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SINISA SLIJEPCEVIC ON MACHINE
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EPISODE 41

Will Bachman:	Hey there podcast listeners, welcome to Unleashed, the show that explores how to thrive as an independent professional. Unleashed is sponsored by Umbrex, the world's first global community of top-tier, independent management consultants. I'm your host, Will Bachman.
	Our guest today is Umbrex member Sinisa Slijepcevic, who studied with Stephen Hawking, among other professors, while earning his PhD in applied mathematics at Cambridge University.
	Sinisa is a McKinsey alum and independent consultant and runs a firm called Cantab Analytica which is based in the UK and Croatia. Sinisa's firm leverages machine learning to help clients make better decisions and to focus energy on the right decisions. In our discussion, Sinisa provides several case examples to illustrate how machine learning can help make decisions in three ways.
	First, decisions that may be subject to unconscious bias, such as the investment decisions made by venture capital firms. Second, decisions that are complex and also occur very frequently, such as dynamic pricing of hotel rooms. Third, focusing management attention on the most important decisions, such as figuring out which purchasing decisions are the most critical in a supply chain.
	You can learn more about Sinisa's firm on the website cantabanalytica.com and of course that's C-A-N-T-A-B analytica.com. The discussion with Sinisa opened my eyes to potential opportunities to consider a machine learning solution with my clients and I hope you find it useful. Hi, Sinisa. It is great to have you on the show.
Sinisa S.:	It's great pleasure to be on the show. Thank you for inviting me, Will.
Will Bachman:	So, Sinisa before we jump into machine learning and explore what you're doing there, we'd love to hear just a little bit about ... understand you got a PhD at Cambridge University and were in the department and studied a bit with Stephen Hawking, would love to hear a little bit about that.

Sinisa S.: Yes, sure. It's a great experience and it was even a little bit relevant to what we want to discuss today. Stephen Hawking was a great inspiration for many people including me. I was literally having tea with a number of professors in the same department including him every, every day at 4 PM in Cambridge. He was an amazing guy with tremendous sense of humor and also all the tremendous vision, and now quite a bit of time later, now it's coming back to be relevant to what I do because we may have heard Stephen Hawking in addition to a number of other industry and technology leaders published a number of warnings about threats of artificial intelligence to the world where we live. Our [inaudible 00:03:19] discussion came to the conclusion, I would say the opposite, that I would like to discuss the opportunity that machine learning, that data based models can give to independent consultants and to create business value today. I'm very passionate about it.

Will Bachman: Now, just one question about that. When you're having tea at 4 PM with Stephen Hawking and a bunch of Professors at Cambridge University in the math department, does one typically be talking about the thing you're struggling with on your paper and academic topics? Or are you typically talking about the weather and the crummy performance of the football team at the last game? So, what are you talking about at 4 PM?

Sinisa S.: Well, just an example. There was a fluid mechanics team in the department which installed a huge water pipe which is going through the entire building, across four floors. In the middle of this pipe there was a yellow rubber duck which was kind of moving up and down, in line with the current experiment the guys were doing, so this is one of the frequent topics. But, we would discuss people, we would discuss some of the issues one would deal with in the recent paper. But, we would also discuss weather and terrible lunch that we had in the kitchen. So, just a group of normal people, I would say.

Will Bachman: Alright.

Sinisa S.: It's great to hang with. But then again, immediately after my PhD I moved into consulting. I went to work for McKinsey and done completely opposite work, while managing information operation, information projects, which required knowing things and going deep into the bowels of the company, which you wanted to move a couple of inches or miles forward.

Will Bachman: Great. So, lets dive into some of this work. I'm really interested to hear about the work that you've been doing around machine learning and how that can be applied to consulting projects. So, you tell me how to get started and educate me and the audience about some of this work. Maybe some case examples, but talk to me about this kind of work that you've been doing.

Sinisa S.: Yes. So, our first, very short overview of where I think machine learning can add value to this area of where we work, independent consulting and I will

also explain what I'm not going to discuss. Then I'm going to give a number of examples.

So, in my view machine learning that I want to discuss today is a tool to assist management to make better decisions and this is the type of machine learning that I want to advocate and the tool is doing it badly but in three levers, by the world three levers that I would try to describe each in a couple of examples.

So, the first one is removing bias or helping management at least control bias in decision making. The second one is being able to make more agile decisions, so decisions more frequently by alternating parts of decision making process. And the third lever is to help forecast limited managerial time on decisions where you can create the most value. And I will give examples on each of these three levers, some of which from my client experience and some from public sources, stories that are available online or in papers. What I'm not going to discuss, I'm not going to discuss a decision intelligence like driverless cars and so on which requires years and years of time and lots of money and investments to implement. So, this is also a decision demonstration machine learning kind of implementation but it's not what I would want to discuss today.

So, maybe we can go and discuss a couple of very interesting examples in which these three levers, particular client, particular industries and functions and how this could work.

Will Bachman: Yeah, that sounds great. I think some case examples would definitely help illustrate what it means.

Sinisa S.: Okay, so let me start with the first lever, with moving bias will make managerial decisions. So, but first, little example is actually Silicon Valley based, it's a recent example, 2017. A Silicon Valley based venture capital firm called Home Capital and they're making, obviously, a number of decisions in order to invest in a certain opportunity or not. Their decisions are tremendously complex, sensitive, and so on, subject to individual buyers, by the way. I'm going to come back to that but, I will first explain what I've done.

To build a tool, a tool which recommends to, we see, management team whether to invest in that certain deal or not and obviously they are not replacing their complex and their experience, personal experience, their process of making decisions for this tool. But, what is this tool doing? This tool is simply deciding whether they are making potentially big mistake and whether certain [inaudible 00:08:48] needs to be revisited, that decision. For example, if you want to invest and the tool is saying that the likelihood of success is very little then you're going to rethink and ask some additional difficult questions. Although the third examples with tool would recommend with high likelihood of success to you and they would simply not even look

into the details and then they would revisit the decision and eventually on one of them I believe they made a decision to invest and seems to be a success.

So a tool which helps you make decisions. Another example, and again to [inaudible 00:09:23] such true, you need data, you never look certain model, you use some statistical machine mannered techniques, this can be done in some cases in a matter of weeks, not even months.

Will Bachman: Wow. That one seems to me to be a particularly difficult place for a decision tool, I guess my initial assumption was that decision tool would be useful for things that are kind of routine, maybe complicated but kind of routine, some kind of purchasing decision, but decision to invest particularly in VC where probably the big money is being made on things that don't have history that are completely new or different, like hey let's invest in a new search engine, or let's invest I know, what's this idea for where people will rent our space in their homes for random strangers to sleep there, seems like of like totally, with no history at all, for decision tool to rely on so, that one kind of fascinates me that [inaudible 00:10:24].

Sinisa S.:   Again, yes, another example with a client of mine, making decisions for the tool to invest in the clinical trial or not, it's a large pharma company, they're making due decisions, they have several thousands clinical trials in their historical data base. And they're using this kind of tool to assistant management in making decisions whether to invest in the new clinical trial based on, of course this is only one data point to take into account but important data point. Why is this important? I will come back to your question, I will teach some more examples on high frequency complex decision making where supply chain like pricing, revenue management, but I wanted to start with the buyer. There are couple of fascinating books which demonstrate that people are very very imperfect machines in decision making subject to all kinds of bias, maybe if you read The Undue Project my Michael Lewis but to Nobel Prize winning economist [inaudible 00:11:31] who describe how we actually making decisions, [inaudible 00:11:36] even the top management who is very subject to bad decisions. And it will [inaudible 00:11:40] for examples for this type of tool can help you at least like a potential source of bias when making decision.

But then I can move to the second area of examples which resonate to what you have said, where you need to make frequent decisions but you need to be more agile and then it moves to [inaudible 00:12:01] at least partly [inaudible 00:12:02] the decision making and I can give a couple of examples.

Will Bachman: Yeah, great, let's talk some examples there.

Sinisa S.:   I'll start again with an industry that everyone's familiar with, when you book a hotel now a days you typically open booking.com or a similar website or a mobile app and then you find the best price and then you book a hotel. And

again, it's a revolution, this happened in the last seven years or decade which completely changed the way that hotels are operating. For example Starwood, big hotel management company, faced a problem a couple of years ago that their internal processes and tools to make this kind of pricing in capacity management decisions simply do not work anymore, and still [inaudible 00:12:56] 2014 they still rely on part and excel in addition to lots of analysts which typical once a day moving this price point and recommending new decisions. And this was not by all means frequent enough.

A client of mine always in hospitality industry needed a similar tool because they could not in the part of year where they could fill their hotel 100 percent they could not reach modern like 93, 94 percent occupancy which their size of business is huge. Now airlines for example and if you think of algorithm trade but airlines and similar companies have been for decades doing this right but now they are more and more industries which move to become experts in this type of decisions, they need to implement machine learning, statistical date, models, they need to out to make it. And just to complete this example, we helped a hotel chain operate more than 30 hotels implement builds and implement best spoke to pricing and for capacity management at least the first page, so now we're moving to the second stage in less than three months.

This is again a tremendous opportunity focus out and again our opportunity is not to build this tools themselves but to tell to a company, to a business where they key sources of value are, how to move forward, which techniques to apply, which technologies and then to help them brand through the implementation and make sure this kind of things happen on time, schedule, and budget that they need to happen.

Will Bachman:	Great, so a big area then would kind of be dynamic pricing, taking that airline model and moving it to other areas like hotels and any place where-
Sinisa S.:	Exactly.
Will Bachman:	-you have probably something to sell where it's a limited quantity and it's expiring, right? So it's-
Sinisa S.:	Absolutely.
Will Bachman:	-you know, certainly-
Sinisa S.:	So another area of opportunity is actually optimizing promotions and making sure we do it in the most effective way, there is a conflict of micro testing, and again now this things are not completely original in things of this concept. All big consultants is offering this type of service and they have also complex analytical tools that help with their clients but my point is that the number of cases for me to look for a client is very bespoke, it's very, needs to be built from scratch for that particular client, needs to take into account lots of

specifics that the client has and again here there is a big opportunity to work in number of niche markets and complete.

To come back to the concept of micro testing of promotions, so another success examples one of them which you can find online is [inaudible 00:16:18] marketing for bank in New York area where the triple [inaudible 00:16:24] in quality sales by doing micro testing for particular promotions and actions that they do. So what you actually do, you mine your CRM system which you have you mine the date from your CRM system and then you bring a little or big tool but again you can do it relatively quickly which works good enough to test hundreds, it's not thousands many promotions to see which one work and which one don't. And then based on this you're ready to decide which ones you, you test each of them a small sample and then based on which one works and which doesn't then you rule them out to all your potential leads. And again there are number of cases that show that this works and my second point is that with some additional resources and knowledge, this can be replicated it's my deep belief by independent consultants. But you need to be a big consultant to hundreds of employees who working only on this particular tool to provide this type of service.

Will Bachman: Great and I think you said the third category then would be focusing on the right decisions to be making, do you have any case examples around that?

Sinisa S.:   Well here I can come back to something you mentioned earlier which is again a very exciting area with lots of amped up opportunities, this is supply chain management and related to that production planning which is relevant for many many large operations with complex productions facility. So, machine learning can be implemented in a number of ways by independent consultants, I would just try to give a simple example where as not to do and what to do.

So one of the mistakes some of the big companies and some of their rivals are doing, they are trying to implement very complex forecasting models in support supply chain to try to predict, I don't know, production or demand or a number of other things which are relevant for planning. And again, it's very difficult to even with the most model machine learning tools, newer metrics or whatever, to build a model such accurate enough that add enough value. But there is a twist in this story how we can help by not focusing on forecasting for example demand or, on the other hand we're forecasting, or trying to focus on decisions which make the most value. And in the practical ways this can work as simple as following, we choose a category in your supply chain which you know that it's very relevant, you mine your CMP or you take all the data and then you can build a model which captures some of quick links for this particular category by making some decisions but flagging the key levers that the management can pull to optimize this particular category. And my

experience this approach can be extremely effective and appreciated by the client and in addition there are lots of opportunities to push this thinking further which I'm strongly believer, I'm not explored to the limit, not nearly to the limit today where independent consultants or startups can focus their energy and time on.

Will Bachman: Can you give us a specific case example of that sanitized if it has to be, so when you say focus in on you know the key decisions, are there trying to figure out are there some categories of things that you're purchasing where the price goes up and down a lot, or where your demand does up and down a lot so, maybe give us an example from some particular factory or situation to help at least make me understand that better.

Sinisa S.:   Yeah. So I'm going to give a very simple example which may be obvious but to them when you go to a particular client you see that the number of such quick links is huge and if you alternate build a simple tool to recognize such quick links and flag them in real time then should [inaudible 00:21:03] for example if you want to optimize inventory and then you look for the total category, you do a good [inaudible 00:21:11] of the product by using a little machine learned algorithm and then identify category where your inventory turnover is very low or you need to focus on. And then management can look into particular categories for category groups where they need to focus their attention and the machine learning as well advised smart [inaudible 00:21:34] of your product categories by intrinsic features that are not that obvious. And again why is it important? Where do we add value? Where do algorithms add value? The complexity of decisions, number of decisions that managers need to make is growing I would say exponentially in a number of industries, doubling on a yearly basis.

And the simple cannot cope. So in such situation it's not another [inaudible 00:22:08] data scientist. You need to work with your client and understand the way they make decisions, we understand the value drivers and then you help them translate this value drivers into a machine learning based tool. And this I think where the biggest value is, to translate business value into technology. So the approach that I'm with much more but growing team and with some partners we are doing we never stop the data, we never start with looking at the huge data base and thinking how to squeeze a little bit juice out of the [inaudible 00:22:46] data. We really try to understand in detail the business levers, the opportunities and only then may the processes of course and only then look into the data sect to figure out how to alternate or how to flag out, how to predict the key things that helped management make better decisions.

Will Bachman: Great. Could we talk a little bit about how an ordinary, independent consultant of moderate intelligence who does not have a PHD in mathematics

from Cambridge University, how can someone like myself who maybe I recognize the situation in which maybe there's like a dynamic pricing opportunity or there's significant number of decisions that need to get made that are kind of complex, so let's say that I recognize the situation where some machine enabled decisions would be helpful, but I don't know the first thing about where I'd go in terms of finding programmers or the approach, how could I get smart on this topic and find teams of programmers who know this stuff, to partner with them to serve my clients? Can you talk to me about how someone like myself could get smart on this topic?

Sinisa S.: Yes. Well, I don't think this is a difficult and complex, this is just an addition opportunity that fits well into classical independent consultant's tool set, we all started our consulting lives or our business lives as some sort of extra [inaudible 00:24:31] or analyzing data in external just I would say a natural one step further. Well you can first help clients in a rigorous way then to their opportunities without going into building through self [inaudible 00:24:51] types of self. For some business in some functions there are number of startups or number of companies providing appropriate tools of the market and they can be evaluated. All large corporations now how their own significant teams of analytics whose knowledge can be mined and whose experience can be brought to the management potential with skill of the consultants to combine understanding of key value to reverse drivers and combining that with what can be done with certain technology. And then of course thank you for throwing the ball in my court, I would be happy to with my team of data scientists partnered with anything the clinic consultants wishing to look into further opportunities in a specific company or industry.

Will Bachman: Maybe we can go through some of the levers, like on that first one, removing bias, so for someone who's not the kind of deeply trained in machine learning reserving a client, how could we recognize a situation where there's large and important decisions being made that are subject to bias where a machine learning might be helpful to inform that decision? Are there some characteristics of those types of situations you mentioned, kind of investment decisions by a VC firm, you mentioned clinical trial decisions by a farmer firm. What would some other types of decisions be like that we should be on the alert for?

Sinisa S.: So there couple of signs that you need to pay attention to. One is the number of decision that the same team needs to make increasing, doubling on a yearly basis, is it tripling, is what's the case that this clinical trial client. The second one of course you can excel if there is a significant number of decisions then you can get to the data set, you look at the hit rate of recent decisions materializing, success rate [inaudible 00:27:01] simple analysis the clinical trial can do. But then going deeper into understanding causes of bias, there are different types of bias that you need to pay attention to.

	So just keep a couple of examples then I mentioned a couple of books, beyond the project and also by then you kind of think but [inaudible 00:27:23] so listing the bias is the management or any decision maker can do. One of them is regency bias, it's a well known issue, for example again coming back to clinical trials if you have recently witnessed a trial in a certain therapeutic area which was not successful and to the large investment, then when the next one with the same therapeutical area is going to come up for decision, you are going to be affected by the recent negative experience and your decisions are going to be objective. So this is just one of the types of biases in decision making that you need to pay attention to and there are number of them you can be in some cases quantified by a little tool so simple that you flag it if you cannot be objective enough.
Will Bachman:	So it sounds like it's gonna be better if there's a fairly large number of decisions, so if a company is faced with a smaller number of big decisions like whether to acquire another firm, kind of very discrete decisions that are fewer in number, that sounds like something that would be less amenable to this machine learning solution where as if it's a maybe a private equity firm that's looking at hundreds of possible deals, that might be more amenable.
Sinisa S.:	All the examples that I mentioned you need I would say of the [inaudible 00:28:51] magnitude of couple of thousands data points to be able to apply some of the [inaudible 00:28:57] so we are discussing today. The basic principals about bias of course apply to all decisions, but I would say you need a data set of a couple of thousands of I would say deals or decision examples in this history where their outcome, their result and enough I would say variables, enough information of those specific deals, specific say clinical trials so that you can build a model which adds value.
Will Bachman:	Okay.
Sinisa S.:	Again, if you discuss [inaudible 00:29:30] to someone position intelligence that you discuss in many orders of magnitude, more data but it is not [inaudible 00:29:36] discussing today. This order of magnitude is what I would say when they start approaching work.
Will Bachman:	So that's interesting. So, you need a couple of thousand data points. So-
Sinisa S.:	Yeah.
Will Bachman:	-one question comes to mind. So, like major hiring decisions by a firm, like they're hiring a CFO or hiring a head of HR, hiring a CEO, an individual firm is only gonna have a very small number of data points there so probably could not do machine learning to inform that but maybe a recruiting firm, like a large executive search firm that's helping hundreds of clients make thousands of hiring decisions, I could imagine that they might be able to collect data points about the candidates and about the feedback on them and their background

	and the companies and then whether those decisions worked out well or not two years later and develop some kind of machine learning that could help inform the decisions of their clients, is that kind of a fair way of laying it out where the same kind of decision depending on how many data points you have in one case might not work with machine learning but in one case might work?
Sinisa S.:	Absolutely, that's exactly the way I look at that, and then when discussing couple of thousand data points and then machine learning based tool is only an additional advisory tool which points out the bias and cannot be, I would not recommend using it with more weight, it's a human and machine approach resonated to what Elon Musk is actually saying about all our future but this is the way it could work. And since you mention human resources this is a book I love by the head of HR of Google with work rules which describes a fascinating number of examples how [inaudible 00:31:48] they apply rigors decision making in HR, Google was a course leader in search they are applying their knowledge to people decisions in a very [inaudible 00:32:00] way.
Will Bachman:	So let's say that we identify, okay so we have some decision that we want to remove the bias from and as independent consultants we found a situation where they are making thousands of decisions, so maybe it is hiring decisions but it's for some kind of global international retailer, so they're hiring thousands of people and looking at tens of thousands of candidates. So we've identified the situation, what would someone whose not a machine learning expert, what would we need to do then to kind of collect the relevant information and what kind of firm would we need to partner with, it sounds like your firm would be one option but more broadly what kinds of firms would be looking for, and what would we need to provide to that partner firm to kind of move forward and actually make a tool, like what are the steps involved in going from hey this is a decision that could be subject to bias, what are all the steps to actually saying okay now we've implemented a new tool that advises the decision makers?
Sinisa S.:	So again, there are many situations in which of course I would not recommend building a tool, I'm not sure that hiring the CFO or even hiring decisions, but again let's play with it example for the moment. So the first step would be the approach, the [inaudible 00:33:37] projects you would do, you would really understand what the client issue is and where the value may be for start and then where you can add value with some process [inaudible 00:33:50] or we look for opportunities and prove there is a reason why you are advising the company on a certain project there is certain issue that you need to deal with, it cost me to understand that issue.
Will Bachman:	And I'll just sort of make one up, tell me if this works, let's say it's not the CFO hiring but we're helping a big fast food chain hire kind of cashiers and front

	line workers, right? And the challenge is that it takes a lot of time to screen through all of the resumes or all of the applications that come in and then the local restaurant might be subject to some bias of hiring either gender whatever race of hiring people and we don't know what factors, and then sort of the economic value is it cost money to train those new cashiers up and the new fry cook up-
Sinisa S.:	Absolutely.
Will Bachman:	-so we want people that are gonna be good employees and last longer but we don't really know what factors, education, location, age, whatever, we don't know what factors are gonna help predict that, so then we want to remove bias.
Sinisa S.:	Actually, so you are describing pretty well a very recent project of mine [inaudible 00:35:16] for a leading technology company expanding in the region, and they needed to hire all the managers 5,000 people in the region and hiring was going very slow [inaudible 00:35:27] why. So the next step after course understanding all the client knows about the issue, you need to collect data. And a couple of ways if you can mine all data sources that the client has you can introduce some of the new tools and then wait a month until the client gathers data that you would require to make decision or you can even in some instances, and this is what we've done, we've done data gathering tool based on social networks which we build in collaboration with a small company [inaudible 00:36:07] in Oxford and by collecting data we actually did add value, awarded some prizes for, applied all extended techniques together, data went into digital market research, and then based on this data that we gathered in addition to what the company we had, we then started building models to segment parts of the market where they can focus their efforts in acquiring new employees.
	And I would say this is pretty effective, identify the couple of really, really good pockets of population and also which value proposition and easily recommended how much money they need to pay them which did it to reach challenge to use to reach the population we wanted to recruit. They actually completely changed their approach based on our recommendations and it's been very successful. So to answer your question, the next step [inaudible 00:37:19] gather data you need to be creative, you either take what the client has or you help client collect addition data or even sometimes collect the data yourself in the market if this is relevant or applicable in your particular science.
Will Bachman:	What sort of reporting do you put in place, once the tool is created I could imagine you might want to as a manager who paid for this whole system you might want to say look at, say alright show me all the decisions that were made for all the ones where we, let's say if it's a hiring decision, for all the ones

where we hired somebody what percentage of those did the machine say hire the person and how often did the machine say no, but we overruled the machine or when the machine say no and yes and we said no, so like the four possible decisions right? Like we made a decision yes or no, the machine recommended yes or no, and then how did each one of those play out over time, you'd want to see is the machine actually adding value, is it recommending yes and causing us to decide yes where we might have not otherwise or is it sometimes recommending no and causing us to decide no, is it overall having us make better decisions overall? How would you kind of report, how would you report on that and then to capture insights to actually determine if the whole effort was worth it?

Sinisa S.: Yeah it's extremely important and again there are many approaches I would give just a couple of examples from recent client experience. The hospitality company that I described, this is an important part of the entire package, they hired a very good IT provider who built the dashboard and we have the dashboard for this new revenue management, sliced pricing, flex capacity management tool which had double purpose, one to help them make decisions, approve or reject what the like books, machine running system was recommending. And secondly to monitor success and occupance rate, their Rev Par, all the other [inaudible 00:39:55] that you need to monitor when the managing hospitality chain. We as independent consultants helped the client plan the entire project, help them even in deign in particular dashboard screens, we help them discuss which levers we want them to position where and of course understanding of business value drivers is extremely important to help design this particular dashboard.

Additional authority [inaudible 00:40:34] how [inaudible 00:40:37] where you can build a dashboard very quickly and connect to the database for specific tools that any CRM system or a similar application specific function area provide for a solution could be to integrate with existing system which already has some good reporting tools in most company. The decision again is not at fault, it isn't where we can add value but you're absolutely right, it's very important that you have clients [inaudible 00:41:10] tool the tools that you gave us to track the success and make decisions up to it.

Will Bachman: What are the common platforms or tools that you use to implement this decision learning type solution? I'm imagining that this is not gonna built on excel, is it something's that's in the cloud, is it some software that companies already own or are there specialized platforms, could you talk about that a little bit, are there some major platforms that we should get familiar with?

Sinisa S.: It's very specific to clients but again if you're building something which does not need to be integrated with existing client systems then a typical [inaudible 00:42:00] is that you have for database is curated as someone cloud which

again is not [inaudible 00:42:07] solution. Then build on top of it your machine learning tool for which I would say could be done a number of program languages like [inaudible 00:42:20] and so on and then on top of it you have a dashboard, you have some visualization decision making tools that actually use the data in a way that are create value to the client. So I would say today [inaudible 00:42:42] all these tools some of them are open source, some of them are available in market, you need to pay attention 'cause the security which is a huge issue today, data security, if you need to integrate the existing client systems then complexity obviously multiply, it multiples, this is always a complex task to channel data from one application to the other by respecting all companies kind of [inaudible 00:43:12] but typically the simplest way the architecture looks as I described.

Will Bachman: And how would an independent consultant find a partner on the decision learning side who can help with the technical aspects of this like, it sounds like your firm would be one option to find firms like yours, I don't even know what I would necessarily search on Google for or where I would find firms like yours or if there are conferences or lists online, I don't know if I would go to Upwork or just Google something, so how would I find firms like yours that are doing this kind of work?

Sinisa S.:   To be absolute frank I have no idea.

Will Bachman: Okay.

Sinisa S.:   There are tons of companies who would provide machine learning type services for distant engineering or for different business or function or functional area [inaudible 00:44:26] if you wish [inaudible 00:44:28] today where the most value lies and what is more difficult to find is this bride, I would say [inaudible 00:44:36] strategic bridge between what the company needs to achieve to remain competitive be it in pricing, promotional [inaudible 00:44:47] supply chain management, and linking these two with the real opportunities and also threats that you see today in the market that everybody is actually trying to understand and use data in a smarter way. So to this bride where the most value is if I see there is also tremendous opportunity. And the approach that I'm advocating is really focusing on where the biggest value is, it's sort of strategic decisions, it's prototype not implementing of machine learning models, this could be done by many people but a quick prototyping of different machine learning approaches to understand where the value is, by understanding what's predictive possibility of data that the client is, where the really strategic threats are that the client may not be aware of. I don't know whom else to recommend.

Will Bachman: Yeah.

Sinisa S.: But again to all the witnesses [inaudible 00:45:50] where we came to expand our footprint and are willing to share our form of thinking and some complex as well in that area.

Will Bachman: While we're on that Sinisa, how can folks find you? What's the best way for folks to find you, either your website or Twitter, what contact info would you like to give?

Sinisa S.: Thanks, again appreciate you giving me this opportunity so our company's called Cantab Analytica, Contab is like in Cambridge, C-A-T-A-B and is our website cantabanalytica.com and all the contacts are on the website, also we have a little blog of interesting case examples and best practices in the area, some of them are mentioned today, I hope some of them may be helpful to the public in the industry.

Will Bachman: Great. And we'll include that link in the show notes for any listener who didn't catch it. What are some ways that someone can get smart on this industry, on machine learning in particular, I haven't taken any of them, I just sort of having browsed the course catalogs of things like Udacity and other massively open online courses, I know there's probably a lot of courses out there on this topic, are there any courses that you recommend or books that you recommend, or websites or blogs, or podcasts that you think are doing a good job talking about what's going on in this industry and how to kind of learn the basics?

Sinisa S.: Yeah, so first what I would not recommend is going to some, reading some machine learning technical [inaudible 00:47:40] technical books because they give to most people, including me by the way, [inaudible 00:47:44] background [inaudible 00:47:47] so the best source to understand are like big consultant's websites I would say which offer the type of service and explain in examples, in case examples what can be done. You of course have to filter out a lot of noise when you read them but this is I would say the best source for making [inaudible 00:48:10] making analytics, this is where the industry is heading and this I would say the business model that we as independent consultants can certain cases or many cases replicate by being agile and creative enough I would say can even move faster and more effective.

Will Bachman: Fantastic. Sinisa I have a couple questions just sort of outside your day to day work, I'm always fascinated by how independent consultants are pursuing their own ongoing lifeline education and building their own skills, what are some things that you do outside of your client work to continue your professional development?

Sinisa S.: First I would very much like to attend one of the events, Umbrex events which keep independent consultants on their toes professionally. And I hope I will do it in the near future, I still recall all the great training I had with [inaudible 00:49:17] consultant and this is something you missed and this is what I

	would like to do. Secondly, what I do to keep myself on my toes, I teach frequently at the university specialist courses in mathematics and finance and I like to [inaudible 00:49:37] some business, and all this in observation to understand better and understand what you don't understand if you cannot explain in simple words, and I must say I have spend a lot of times with my kids, I have four, this is also great source of inspiration and challenge but in a different way.
Will Bachman:	Well that point is really fascinating. I've spoken to other folks that do some teaching and I often hear people phrase it as giving back, but that's really insightful to say if you want to learn something teach it and rather than kind of taking courses by actually teaching at the local university it forces you to go back and relearn it yourself, so that's an interesting insight into professional development of going out and teaching.
Sinisa S.:	Yeah it's also great recruiting method too, the best young data scientists that we have actually came to me after one of this lectures and ended up working for the company and quite a few of the project that we mentioned today, there is an additional benefit that you could find some great future colleagues or employees.
Will Bachman:	Probably particularly some folks that are younger and perhaps even more in touch with the different sort of segment of knowledge or connected in a different way, so that's kind of-
Sinisa S.:	Absolutely. Absolutely.
Will Bachman:	Any tips that you have on managing your day? I'm always interesting in kind of people's morning routines, what you do in the morning to kind of win the day, or if you have routines that you found really helpful to you?
Sinisa S.:	Well I have three morning coffees I would say and in the evening if I can [inaudible 00:51:36] in the same time as my kid because obviously I commute a lot and telling her story in the evening, it's a great way to empty some of his brain, I never read my kid, I have kids which are quite young, three of them by the way, and they get their goodnight story which is never read, I always try to invent a new fairytale for them for my head and then this is a great way to clean all the daily issues and complications and challenges and be a fresh afterwards.
Will Bachman:	That's really cool. Making up fairy tales for your kids, awesome. Well Sinisa thank you so much for joining, really appreciate your time calling in from Croatia and I look forward to opportunities to collaborate and I hope folks that are interested in machine learning will follow up on this and check out your website and thanks so much for your time, this was a really fascinating discussion.

Sinisa S.:	Well also I appreciate very much you giving my team this opportunity, I'm looking forward to keep in touch with independent consultants in your network of course with you.
Will Bachman:	Thanks very much. Thanks for listening to this episode of Unleashed, the show that explores how to thrive as an independent professional. Unleashed is sponsored my Umbrex, the world's first global community of top tier independent management consultants. The mission of Umbrex is to create opportunities for independent management consultants to meet, share lessons learned, and collaborate. I'd love to get your feedback and hear any questions that you'd like to see us answer on this show. You can email me at unleashed@umbrex.com. That's U-M-B-R-E-X . com.
	If you found anything on the show helpful it would be a real gift if you would let a friend know about the show and take a minute to leave a review of iTunes, Google Play, or Stitcher. And if you subscribe, our show will get delivered to your device every Monday. Our audio engineer is Dave Nelson, our theme song was composed by Gary Negbower, and I'm your host Will Bachman. Thanks for listening.