**Kai Reimer – Artificial intelligence and the future of work**

>> Welcome to the podcast series of "Raising the Bar Sydney". "Raising the Bar" in 2017 saw 20 University of Sydney academics take their research out of the lecture theatre and into bars across Sydney all on one night. In this podcast you'll hear Kai Reimer's talk, "Artificial Intelligence and the Future of Work". Enjoy the talk.

[ Applause ]

>> Okay. The speaker would like to advise that the following talk may challenge word use, it may contain the occasional rant, strong language, and hints of philosophy. There will be no nudity. Also, I'm German. I don't joke, okay. So let me start by saying that I'm not a believer, right. I have stopped drinking the Kool-Aid. I'm not a -- I'm a party pooper. I want to put it out there. There is no artificial intelligence, okay. There is no intelligence in machines. There is, at best, what I might call fake intelligence. Any one of you ever had a conversation with Alexa or Siri? Right. Those people I talk to, when they report back their experiences, intelligence is not a word that they would use. Okay. Now, that's bad news for any of you who are looking forward to the singularity. That moment in the future where supposedly machine intelligence will outpace our own intelligence is not going to happen. And that's bad news because for those of us who had hoped that we can hand over this mess that we're creating on this planet to some higher intelligence to sort out, it's not going to happen, right. So we have to clean up that shit ourselves. So why is then that we hear so much about artificial intelligence, and the robots are coming, and, you know, all of these kind of hysteria in the media? There's three things, okay. First of all, there's quite a lack of understanding of what AI or machine learning actually is and so I'm going to look into that. There's also, of course, this sensation of this media, right, it's more fun to report on the robots coming than, you know, some boring, statistical learning algorithm. But there's also the way in which we ourselves think about ourselves and technology that make us believers in our technology and also kind of wanting to believe that we can create this intelligence and just play God, just that little bit. Okay. Now, let's take a look at what's happening in the media. There's actually two stories, right. So the first one I call the "automation hyperbole". That's the idea that we're all going to be automated. We're all going to go to the beach and some robot will do our work, right. Again, bad news, ain't going to happen, not for all of us anyway. For most of us all these productivity gains in technology so far, I'm not working less, right. Many people work more as a result of all these technologies. But there's a second story which I call the "robot hysteria", right. This is taken straight out of "Terminator". This is the Skynet scenario and I'm going to talk about that as well. So we hear a lot in the media data about how all of these jobs are going away, right. The Committee for Economic Development in Australia is giving us numbers of 40% of all jobs in Australia gone within the next ten or twenty years. Similarly, an Oxford University study 47% of all jobs in UK and U.S. gone, right. I don't know where those people are going. It's going to be very crowded at the beach. It's not funny, right. I'm German. I don't joke. So, but there's also, you know, there's heaps of those studies. And we're going to look into that and I'm going to show you why this is unrealistic. But then there's the big narrative. There's the robot story. There's Elon Musk, the founder of Tesla. There's Stephen Hawking, the physicist, who think that AI is the greatest threat to humanity, that the volvers are going to rise up and they're going to decide that once they've studied humans, they think we're completely dispensable, right, and they just discard us, and they're going to take over. Now is this likely to happen? And the answer to that is no. And that's not just me saying this, this is people saying this who are actually working on these technologies, right. Now there's Pedro Domingos. He's a professor in Computer Science in Washington University. He says many of us have tried to educate him -- that's Elon Musk -- about the real versus the imaginary dangers of AI but apparently none of it has made a dent so far. Professor Luis Perez-Breva, Director of MIT innovation teams programme, he says AI is at best an aspiration today. Now let's take a look, take a look at how this works. So I'm trying to explain to you in a couple of minutes what we mean when we say "AI". What we mean is a form of what we call machine learning. These are algorithms. But they work differently to traditional algorithms. So a traditional algorithm, what we need to do is we need to programme, code knowledge about our world into the machine. Usually we do this by step-by-step instructions so we have to give the computer the programme to then execute, right. That's typically what we do. Machine learning works like the different way. In machine learning what we give the computer is data, lots of data about our world, pictures from the internet, right, pictures that have animals on it. And so what we do is we give the computer a million pictures and we tell it which of those pictures contain a cat. And the computer will learn by readjusting internal numerical values to associate certain pixel combinations in those files with the word "cat". Okay. And so it's a statistical waiting machine. And it works really, really well. And we can use this in many different contexts. It's immensely useful. Finding cancer cells in MRI images, great. Face recognition, your new iPhone X will have face recognition, uses that technology. Great, not so great, we don't know. Speech recognition. Anywhere where there's patterns in the word that might be too complex for us to understand or where computers might just be much faster and more accurate and in actually learning those patterns. But that's it. That's what these things can do, okay. Immensely useful but not quite what we might call intelligence. And we call this supervised learning. There's a second technique, unsupervised learning or reinforcement learning has recently been in the news again with this picture. AlphaGo Zero, the Google algorithm that has learnt to play the game Go, which is known as the hardest board game known to man, has been able to learn playing the board game supposedly without any human input. Now that sounds scary as if that has done it all by itself. Of course there was human input. We gave it the rules. We let it know at every moment in time the complete state of the board. And we gave it a criteria to optimise. And so what this thing has done with brute force played millions and millions of games, trial and error, against itself. And at every moment in time it would be told if it is improving or going backwards. If it is improving the likelihood of winning the game. So doing that, doing it a lot, it learnt how to play the game Go better than any of the AlphaGo's previously who had already beaten all of the best human players. So this thing is now the best thing at playing Go. Does that mean we have created intelligence? Not at all, because that's what it can do. These algorithms are one-trick ponies. This algorithm will not decide, "Oh, you know, today I might play Chess," or, "I'm going for a hike," right, "because I want to get out into nature." No. This thing doesn't give a damn. These things do not know what cats are, nor have they any understanding of what it is to have a cat as a companion. They do not live in our world. They have no imagination. They can't think. They can't analyse what they do. They can't even explain how they come to recognise these pixel combinations in those pictures. They're essentially black boxes, right. We're making some progress understanding slightly how they might work but Go is a good example. AlphaGo wasn't able to have the customary conversation with the other player afterwards, strategizing about the game. It's only programmed to win. It doesn't actually play the game as a human would play the game. Okay. Now how come we attribute this, we call it artificial intelligence? Because these are all tasks that are associated with cognitive abilities. It's what intelligent people do, playing Go, you know, being doctors, all of these kind of things. So we think that we have created an intelligence but the thing is that this thinking is misleading and it's not helpful. These things are immensely useful but by attributing intelligence, we're actually overreaching. So we are at danger of entrusting these things certain tasks that they can't do. So first of all these algorithms are biassed. They're deeply biassed because the data that we give is deeply biassed because, guess what? The world is full of patterns and the patterns reflect our world. They reflect gender biases. They reflect all kinds of things. So by training these algorithms with the known biases that we already have, the decisions that they're going to make would just reflect those biases. And it's a hard problem because who gets to decide what is unbiased data if we're all biassed, right? So the idea of unbiased algorithmic decision making, it's a fallacy. It doesn't exist. Okay. But more importantly, these are statistical machines. They don't work with precision. So we have a problem here. If we use these machines to decide about people's mortgages, who gets parole, who to incarcerate, which neighbourhoods to police proactively because we might expect a higher crime rate, or which person to hire, all areas in which these technologies are already being used around the world, then we cannot guarantee a precise outcome because these things are most likely okay but there are statistical inferences. They have a large false positive. They have a large room for error. So any decision where we're not prepared to make the wrong decision, we shouldn't use these technologies. We should at least be aware of the dangers that these technologies carry because they are black boxes. They can't explain why you or you do not get the mortgage. All you got is computer says no. You cannot explain an individual decision with these algorithms. You can at best try to figure out what are the kind of things that these machines take into account when they make decisions. So how then come that we think about these technologies in these ways? And there's a paradox here, all right. Fundamentally what is at play here is the way in which we think about ourselves, yeah. So first of all, we think about our own minds as a kind of computer, right. Fifty years of computing has given us this idea that the mind works kind of like a computer. And this is reflected in everyday language. So we talk about our own memory, that we have information processing, we have information overload, we're downloading some information, right. So fundamentally the metaphor of the mind as a kind of computer has crept into our theorising about the mind and the cognitive signs and it also underlies the common sense way of thinking about the mind. So if the mind is indeed a computer, we should be able to build something in a computer that works like a mind, right. So that sounds logical. So that gives us the belief that we can build intelligence in machines. On the other hand, we all know that our minds are deeply deficient, right, we have all these biases. We're so imperfect at making decisions, right, and we know this because there's all these experiments that have exposed -- . If you look it up, 188 biases we supposedly have. You can go to Wikipedia. So we're deeply deficient machines and that lets machine intelligence actually look like a great idea because supposedly we can build unbiased decision machines that are better than us. But there's a fallacy in this as well. And the fallacy is that we're using the wrong yardstick. The way in which we think about the human mind is against an artificial view or miss of rationality that decisions should be unemotional. They should be purely economic, rational, essentially what you get in the experiments that economists run.

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>> But those experiments and some exceptions in the real world are the only situations where that actually happens. Think about where you make decisions in your life. Most decisions are not like that. We do not have full information. We do not know the rules of the game. We do not know what the optimal solution is. We have to make decisions living our lives forward. We can't go back in time and hire the other person and see what it would be like, right, whether we made a mistake. So decisions are essentially commitments. They are commitments and they need expertise, judgement , emotion, imagination, intuition. Incidentally, all of the things that we have come to think about as deficiencies that we want to do away with to go and reach for machines. But those machines don't work, right, as we've just seen. So what then can we do? Where do we go from here? So my view is we need to recover the notion that intuition is actually something valuable, intuition in experts that is, because it's expertise. It's judgement , right. It's not you and me having a hunch about the weather. It's trusting the expertise of the experts surrounding us: Doctors, teachers, you know, professionals of all different nature. And the problem is that if we don't trust people because we think we're all deficient, we're all biassed, you know, then what we're building is, we're building these organisations that are full of rules, that try to control people because they can't be trusted. We're building bureaucracies that stifle expertise, where teachers and doctors have to fit in forms in the name of accountability. They can't actually exercise their expertise. They have to live in these machines that we're building. It's already a form of algorithmic management. Giving it to the computer has been only the logical next step. But there's a problem in that because these organisations that we built, they become incapable of changing. They're not agile. They're not responsive. They're not able to actually change in the face of external market disruptions because no one is allowed to exercise their judgement or to think because we've built all these rules surrounding them in order to control their deficiencies. So what I'm saying is we actually have to recover the idea of human expertise. We have to free experts from the cages that we build around them from these algorithms, these rules. And we have to then team them up with machine intelligence, right. It's not about replacing the doctor and their diagnosis with an algorithm. It's giving this algorithm to the diagnostician because they have the judgement and the algorithm can detect the pattern, right. We need to team up humans with these technologies rather than making it an either or, rather than making it a story about replacing, about, you know, making people redundant, about making it about automation of work. We don't need automation of work. We need augmentation of work. We need to see these things as the tools they are, right. Scary stories about robots or fallacies about intelligence in machines doesn't help, right. It doesn't help because it misguides research. It creates false hopes. It creates false expectations. And it also leads to the problem that I mentioned that we're attributing intelligence to something that is not intelligent and entrust it with decisions that they can't actually make. Okay. So we need to rethink this. So where do we go from here? What is the future of work with AI? Will we see some automation? Yes. We will see some automation, right. And we will see the changing of some professions. So which professions are going to change? Now, [Inaudible] White, who's now the Chief Scientist of the UK Defence Force, he also has a role at the University of Sydney, he has recently said on one of our "Sydney Business Inside" podcasts that it will hit those type of professions hardest that do not have to do with people. Anything that doesn't have to do with people, machines can do best, right, because people are messy. Right, we live a life. We're unpredictable. We're also busily recreating and changing our world. Algorithms can't cope with that because they can't think, they can't keep up. They have to be retrained every time. They're not good with change. So mining, agriculture, these are areas that will be automated and are already largely being automated as we speak. Incidentally, these are things that will hit rural Australia harder than the cities so that will create problems. There's a danger in that, right. So think about social inequality. Anything that happens in a city where there's lots of people like self-driving cars, not so likely he says, and I agree with him. But there's also a third type of work, the type of work that has purely to do with the manipulation of information, like in finance jobs where work is already like working like a computer. It's very mathematical, right. Computers are better computers, that's a truism. So any of those works will see a lot of automation. But for example, the law profession which has been put forward as one of the big candidates for automation is not so likely. There's recently been a study from MIT which it says it's about ten percent of all tasks in the legal profession can be subject to automation to date. That isn't a lot but it also might change the profession because it might hit those entry level jobs the hardest, those jobs that graduates would take. So that might actually mean that we have to retrain, rethink the way in which we do apprenticeship in those professions. So there will be changes, yes, absolutely. But the changes will not be, you know, these ones here, the Skynet of "Terminator" is not what is going to happen. But also those changes are not inevitable. The future is not something that happens to us. Technology is not something that happens to us. It's up to all of us to be educated about this, to have a say, and to go back to our organisations and try to build organisations that actually bring to the fore human expertise and team them up with machine learning as a tool. Because I fundamentally believe that those organisations would have a competitive advantage who are able to channel and harness human expertise in a genuine way, yeah. Now I want to close with one of those quotes. Physicist Haim Harari says, "I am more concerned about a world led by people who think like machines, a major trend in the digital society." So he thinks that we're achieving the goals of machines thinking like people from the wrong end, that we become more like them because we are encaging ourselves in these algorithmic management structures in the name of correcting our human deficiencies that are, in fact, at the heart of what makes us human and also at the heart of what makes us good experts in our fields. So that's something that we should think about. So fundamentally I think AI, and machine learning, and the things that are happening around us, they're a great opportunity to rethink what we mean by intelligence and to recover who we are and what we mean by human expertise. And then use that as a positive force to using those tools going forward, all right. Now, and on the off chance that I'm wrong about all of this and the robots are indeed coming for us, right, here's three tips. Okay. Listen carefully, you might need it. First of all, when the robots are approaching go change the Wi-fi password, that will confuse them.

[ Laughter ]

Second of all, approach them quickly, push them over, and flip the switch, right. We should all be fine. Thank you.

[ Applause ]

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