Me, Myself, and AI Podcast

Partnerships in AI Drive Conservation Efforts: WWF's Dave Thau

SAM RANSBOTHAM: From satellite imaging to marine acoustics, wildlife conservationists can use artificial intelligence to advance their vital work. Find out more on today's episode.

DAVE THAU: I'm Dave Thau from the World Wildlife Fund, and you're listening to *Me, Myself, and AI.*

SAM: Welcome to *Me, Myself, and AI*, a podcast on artificial intelligence in business. Each episode, we introduce you to someone innovating with AI. I'm Sam Ransbotham, professor of analytics at Boston College. I'm also the AI and business strategy guest editor at *MIT Sloan Management Review.*

SHERVIN KHODABANDEH: And I'm Shervin Khodabandeh, senior partner with BCG and one of the leaders of our AI business. Together, *MIT SMR* and BCG have been researching and publishing on AI since 2017, interviewing hundreds of practitioners and surveying thousands of companies on what it takes to build and to deploy and scale AI capabilities and really transform the way organizations operate.

SAM: Welcome. Today, Shervin and I are excited to be joined by Dave Thau, global data and technology lead scientist at the World Wildlife Fund. Dave, thanks for taking the time to talk with us. Welcome.

DAVE: My pleasure. Thanks for having me.

SAM: Let's start with the World Wildlife Fund. My first blush is that's a little bit of an unusual organization that you wouldn't normally pair with artificial intelligence. How are you using artificial intelligence in your job?

DAVE: WWF is very interesting. It's a federation. We're active in about 100 different countries. Many of those offices are run completely independently, but cutting across all of them, we have a network of analysts. The team I'm on is called the Global Science team, and we span the network. We have scientists on our team who focus on forest, food, [and] climate, and they work with the people throughout the network who focus on those areas.

I manage the Data and Technology team, and I'm working with these scientists. We work across the organization, helping with projects that are starting up in all the local offices. We have our own set of work within the Global Science team. A lot of that is focused on impact monitoring. And then I'm out in the world talking to other conservation organizations that are doing data management and artificial intelligence and coordinating with them.

Conservation organizations have been using AI for a long time. One of the first applications of artificial intelligence has been in land-cover monitoring. So there are satellites surrounding the Earth, monitoring the environment, but the signals from the satellites are very noisy, and so artificial intelligence has long been used to do things like identify "Am I looking at a forest? Am I looking at a grassland? What sort of land cover am I looking at?" So that's one of the initial applications of machine learning and artificial intelligence in conservation.

SAM: So you said "initial." How far back is initial? Is initial last week, last month, last year, last decade? When did you start doing all this?

DAVE: The use of machine learning to analyze satellite data in general dates back to the '70s. I'm not sure when WWF started using it for conservation applications, but it's been quite a while. I've been at WWF for four years, but the application of machine learning on satellite data preceded that. It really broke through though sort of around 2008, when NASA made the Landsat satellite data archives freely available.

This is a series of satellites that have been collecting Earth data since the early '70s, but up until 2008, you had to buy the imagery, and so you were limited to what kinds of analyses you could do. Around 2008, the U.S. government decided to make those publicly available and free, and so

then you saw a real explosion of the use of that kind of information.

SHERVIN: Yeah. That's quite fascinating. We do a fair amount of satellite imagery work at BCG. It's not my area of expertise, but I have to imagine that with both this proliferation of data, as you're talking about, as well as the higher and higher resolution that's becoming available, as well as the massive jump in computing and complicated neural nets and machine learning models, that the state of the art has changed a lot. So maybe if you can contrast, what's the cutting edge of this stuff today versus maybe what it was a decade ago or two decades ago?

DAVE: Yeah. The changes in machine learning in particular over the past five years even have been enormous. And it goes hand in hand with access to computational resources and data. In the past, you could do a Ph.D. on one Landsat scene, which is about … 100 kilometers by 100 kilometers — that was, you know, cutting edge.

Now, people are typically doing global analysis on these data, accessing millions of these images, and that's because they're available and also the computer power is available. What's going on now is, the speed at which you can do the analyses is increasing and the speed at which the data are collected is also increasing, and that's all been enabled by this explosion of data and computational power and breakthroughs in machine learning.

SHERVIN: Maybe for our listeners, it would be also helpful to start explaining, what are some of the outcomes or use cases that this kind of capability allows you to predict or preempt or prevent?

DAVE: Yeah. Plenty of examples. On the deforestation front, at WWF we work on a project called Forest Foresight. This is mostly with WWF Netherlands, and it's a forest loss-prediction algorithm and tool, so it tries to predict forest loss six months out. And using Forest Foresight, they've been able to predict where deforestation is likely to occur and act on that earlier. So that's one example.

We do a lot with motion-sensitive cameras, also called camera traps. The artificial intelligence there is identifying species from camera-trap images. And this is a project involving many NGOs [nongovernmental organizations], in partnership with Google who … they're doing the AI part of it. And there, the outcomes are massively increasing the speed at which scientists can analyze the data.

Sometimes in these data sets, 90% of the images are due to leaves triggering the camera. There's nothing there that's of interest to the scientist, so they're spending 90% of their time saying, "Nothing, nothing, nothing." So with these artificial intelligence models, they can very quickly just get rid of all of those and also identify the species. And using that kind of technique, they're able to target different interventions, so if they find out that there is an invasive species in an area that's impinging on the endemic species, they can do something about it.

Another example is using artificial intelligence to help optimize patrols for people who are looking for snares — like wildlife snares … to try to trap elephants. There are normal patrols that happen in conservation areas, and trying to figure out the most effective way of doing those patrols — there's a system that we're using called PAWS [Protection Assistant for Wildlife Security], which is developed by Milind Tambe in his lab, that helps optimize those patrols. And that also uses artificial intelligence.

SAM: All these are fun examples because, Shervin, so often you and I are talking about fraud detection or optimizing clicks or improving these algorithms and recommendations for products, which, you know, again, [are] crucially important, but this is a fun and refreshing alternative.

SHERVIN: Yeah, and for good — also, for good.

SAM: Exactly.

SHERVIN: And, Dave, you said "species," and I couldn't help myself maybe digress a bit. You're the only data scientist that has an ant named after them, so maybe you tell us about that story. And I'm assuming you didn't use satellite imagery to discover this new ant species, but I couldn't resist the joke. But we would love to know a little bit more about your background.

DAVE: Sure. So that ant is [Plectroctena thaui](https://www.antweb.org/description.do?genus=plectroctena&species=thaui&rank=species). It's got to have the "i" at the end because you need it to sound Greek in the species names. It was Brian Fisher, who's a researcher and curator at the California Academy of Sciences, who named the ant that. And that came out of work I was doing with the ant taxonomist community; back in, like, 2002, I started working on this thing. It's a site, still up, called AntWeb.org, and it's like social media for ant experts. So all the ant experts use it to share their data on ant taxonomy. They're a very social group of people, and the platform is very well used by that community, and sort of as recognition of the work I did

setting that up, Brian named that ant after me — which I love.

SHERVIN: That is quite poetic, too, that you go from ground level and, like, subterranean all the way to thousands and thousands of feet above ground level to satellite imagery, and a great example of being at the 40,000-foot level and also a few feet below ground as a scientist.

DAVE: Yeah. Managing this ant taxonomy data and tons of images of ants, which are amazing — you should go to AntWeb.org and look at some of these ants. They're incredible. There are about 14,000 different kinds of ants.

SAM: I think we just lost Shervin, he's off on ... I can tell he's off on the internet.

SHERVIN: I'm going to look at your ant.

DAVE: And it's imagery too. AntWeb has lots of images of ants, and so it's managing this imagery data, and it's the same with the satellite data. It's like, "How do you manage massive amounts of satellite data in a way that you can analyze it?"

SAM: That was a segue a bit to your background. I mean, I can see you're a computer scientist and you've been doing this for quite some time. Take us along your path from being initially interested in these sorts of topics to how you're in this position at World Wildlife Fund. What's the long and twisted story?

DAVE: Ha! It's long and ... it's too long and too twisted. I'll tell a somewhat shorter version of it.

As a kid, I was always interested in biodiversity. All the books that I rescued from my parents' house when they moved were about animals and plants and the weird things that they do. And I grew up in New York, and we went to the American Museum of Natural History frequently, and it was like heaven for me. I just loved it. And then we moved to California, and one of the first things we did was [go] to Yosemite. And I was hiking around the redwoods in Yosemite, and it was amazing. And so as a kid, I was always interested in biodiversity.

What I ended up studying initially was nothing to do with biodiversity. Well, a little bit; I was studying cognitive science, and I was interested in how people categorize. One of the interesting questions about that is, do people categorize natural things, like plants [and] animals, differently than they categorize tools like, you know, forks and knives?

So that was one of the questions. But what I was doing was a lot of modeling, and as a kind of fallout of all that work, I picked up a computer science master's degree, just because I was taking so many computer science classes in my graduate program.

Then, soon after that, I went into industry. I worked for a financial firm doing options and derivatives training at the Chicago Mercantile Exchange. I worked for Wired Digital, which was the online part of *Wired* magazine. I was one of the people who started an online marketing company, which was one of the crazier things for me. So I did many different things that all use my computer science skills.

Then the dot-com bust happened, and I and many of my friends were out of work. And so I took that time to do some soul searching and think, "What do I want to do with my life? I've done all these things since I got my master's degree ... but they're not adding up to anything." That's when I reflected back on my love of biodiversity and nature. And then I just looked for an organization that I could join that would let me do computer science in that area.

And so I went to conferences, workshops, meetups, all kinds of things, and I heard about this project called the All Species Foundation, which grew out of the Long Now Foundation, which is a group here that's focused on long-term thinking. And they were trying to accelerate the discovery and identification of new species, and I thought, "Oh, this is the perfect job for me." So I pestered them incessantly until they hired me, and that's what kicked me off on what I'm doing now.

And since then … all I've been focusing on is biodiversity, conservation, and ecology using the computer science skills that I have.

Before WWF, I worked at Google. For most of the time I was there, I was working with partners developing solutions using the tools that we had developed at Google. In particular, I worked on this thing called Google Earth Engine, which is that satellite data analysis platform.

I worked a lot with partners developing platforms on Earth Engine, and one of the things that brought me to WWF was trying to understand better how these systems were actually being used to drive change. My focus within WWF is on the science side and on the conservation program side. Most of the things that we work on are in partnership with other organizations, which is great.

SAM: One of the things I thought was interesting when we met about a year ago was some of the work on smuggling. Can you explain a little bit about some of those activities or endangered species and how that's working? I thought that was a fascinating use as well.

DAVE: One of the things that we're using AI for, and this is in partnership with big tech firms, is trying to reduce the amount of illegal wildlife trade that happens online. So there's a lot of illegal wildlife trade happening online through various platforms. And through something called the Coalition to End Wildlife Trafficking [Online], a lot of the big tech organizations that have social media platforms and search engines have gotten together to try to limit it.

Artificial intelligence is one way that people are using to identify where trade is occurring. It's very challenging because the language people use to do this is constantly shifting. I mean, it's illegal, so they're trying not to be caught. It's a very, very interesting challenge.

SHERVIN: That is just fascinating.

DAVE: Then there's … well, a great example of machine learning is Global Fishing Watch, which is now its own thing. It grew out of a partnership of SkyTruth, Oceana, and Google. They track vessels above a certain size, which are mandated to emit a location signal every 15 seconds, and they use that signal to determine whether a ship is illegally fishing in a conservation area, and also they've been able to track when one ship will go offload their catch onto another.

SAM: What I thought was fascinating about these stories is, naively, my take on what your organization [did] before I talked to you was … I just had no idea of the scale of these sorts of things. And everything you're saying to me sounds like scale.

DAVE: Yeah. One area that really interests me is the temporal scale. Often, we'll do some conservation work and we'll monitor to ensure that we're having the impact we want at the time. But sometimes you'll do conservation efforts that might take 10 years to reach impact just because we're dealing with things like "How fast can a tree grow? How fast can a population increase?" These are long-term efforts, and so there's this sort of temporal scale that's really interesting too; like, can we develop systems that will be able to track things over the long term in ways that are efficient, especially given that, often, funding for a project might end before the impacts of the project are felt? So how do you develop projects that can leverage AI and technology to do that long-term monitoring? That's one of the things I'm spending a lot of time on.

SAM: It seems like so much of this comes down to a lot of measurement that these techniques allow you to do, that previously you would not have [had] before.

SHERVIN: That's a very good point.

DAVE: Mm-hmm. We call it monitoring evaluation and learning, and it's the learning part: You need to be able to measure the impacts in order to learn what worked and what didn't.

SHERVIN: I really love where you're going with this, because the thing about the temporal scale and whether it's a 10-year scale or whether it's some leading indicators of something good or bad that's about to happen or has happened is really fascinating and is a big part of what Sam and I have been talking about around … you need feedback loops.

SAM: We're so excited about measuring what we have data on, and we're thrilled at all the new data that's coming out. But so often, we're missing out on the absence of data itself as a signal. And I think that's one of the things that you were touching on: that there's a whole world of opportunity in the data that we don't have, and the absence of data tells us a lot.

So Dave, we have a segment where we ask you a series of rapid-fire questions, so we just want you to answer the first thing that comes to your mind. What are you proudest of so far with artificial intelligence? What have you done that you're proud of?

SHERVIN: Everything.

DAVE: Yeah, I mean, so much. Just the ability to apply AI to these conservation challenges in so many different contexts: the satellite data, the camera traps, bioacoustics, eDNA [environmental DNA], the variety of applications, the natural language processing. AI … there are many varieties, and what I'm really proud of is that we are leveraging as many versions of AI as possible.

I didn't even talk about work we're doing with the Basque Centre for Climate Change on driving financing to nature-positive businesses, using AI to measure potential impacts of those businesses. And that's using not standard statistical machine learning but more symbolic AI, which is yet another kind of AI. So I think I'm mostly proud of the breadth and depth of the applications that I've been able to leverage.

SAM: As well you should be. So maybe, perhaps aside from bias that we've heard a lot about, what worries you about artificial intelligence?
DAVE: Right. OK. So bias clearly is a huge one, and there's been a lot of discussion on bias. One of the things is the data sovereignty issues. AI applications are so data hungry; there's a pressure to have them consume as much data as possible, and there are many contexts in conservation where that's just not appropriate. One of the challenges, which is, I think, an exciting challenge, is how do you move forward with these technologies [while] respecting the sovereignty of people who just don't want to share the data for very good reasons?

SAM: What's your favorite activity that doesn't involve technology at all? What do you do that's not AI — besides ants?

DAVE: Oh, let's see. I've been reading a lot about time lately, trying to understand how time works, and I've been reading a bunch of books on that, so that's been kind of good. And I've been starting to try to make music. It's using technology, because it's electronica, but I'm trying to make electronica by looking at the screen as infrequently as possible.

SAM: What's the first career you wanted?

DAVE: Well, initially I was going into neuropsychology. That was the first thing. I was always really interested in how people learn, and so I was going to go into neuropsych to study how people learn using neuropsych.

SAM: What's your greatest wish for AI in the future? What are you hoping that we can get from all this?

DAVE: So nature and climate are twin challenges, and they go hand in hand. But climate change is causing damage that we see now, and we need to address it, and nature loss is another crisis that we're in the midst of.
According to Living Planet Index, there's been a decrease of [69 % in species populations] since 1970, right? Using AI to address both of those challenges is what I really hope for, but I want it to both have global solutions and local solutions.

So I want to, as a planet, be able to address the climate and nature-loss challenges using AI on a planetary scale but also make it locally relevant so that the people in the places where land use is changing or who are trying to preserve the nature that they have can do that as well. So I'm hoping that AI can be used both sort of globally and also locally and that the local actors are as empowered to use these techniques as the global actors are.

SHERVIN: Dave, it's been such a pleasure talking with you, from the very minute to the very big, and ground level to satellite level, and sound waves to electromagnetic waves. It's all been quite fascinating. Thank you.

SAM: Thanks for taking the time to talk with us. Thanks.

DAVE Oh, it's been a pleasure. Thank you so much for having me on. I've really enjoyed the conversation.

SAM: Thanks for joining us today. On our next episode, we'll talk with Stephanie Moyerman, director of data science and wellness at Instagram.

ALLISON RYDER: Thanks for listening to *Me, Myself, and AI*We believe, like you, that the conversation about AI implementation doesn't start and stop with this podcast. That's why we've created a group on LinkedIn specifically for listeners like you. It's called AI for Leaders, and if you join us, you can chat with show creators and hosts, ask your own questions, share your insights, and gain access to valuable resources about AI implementation from *MIT SMR* and BCG. You can access it by visiting mitsmr.com/AIforLeaders. We'll put that link in the show notes, and we hope to see you there.