aiworld Conference & Expo

TRANSCRIPT FROM THE PRESENTATION:

Introducing Fractal:

An Alternative Route to Machine Learning Presentation

Seth Adler
Editor in Chief, AI & Intelligent Automation Network

Govind Sandhu
Co-Founder and CFO, AntWorks

SETH ADLER: Good morning. How is everybody? I'm Seth. I'm the person that'll be doing the questioning. This is Govind. He's the one who'll be doing the answering. I'm not sure where he's going. Oh, he's going to get the clicker. The reason he's doing the answering is he's the smarter one. I'm literally here to be someone that doesn't understand so much, and so I think that I got from the first couple of sessions we were talking about ethics a little bit in the first panel and then we were just being told that, "All we've got to do is get our data right and then everything's easy after that."

GOVIND SANDHU: That's right, Seth, and that's the little problem we are trying to solve, right? For everybody. Before we get started, I'll tell you -- I don't know how many of you watch Seinfeld but I still remember him picking out a queue where he said the number one human fear was public speaking, right? I don't know how many of you knew that. And the number two is death.

ADLER: Indeed.

SANDHU: Yeah. So, I actually Googled that before I came in, and so I told them to put the mic on my right side so you can't hear my pounding heart. (laughter) But essentially, death has actually fallen down to number five.

ADLER: Look at that.

SANDHU: Yeah. But the important thing is if you took that data and gave it to any sensible AI engine, it would clearly tell you to jump in to the casket rather than giving the eulogy, (laughter) right? And so I think we're still some time go for common sense but it's a very exciting time.

ADLER: Yeah. Some might argue that actually curating and managing data for artificial intelligence would be the new number two, right?

SANDHU: I would absolutely think so.

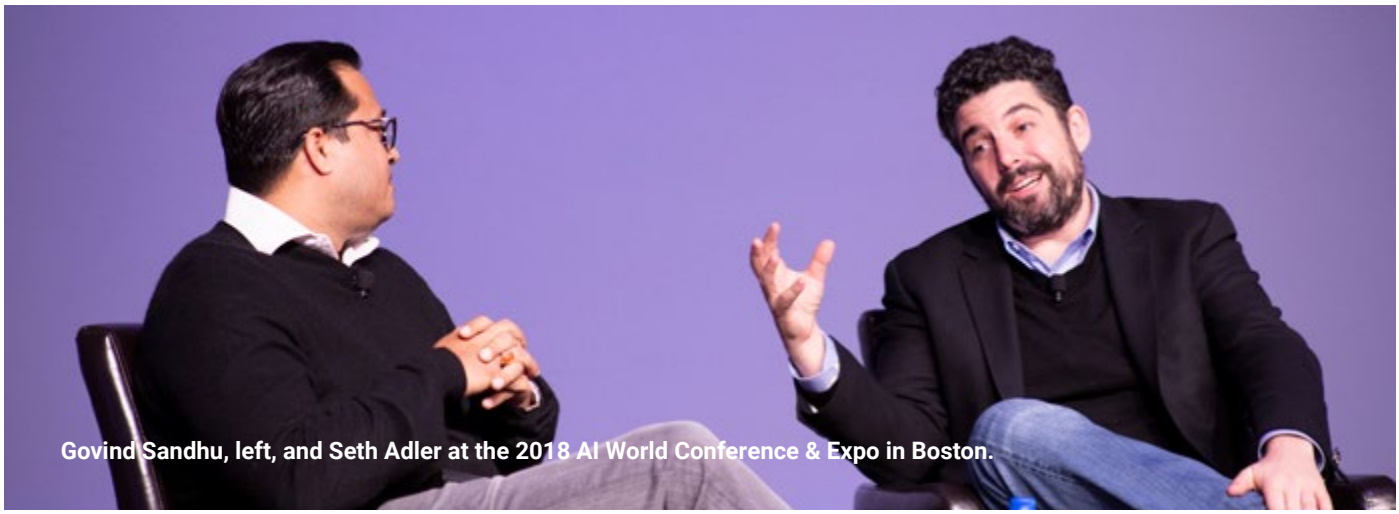
ADLER: So, I think that we all come -- and I'm speaking to corporate enterprise practitioners all day long at the AI Intelligent Automation Network, which is on your computer at AIIA.net -- and essentially it's all about that, you know? What data do we have? What data do we know about? What's our structured data? What data do we not really have control over? What's our unstructured data, and how are we going to measure that and get on top of it? And, one good option is to go the neural networks route, and when we first started talking about

this conversation, obviously, this was not -- this slide that you're seeing was not put together by somebody that was on peyote (laughter), this is the pattern of the sentences that is the title of this session, so there's an alternative to neural networks and what's that?

SANDHU: So what happened was when we actually started out -- and -the last session was really fantastic, right? -- because it really tells you, it lays it out that you've got to do this. If you're not going to do it you're putting your business at risk. But we're going to actually get slightly narrower about "Yeah, we need to do it but how do we do it, right?" And when we looked at it as a company, we kind of said "hey listen, if you look at AI historically, there have been a couple of winters, right, from 1956, when it started in Dartmouth, the problem was there wasn't enough processing power, and then they moved on and they found there wasn't enough data, and then they found that there was not enough investment, and then the problem comes to adoption, right?" And so right now we're sitting at a point where you're almost at a perfect storm, right? You've got the data, you've got the processing power, you've got the investment, and adoption really becomes the key success factor, right? And that's why this community here really needs to be able to adopt it. And so, what we found when we looked at it was that if you look at adoption, there's certain inhibitors which come in the way of adoption, and some of those challenges were things like data availability, right, so a lot of organizations struggle with finding the data that they need. Once you have the data, the second challenge that we saw was data usability, so you can have data but is it ready to be used? I mean, we're dealing with a bunch of companies which have data lakes -- I met some people here as well -- and they have the data lakes but they don't know what to do with the data lakes, because now you've got all this data sitting in a data lake but you can't harness it for machine learning, right? So that was again a big challenge. The third was processing power and GPUs and the infrastructure and investment which is required, which is also a problem. So personally, whenever somebody tells me neural networks, I've got this image in my head -- and I don't know how many people have it -- which is essentially of a room full of big blue machines and people wearing doctor coats and walking around, right? So it's very intimidating and so when we looked at all these problems we started looking at is there another way to do this? And that's where we actually found fractal networks, which is a different science and which actually lent itself to take a lot of those boxes, right?

ADLER: And I think within what you just shared, one of the things that I hear all the time from corporate enterprise practitioners is -- first off, I don't have the computer science talent to manage this in any real way. I'm a good strategy person, I'm a good business person, I might even be a good IT person, but as far as being a data scientist, I ain't one, and I don't see a lot of folks out there that have the commensurate experience to do what we need to do. There's like five people at Stanford.

SANDHU: You're absolutely right. That's going to be another inhibitor, basically. So, If I just tell you a little bit more about conceptually how the science is different, it'll kind of bring out a lot of the benefits. So, if you look at fractals as a science, the basic fundamental principle which separates fractals from neurals is that neural networks focus on absolute values and fractal networks actually focus on patterns and we really believe -- and I might be making a controversial statement here -- that the human mind really works with patterns more than absolute values, right? So take for example, Seth, if I saw you in Grand Central 10 days from now and you're standing at a 45-degree angle, I'm sure I'd be able to shout out and recognize you, right? And I'd be able to do that not because I remember the distance between your eyes and the exact structure of your face, I'd be able to do it because I can recognize the pattern. And so the underlying philosophy is patterns are more important than absolute values, right? Even if you go back to ancient Indian medicine, they actually picked out physicality of people and actually understood those patterns so a good Ayurvedic doctor could actually see you when you walked through the



Govind Sandhu, left, and Seth Adler at the 2018 AI World Conference & Expo in Boston.

door and see your physicality -- the shape of your nails, the shape of your eyes, the shape of your facial structure -- and actually tell you you're susceptible to these five diseases -- right? -- with a severe amount of accuracy. So, patterns really become more important than absolutely value. Now if you understand that concept, that has a lot of ramifications, right? For example, the minute you start talking about patterns, fractal networks are essentially really looking for self-similarity and they're looking for resonance of self-similarity, and so they're actually converging on that self-similarity and learning from that -- right? -- so fractal becomes a very deterministic science, right?

ADLER: You have a slide I think that kind of gives a -- in four quadrants, right?

SANDHU: Yeah.

ADLER: Here's a little bit of background. Sure, that's fantastic.

SANDHU: So if you look at, really, the fractal network itself, the fact that it stresses that patterns are actually more important than absolute values -- so as a science it's basically converging on the data and it's trying to find the resonance in the data and actually work in a deterministic manner, and when you talk about neural networks, you're looking at absolute values and then you're applying probability to actually move down the tree, and so you're actually on a divergent journey, right? And that really becomes the differentiator between the two.

ADLER: But on that divergent journey, when I do have enough data scientists to kind of harness all that data and actually do all that work, I do have a sense of precision that it feels like from what you're saying I don't get from patterns. Patterns feel messy to me -- just how you're describing it, right?

SANDHU: That's a great question.

ADLER: I admit to not being a data scientist by using a word like messy.

SANDHU: Super. So that's where I'd actually focus on the word deterministic, and because it's not working off probability, it's like it's going to rain in Boston and the probability of rain in Boston is 30%, is what you're neural network will tell you. But what the fractal network will tell you -- it will converge on the data and tell you in a deterministic fashion that it will rain in Boston and my confidence level for that is such and such. So in a way the fact that it's deterministic, and when you add heuristics to it, it actually becomes a lot more revealing.

ADLER: What happens if we get kind of off on a tangent and it -- we go down the wrong path here, right? We're looking for rain, we find rain, and that turns out to not be it at all. It wasn't rain, it was frogs.

SANDHU: That's where while you get the deterministic outcomes with confidence scores, it allows you control

on how to adopt them -- right? -- so it does become a controlled environment, and there is something known as dimensionality reduction which basically means when you're looking at a pattern [worse than an?] absolute value, you can actually eliminate some of the dimensions, right? So for example scale invariants. Scale invariants means if you're actually teaching a neural network what an apple is, you've got to tell it what's a small apple, what's a big apple, what's a medium-sized apple --

ADLER: Top apple, bottom apple, side apple --

SANDHU: -- so you look at the data set that you're dealing with, it gets a lot more absolute value focused. In fractal networks, it'll just pick up the patterns of the apples and apply scale invariants, right? So if you look at these four or five different things that I've just spoken about and you go back to some of the challenges that we were seeing it really boils down to, from a business perspective, there are other ways to machine learning and with fractals you can do it with smaller data sets to get the same level of yield, if not better at certain times, lighter on infrastructure, so you don't have to go to a GPU environment or big infrastructure to get it done, and it's easier to implement, because from -- to your point, from data curation perspective, it's actually much lighter, so I don't need an army of data scientists to actually curate my data, make it absolutely right so that my neural network can take the right decision, so it works great, but hang on. So, I'm not saying one science is better than the other. The important thing is: what is the problem that you're trying to solve, right? If you're trying to predict the weather, you probably want to go neural, but if you've got a finite variance in your data set and -- in our case, when we look at businesses, businesses are controlled environments, right? And your data variances are finite. There, we're finding fractals to be actually much more fit for purpose, right? And if you look at businesses, businesses are actually designed for controlled behavior. You're designing your business for certain outcomes within your processes, right? So for us as an organization, when we focused on the specific problem that we're dealing with, we actually found fractals to actually fit in very well.

ADLER: So that's helpful because rather than a choice between rain and frogs, you're point here is there are no frogs. I was going to ask you apple and pears because a pear kind of sort of looks like an apple and if I'm just doing patterns, I might mistake it for a pear. I think the environment you're talking about, the business environment you're talking about, doesn't have any pears, so you don't have to worry about it.

SANDHU: Exactly.

ADLER: As long as it's close enough to an apple, here's your answer.

SANDHU: Exactly. So that's why we've found it to be very fit for purpose, and so we've actually applied it across various sorts of problems that we've tried to solve --

ADLER: Such as... here we go. This is the stuff. Open up the notebooks.

SANDHU: Open up... (laughter). So actually the most interesting one for us is -- which lends itself to everything, which the Gartner pack was talking about -- and in the last slide he summed it up -- you really need to be able to demystify your data because if you don't have data, you cannot do machine learning because what's the machine going to learn from, right? So we've kind of applied fractals to totally do away -- and I'm sorry for being very, very blunt -- but with this rubbish technology called OCR...

ADLER: [Exhales loudly].

SANDHU: Which we call...

ADLER: That's rough. Everybody loves OCR. Everyone wants more of it, come on.

SANDHU: I personally call it obsolete character

"So we've kind of applied fractals to totally do away -- and I'm sorry for being very, very blunt -- but with this rubbish technology called OCR...."

recognition because it was good to use OCR until about five years back when people weren't trying to automate, but the minute you start trying to automate you quickly realize that that's you're biggest bottleneck, right?

ADLER: Interesting.

SANDHU: So what we've done is...

ADLER: The goal should not be to plug in to OCR (laughter). No, but that's what I hear. It's what...

SANDHU: Yeah. Yeah. And the idea is that we've basically taken image recognition and we've married it with pattern recognition and machine learning and so now you've got something which is actually reading the documents with some context and not just picking information without any context and bringing it out, right?

ADLER: Mm-hmm.

SANDHU: So, that's one big problem statement that we solved, but you take the same science -- we looked at something known as natural language processing, which I'm sure everybody knows and which is basically taxonomy-based keywords tokenized together to actually get meaning out of sentences, right? So we again looked at the way it currently works and we said "Hey listen, hang on, can we apply patterns to this, and we actually started applying patterns to grammar, and so now it's not only keywords but the grammar and the sequence itself is starting to come into play, and so we were able to create what we call is natural language modeling." To give you a sense, I was talking to somebody yesterday and they were like, "I need to do a lot of work to get my NLB models going," and I was thinking in my head "Hey hang on, it's not that much work because we were working with a title company where we kind of automated their whole title process, right?" And so we needed to read these legal deeds of trusts and legal descriptions of properties to determine what sort of a property is it. We asked them for 1,500 descriptions and 1,500 right answers. We uploaded it into the model. In 15 minutes it was giving 85% yield, right? So, again, you're just demystifying technology, you're applying patterns inside of that. Same thing for robotics. I mean, anybody who's done robotics here, RPA, will tell you RPA has this horrible thing which nobody talks about, or they talk about it behind closed doors --

ADLER: Failure (laughter)?

SANDHU: No (laughter). It's called -- well, I call it as the exception discovery -- right? -- and you put your bot and you think you've thought of everything and then the minute it starts, you realize "Hey, hang on, here is an exception -- here is an exception, and that exception discovery is a killer as far as that journey is concerned so why not apply patterns to actually do exception handling, right?"

ADLER: Yeah.

SANDHU: So, to give you an example, if your bot is processing invoices and there is a marriage certificate in it, it should be able to sidestep and move on and not come to a standstill.

ADLER: But now you're talking about invoices. You're talking about revenue. And again, I worry -- especially from financial services, I'm highly regulated, and you're just doing these kind of quick pattern matching and everything should be fine -- how do you -- how can I rest assured that we've got the right kind of findings here? You know, with neural networks we know because it goes from here to here to here to here, there's a nice tree, we can see it, it's all nice and neat.

SANDHU: Yeah. In this case again, it goes back to the deterministic point where you've got the deterministic way of doing it and then you've got the heuristics and then you've got the controls and you are in control, and so if you say:hey listen, if the confidence level of the algorithm is 85%, I want to look at it myself, everything that's 90% and above, let them do it, right? So yeah, and if you look at it, it's the same technology which we're using for -- you know we're tied up with one of the leading oncology thermologists to look at thermal signatures of breast cancer scans.

ADLER: This sounds important. Let's actually breathe for a minute and talk about this, right? You know? This is a

great -- this is obviously -- this is life and death so let's talk about that. Take me through it.

SANDHU: Yeah, it's the same technology which is being used -- right? -- from looking at invoices to looking at heat signatures in thermal scans and detecting breast cancer or pulling out high-risk cases for doctors, right? Same thing. It goes back to being able to see the patterns, work with the patterns, and then use them.

ADLER: So, have these doctors kind of tried to implement something else and now they're coming to this, or is this a first go at automation?

SANDHU: This is a first go.

ADLER: And what is their feedback to you?

SANDHU: Well, we've just started and the initial results are pretty encouraging.

ADLER: Give us anything to chew on.

SANDHU: I'm not going to give you any data --

ADLER: OK. Fine.

SANDHU: -- but the point is that we've reached a point where it's got enough confidence to say: All right, I think we should go the whole hog.

ADLER: Got it. OK. All right. So, really, we're dealing with breast cancer so we should be able to deal with legal documents from a title company.

SANDHU: Absolutely.

ADLER: Can you give us maybe a couple of other case studies of where you've been playing, so to speak?

SANDHU: Well, you know the thing with fractals --

ADLER: Because this is new, right?

SANDHU: It is new, and the thing with fractals is -- I don't know how many people saw Danny's session here yesterday, and -- brilliant guy, bright guy -- and the minute he finished I actually walked out and I wanted to shake his hand and congratulate him on all the fantastic work he's done, but I was also very curious to ask him, I said, "Danny, have you heard of fractals?" and he said, "No." And I was thinking to myself, so this is really -- and it's one of the oldest sciences, right? And it's been there since the '60s --

ADLER: Fractals, now?

SANDHU: Yeah. And it's being used by NASA, it's being used by Boeing, it's being used by all these different companies but nobody has applied it.

ADLER: Why are we just getting to this if it's less compute -- if it's less talent needed, meaning data science, less specific talent needed -- why are we only getting to it now?

SANDHU: I'm asking the same question.

ADLER: Fair enough.

SANDHU: And that's the reason I'm here talking about it and we're pursuing it as an organization.

ADLER: All right. OK. I'm just trying to see if there's the time -- they said that there would be the time. I can't find the time. Who knows. One minute. So, there you go, we've got one minute left. I'll ask you the three final questions. I'll tell you what they are and I'll ask you them in order. This is what we do on the podcast all the time.

SANDHU: That's a surprise.

ADLER: (laughs) What's most surprised you at work along the path here? What's most surprised you in life? And on the soundtrack of your life, one track, one song that's got to be on it. First things first, what's most surprised you at work? How long you been at AntWorks?

SANDHU: We started about four years back.

ADLER: OK. Why is it called AntWorks?

SANDHU: Well, it was three in the morning when my cofounder called me (laughter) but the basic thing was we that really liked the attributes of ants. I mean, they lift 50 times their body weight, they work great in teams together and all sorts of wonderful things and we were definitely setting out to carry more than 50 times our body weight so it fit right in.

ADLER: And it seems like we can do that with fractals.

SANDHU: Yeah.

ADLER: What has most surprised you at work?

SANDHU: Well, I think what surprised me at work is that as individuals, we're capable of so much more than we think we're capable of and I've actually seen that in myself through this journey of a startup, right? And I've seen it in people that we work with, so people have more than what they think they have.

ADLER: They have more than what they think they have.

SANDHU: That's right.

ADLER: They are capable of more than what they think.

SANDHU: They are capable of more than what they think they have.

ADLER: All right. I thought they were saying the inverse about it.

SANDHU: No, no, no, no.

ADLER: I think for some that is true but it's a different conversation (laughter). What's most surprised you in life?

SANDHU: What most surprises me in life -- OK, this is going to be a little on the tangent -- but I think every one of us knows deep in our heat that money is not going to give you happiness but everybody still has a relentless pursuit for it and I can never kind of get those two aligned right.

ADLER: Yeah. I think it's the system of capitalism (laughter) that might be at play.

SANDHU: That's right. It is.

ADLER: We can discuss that later though again.

SANDHU: We can discuss that [next day?] for sure.

ADLER: So on the soundtrack of your life, one track, one song that's got to be on there -- what would that be?

SANDHU: I would say it's Louie [sic] Armstrong, "It's a Wonderful World."

ADLER: Aw, look at you. How wonderful is that? A wonderful world at AI World. Thank you so much for having us. Govind, thank you so much for your time.

SANDHU: Thanks, Seth.

ADLER: See you down the line.

About the Speakers

Seth Adler

Editor in Chief, AI & Intelligent Automation Network

Seth Adler is the Editor-in-Chief of the AI & Intelligent Automation Network. As a host, moderator, producer and unlicensed anthropologist, Seth has a dynamic background including 20 years of international event, podcast, video and text product in. Cultural significance is a focus for Seth, as he at one time was responsible for bringing the former greatest show on earth - Ringling Bros. and Barnum & Bailey to town. At another time he produced music showcases at the historic, now closed CBGB. He's currently focused on the societally significant industries of legal cannabis and artificial intelligence.

Govind Sandhu

Co-Founder and CFO, AntWorks

Govind has 20 years of work experience in the technology and outsourcing industry working with various Fortune 500 customers to design and deliver India leveraged outsourcing strategies.
Deep operational and financial experience in building businesses having worked with varied commercial and operating structures. Extensive track record of business development in the US and UK markets, M&A and change management, including leading one of the largest captive acquisitions in India.