CRAIG: [00:08](https://www.temi.com/editor/t/9W_6X2J-5vPYQyL4mszMQI3y8kMngHuroCWTY09K-N2cjGUzpMm0tcivjycnZV9DL6i-iYWZ_5o2SjrS7pegnucba98?loadFrom=DocumentDeeplink&ts=8.09) Hi, this is Craig Smith with a new podcast about artificial intelligence. I'm a former New York Times correspondent now focused on AI and I've been talking to people who are making a difference in the space. This week I speak with Ben Rosman, an assistant professor at the University of Witwatersrand in Johannesburg, South Africa. Ben runs what may be the largest machine learning lab on the continent and is one of the founders of Deep Learning Indaba an attempt to bring African machine learning under a single umbrella. Indaba, which means gathering is the second such organization on the continent with that goal after Data Science Africa or DSA founded in 2015. I spoke to Ben about the challenges facing Africa in the Ai Revolution and how Indaba and DSA are trying to unify the continent so that it won't be left behind. I hope you find the conversation as interesting as I did.

BEN: [01:10](https://www.temi.com/editor/t/9W_6X2J-5vPYQyL4mszMQI3y8kMngHuroCWTY09K-N2cjGUzpMm0tcivjycnZV9DL6i-iYWZ_5o2SjrS7pegnucba98?loadFrom=DocumentDeeplink&ts=70.47) DSA started a bit earlier. There was some strong researchers there in east Africa, like Kenya, Uganda, Tanzania, that had some good connections I think to the UK and some of the big names in the UK were involved in setting it up as like an annual meeting and they were talking more about data science, which is typically more application of machine learning to industry and that kind of thing. In one sense it's more like trying to pull insights out of data. So that's been going on for a few years now and then the Indaba we started two years ago as primarily a summer school - an intense week of training, of kind of very in depth technical discussions and practical sessions and so on. So it was firstly a way to bring people into the African machine learning community at the same time, building that community. But now as it's maturing a little bit, those two groups are two groups w e're trying to find ways of bridging the gap between them. So like for example, we've set up a machine learning and data science, African mailing list meant to reach out to everybody and a lot of people that have come to one, they're going to the other as well and vice versa. So they're not competing programs. They're very much aligned in the mission they're trying to carry out. It's just being done in slightly different ways.

CRAIG: [02:17](https://www.temi.com/editor/t/9W_6X2J-5vPYQyL4mszMQI3y8kMngHuroCWTY09K-N2cjGUzpMm0tcivjycnZV9DL6i-iYWZ_5o2SjrS7pegnucba98?loadFrom=DocumentDeeplink&ts=137.64) Is DSA more eastern, central Africa and Indaba more southern Africa.

BEN: [02:24](https://www.temi.com/editor/t/9W_6X2J-5vPYQyL4mszMQI3y8kMngHuroCWTY09K-N2cjGUzpMm0tcivjycnZV9DL6i-iYWZ_5o2SjrS7pegnucba98?loadFrom=DocumentDeeplink&ts=144.33) I guess by the way they both started. That's right. I spoke to some of the DSA guys. They said originally the plan was to move around, but the community that we're targeting at the start was all based in eastern Africa. We started Indaba in South Africa because all eight of us who were involved in starting it were South African.

BEN: [02:42](https://www.temi.com/editor/t/9W_6X2J-5vPYQyL4mszMQI3y8kMngHuroCWTY09K-N2cjGUzpMm0tcivjycnZV9DL6i-iYWZ_5o2SjrS7pegnucba98?loadFrom=DocumentDeeplink&ts=162.21) So we started there, we did it again in South Africa the second year, which was this year, but there were still things we wanted to tweak with the structure and we're still playing around with it and we didn't feel comfortable to take it out of South Africa. Particularly for things like sponsorship. We want a lot of local sponsorship because otherwise you very much get this impression that, well, clearly you can do a lot of amazing things in AI, but you have to go overseas to do that. So we thought, no, that's the wrong messaging, we need local sponsors as well. So we did it twice in South Africa, but the plan is then to move it around because the whole tagline is to strengthen African machine learning. So it will be in Nairobi in Kenya next year, partially leveraging the fact that DSA has been fostering a community in that part of the continent.

CRAIG: [03:20](https://www.temi.com/editor/t/9W_6X2J-5vPYQyL4mszMQI3y8kMngHuroCWTY09K-N2cjGUzpMm0tcivjycnZV9DL6i-iYWZ_5o2SjrS7pegnucba98?loadFrom=DocumentDeeplink&ts=200.35) And where's the funding? Is it national governments funding this? Or private companies?

BEN: [03:25](https://www.temi.com/editor/t/9W_6X2J-5vPYQyL4mszMQI3y8kMngHuroCWTY09K-N2cjGUzpMm0tcivjycnZV9DL6i-iYWZ_5o2SjrS7pegnucba98?loadFrom=DocumentDeeplink&ts=205.3) All over the place. I mean firstly there's entrance fees for attendees except for students, but that's not actually a primary source of income. It's been mainly sponsorship. So we've had a lot of sponsorship internationally. The international community's been amazing. Like a lot of the big tech companies have poured quite a bit of money in and then we've been spending a lot of time going to South African companies ranging from a lot of the banks to insurance companies and then even to startups to get sponsorship from them because again, it talks to our bigger mission which is to build a whole ecosystem around machine learning across Africa. So we want participants from all sectors, all parts of society, so that's been quite an important drive for us as well. And then that links in quite nicely through things like recruitment and so on because if you want to grow this community, people need to see that going into this gives you viable career options and all sorts of things like that.

CRAIG: [04:11](https://www.temi.com/editor/t/9W_6X2J-5vPYQyL4mszMQI3y8kMngHuroCWTY09K-N2cjGUzpMm0tcivjycnZV9DL6i-iYWZ_5o2SjrS7pegnucba98?loadFrom=DocumentDeeplink&ts=251.8) And so the goal is to build a competency on the continent, to give opportunities for people to study on the continent as opposed to everyone going to the US or China or Europe.

BEN: [04:24](https://www.temi.com/editor/t/9W_6X2J-5vPYQyL4mszMQI3y8kMngHuroCWTY09K-N2cjGUzpMm0tcivjycnZV9DL6i-iYWZ_5o2SjrS7pegnucba98?loadFrom=DocumentDeeplink&ts=264.61) There were a few things. One of the concrete facts that we looked at when we started was that so far as we could tell, it never been an African paper at NeurIPS and being the big flagship conference - obviously there'd been African authors, but they're all based at international institutions and that was something that had always irked all of us and that was purely from an academic point of view. We thought, you know, there's clearly something wrong here and we have to change things and we all knew that there was good enough work, but the community was very fractured and generally lacking a lot of confidence and so on. In fact, when I came back from doing my PhD in the UK, I had an awesome time studying abroad and at that point I couldn't have studied what I wanted to study in South Africa.

BEN: [05:03](https://www.temi.com/editor/t/9W_6X2J-5vPYQyL4mszMQI3y8kMngHuroCWTY09K-N2cjGUzpMm0tcivjycnZV9DL6i-iYWZ_5o2SjrS7pegnucba98?loadFrom=DocumentDeeplink&ts=303.73) I wanted that to never be the case again. If someone wants to study abroad, we are all very happy to help encourage them and give them advice and make sure they get into the right places, but they shouldn't have to do it out of necessity. So we've all got all these different ideas of how to try and grow the ecosystem back in Africa and one of them was to start upping the quality of research, but at the same time there's a big focus on the aspects of the startup companies, people working on various side projects that have some sort of societal benefits and we thought if we could upskill all these people and get them competitive with people doing the same kinds of things elsewhere in the world. And in fact in many cases it hasn't been that much about upskilling. It's been almost a soft skills and the confidence and that kind of thing.

BEN: [05:44](https://www.temi.com/editor/t/9W_6X2J-5vPYQyL4mszMQI3y8kMngHuroCWTY09K-N2cjGUzpMm0tcivjycnZV9DL6i-iYWZ_5o2SjrS7pegnucba98?loadFrom=DocumentDeeplink&ts=344.23) Plus the amount of material available online at the moment. We'll have these applicants coming from countries that you basically didn't even know had a university. When they say the kinds of projects they're working on in their spare time. It's on a par with anyone anywhere and it's kind of mind blowing. So crystallizing the community together. And we've done a few things like we encourage all the students to present posters during the Indaba and this year we had a session on how to write a good research paper and that sort of thing, which I think has really changed people's perceptions and suddenly these guys are at this conference here and they look around and say, Oh, I can do this. I'm going to come back next year, I'm going to write a paper and be here next year. And there's just these few psychological factors that need to change. But without this big force externally, it's a very hard thing to achieve.

CRAIG: [06:24](https://www.temi.com/editor/t/9W_6X2J-5vPYQyL4mszMQI3y8kMngHuroCWTY09K-N2cjGUzpMm0tcivjycnZV9DL6i-iYWZ_5o2SjrS7pegnucba98?loadFrom=DocumentDeeplink&ts=384.25) What kind of cohort is there in Africa? I mean, I've talked to people in China about how many qualified researchers there are in China or how many qualified researchers there are in North America. Do you have a sense of numbers?

BEN: [06:38](https://www.temi.com/editor/t/9W_6X2J-5vPYQyL4mszMQI3y8kMngHuroCWTY09K-N2cjGUzpMm0tcivjycnZV9DL6i-iYWZ_5o2SjrS7pegnucba98?loadFrom=DocumentDeeplink&ts=398.45) I wish I did. It's not huge. When I went overseas, I was in a very big master's program and I had this strange realization that my fundamentals were probably as strong as if not stronger than people from anywhere else in the world, but I hadn't been taught anything that was invented in the last 30 years and I think that's the practicalities of when you've got quite old at departments and very small. Now what we've seen is possibly with the whole deep learning boom and everything a lot of very young enthusiastic people coming into the departments and getting really excited about machine learning and deep learning and data science.

BEN: [07:11](https://www.temi.com/editor/t/9W_6X2J-5vPYQyL4mszMQI3y8kMngHuroCWTY09K-N2cjGUzpMm0tcivjycnZV9DL6i-iYWZ_5o2SjrS7pegnucba98?loadFrom=DocumentDeeplink&ts=431.09) And I think that's driving a lot of change. Definitely in South Africa. I don't know the extent to which around the rest of the continent, but there's definitely communities across the continent. So as part of the Indaba that we had another initiative called the Indaba X. Where we had a call for applications for anybody from any country to host a small local event. Where all the local organizing was left up to them and we would give them a little bit of financial support and then help find speakers and that sort of thing. We didn't even tell them what formats to run. We ended up having 30 satellite events ranging from Zimbabwe to Sudan, which was phenomenal. It was so exciting and now we've got the call out for this year as well and we're hoping to get 20 plus as well, which means that there's these 15, 20 pockets of excellence that are starting to develop in different countries.

BEN: [07:54](https://www.temi.com/editor/t/9W_6X2J-5vPYQyL4mszMQI3y8kMngHuroCWTY09K-N2cjGUzpMm0tcivjycnZV9DL6i-iYWZ_5o2SjrS7pegnucba98?loadFrom=DocumentDeeplink&ts=474.94) We want to try and foster those and build the networks between them because again, there's people of amazing quality in all these countries. We had incredibly tight vetting and review procedures for all our applicants. From across the continent, there were phenomenal people, so I think if we can just drive putting these groups together, I expect that to have a rather large impact

CRAIG: [08:13](https://www.temi.com/editor/t/9W_6X2J-5vPYQyL4mszMQI3y8kMngHuroCWTY09K-N2cjGUzpMm0tcivjycnZV9DL6i-iYWZ_5o2SjrS7pegnucba98?loadFrom=DocumentDeeplink&ts=493.161) What's the largest machine learning department or machine learning program.

BEN: [08:16](https://www.temi.com/editor/t/9W_6X2J-5vPYQyL4mszMQI3y8kMngHuroCWTY09K-N2cjGUzpMm0tcivjycnZV9DL6i-iYWZ_5o2SjrS7pegnucba98?loadFrom=DocumentDeeplink&ts=496.99) Right, right. so I'm going to sound self aggrandizing, but I think it's the University of Witwatersrand in Johannesburg, which is where I'm based. It's one of the two most prestigious universities in South Africa and South Africa just by virtue of history and economics is in a particularly good position as far as academia goes. And we've been putting in a particularly big push into machine learning at our university, at least from the point of view of published research. For the last couple of years, we've been starting to hear it all the big AI and machine learning and robotics conferences and there hasn't been much African presence there at all, but now we're regularly appearing at these conferences as our research lab and now we're trying to partner with other labs across the country to get them to that same state as well.

CRAIG: [08:59](https://www.temi.com/editor/t/9W_6X2J-5vPYQyL4mszMQI3y8kMngHuroCWTY09K-N2cjGUzpMm0tcivjycnZV9DL6i-iYWZ_5o2SjrS7pegnucba98?loadFrom=DocumentDeeplink&ts=539.61) How big is your program or the program at the university?

BEN: [09:03](https://www.temi.com/editor/t/9W_6X2J-5vPYQyL4mszMQI3y8kMngHuroCWTY09K-N2cjGUzpMm0tcivjycnZV9DL6i-iYWZ_5o2SjrS7pegnucba98?loadFrom=DocumentDeeplink&ts=543.24) It's very complicated because there's a lot of activities going on in different schools ranging from math to stats to the various engineering departments and so on. We're actually at the moment trying to find instructors that can bring everybody together to stop siloing effects. But we kind of started the machine learning at third year. So teaching a third-year course to the computer science students, so we have roughly about 80 students in that cohort and then there's various masters programs as well.

BEN: [09:26](https://www.temi.com/editor/t/9W_6X2J-5vPYQyL4mszMQI3y8kMngHuroCWTY09K-N2cjGUzpMm0tcivjycnZV9DL6i-iYWZ_5o2SjrS7pegnucba98?loadFrom=DocumentDeeplink&ts=566.231) We've now set up a masters in data science, masters in artificial intelligence and masters in robotics. I don't know all the numbers, but I teach an honors robotics course and we get about 20, 25 students in that.

CRAIG: [09:37](https://www.temi.com/editor/t/9W_6X2J-5vPYQyL4mszMQI3y8kMngHuroCWTY09K-N2cjGUzpMm0tcivjycnZV9DL6i-iYWZ_5o2SjrS7pegnucba98?loadFrom=DocumentDeeplink&ts=577.62) But in terms of trained researchers across the continent, we're talking hundreds or thousands?

BEN: [09:45](https://www.temi.com/editor/t/9W_6X2J-5vPYQyL4mszMQI3y8kMngHuroCWTY09K-N2cjGUzpMm0tcivjycnZV9DL6i-iYWZ_5o2SjrS7pegnucba98?loadFrom=DocumentDeeplink&ts=585.36) I would say people that are active in machine learning, hundreds and low hundreds at that. Yeah, I'm pretty sure it wouldn't be that difficult to compile the list.

CRAIG: [09:53](https://www.temi.com/editor/t/9W_6X2J-5vPYQyL4mszMQI3y8kMngHuroCWTY09K-N2cjGUzpMm0tcivjycnZV9DL6i-iYWZ_5o2SjrS7pegnucba98?loadFrom=DocumentDeeplink&ts=593.671) Yeah, I mean the reason I ask is because this stuff is working its way into the economy and it's going to have a huge economic impact and countries or continents that don't have the competency are going to be at a disadvantage. Is that one of the concerns?

BEN: [10:10](https://www.temi.com/editor/t/9W_6X2J-5vPYQyL4mszMQI3y8kMngHuroCWTY09K-N2cjGUzpMm0tcivjycnZV9DL6i-iYWZ_5o2SjrS7pegnucba98?loadFrom=DocumentDeeplink&ts=610.231) Yes, excactly. We've got all sorts of historic imbalances that we're still trying to address in Africa at large and the opening address of the Indaba last year, our vice chancellor at the university came and gave the opening talk.

BEN: [10:23](https://www.temi.com/editor/t/9W_6X2J-5vPYQyL4mszMQI3y8kMngHuroCWTY09K-N2cjGUzpMm0tcivjycnZV9DL6i-iYWZ_5o2SjrS7pegnucba98?loadFrom=DocumentDeeplink&ts=623.41) He'd just come back from a trip to China where he had seen all the efforts they were pushing into AI and he said he had this terrible sense of foreboding, that we're busy focusing on, still trying to right the wrongs of the past and we're about to get left behind on the biggest explosion of innovation in human history. So we've been really motivated by that kind of vision. Going and talking to the banks and the big corporates. South Africa especially in Johannesburg, the financial sector is very strong and you know, I found a few years ago all the banks suddenly decided they need data science teams now in the last year or so, they've all decided they need AI teams, but that talent isn't there, so we're trying to partner with them to do various things such as get them to help sponsor students, we're looking into programs to help upskill people that are already working in those environments to equip them with more of the machine learning skillset.

CRAIG: [11:08](https://www.temi.com/editor/t/9W_6X2J-5vPYQyL4mszMQI3y8kMngHuroCWTY09K-N2cjGUzpMm0tcivjycnZV9DL6i-iYWZ_5o2SjrS7pegnucba98?loadFrom=DocumentDeeplink&ts=668.52) But are there countries in Africa that have well articulated AI development strategies?

BEN: [11:14](https://www.temi.com/editor/t/9W_6X2J-5vPYQyL4mszMQI3y8kMngHuroCWTY09K-N2cjGUzpMm0tcivjycnZV9DL6i-iYWZ_5o2SjrS7pegnucba98?loadFrom=DocumentDeeplink&ts=674.21) It's a hard one to answer

CRAIG: [11:15](https://www.temi.com/editor/t/9W_6X2J-5vPYQyL4mszMQI3y8kMngHuroCWTY09K-N2cjGUzpMm0tcivjycnZV9DL6i-iYWZ_5o2SjrS7pegnucba98?loadFrom=DocumentDeeplink&ts=675.72) Or even funding.

BEN: [11:17](https://www.temi.com/editor/t/9W_6X2J-5vPYQyL4mszMQI3y8kMngHuroCWTY09K-N2cjGUzpMm0tcivjycnZV9DL6i-iYWZ_5o2SjrS7pegnucba98?loadFrom=DocumentDeeplink&ts=677.32) I don't think at this point it's a very well coordinated effort, but there's certainly more and more recognition that this is an important area to be funding. I don't really know as far as the rest of the continent goes, but there's various things like in our discussions with Kenya both previously for the Indaba X there and now with them going to be hosting the Indaba next year as well as Sudan when they held their Indaba X there were discussions that those teams on the ground were having with their governments that they were interested in getting involved and trying to push these efforts and it sounded very positive, their viewpoints towards AI. The other place that I've heard is taking it very seriously is Rwanda where they're apparently very forward looking and thinking on issues around technology and innovation, but I don't have any firsthand experience.

CRAIG: [12:00](https://www.temi.com/editor/t/9W_6X2J-5vPYQyL4mszMQI3y8kMngHuroCWTY09K-N2cjGUzpMm0tcivjycnZV9DL6i-iYWZ_5o2SjrS7pegnucba98?loadFrom=DocumentDeeplink&ts=720.46) What about Nigeria.

BEN: [12:01](https://www.temi.com/editor/t/9W_6X2J-5vPYQyL4mszMQI3y8kMngHuroCWTY09K-N2cjGUzpMm0tcivjycnZV9DL6i-iYWZ_5o2SjrS7pegnucba98?loadFrom=DocumentDeeplink&ts=721.21) Nigeria is an interesting one and we've been struggling a bit with Nigeria almost just to penetrate into the networks there. We struggled last year. We had very few Nigerian attendees. We didn't manage to get an Indaba X there. But as of this year we've started getting the connections there people are starting to propose these sorts of things and getting involved in the communities. I still don't have a strong handle on what's happening there. From what I understand, there's a lot of activity, incredibly uncoordinated. There's so many universities and so on, but I don't get the feeling that there's any overall push in this direction. I suspect you need some sort of critical mass at the researcher level before that starts happening and my suspicion is that's not there yet.

CRAIG: [12:37](https://www.temi.com/editor/t/9W_6X2J-5vPYQyL4mszMQI3y8kMngHuroCWTY09K-N2cjGUzpMm0tcivjycnZV9DL6i-iYWZ_5o2SjrS7pegnucba98?loadFrom=DocumentDeeplink&ts=757.27) Beyond the competency is the research that's being done state of the art, I mean current.

BEN: [12:42](https://www.temi.com/editor/t/9W_6X2J-5vPYQyL4mszMQI3y8kMngHuroCWTY09K-N2cjGUzpMm0tcivjycnZV9DL6i-iYWZ_5o2SjrS7pegnucba98?loadFrom=DocumentDeeplink&ts=762.221) That's a question that we've all been grappling with.

CRAIG: [12:45](https://www.temi.com/editor/t/9W_6X2J-5vPYQyL4mszMQI3y8kMngHuroCWTY09K-N2cjGUzpMm0tcivjycnZV9DL6i-iYWZ_5o2SjrS7pegnucba98?loadFrom=DocumentDeeplink&ts=765.16) Annoyingly, the way that the incentives are set up is that you get more credit for publishing a paper in the South African Journal of no-one-will-ever-read-this than for going to like a major international conference and presenting your work to your peers. So again, a group of us involved with the Indaba have been trying to push back against that. Since I came back to South Africa, I've been pushing that very hard and we've now been published all over the place and I would say being cutting edge and competitive in that regard. But more and more groups in our network are starting to do that as well and we're trying to encourage people and help people along that path because there's a lot of really good work that's actually been done at the Indaba over the last two years that you could look around and there was some phenomenal work there, but again, I think the authors and the students or the academics were just lacking the either the confidence or the know how to actually get the work out there. So quality wise, I think there's some phenomenally cool stuff and ranging from fundamental research in reinforcement learning, but also in some application areas like education and healthcare.

BEN: [13:41](https://www.temi.com/editor/t/9W_6X2J-5vPYQyL4mszMQI3y8kMngHuroCWTY09K-N2cjGUzpMm0tcivjycnZV9DL6i-iYWZ_5o2SjrS7pegnucba98?loadFrom=DocumentDeeplink&ts=821.59) But generally across the continent there's a lot of people working on trying to address African problems with machine learning. There's a lot of people that are in fact not just research that are building companies and apps and things to help their communities and so on. There's a lot of innovation.

CRAIG: [13:54](https://www.temi.com/editor/t/9W_6X2J-5vPYQyL4mszMQI3y8kMngHuroCWTY09K-N2cjGUzpMm0tcivjycnZV9DL6i-iYWZ_5o2SjrS7pegnucba98?loadFrom=DocumentDeeplink&ts=834.85) And that was my next question, where is the largest entrepreneurial ecosystem in Africa, but outside of South Africa?

BEN: [14:02](https://www.temi.com/editor/t/9W_6X2J-5vPYQyL4mszMQI3y8kMngHuroCWTY09K-N2cjGUzpMm0tcivjycnZV9DL6i-iYWZ_5o2SjrS7pegnucba98?loadFrom=DocumentDeeplink&ts=842.92) South Africa is very big and so is Kenya. Again, I don't have the numbers on these things, but there's a thriving startup economy going on in Kenya. A lot of people working in that space as developers and coders and innovating and trying new things.

CRAIG: [14:15](https://www.temi.com/editor/t/9W_6X2J-5vPYQyL4mszMQI3y8kMngHuroCWTY09K-N2cjGUzpMm0tcivjycnZV9DL6i-iYWZ_5o2SjrS7pegnucba98?loadFrom=DocumentDeeplink&ts=855.76) What kind of access do researchers or entrepreneurs have to data in Africa. Is it a fairly open, transparent place?

BEN: [14:26](https://www.temi.com/editor/t/9W_6X2J-5vPYQyL4mszMQI3y8kMngHuroCWTY09K-N2cjGUzpMm0tcivjycnZV9DL6i-iYWZ_5o2SjrS7pegnucba98?loadFrom=DocumentDeeplink&ts=866.651) Well... so there's... I've, again talking about South Africa, we have this Protection of Personal Information Act which is supposed to guard data in the same way as these laws around the world are and it's not always entirely clear that that's the approach that people really follow.

BEN: [14:45](https://www.temi.com/editor/t/9W_6X2J-5vPYQyL4mszMQI3y8kMngHuroCWTY09K-N2cjGUzpMm0tcivjycnZV9DL6i-iYWZ_5o2SjrS7pegnucba98?loadFrom=DocumentDeeplink&ts=885.72) If you talk to the right people, you can usually get data quite easily and you know, we try to do all our due diligence as the university, but it's very easy to come across people who will show you and tell you all the cool things they're doing with their company's data that you're not entirely convinced they shouldn't be allowed to do. But I don't think there's much of that across the rest of the continent in terms of regulations and there's some very interesting data sets that you know because more and more there's everything from like census data to satellite data and I mean every government's got their own projects that has data and unfortunately it's not the case where you can just go and get these datasets. Often it involves knowing the right people and making introductions and negotiating, but there are so many interesting data sets and that's I think what's driving a lot of excitement there because you know, these can be used anywhere from monitoring different kinds of livestock and crops and these kinds of things to population movement and something that's quite exciting.

CRAIG: [15:37](https://www.temi.com/editor/t/9W_6X2J-5vPYQyL4mszMQI3y8kMngHuroCWTY09K-N2cjGUzpMm0tcivjycnZV9DL6i-iYWZ_5o2SjrS7pegnucba98?loadFrom=DocumentDeeplink&ts=937.911) Can you give an example of data set that would surprise people?

BEN: [15:41](https://www.temi.com/editor/t/9W_6X2J-5vPYQyL4mszMQI3y8kMngHuroCWTY09K-N2cjGUzpMm0tcivjycnZV9DL6i-iYWZ_5o2SjrS7pegnucba98?loadFrom=DocumentDeeplink&ts=941.931) The kind of thing is quite interesting, a colleague of mine who's trying to look at crime reports, so he started a project trying to mine reports of incidents off Twitter and then came across these interesting problems like the fact that in South Africa we have 11 official languages and a lot of people communicate with mixtures of different languages. With a whole lot of slang in different kinds of abbreviations and so on and turns out there was a whole interesting projects in how do you make sense of these, not even just an informal language at one might find online, but as a blend of all sorts of different dialects and speech patterns.

BEN: [16:16](https://www.temi.com/editor/t/9W_6X2J-5vPYQyL4mszMQI3y8kMngHuroCWTY09K-N2cjGUzpMm0tcivjycnZV9DL6i-iYWZ_5o2SjrS7pegnucba98?loadFrom=DocumentDeeplink&ts=976.4) But then at the same time you're trying to localize crimes to then go and say, we can't use place names that are used internationally, then you have to go and mine these things as well, and then because of the history, a lot of place names they've changed so there all these different complexities that you wouldn't think about. Things like, hey, we can just take some system that's applied everywhere else in the world and just drop it in here and that would work and those kinds of things turn out to not be the case at all. We had similar sorts of things when, one of the projects we worked on was an autonomous vehicle in our robotics group and you just download the data set for object recognition. While this thing's driving around and it ended up labeling every single building on our campus as a prison just based on the architecture from like the seventies when it was built, and then you'll find like the lighting conditions are different there, so washes out a lot of things. There's all these weird problems that pop up that are often unexpected

CRAIG: [17:08](https://www.temi.com/editor/t/9W_6X2J-5vPYQyL4mszMQI3y8kMngHuroCWTY09K-N2cjGUzpMm0tcivjycnZV9DL6i-iYWZ_5o2SjrS7pegnucba98?loadFrom=DocumentDeeplink&ts=1028.15) What's the hope for the future then, that you'll build this community and population of young researchers that'll stay in the continent?

BEN: [17:16](https://www.temi.com/editor/t/9W_6X2J-5vPYQyL4mszMQI3y8kMngHuroCWTY09K-N2cjGUzpMm0tcivjycnZV9DL6i-iYWZ_5o2SjrS7pegnucba98?loadFrom=DocumentDeeplink&ts=1036.61) Yeah, exactly, and I think there's a lot of compounding effects that we're hoping to get such as, the more excitement there is around this, the more we can get young people to study the STEM subjects and carry these through and become interested in maths and science and so on. But more concretely, we obviously have a lot of problems in Africa and I think getting these levels of skills seems to be the most direct way to solve this. Rather than relying on governments, which typically doesn't work anywhere in the world. You know, you've got a lot of passionate people with great ideas to help deal with problems like healthcare and education, transparency and governance, crime, all sorts of problems like this. We've got the technology to do it. We just need the know how we need to be able to piece everything together and sold a few difficult technical problems that come along to actually deploy solutions to these things and I think that could be hugely transformative. Through technology like this, we can find ways to deal with all the crises around poverty and refugee situations and droughts and so on. As I really think if we can start producing a lot of people that are passionate, that are very knowledgeable in this area, that are contributing internationally. The second you arrive at a big conference and start talking about these things, other people become aware of these problems and want to get involved. Rather than being a charity case, it's a case of just wanting to be an equal player in an international community, but we're also putting forward problems as well as solutions and engaging the academia of the world in these discussions as equals.

CRAIG: [18:36](https://www.temi.com/editor/t/9W_6X2J-5vPYQyL4mszMQI3y8kMngHuroCWTY09K-N2cjGUzpMm0tcivjycnZV9DL6i-iYWZ_5o2SjrS7pegnucba98?loadFrom=DocumentDeeplink&ts=1116.96) Can you talk a little bit about your research, your reinforcement learning research. What kind of problems are you, are you addressing?

BEN: [18:44](https://www.temi.com/editor/t/9W_6X2J-5vPYQyL4mszMQI3y8kMngHuroCWTY09K-N2cjGUzpMm0tcivjycnZV9DL6i-iYWZ_5o2SjrS7pegnucba98?loadFrom=DocumentDeeplink&ts=1124.1) Yeah, absolutely. So I think the core research that we work on is more foundational rather than applied. The kinds of questions that we're interested in in my lab are around issues of transfer and multitask, so what that really means is you'll see a lot of the work that's done in machine learning is very much around these narrow AI problems. Basically name a domain, something like Go or chess or whatever it is, and we'll build some sort of intelligence system that will solve that problem exceptionally well. Usually better than a human could do it. But to me that's to some extent fundamentally uninteresting. I want a system that I can then say, okay, and now I want you to solve this. Then I want you to have a conversation about that and then I'd like you to clean this up.

BEN: [19:25](https://www.temi.com/editor/t/9W_6X2J-5vPYQyL4mszMQI3y8kMngHuroCWTY09K-N2cjGUzpMm0tcivjycnZV9DL6i-iYWZ_5o2SjrS7pegnucba98?loadFrom=DocumentDeeplink&ts=1165.23) So is it's really about that diversity of knowledge or skill sets and so a lot of our work focuses on these ideas of, how do you take the knowledge you've gained by solving one problem and either distill out something that's more general about the world, something that you might very loosely call some sort of common sense knowledge that you presume you would accumulate from solving a whole load of different problems? Or how do I take several skills that I've acquired and piece them together in a way that gives me more general skill sets? You know, if I brought home a robot one day and taught it to sweep the floor and then I wanted to teach it to mop the floor, it should be easier for her to learn to mop the floor, having already learned to sweep. But in addition it's sweeping should get better because it's now maybe more skilled and more experienced.

BEN: [20:06](https://www.temi.com/editor/t/9W_6X2J-5vPYQyL4mszMQI3y8kMngHuroCWTY09K-N2cjGUzpMm0tcivjycnZV9DL6i-iYWZ_5o2SjrS7pegnucba98?loadFrom=DocumentDeeplink&ts=1206.99) So these ideas of how do you deal with different classes of skills or different classes of problems and obviously being based in machine learning and particularly reinforcement learning a lot of the notions around agents, so that's the robot or the system or whatever it is, learning these skills for itself from a mixture of its own experience like trial and error learning and possibly by being instructed by someone or watching someone else do something and then combining all this knowledge in ways that helps generalize.

CRAIG: [20:34](https://www.temi.com/editor/t/9W_6X2J-5vPYQyL4mszMQI3y8kMngHuroCWTY09K-N2cjGUzpMm0tcivjycnZV9DL6i-iYWZ_5o2SjrS7pegnucba98?loadFrom=DocumentDeeplink&ts=1234.5) And specifically, can you give us an example of some of your experiments?

BEN: [20:38](https://www.temi.com/editor/t/9W_6X2J-5vPYQyL4mszMQI3y8kMngHuroCWTY09K-N2cjGUzpMm0tcivjycnZV9DL6i-iYWZ_5o2SjrS7pegnucba98?loadFrom=DocumentDeeplink&ts=1238.81) Sure. So the domains we work on tend to be the standard things people work on in the reinforcement learning community, which is video games and simulated robots and that sort of thing. That's a limitation in Africa. It's harder to get the physical robots. And the reason we do this, people often think it's kind of weird that we get these intelligent systems to play games, but really if the problem that you care about is about making decisions, which is really what any of these endeavors is about.

BEN: [21:03](https://www.temi.com/editor/t/9W_6X2J-5vPYQyL4mszMQI3y8kMngHuroCWTY09K-N2cjGUzpMm0tcivjycnZV9DL6i-iYWZ_5o2SjrS7pegnucba98?loadFrom=DocumentDeeplink&ts=1263.9) You're playing a game of chess, you're going to make a whole sequence of decisions and the challenge there is it's not like a one off decision which looks more like supervised learning where a decision might be, is there a pedestrian or not? Is this a dog or a cat or something like this. These are decisions where it's a whole sequence of choices you have to make where you know you play a game of chess and you lose. You get that feedback signal at the end that says you lost. Now you've got to figure out was that because I messed up at the beginning or did I play badly consistently? Or was I just unlucky right at the end? So to be able to test the algorithms and methods that we're developing, you really want a situation where you can try them out. Then you could say, okay, what would have happened if I've done something different, tough way through and try the counterfactuals and the other options and so on, and although these techniques would then apply as well to making financial decisions and longterm health care and that sort of thing, you don't really have the simulation options to be able to try millions of different possibilities to say how well was my algorithm actually working against the best thing that could've happened.

BEN: [22:01](https://www.temi.com/editor/t/9W_6X2J-5vPYQyL4mszMQI3y8kMngHuroCWTY09K-N2cjGUzpMm0tcivjycnZV9DL6i-iYWZ_5o2SjrS7pegnucba98?loadFrom=DocumentDeeplink&ts=1321.001) So we need these kinds of domains and that's why video games are fantastic. I can leave this thing playing millions of levels of this thing overnight to greatest performance. So we tend to work on those kinds of settings, but because of the particularly this multitask nature of what we look at, a lot of the standard video games don't really apply it there. Right? I mean even a game like chess, there's one thing you do in chess which is to try and win the game of chess, so we tend to look at slightly more sophisticated video games but more more about simulations of robots so I can get it to pick up something or put something down or open a door and that sort of thing. And then we try and find ways of structuring the knowledge around those behaviors. Because it's very much the equivalent of some of these large image databases that people use to test their supervised learning algorithms or their object recognition algorithms. But again, in a decision making paradigm, you can't just have a data set. You've got to have something interactive like a simulator.

CRAIG: [22:54](https://www.temi.com/editor/t/9W_6X2J-5vPYQyL4mszMQI3y8kMngHuroCWTY09K-N2cjGUzpMm0tcivjycnZV9DL6i-iYWZ_5o2SjrS7pegnucba98?loadFrom=DocumentDeeplink&ts=1374.55) For those of you who want to go into greater depth about the things we talked about today, you can find a transcript of this show in the program notes along with a link to our Eye on AI newsletters. Let us know whether you find the podcast interesting or useful and whether you have any suggestions about how we can improve. The singularity may not be near, but AI is about to change your world. So pay attention.