too complex but here, you will really see in action, what you make at each section of the cut.

Kirill: So, tell us a bit about the structure of the course.

Hadelin: Of the course? Okay.

Kirill: Three sections right?

Hadelin: It's in three sections. First section, we start by building a general blockchain. So, we set basically the pillars of a blockchain so that we can change it to adapt it to any purpose. We create a general blockchain. That's what we do. Therefore, in the blockchain, you have the blocks, and in the blocks, you have some data, which you want to secure, or, which you want to record in the ledger. So, we don't put anything in the ledger so that we can adapt it later. That comes to the second module.

- Hadelin: In the second module, we take that first blockchain built in the first module and we adapt it, we change it, we develop it, we decentralize it, to build a cryptocurrency. You'll see how it is quite easy to go from the first general blockchain, which was totally general and not specialized to anything, to this cryptocurrency and you will see how we can easily develop it to make it a cryptocurrency. Besides, not only will we make a simple blockchain, but a decentralized blockchain. Speaking of the demo, we have a demo where we show how we can interact with each other, exchanging the cryptocurrencies with me. By the way, it's called ArtCoin.
- Kirill: ArtCoin.
- Hadelin: Yes. So, this course is like a story because the third module is the last part of this story. It's the last part of the journey. We take this ArtCoin, built in the second module, the cryptocurrency and we build a smart contract, to do a nice year of one million a piece, cryptos. That's exactly what we do in module three. We implement a smart contract that will make sure the ICO happens in the right way, in the secure way without any fraud.
- Kirill: Yeah. A smart contract is basically a way to code on Ethereum.
- Hadelin: Yes. We implement the smart contract in Solidity, which is inspired from C++ but linked to Ethereum, so that you can for example buy some tokens, with ethers.
- Kirill: Okay, awesome. All right, that's the secret rundown of the course. If anyone's interested in the course, I hope you liked this, all your blockchain [inaudible 00:53:46] in the course, you can find a kick starter, jus search for it there. That's pretty much it. Anything else?



- Hadelin: Yes but, I couldn't stress enough that we were so excited to work on this project. It's not finished. We're making good progress but we are really into the middle of the wave of excitement and it will be a perfect way to make a course.
- Kirill: Yeah, yeah, for sure. It's going to be epic. In any case, just look out for blockchain, look out for these opportunities and just see them when they come. This is an exciting time to be alive. It's a new era that's coming and blockchain is empowering it. So, be on the lookout for opportunities that come along.
- Hadelin: Blockchain is the new wild west.
- Kirill: Yeah, for sure. All right, thanks guys. Hope you have a great time and talk to you soon.
- Hadelin: See you guys.