

## CUSTOMER FIRST THINKING PODCAST #3

### Deep Learning: An Interview with Gary Saarevirta, CEO, Daisy Intelligence Corporation

Businesses are “drowning in data but starving for insight”, as the saying goes, and that problem is about to get worse. As society becomes increasingly connected, marketers are facing a rising tide of digital interactions. Somewhere inside that massive pool of data are the answers to questions marketers haven’t even thought to ask – yet are essential to creating a better customer experience.

Relief is on the way in the form of artificial intelligence. The capability to skip right to the answers without even forming the questions will be the salvation of marketers, who until now have had to rely on their own made-up rules or overworked data scientists. With AI, the analytical load shifts to machine learning algorithms that will help marketers reach the promised land of hyper-personalization. The first wave of commercial AI solutions has already made landfall. AI is being used today to improve audience targeting for programmatic media buying; make dynamic content and product recommendations; and drive demand-level pricing. Most of the major marketing automation and CRM vendors have already integrated AI capabilities into their platforms (like Salesforce’s Einstein). Companies also have the option of outsourcing the analytical work to software-as-a-service platform providers who will help them benefit from the technology immediately.

One of those SaaS providers is Toronto-based Daisy Intelligence founded by CEO Gary Saarevirta. The company, which specializes in retail merchandising solutions and insurance fraud detection, was recently awarded the first-place prize at the 2018 Elevate AI Pitch competition in a tough field of 16 start-ups. The “deep learning” platform developed by Daisy Intelligence can ingest a massive amount of SKU-level transactional data and through its self-learning algorithms determine the best product price points; adjust the promotional mix to minimize cannibalization; identify optimal store locations and layout, and much more, saving merchandisers from needing to figure it out themselves. All the retailer needs to do is turn over as much sales history as possible, and let the platform perform its magic.

“Deep learning” is very much like magic because no one can ever say how it arrives at the answers it comes up with. Known as a “convolutionary neural network”, the idea was first conceived by Toronto computer math wizard Geoffrey Hinton in 1986. Since that time advancements in GPU computing has allowed “deep learning” to grab the pole position in the AI race, much to the excitement – and sometimes dread – of futurists who imagine a world where machines are smarter than humans. Remember Elon Musk’s dire warning that AI would “summon the demon”?

For the time being, AI evangelists like Gary Saarevirta are proving that “deep learning” offers clear advantages over traditional approaches to data mining and analysis, both in speed and precision. And he should know: Gary ran the analytics practice at Loyalty Consulting Group for years, and once led IBM’s analytics and data warehousing practice areas. He’s also a trained rocket scientist, having entered the workforce with an aerospace engineering degree. But today Gary’s focus is much more grounded in making AI an indispensable tool for data-driven businesses. He explains why in this “deep learning” interview which started with the genesis of the company’s name.

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**Shaw:** Where did the Daisy name come from?

**Saarevirta:** Yeah, I wanted to name the company something that was, you know, innocuous, had no meaning, like an apple or something like that. And I gave our ad agency an episode of "Nova," which is a great math mystery as a kind of motivation. And so the name Daisy came from the fact that, you know, you have the flower daisy, the number of petals in a daisy is a Fibonacci number. So the number of petals, or if you look at daisies and count them there, it's a Fibonacci sequence number and then the florets in the middle of a daisy is clockwise spirals and counter clockwise spiral. So the number of clockwise spirals are a Fibonacci number and the counter clockwise spirals are neighboring Fibonacci number, so, right? And then the song "Daisy" was the first song sung by computer ...

**Shaw:** "2001: A The Space Odyssey."

**Saarevirta:** Yes. And in 10 years, by 1964, an IBM mainframe sang that song "Daisy, Daisy, give me your answer, do," and it was in HAL, "2001: A Space Odyssey." So that's the backstory to Daisy, which we love the name that came up with, so it's got a great story that aligns with our math and science geeks that we are, so.

**Shaw:** It is a great story. And a 15-year trajectory for your company, you started out providing analytical services primarily, is that correct?

**Saarevirta:** Yeah, I think the vision was always around doing this and so I realized having, you know, worked at Loyalty Group Air Miles, doing analytics, it was one of the first worldwide users of IBM's data mining was the buzzword back then, right? The terminologies evolve faster than the technology. So we use neural nets and machine learning back in the '90s and then I worked for IBM, I ran IBM Canada's data mining practice and was one of their go-to global people for doing really high-end analytics. My goal has always been using math and science to make companies operate smarter. That was always, you know, my background's aerospace engineering, so you know, I thought so much math and science, he's in engineering and I was shocked at how little was in business so I kinda accidentally walked into this career. And so a lot of experience, I realized along the way that analytics is not a human endeavor, that businesses are so complex, that sitting in front of a laptop building models and doing math is really not feasible. You know, a typical retailer with hundreds of locations, hundred thousand products, millions of customers, even if you had a thousand analysts, you couldn't figure out what's going on. So our vision was to build this autonomous decision-making system using artificial intelligence, and so we've kind of, you know, 2003, people thought I was a heretic when I was talking to venture funding people about autonomous decision making and AI. You know, it was 15 years ago and so we funded it through professional services, working with one or two clients at a time and retail to kinda work out how to apply the technology in a practical setting. Our vision is this, using autonomous decision making for business processes that are beyond human capability, things that are really highly mathematical, repetitive, complex. (7:22)

**Shaw:** We're gonna get into that quite a bit a little later on. You are one of the pioneers, let's put it this way, in the data mining business, as you alluded to, you've worked at Air Miles, obviously, you mentioned IBM as well. In that arc, in that evolution, if you will, that was

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primitive even back in the late '90s with respect to analytics, where were the key inflection points for you along the way? The moments where you saw a leap forward either in technology or in the adoption and embrace of analytics, what were those key markers if you will?

**Saarevirta:** I think in terms of technology, I see, you know, coming out at IBM with their data mining tool chat neural networks, so in commercial setting, and they came out with parallel computing and that was really a step up in computing power so you could actually use this sophisticated technology. So that was kind of around the, you know, the late '90s, early 2000. There was a real interest in that and did a lot of work in banking and insurance companies back then, and telcos, you know, and the biggest retailers, you know, had lots of data. So that was the first time that I saw, you know, real large relational databases and the ability to wanna mine that and do reporting against that, and that was kinda late '90s, 2000. There was a real increase in that business world around IBM and Oracle and Microsoft, and so it's that relational databases was catching on and having these massive data stores that were around back then.

**Shaw:** It's interesting, I remember back in the early '90s going around knocking on the doors of banks trying to promote the idea of predictive modeling and they looked at you like it was voodoo science even though, companies like Reader's Digest and other direct mail catalogs had been using advanced analytics for some time for targeting purposes. So the roots had been set early, but it wasn't, as you said, until the late 1990s that it really started to germinate.

**Saarevirta:** Yeah, absolutely. Yeah, the technology was invented, you know, like in the '60s, right. Linear regression was invented in 1805, right, so the state of the math hasn't really evolved that much. Then there was a resurgence of interest in neural networks because of this computing ability and so that brought more height to data mining and advanced analytics. And I think it all really started with, you know, you have the ability to build data warehouses and these large relationship platforms.

**Shaw:** Yeah, that was the convergence, wasn't it? Data warehouses, relational databases, but it seems to me the analytical software market was very immature in those days. Those were the early data mining tools as you alluded to..

**Saarevirta:** Yeah, they were very tool based, right. I think that's always been the issue that it's like the data mining technology or AI technology or statistical analysis is targeted at a technical user and so you need to have somebody with a mathematical, statistics, engineering, kinda STEM background. And there's always been this gap between those technical people and the business practicality, and I think that gap still exists today to this day. And that's really been, you know, the reason that it hasn't really fulfilled the promise. I mean, my belief is that the information age is about making the world a smarter place and making every business operate smarter, but it hasn't really become a strategic asset yet I believe, you know, this... (10:45)

**Shaw:** So, which is a great leaping off point to a Forrester stat I came across that suggested that half of companies are still struggling with creating insights to drive decision making. In the

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face of this, we're surrounded by technology, as you indicated, where we're living in an information society, we're all knowledge workers practically today. Why is it that analytics isn't more of an equal partner in business or even really an essential function of most businesses at this point?

**Saarevirta:** Because they haven't figured out the use case like so, you know, the output of a predictive model is a numerical label or a text label like a segment, you know, and so what do you do with that? There's no decision-making process that's been wrapped around that so what do you do with the label? So somebody says, "When the number is two, what should I do versus when it's one?" Like there's no use case to say, "When it's two, alarm bells should go off, we should go crazy and call all our..." you know, like they have build...the decisioning framework has not been built around the analytic technology right? And that's what, you know, we've developed at Daisy, which is, you know, using AI to deliver decisions. So predictive analytics and statistical analysis and deep learning even today is really looking at historical data and it creates a label. And so you have to say, "What am I going to do with that label?" And that's never been adequately resolved because the technical guys go, "Great, I can more accurately predict and generate this number and I can build a gain chart, rank my...and look how great it is." But then what do you do with that? Right?

**Shaw:** So is it though, and I'm speaking specifically here with marketing as opposed to business decision making in general because of the adoption of data scientists as, you know, faster in areas of a business governed by engineering types. Marketers aren't engineers. They're not even that data oriented. They manage by assumption, by guesswork often, they don't really lean toward informed decisions around data. Is the barrier there simply not having enough data fluency or analytical comfort amongst marketers? Is that one of the barriers? Is that one of the reasons why there's no planning processes wrapped around the use of data in segments?

**Saarevirta:** Yeah, I think that's one of the...I think that, ultimately, business users gap in understanding and belief, you know, we look at it as voodoo black card because there's a level of complexity that that gap hasn't been bridged.

**Shaw:** They feel cowed by it.

**Saarevirta:** Yeah. Yeah. And then I think the direct marketing world has seen the most adoption, I believe, of analytic technology because it's really started out in the early days at Reader's Digest and Amex with doing targeted direct marketing. And I think that world has really been the only place that have seen significant adoption of analytics and that happened over the last 20, 30 years. That's not a new thing. And it's gotten into this, you know, dynamic advertising, you know, real-time ad placement.... That's been really, I see the only place that analytics has really flourished. Now what's missing there though is the tie back to the P&L, that if it doesn't move the needle on the P&L statement and that's what...

**Shaw:** How do you convince the CFO unless you can show them?

**Saarevirta:** And you know, I don't wanna poo-poo on my days at Air Miles, fantastic company. I love

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that place, it was a formative place for me and a lot of great people have gone through there, but I will always remember that every PowerPoint presentation was, "This is a 100% ROI, 500% ROI. Look, I got, 200% lift over random," but then I look at the client P&L and it wouldn't even move. So all you were doing was moving money around the building, right, and you know, then that was a really formative moment for me to say, well, how do I move the needle because we're seeing all this awesomeness from a statistical perspective, but it's not translating into business results? And I think that's what's been floundering for 20 years. (14:36)

**Shaw:** So is it then the problem is that it's been used, has been used, whether it's predictive modeling or name your data mining tool, as a tactical device as opposed to something that can drive business strategy or marketing strategy? Is that the central problem here?

**Saarevirta:** Well, I think it's the fact that if you imagine a company as a pie, we're only taking a little circle out of the pie and you're assuming that all the ripple effects of what you're doing are...that is independent. When I create incrementality in this one little sliver, it's incremental to the whole pie but it's not. Especially in retail, you know, you look at when you buy Coke and you go, "Great, look, I did a direct marketing campaign. I had doubled the response rate. I sold twice as much Coke this week as last week." But then you don't negate out the fact that Pepsi sales went down, juice sales went down. You don't measure cannibalization, you don't measure the forward buying. People bought two cases this week, but they're not gonna buy a case next week. So the marketers don't measure all of the ripple effects because that gets very complicated. When you have 100,000 products, you have 10 million ripples this week and 10 million every week, and so a lot of the benefit is negated, you know, if you're not even looking at it and predictive analytics can't look at those ripples and so then the business result is questionable, right?

**Shaw:** Yeah. So, just to go back to what you're saying, the inability to answer the question of why analytics hasn't yet reached the tipping point, and we'll talk more about that, is the fact that in the end, there's no proven correlation to the success of the business. There's no way to connect the dots here between the success you might have tactically in the application of data sciences to, as you said, moving the needle with the business.

**Saarevirta:** Yes, I would agree with that. That's really the challenge. And I think all the hype today is gonna flounder on that same point, right? We made some exciting advances like in deep learning which does image detection and, you know, audio to text. You know, it's been exciting, but really it's just, you know, statistical analysis still. It's the same predictive modeling and classification, just more sophisticated technology, but there's still no business use case for, you know, what's the economic value of image detection or text to audio to text? They're still supporting technologies looking for a business use case, super amazing advances, but again, there's no great case for it. Again, it still ties back to what's happening at the P&L level and that's what we have, Daisy's folks have been focusing on that for the last 15 years is moving the P&L. and I tell my customers if I don't move the P&L, then fire me or we will quit because there's no point doing analytics if you're not moving the P&L, right? (17:30)

**Shaw:** And moving the P&L really means looking for breakthrough insights as opposed to

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incremental insight.

**Saarevirta:** Yeah, it's net income and I think our view is in this autonomous world where the system is...where we're solving problems that are beyond human capability, so we're not generating one or two insights at a time. The machine is just making the decision where people aren't good at making those decisions.

**Shaw:** I wanna come back to that point because it does speak really to the future of marketing, that exact point, a little later on. I do wanna address just one other, I think, challenge I see here in Canada anyway, maybe less so in the U.S. and I'd be interested to hear, to get certainly your perspective, again, as one of the most advanced experienced practitioners of data science in Canada, you obviously have a point of view on this, which is that it seems to me that the analytics vendor business in Canada has been a cottage industry. There are smaller shops that never scale very large versus the U.S. where there were some big players here in this space. Why do you think that is in Canada? Is it that data volume really drives the need for advanced analytics, data volume and complexity, and that so many businesses in Canada really just don't have that size and scope that require that sort of analytical muscle?

**Saarevirta:** I think the reason it just happened that for whatever reason there's practitioners and then, you and I know them, you know, great people went out and started their own entrepreneurial businesses, and then because we couldn't sell it, and I was one of them too, you couldn't sell analytics to the companies because there was no belief in the P&L impact. So then you're going, "I have to pay the bills," and then you start doing things for 10k-15k a project and that devalues the whole industry and there was like a dozen of us in the Toronto area and probably, I don't know so much western and eastern Canada, and I think that's what drove it. We just set price points that we can never get out of back in the day and then because you didn't really move the P&L, it was hard to get out of that and then the market just valued it at that. That's what I think. I think Canada is...we have some really large companies and we're smaller than U.S., but I mean, there's still massive volumes of data and we can move the needle...

**Shaw:** The banks, the retailers, yeah.

**Saarevirta:** Yeah, I mean, we're moving the needle for our clients in the order of billion dollars a year, so I mean, there's opportunity to be what we are in the U.S. I think in the U.S. is a larger market, more players, maybe they're more aggressive economically. Canadians are conservative by nature and I think this spilled over into just the cultural differences between the two. (20:06)

**Shaw:** You need evangelists, you need proselytizers, you need people out there like yourself, articulate spokespeople for the use of analytics, and that very conversation, it would suggest that there aren't enough of those folks out there really beating the drum on. You don't even really see that much in the way of conferences in Canada on this subject. That doesn't seem to be sort of a rallying point here. Do you see that changing over the next number of years?

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**Saarevirta:** I hope so. I mean, I hope to get the message out. I mean, I'm probably one of the most experienced analytical people around, but you know, nobody knows who we are, you know? We shouldn't be the ones out there telling the story like, you know, people like Richard Boire who I have great respect for, Emma Warrillow, been in the trenches for decades. And we know and we've been doing it for 20 years and so it's our real story that needs to be the story not being led by academics, which really don't have the practical know-how. And that's why I think the whole conversation is slightly missing the mark, right? I see that you know, we're getting a lot more attention, and hopefully, we have a pulpit to share a practical, realistic message. I know our customers connect to what we have to say. So I hope that this story gets out and that the AI doesn't flounder with overhype that a lot of technology does because I believe it is game-changing.

**Shaw:** Yeah, I totally agree that it is game-changing and again, we're gonna get into that in a big way momentarily. Let me just ask you this other question because you've been a outsource services provider, but you've now adopted a SaaS model as your business model. Is the direction here for businesses really to outsource their analytics function given the shortage of...I'm gonna say shortage of talent, the scarcity of talent out there? Is that a better option for companies today is to look to an external partner that they can, you know, basically outsource all their heavy lifting to? Is that where companies should go today?

**Saarevirta:** I believe so. Your core competency can't be everything, and so, imagine you're a retailer and you hire an analytical person and then well, what's that person's career path? You know, if you want a career path for that person, you wanna expose them to different things so they can learn and, you know, who's gonna manage that person and mentor them? I think the career path for analytics, if you want the best analytical people, you want them to have a career path out of a company like us or other companies like us who would give that person a career path, expose them to multiple clients, multiple industries, and then we can then bring the best of that capability to the clients. And as a bank, you should focus on banking and know what questions to ask, know what to do with the answers. But figuring out the math and science, I don't believe that should be a core competency. I think it should all be outsourced, but the challenge, big companies have so much money and they're successful and they develop some arrogance and think they can do everything, but I really think that's the wrong path.

**Shaw:** Well, absolutely, and unless you're a bank that has the resources that they can put into it, I mean, in case of Bank of Montreal, they've created a center of excellence around analytics. In case of KooDoo, they've created a whole journey mapping journey analytics area that powers the business, but with those exceptions, you really can't see the business case for it in a lot of companies to insource that kinda capability.

**Saarevirta:** And even, you know, the big companies building these centers of excellence, great, but I still think the best talent will come from companies that focus only on doing that task and they have the vision. The bank doesn't have an analytics vision, the bank has a bank vision and an analytics and AI vision will come from outside and I think to get the best, you need to partner outside of it. You know, certainly, own some of the capabilities, I don't know,

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you should have just not have zero. But I think you should outsource the, you know, the real innovation and the real deep technical skills from outside.

**Shaw:** Right. That's a tough core competency otherwise. And let's talk about the talent pool in Canada. I know that Toronto is, you know, viewed as a AI hotbed, you know, a source of innovation, does that mean there is a larger pool of people to draw upon here or is that a real issue for you running this business, finding the right people with the right background?

**Saarevirta:** Yeah, we haven't had a challenge finding technical people. Again, the world is looking for one domain, computer scientist kinda people, but I think engineers and computational scientists are the pool that we go after because I think, again, that's the world slightly missing the mark and it's not computer science, I think it's an engineering domain. AI is a system and when we systemize things you get engineering thinking involved and so having engineers, math, computer science, they know physics, you can teach an engineer more math, it's hard to teach physics thinking or control theory to a computer scientist. So we're going after the engineering pool and we're, you know, collaborating with the University of Toronto and we've done hackathons with the engineering department and so that's the kinda people we're going for. Maybe I've let the cat out of the bag here that there's, you know, a lot of companies are hiring engineers, so we haven't had a challenge finding the technical people. Our challenge has been more on sales and marketing and client management type of role.

**Shaw:** Oh, that's curious. Why is that?

**Saarevirta:** I don't know. I mean, I think I've heard that you know, Canada has a lack of great sales talent. We've got a few good people, but we have a hard time finding that and finding client managers in order to do client service management. Even in a software as a service world, it's still hard to...we still have a people relationship and we know even though we wanna build a 100-year relationships with our clients, there's still a role for people and talking to executives and making sure that we're delivering value and that client account management role can't be ignored even in a SaaS world, right?

**Shaw:** Well, and it's a good point because the issue isn't creating the insight as much as it is explaining the insight and having a business translator role in the company that actually can interpret that and define its business impact and tie it to the bottom line, as you were saying earlier, that's a difficult talent set to find.

**Saarevirta:** That's the talent set that we have the hardest challenge of finding today and I think it's an important role and we call it the customer success team that makes sure that we're delivering value to the client, that we communicate it to the client, that they see the value we're delivering and build a collaboration. And I think that that's a human task and I think, you know, we're good at technology and I think we have an easier time finding technical people. (27:16)

**Shaw:** And your audience when you're knocking on doors, are you talking to the CIO or are you talking to the CMO? Are you even talking to the C-suite? What level are you addressing

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when you try to convince them the merits of applying AI to the business problems?

**Saarevirta:** Yeah, we're talking to the C-suite, so we, you know, we talk to...in retail, we wanna talk to the CMO, the head of merchandising, so it's the chief merchant or marketer, chief marketing officer. Different companies name their you know, those kinda people responsible for merchandising and marketing and advertising, or the CFO or the CEO in mid-market companies. You know, our goal in retail is to double the net income of retailers or more, double, triple. We wanna turn a 1% industry into a 6% industry. That's what the game stakes for AI are, the people who care about that are the C-suite. And then our users are the retail operators, the merchandisers, category managers, marketers are the ones who use our technology on a day-to-day basis. And in insurance, same thing, we go at the C-suite, the claims people and the risk people in banking.

**Shaw:** Well, I may be unfair in my characterization here, but I have my own fair amount of experience dealing with retailers, Sears, I mean one of them, and they had been rather notorious laggards when it comes to embracing innovation. Is that changing because of the pressure that Amazon's putting on the retail business to innovate or die? Like is that the...?

**Saarevirta:** Well, I think, I mean, one of our longer-term client relationships have been Walmart and, you know, they're technology innovators, I mean, they're founding folks really invested in technology and that's been one of the drivers leading to success. They're visionary in that regard and so it's been a great relationship and we've been helping each other out. And I think in general, retailers are recognizing whereas I'm seeing kinda a coalescence of requirements around the globe. We have clients in four different geographies today, so it's very interesting to see their needs kinda coalescing, and technology is a key driver on the roadmap, you know, for most retailers of even mid-market size, you know, \$500 million in revenue and up. I think there's a psychological threshold that happens at like a billion and \$2 billion in revenue, companies have enough resources and they've invested in technology. So everyone's really looking at technology as a key enabler and a survival mechanism.

**Shaw:** Well, it must be because they have a double whammy. Not only do they have to deal with the omnichannel consumer who has to cross devices and channels and expecting that experience to be pretty good, but they've also got the deluge of data that comes with it and how to possibly manage it. And they're not used to that, used to looking at SKU level data and trying to make merchandising decisions, not customer level data, trying to make customer management decisions.

**Saarevirta:** Yeah, no, that's a real challenge. I think that's one of the reasons I chose retail because the volume of data and the technical complexity challenge of doing something in that space. And so that was really one of the founding premises of Daisy is to help retail something we all relate to. It's like 50% of world GDP is retail. So if we could move the needle in retail, we can move the world. That was really my going-in premise. (30:28)

**Shaw:** Yeah. So, we'll come back to that too because I wanna get into a bit of some use cases around that. But let's talk about AI. You know, as you were talking about earlier, you were

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there in the very early years as data mining was the buzzword of that decade, and then big data comes along and there was the buzzword of the early 2000s, and now we have AI. What phase is AI at? Is it still in a hype phase? Is it early adoption phase? Is it even a honeymoon phase? Where does it stand? There is so much being written about the subject and its application in various ways. How do you define where AI is on the maturity scale?

**Saarevirta:** I think it's in the hype phase. I think the definition hasn't been clearly articulated, and I'll share our definition. So if you only analyze historical data, that's called statistical analysis. Deep learning is statistical analysis. You learn from history only. You have to have labeled training examples to train your algorithm, be it linear regression invented in 1805 or deep learning, which is in the last 5 years. That's all of the same class of math and the learning, if you call it learning, is mathematical labeling. So you create a label, a numerical number, or this is a dog, that's a cat. It's a label. Now if you call that learning, then let's call that learning, but it's mathematical. It's a mathematical process that drives and it can only learn new things at the pace that you collect new data because it relies on historical data.

**Shaw:** So I just wanna clarify. So when you talk about machine learning, are you really referring to neural nets or some other technology?

**Saarevirta:** Neural nets or, you know, support vector machines, or support vector regression, all of those things, all the fancy technology, it's really all historical learning, historical data learning. And so you can only learn at the pace of time because you can only learn a new mathematical pattern when you collect new data. So the learning happens at the pace of real-time, which is not that interesting. And if statistical analysis was the panacea, it would have had its impacts in the last two, three, four decades given the proliferation of statistical analysis tools. So I think there's a lot of hype and misunderstanding around that. I think it's a new generation of people realizing that wow, this is the same thing I did 25 years ago and I go, "Wow, that's predictive modeling stuff's amazing. Look how well I can predict." And I think it's a new generation of people doing that with more computing power and more excitement. So the hype of that is like it's a whole generation going, "Wow, this predictive modeling stuff is really powerful."

**Shaw:** Well, it is until you realize it's still only a 65% accuracy rate or whatever that figure may be, right? It's never 100%.

**Saarevirta:** Yeah, I know. And it doesn't make decisions...

**Shaw:** It's not a crystal ball. (33:24)

**Saarevirta:** It doesn't make decisions and it doesn't move the needle on P&L, so that's predictive analytics. When I talk about what we do, which is called reinforcement learning. So if you're training a new car on the road, you wouldn't let it go on the road with an empty brain and crash into things, run over people, and you train it in a simulator. So you have to build a simulation of the world, which is a model of how the world works. Now you train your car in a computer simulation, you can do a million hours of driving in one hour so you can learn faster than the pace of time, which is very interesting. The autonomous

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car makes the decision on what should I do? It's not a mathematical label. There is no label training. You need no historical data to train a car. If you could only drive a car on the roads you've previously driven on, that would be such a waste, right? So you have no labeled history, you have a model of the world, you can do a million hours of driving in one hour and learn how to drive and you make decisions. Turn left, turn right, push the gas, brake. So it's a decision making autonomous. I call that AI. That's called reinforcement learning.

Now, think about applying predictive analytics to the retail problem. If I have to pick products to promote, I have to pick 500 products to promote out of 100,000, the number of combinations, the combinatorial math, 100,000, choose 2,000, it's 10 to the power of, you know, 20,000. Well, that's more than the number of molecules in the universe, so there's not enough label data that you can create because it's the mix that matters. It's you can't treat Coke and cheese and bread as three independent things. They're all related. It's the marketing mix that drives a result. Therefore, I have to have a label for each mix. Well, if there's 10 to the power of 20,000 mixes, I don't have enough labels and I don't have enough things in the universe to create that many labels, so predictive analytics does not work in that paradigm. And so you have to use reinforcement learning, and we've created a simulation model of retail, like the laws of physics. We generate 100 years of retail every day with the math and computing power. That's really been the driver of this generation of enablement is this GPU computing. Companies like Nvidia, we're an Nvidia partner. One of the most successful tech companies, have been dramatically growing, and they're driving all the computing behind this. And so reinforcement learning for us is the ability to simulate, make autonomous decisions, our decisions for a retailer are, here's what you should promote, here's the price, here's the inventory allocation to all your stores and distribution channels. Those are the inputs like brake, gas, pedal, steering, it's product price and placement and volume. You know, those are the inputs driving a retailer, one year of retailer is like one lap around the race track. So I use that analogy and that's what we call autonomous decision making. So that's, for me, the big difference between AI and statistical analysis.

**Shaw:** What's the business case you make to the merchandiser sitting across the table from you when you talk about this?

**Saarevirta:** We deliver decisions. If you execute the decisions, we're going to grow your revenue by 3% to 5% or more and in a 1% net margin industry, we just doubled your profit. And we can actually deliver. We've delivered that.

**Shaw:** And you do that by optimizing price and shelf allocation and promotion?

**Saarevirta:** And the key product. The thing that's been missing, there's a lot of companies doing price optimization and forecasting, but I haven't seen anybody do what products to pick because I can price and forecast the wrong product. So an example would be a product like ground beef is a great product. Consumers shop because they have a use case in mind and if they see ground beef promoted, they go, "Oh, I'm gonna make an Italian dinner," and nobody consumes just raw ground beef except my crazy uncle. (37:17)

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**Shaw:** They have to buy associated products.

**Saarevirta:** They have to buy associated products, so you buy pasta, tomato sauce, produce. If you're making hamburgers, you buy hamburger buns and condiments. And contrast that to a case of water, the use case for water is just buy the water. So if you promote a product with a use case, your transaction will be larger than if you only promote products with no use case. Then you have to net out the ripple effects. Because I bought ground beef to make hamburgers, hot dog sales go down. In the halo, hamburger buns I bought because I'm making hamburgers, I bought less hot dog buns, so even the halo has a cannibalization effect. And then there's forward buying. I bought a two-week supply, and probably not in fresh and perishables, you would buy a two-week supply of pop or coffee or paper towels when it's on sale and you're stealing from the future. So you have to net out all of those facts, and that's the kinda theory of retail as well as the spatial geography. I'm not gonna drive by 10 competitors to go to your store to get 10-cent discount on carrots, but if you're giving gold bars away for free, I'll drive across the world to get my free gold bar, you know. So, you know, product, geography, all the common sense things that retailers know, you know, lower prices result in more sales, better promotional elasticity, TV ad, flyer, front page of the flyer is better than no ad. These are all the common sense things which we've assembled into a theory of retail like the laws of physics that we simulate.

**Shaw:** So this sounds phenomenal, obviously, but I'm still struggling a little bit with that merchandisers are sitting across the table from me hearing all of this and saying, "Yes, but what do I do with this information? Like how do I apply it? How does it change my planning process? You know, what do I do differently as a result of this information you're giving me?"

**Saarevirta:** So every week a merchant has to go, you know, "What am I putting in the..." let's say, just use a flyer example. It could be a website or a mobile app, or just a stock flyer. I have to put 10...I'm a merchant, I'm in the dairy category, I have three ads I have to fill and decide what product am I putting in those ads? Well, Daisy says, "Put milk, cheese, and yogurt. Put milk on the front page, cheese and yogurt on the inside page." We say, "And here's the price you should charge." So we give the merchant, "Here's what you should do." And the merchant could say, "Well, I don't really like that," or "I have a vendor willing to give me money on this other brand of yogurt, so I'm gonna swap out the brand." Or I'd say, "There's not enough supply in the market so, you know, swap it out." And then Daisy will say, "Well, here's the next best 10 products you could pick." So we help them make the decision. In fact, we can make the decision for them and do it autonomously, you know, in promotional planning there's people in the loop, in regular assortment and regular price there's already too many data points for people to look at. One very large retailer asked that we responded to an RFP, they were looking to do 90 billion forecasts 3 times a day, 90 billion. And so there's no human in the loop on that. And that was because they have, you know, several million products and they have thousands of locations. So the cross product of product times location was 90 billion and they wanted to know 3 times a day what the demand for those store product combinations will be. And so we responded with 30 other vendors and the other vendors' questions were, "How many users of the system?" and the client went, "It's 90 billion data points. There's no human in this system."

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So it's already some of the world is already thinking of autonomous, right? And it's because these problems are beyond human capability and that's the class of problems that I think AI should focus on. Now, it's not gonna replace people because there's lots of things that people can do. Businesses are complex. In retail, you gotta talk to the vendors, you know, other things. (41:17)

**Shaw:** So it's interesting because there's a liberating effect to this because if you can take that complexity away from the marketer or the merchandiser, they can actually focus on other things where human judgment and intuition actually might be important or play a role. Is that fair to say?

**Saarevirta:** Absolutely. We think it's like it's improving people's working lives. I like the word "liberating" because that's one of our founding principles is that yes, we'll make the world smarter and more efficient profitably and we'll take away human drudgery out of work by doing some of these tasks that are so complicated and...

**Shaw:** Defeat data tyranny, I call it.

**Saarevirta:** Yeah, absolutely. That's what our belief is. The human beings can do things like what are the images, the creative, you know, talk to vendors, service customers, you know, figure out the last minute exceptions. There's a hurricane wiped out the raspberry supply and I gotta figure out something else to do. There's a lot of things that people could do that machines are terrible at, you know?

**Shaw:** And marketing really has a role to play going forward in humanizing the corporation and learning to create a brand voice that resonates more closely with customers. The whole question of complexity raises its head here because with the omnichannel consumer now traversing multiple devices and channels, as I said earlier, it introduces a level of complexity they've never seen before in terms of how you manage those interactions. So you've been talking about price optimization and merchandising, but there's the other side to this, which is the actual interactions that are occurring day to day and the real-time requirement to provide information on demand that is rule-driven today and rule-driven by some database marketer or CRM person sitting in a room. That's going to be beyond those companies, which is I guess why a lot of the CRM vendors are beginning to embrace AI tools like Salesforce with Einstein, for example.

**Saarevirta:** Yeah. And what do we do, you know, marketing mixes well across channels so optimizing how much should you do on which channel, what version you spend and doing that and I think all of that is that beyond human complexity stuff that should be done. And I think that's where AI can play a role and we shouldn't be spending time having AI try to get into the domain of human beings. You know, AI should be a tool to make humanity better, you know, having AI do creative things and write songs and books. Interesting technical challenge, cool, but I mean, you know, we need to leave a place and space for what we're good at it. I think there's hype about singularity. I think it's completely overblown. But I think in the creative, ambiguous thinking world, human beings are great at that and I think that's the marriage between the two sides, so. (44:02)

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**Shaw:** Yeah. So, beyond the use case that you've mentioned in retail which you can easily see, where else is AI a candidate for, you know, sort of immediate business impact?

**Saarevirta:** I think it's all of those problems, you know, that have huge volume of decisions required every day, that are highly complex, highly mathematical, large volumes of data. In insurance, we're doing fraud detection and predictive underwriting, so you get a million claims coming in an insurance company every day, identifying what's fraudulent or bank transactions, whereas money laundering going on, having somebody apply for a mortgage, doing the credit rating on that and you know, you have that happen thousands of times a day. So I think these high volume decision-making processes is where we see it making a difference. So we see in manufacturing, you know, predictive maintenance, which tools should you maintain? How do you optimize the flow through a production plant, how do you make decisions on pricing and forecasting and whether I should pay this claim or process this transaction? All of these areas, I think, are these beyond human capability things where we can have an immediate impact and where a lot of cost is spent today and there's huge opportunities. Again, just moving the needle 1% or 2% in those high-volume areas as a massive, you know, financial impact and we always go after the largest costs in line in every industry. If you look at that, those large cost lines, that's where the opportunities are.

**Shaw:** And what about in so far as the customer experience goes because you know, if you look at, for example, Chinese society today is largely a mobile-first society. They live on their phones, they buy on their phones, they pay on their phones, they look for information on their phones, all in real-time. Is AI going to govern that real-time experience for customers going forward? Is that going to be the platform because it's, frankly, the only way to be able to handle that sort of real-time interaction?

**Saarevirta:** Yeah, I think planning doesn't happen real-time. Planning happens, I think, before that. Real-time would be the execution of the plan in real-time. So I think what we're talking about, you know, planning a flyer or planning mobile is the same thing. You decide because you have to merchandise it, if you don't have the product available at that moment, you have to somehow anticipate what are my millions of customers going to want two weeks from now, we'll be ready to supply that demand. So the planning happens earlier and then in real-time, you can execute interaction with customers. The key thing that we look at is we're analyzing 100% of the transactions done by companies in-store, online, mobile, every channel, so we're listening to 100% of what your customers are saying. It's the ultimate customer experience and then executing across all your omnichannel and giving the customers what they want, which is having the products available that they're interested in, having prices that customers find compelling, and having the stock there when they wanna buy that product. And that's how you service customers in retail. (47:17)

**Shaw:** Do you also use AI to identify micro-segments within the base that you might start thinking about differently? In other words, I guess where I'm going with that is as opposed to thinking of AI as a tool for handling individual interactions and perhaps that's the answer, or, hyper-personalization, but is there also room strategically to use AI to really sort out

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with this mass of data that you were describing particular customers that share common characteristics across a number of different types of behavior?

**Saarevirta:** Yeah, I'm a believer in segments and so in our math, in our simulation, we, you know, decompose the business into customer segments and store segments because, you know, your best customers, the frequent customers, the data around those customers is very different than your infrequent customer. So all the math and science works better when you have homogeneous pools of data. And so hyper-personalization going one-to-one, I'm not sure that there's an economic value proposition there. I think having segments of, you know, instead of having maybe 10 segments, you could have hundreds or thousands of segments in a million-customer database. I believe in that. So, you know, having thousands of segments and servicing the segment because, you know, it's hard to merchandise one customer, you know, you merchandise an entire business, so in retail, if we keep using the retail example, the same could apply everywhere, you know?

**Shaw:** I was thinking more along the lines of what you were describing earlier where, you know, there's that wave effect where if somebody buys one product and then it suggests three, four, five, six other products they should be picking up. In real-time, they could be checking their mobile phone, those recommendations made to them instantaneously based on that purchase that just occurred.

**Saarevirta:** Yeah, I think for sure, but I think there's also enough free halo that you don't need to promote the halo products because if a customer is buying a turkey at your store, most people don't cherry pick a turkey, some people do, but you don't have to promote the pumpkin pie and the aluminum foil and the other fixings because that's going to happen anyways. So what you wanna do is promote - you might wanna remind them...

**Shaw:** Well, you just don't want them getting in their car and driving across the street and buying someone else's.

**Saarevirta:** Yeah, yeah, I know. For certainly, you'd say, "Hey, you know, the tin foil is in aisle three," but you don't have to necessarily discount it. You can just remind them that, "Here's where all the other things are that you should pick up." So for sure, I believe in maximizing the opportunities for the retailer. At the same time, that's good customer service because, you know, I think you can view it negatively saying, "Oh, we're manipulating the consumer." No, we're not. The customer is there for that use case and if you can make it easy and service them and let them know availability and how to find it, that's good customer service. If customers consolidate their spend in your store, you've done them a favor because they were gonna buy those things anyways.

**Shaw:** But so just fast forward to the future though. If we start to embrace conversational marketing same way you're seeing sort of chatbots embraced by customer service, isn't that going to be AI-powered as we move toward real-time conversational interfaces, voice interfaces? (50:22)

**Saarevirta:** Yeah, I mean, there's a lot of hype around that. I'm not sure. I mean, we're a long way from semantic language understanding. Some of the examples like the Google making a

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hair appointment, that's so far from reality. I mean, so we can do text, you know, audio to text more accurately like than in the past, but semantic language understanding is a long way away. And frankly, I mean, some consumers, sure, might wanna interact with conversational AI, but I mean, you know, why not interact with a person, hire a person and interact with a person. I mean, that's not a bad thing. I think the race to replace humanity in every corner, I think there's priorities, you know, we should focus on the priorities and if we wanna replace ourselves at the end of the day and sit on the couch at home and do nothing, I don't know.

**Shaw:** Well, that's, of course, the specter of AI as, oh, we're all gonna be robotized out of jobs, right?

**Saarevirta:** That's a long way away. I don't believe the singularity will ever happen. I mean, how do you...just an example, the language thing, how do you train a computer to communicate? So just think of all the lifelong learning about, you know, the appropriateness of language when you were a kid and you swore your parents got mad at you or you told a joke, nobody laughed, you got embarrassed. I mean, communication is a social interaction. How do you train that into computers, right? And I think if you collected every conversation ever had, I don't think the computer could figure out what ...

**Shaw:** So we're not gonna see a "Westworld" anytime soon in our life?

**Saarevirta:** I don't believe so.

**Shaw:** That's a good thing actually. So we talked at the very beginning about what's been the barrier to the acceptance of analytics as a core competency in most organizations and is there a risk with AI that it will actually create greater distance between marketers or business decision-makers and the data because basically those decisions are getting handed off to a machine? Is there a risk there that we actually will reduce data fluency as a result of automating data analysis?

**Saarevirta:** You know, I think that's a good point. It could happen. I think customers are always asking, "So what's inside the black box?" And we try to be as transparent as possible, but it's so complex that, you know, I could say, "Here's the factors that were considered in making this trade-off, but I don't know exactly why because we did a hundred trillion computations to come up with the answer," so certainly there's some element of trust. I think the human being has to know that there's common sense being applied and I think having that common sense and oversight will always be part of it. I think that's the role of the person, even an autonomous system is that there's some oversight and continuous measurement that it's working properly in generating financial impact. But certainly, I think they think there are certain problems that human beings will continue to apply analytics. It's not like the machines will take over all analysis and humans will do none, so I think it's just focusing analysis where people can, you know, handle it and do it, I think. And there are lots of problems, you know, that the machine doesn't have to do, so. (53:44)

**Shaw:** So you're saying there's still a role for predictive analytics and the sister disciplines?

**Saarevirta:** Yeah, certain problems. If a problem is purely data-driven, that's a predictive analytics role

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or where there's very little ripple effect in the decision. So if I'm buying tires, there's not a big ripple effect with tire purchase. It happens once every five years so there's not a frequency issue. That's a customer acquisition challenge. That's a targeting challenge. That's a perfect predictive modeling opportunity. Or image detection, you know, there's no theory of images really. You know, you create this completely data-driven, deep learning, convolutional neural net of doing medical imaging. That's a data-driven problem, so there's predictive analytics being done there with deep learning. And so there's certain problems where predictive analytics will play a role and certain problems where it's this reinforcement learning approach will play a role. I think the vast majority of problems are reinforcement learning, business complex, business problems. And I think humans still need to be analytical. We still need to train them. Somebody needs to build these systems so, you know, at the end of the day, I don't think it changes the requirements for people at all.

**Shaw:** No, I just, I worry about a chasm being formed between the sort of the technical people in the organization and the nontechnical people.

**Saarevirta:** No, it's already there.

**Shaw:** It already is there, it's gonna widen even further, which is this chasm that creates different languages and they can't relate to each other and you need this interpretive...

**Saarevirta:** But if we focus the AI on delivering business results, then it forces the technical people to speak business. That's been the lack of adoption. So if we bring economics to the AI world, that's what has to happen to make it proliferate. If that doesn't happen, then it's gonna go into the valley of despair or whatever the next technology...

**Shaw:** Disillusionment, I think they call it.

**Saarevirta:** Yeah, the valley of disillusionment. So I think we're headed there very quickly with all this hype.

**Shaw:** And so that brings me to the question of what do you see as the future of AI over the next number of years? How do you see it evolving and maturing and flourishing, to use the word you used earlier?

**Saarevirta:** I think the conversational change to this reinforcement learning and approach and autonomous approach we've talked about, there's some topics that need to be talked about like fault tolerant. So if a machine is running autonomously, how do you know that the processes ran properly? Like in a fighter jet or a Mars lander, you know, there's fault tolerance software that says, okay, you know, "Is it all running properly?" If the computers fail, then there's a backup plan and that has to be placed. You know, and when the Mars lander is landing at the last minute, there's no human joystick, there's two or three computers going, "Pull the chute now," two say yes, one says no. The three computers gotta figure it out and make the right decision. And so if I order, you know, a million tons of bananas, whoops, that should have been 100,000, that's not like I'm gonna kill anybody but it could kill the business. And so it has to be fault tolerant and there has to be a system to control it. So I think you're gonna hear more about systems and control theory being

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applied to an AI system. It's not just an algorithm which is dominating the conversation. So, I mean, we'll broaden the conversation to what's the economic value, how do we control these systems, how do we make them fault tolerant? And I think those are the conversations that need to start happening. And I think the concept of label training data, the sea hunt for data is misguided. It sells a lot of hardware, which is why the hardware vendors invented big data because hardware sales should be following the curve of Moore's law, right? But they had to invent, go collect all this data, we can keep propping up the hardware sales. And so the view of the market or is that the hardware companies are like, "Whew, whank God we got past that one. We were even in this Moore's law world, we're still able to sell just as much gear because we convinced everyone to put sensors on their car and collect your driving data and collect social media data. Thank God, you know, we convinced everyone to do that." But I think that's... (57:46)

**Shaw:** So you're saying, IoT won't be the accelerant for AI?

**Saarevirta:** No, no, I believe it's gonna be reinforcement learning and decision making. Like we said, you don't need to have any labeled training data to drive a car. You create your own label. So there is data required and we certainly use the historical data, but it's not this sea hunt for data sources. That's not the driver of AI. It's the decision making, profitable decisions, or smart decisions that impact a system. And I think the economic benefits will be the driver of AI, otherwise, you know, this hype cycle will come into play when it's not generating any economic results.

**Shaw:** So, one final question, I'd love to sit here and talk to you for another hour, maybe we should do a part two. If you're sitting across from a company for the first time and I mentioned this earlier, trying to make the business case, when they ask you the question, "Well, how do I even start, where do I start with this? How do I, you know, start to use AI and build out a use case internally that I can merchandise?" What's your answer to that? What's the on-ramp for AI in a company that hasn't been down this path before?

**Saarevirta:** See, you know, I take a budget or a revenue line then say, "Is 1% of that an interesting number?" So that's the first thing. If it's \$100 million cost budget and I say, "If I move the needle 1%, that generates a million dollars of value." Okay, that's interesting because I can now go spend a couple hundred thousand or half a million dollars and there's a business case there. So start there with a big problem. Then look at business processes where people struggle, where there's lots of data, super complicated trade-offs that make millions of decisions every week, so we know that 90% of the things that happened, there's been no decision made at all, it's just old rule-based systems cost plus or random what's happening. So focus on that and then figure out what to do with the math. How is the math gonna help? Like, you know, if you're gonna create a predictive model or a label, what am I gonna do with the answer and how does that tie back to the financial results? I think those are the key things that you need to think about. And there's still a lot of data management issues that haven't been addressed. So people have forgotten about data warehousing, you know, they're talking about data lakes and new terminology. We still need to manage the core data because that's what's used to drive AI. If you're not managing your core, the master data, what's your product hierarchies are, definitions,

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historical promotions, and retail. You're managing who your customers are, who the providers are, and healthcare, you know, managing that data is the data that drives the quality of AI and so we can't forget about managing our internal ... (1:00)

**Shaw:** I was gonna ask you that earlier, about data quality and how much of an obstacle...that was an obstacle 30 years ago, is it still an obstacle today?

**Saarevirta:** It still is. To me, it's the proof point that nobody is really doing any strategic analytics because we haven't solved that problem yet. So almost every retailer we work with, the first thing we do is have tons of data management work to get the data to the place that the...

**Shaw:** Still?

**Saarevirta:** Still because...

**Shaw:** That's amazing.

**Saarevirta:** ...that means to me that nobody's actually doing anything really strategic with it because they haven't solved the data problems yet because that's very hard. You know, like a product hierarchy. Having products organizing departments, sub-department category, sub-category, and then all these UPC codes, that should be the same price because it's blueberry, strawberry yogurt, vanilla yogurt. They're all the same price. They're all different UPC codes, but they should be considered as one group. That data entity doesn't exist in the vast majority of retailers. Ad blocks, the fact that when we do cereal, we do Cheerios, Honey Nut, you know, all of these different things go into an ad, those are multiple price item groups in an ad price side of groups and ad groups don't exist in the vast majority of retailers. And we see them now starting to build these things because they realize to do analytics or any analysis at all, you wanna analyze how did that ad do or how did that item do, but you have to have that data entity created, and so none of that stuff existed in retailers. I could tell you very large retailers only very, very recently, in the last year or two, starting to actually think about those things, which to me is proof that analytics hasn't even scratched the surface of possibilities because most of the things we're working on are completely irrelevant if we're not dealing with the core data assets.

**Shaw:** So there's a significant on ramp just getting past that challenge before you even start down this path.

**Saarevirta:** Yeah, there's solutions. You know, AI can help do those things to group your products together. That's where we can create the labels. That's where traditional statistical analysis and text mining comes in. Look at, you know, red wine and white wine. What's the different words and should they be in the same group, or they should be in wine and then red and white? We can use text mining and traditional statistical analysis to help build product hierarchies and groupings, ontologies and lots of different businesses, so. (1:02)

**Shaw:** Well, Gary, I have to say this has been an absolutely fascinating hour. And just one last thing, you recently picked up an award that got you some attention in the press. Tell me

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a little bit about that.

**Saarevirta:** Yeah. So three things happened this year. We were named the Gartner Cool Vendor earlier this year, one of three worldwide vendors for AI and retail, which is a Gartner recognition for companies - kinda precursor to the Gartner magic quadrant. You know, tech vendors is kind of a holy grail of one of the big industry analysts. So we were named that, that was very cool. In Silicon Valley about a month ago, we were named the AI start-up of the year, which was a hotly contested category of 100 entrants and, you know, there's NASA and XPRIZE were the judges, so that was very exciting. And then in Toronto, the Elevate AI, which looks like it's coming to be Canada's big tech week in Toronto anyways, and we were announced as the winner of the pitch competition and got a \$5 million term sheet from Espresso Capital who's one of our great partners. And so it's all exciting that I've been at this for 25 years to have my vision starting to gain some legs. You know, at times I thought I was, you know, maybe out of my mind and doing the wrong thing. So it's very exciting to have people start to buy into the vision and I always say it takes a community to build a company and certainly we have a community of support and hope rallying around us.

**Shaw:** It can't happen to a nicer guy, so.

**Saarevirta:** Thanks, I appreciate that stuff. Thank you.