

Santa Ono: Broadcasting from the University of British Columbia, where volleyball players practice at War Memorial gym, this is Blue and Goldcast.

[music]

Santa: I'm Santa Ono, the President and Vice-Chancellor of UBC.

Jennifer Gardy: I'm Jennifer Gardy. Professor with UBC School of population and public health. Blue and Goldcast is a monthly podcast where Santa and I talk with people at the university about some of the big issues in higher education, and today we're talking AI, Artificial Intelligence, and what some people are calling the fourth industrial revolution. What do you make of this, Santa?

Santa: I have to say with the research supercluster in Canada being based in Vancouver, with artificial intelligence being one part of that supercluster, and with the tremendous revolutions occurring in many different sectors from transportation to including aviation and aeronautical, that this artificial intelligence will impact everyone's lives, and we have to be ready. We have to think about how it affects current jobs, and how we train our current university students to be part of that ecosystem.

Jennifer: It's a really exciting time, you know, whether you talk about it as AI or machine learning or even broaden it to include data science. It really is transforming our lives. I think for our students, for our staff, our faculty, it's a transformative technology at the university level and beyond. I'm personally really excited to talk to today's interviewee Alan Mackworth. He's a prof here at UBC, he's doing absolutely incredible work. The stuff that he's doing, I think, is really going to transform people's lives both here at UBC and beyond.

Santa: I'm really excited that Alan actually is part of this because he's the founding father of AI at UBC. He's internationally renowned. He has really interacted with me, talking to me about the importance of investments in this area as a university, but also bringing people together not just at UBC, but at UVIC and SFU, and BCIT, so that we can really maximize the total human capital we have in British Columbia.

Jennifer: Let's jump in and start talking AI.

[music]

Jennifer: Alan Mackworth is an expert on artificial intelligence and a professor of computer science here at UBC. Alan is probably best known for launching a tournament called RoboCup, where robots play soccer. Today, we want to talk to him mostly about a different project, his quest to build a smarter wheelchair.

Santa: Alan, thank you so much for being part of this podcast. Thanks for all that you do at UBC to make AI front and center and also for your leadership in the province and nationally and internationally for that matter. Let's start off with just a general question for everyone. What exactly is AI?

Alan Mackworth: Well, artificial intelligence is the study and design of artifacts that act intelligently. Of course, what do we mean by intelligent? By intelligent, we mean that they act to achieve their purposes, they may have preferences on the kinds of

worlds they want to make happen, and they act accordingly. I mean, we claim to be studying intelligence generally. The fact that we can design mechanisms that act intelligently means I think that we're constructing a science of artificial intelligence. It's really, it's a funny discipline. It's Science and Engineering.

We're exploring the mechanisms that make intelligence possible. We do that by constructing artifacts, or we actually build things that work, maybe just as prototypes. Then the engineering is to take those prototypes, take them out into the real world, and make them effective, act intelligently, satisfying users' desires with good user interfaces, and so on. That's the engineering side of AI.

Santa: Alan, I'd like to say that a lot of people are excited about AI, and they can see it's actually being integrated into many different sectors. There's enthusiasm at many levels especially with young people, but there are also individuals that are, there's some trepidation about perhaps losing jobs or computers or machines or robots actually gaining an upper hand on human beings and even conversations about bringing in ethicists and social scientists into the equation sooner than later. What do you think about those concerns?

Allan: I think they're very valid. I think every time we, as humans, develop new technologies, there are massive concerns. Socrates was concerned that developing printing would allow us to forget how to remember things, an external memory, the same thing is happening with iPhones, we just now consult our iPhone when we forget something. Yes, it changes the balance of humans and artifacts. I think there are real concerns, ever since the Industrial Revolution about the way jobs shift, the shift from agriculture to industry, people moving into the towns, cause huge social effects.

I think we'll see similar disruption with artificial intelligence. I mean, I think we have to be very concerned, very prepared. The very structure of our economy may change, the notion of a job may disappear, as the gig economy takes over, and so on. We have to think about ways of distributing the wealth that AI and robots will produce equitably throughout society. Otherwise, we're in for huge social disruption, so on. I think it's a very valid concern.

Jennifer: I want to talk to you about the wheelchair you've been working in your lab because I know a lot of our listeners are going to have personal experience with this, maybe their parents or the grandparents. For those who don't, the way it works now, most people with dementia aren't allowed to have motorized wheelchairs. Their caretakers are afraid they're going to drive down the stairs or smash into the neighbors or something. For many people, the day they get their chair taken away from them is also the day that they lose a lot of their very basic human freedoms.

Now, when the caretaker wheels them in front of their TV, they can't go get a cup of tea, they can't take themselves to the bathroom, or go visit their friend without help. This is what is so exciting about your project. You and your team have been working on a chair that will let these people wheel over to their friend's room but will intervene if they try and smash into a table of people playing cards or fly down a flight of stairs.

We're going to ask you some questions about these wheelchairs in just a minute, but first, I'm going to play some clips from a demonstration that you gave to our producers Erin and Sam.

Speaker 2: Alan, where are we now?

Alan: Okay, we're in the lab for computational intelligence, which is part of the computer science department, and [unintelligible 00:07:22], we cleaned up the mess just for you [chuckles].

Jennifer: Your lab is basically just a normal communal workspace. There's a lot of computer equipment lying around. There's some desks, a kitchenette. You've cleared out most of this stuff and set up what's essentially a wheelchair obstacle course. There are paper targets attached to the wall, small openings between desks. In the middle of the room, two of your graduate students, Jocelyn and Ariana are standing beside a motorized wheelchair.

Speaker 3: Okay, well, we have the standard power wheelchair, Permobil M300. I think it's a very common model. Essentially, the hardware changes that we've made is the joystick change. We need to be able to record what's coming from the user and the two lasers. Those are for obstacle detection and collision avoidance.

Speaker 4: Are these lasers good enough that if I was trying to get hit, is it--

Alan: It would react in time. I mean, they react in real-time, they detect you and stop the wheelchair.

Jennifer: We asked to see how your chair actually works, so you let our producer Erin sit down in it, and then your students told her to try it out.

Erin: All right. Okay. I just start, it's ready to go. Okay, here we go. It'll be able to get me through this like a tight corner here?

Speaker 5: Through between the desk there?

Erin: Yes.

Speaker 5: You should be able to navigate through there.

Erin: All right.

Alan: There have been many, many smart wheelchair projects in the past. They almost all tried to be super smart, and they just drive around like a piece of baggage, and people don't want that.

Speaker 3: The maximum speed.

Erin: It wants me to go this way. If I try to go the opposite way.

Speaker 5: Try driving straight ahead and see what happens.

Erin: Yes, it's not going to let me do that.

Speaker 3: How does that make you feel? It's [unintelligible 00:09:25] control.

Erin: Yes, it's definitely more frustrating.

[ding sound]

Speaker 5: That that little ding meant that you achieve the goal location.

Alan: you got the goal.

[laughter]

[music]

Alan: As an academic, you work on algorithms, as computer scientists, we develop algorithms, and we publish papers, and we show demos. It's rare that you actually get to work on a project that has a real impact for real people in the real world, and that's, to me is the most important emotional satisfaction in this work.

Jennifer: Alan, where did the idea for this smart wheelchair project come from?

Alan: Yes. Originally, we had a lab for computational vision, and then we became the lab for computational intelligence. In that lab, we developed and some of my colleagues, developed some of the world's best computer vision systems. We had developed robot soccer players and that was great fun, and certainly, kids got really excited about building robots that could play soccer. We thought maybe there's something a little more socially useful we could do with our talents.

Actually, it's a personal story because my mother suffered from early-onset Alzheimer's, and she was confined to a long term care facility. I saw there that people in wheelchairs, especially the ones that had early-onset or mild dementia, were often confined to manual wheelchairs. They weren't allowed to have a powered wheelchair, even if they didn't have the strength to operate a manual chair, because it was dangerous, some became irascible and unpredictable. They might drive their wheelchair into someone else or into the wall, and so on.

Confined to a manual chair means you're just sitting there watching TV most of the day unless you can get someone to drive you around, you can't move yourself. We thought we could use computer vision and other AI technologies which are just becoming feasible at that point to use, we're just getting to the state where the technology was right. The idea was not to build a completely autonomous wheelchair that would drive someone around without their control but to give them as much control as possible.

We talk about shared control where the user is driving the chair, but the chair is constantly sensing where the chair is, what the dangers are. Also, the state of the user, is the user alert and paying attention to what they're doing or not. If there's any danger, the chair just intervenes and for example, won't allow the chair to be driven into the wall or another person. That was the basic philosophy and we were able to develop prototypes.

This is with my student, Pooja Viswanathan who has now started a company in Toronto called Braze Mobility based on this technology, she's doing very well. She developed the very first prototypes that were quite successful. We demonstrated them in various long term care facilities in Toronto and in Vancouver and got them to the prototype stage and now they're moving to market.

Jennifer: What did it look like to see people testing the chair in those long term care facilities? Could you see the difference it was making in their life?

Alan: Yes. Not all of them liked the chair, to be honest, and we were very careful not to bias their opinions. We did quantitative studies, but also qualitative research. Most of them were excited and said, "Can I buy one now? I want one." We had lots of calls from the public once it's hit the media that where can I buy my chair? We have to explain these were just prototypes that weren't safe yet, we have to go through various ethics boards and so on to prove their safety. Still, we didn't want to release them.

Most were very strongly favorable and excited and wanted to participate. We have one who was an engineer who was suffering from both Parkinson's and some dementia, who participated in the early design of our next prototype. That was really exciting. He was so excited, he really wanted one. His main use case was that he'd have a sing-song, in the afternoon, in the long term care facilities. He often gets there late because he had trouble navigating with his chair. It was always a big circle of chairs and he had to navigate backwards into a very tight slot.

He said, "If I only could get the chair to do that." My next student was Bikram Adhikari, who actually developed a Back in parking solution just for him, and it worked well. That was exciting. Others said, "Actually, I don't want to be wheeled around by a robot. I find it frustrating when the robot interferes with me." We had that to worry about. The form of intervention had to be carefully modulated.

Others said, "When I'm in my manual chair, an aid worker would come by and move me around, and I can also talk to that person." That human contact, we have to be very careful when we introduce these robotic systems not to reduce the level of human communication and contact. We designed that into the next stage. We have to be careful about their effects.

Jennifer: Alan, can you tell us a bit about the things that people can do with this chair that they couldn't necessarily do before?

Alan: There's something called the wheelchair skills test, okay, which has been developed by occupational therapists both for manual and for powered wheelchairs, we've developed at Dalhousie University. That involves things like getting in and out of an elevator, coming to a table, and getting the arms of the chair under the table so that you can actually eat your meal, going down the corridor, and then suddenly someone runs across in front of you and you have to stop or avoid them.

Challenges like that, going through an obstacle course, people have to pass that test in order to be certified for a powered wheelchair, for example, and often the people we're working with won't pass that test in the past. Those are the things they can do now they couldn't do before. Especially if you have a motor disorder like Parkinson's,

navigating through a very tight space like a tight doorway, or whether it's cluttered furniture or getting in and out of an elevator, the chair can assist you either give you a prompt, without taking over or actually take over and do it for you if you ask it to.

Santa: Alan, you've talked a little bit about how complicated and how integrated the approach has to be to designing these chairs and you're in a university that's multidisciplinary, with a world-renowned center for brain health, with world experts in Alzheimer's and Parkinson's, can you talk a little bit about how important that is for you to have that community of individuals to interact with?

Alan: Yes, indeed, it's been a pleasure. It starts with just integrating the computer scientists with the engineers. In the old days, computer science used to be in the middle of the campus. We were building a new building and we were trying to decide do we want to be near the mathematicians or do we want to be near the engineers? What's the future of computer science? This was many years ago, we decided to move down to the south campus where the engineers were, right next to the electrical, computer engineering, mechanical engineering.

Then we formed ICICS, the Institute for Computing, Information and Cognitive Systems. I snuck cognitive systems into the title when we did that because I knew that was important. Just starting at that level of integration was a change, getting outside your discipline was difficult for many people. That umbrella organization has helped us in many ways. I'll say we work with Bill Miller, who is an occupational therapist, Professor in faculty medicine, and he works in long term care facilities. He has worked on wheelchair technology for a long time and rather than just us going in as complete, naive idiots saying, "Well, we know we can automate wheelchairs, let's just do it."

He made us much more aware of the practical difficulties of the real concerns of users. We had a project called CanWheel which was across Canada, working with people at Dalhousie and McGill and Toronto, Toronto Rehab Institute, who also work carefully with users of these technologies. That cross-disciplinary effort is really important and having people in brain health who were actually studying the causes of Alzheimer's and the symptoms and the need to deal carefully with patients in this situation has just been invaluable for us.

Santa: Now, Alan I just want to say that at the beginning, I saluted you for your leadership not only here at UBC and in computer science, but in the province and in the nation. I've had the privilege of working with you and I'm going to do my best moving forward to continue to support you and your colleagues in what I think is going to be a critical technology but also intellectual activity on this campus and beyond. Can you speak a little bit about your thoughts about the research supercluster, and about your organizing really center without walls between researchers at UBC, but also at SFU and UVIC, and how you think those sorts of institutional collaborations are going to be important for this region?

Alan: Certainly. Thank you, Santa. I do appreciate your support. It's always nice to have a champion. As you know, there is a national strategy for AI, which is funded through the Canadian Institute for Advanced Research, they funded work at McGill, Toronto and, and University of Montreal and University of Alberta. We are also going to get funding partly thanks to your support.

We will also be getting funding at UBC through that program, through various affiliate chairs and so on, which is great. We need to raise the profile of AI at UBC. That's why we started CAIDM, Center for AI Decision Making action, and now Kevin Leyton-Brown has taken over as the director of CAIDM and he's a really young exciting researcher in AI who does fundamental basic research and applied research in computational sustainability. That's part of the puzzle but also we need to reach out beyond UBC. We're involved in creating what we're calling the AI Network for British Columbia, AIInBC. Which involves Simon Fraser, Greg Maury, other people at SFU, but also a lot of companies. I know about 160, 170 companies in British Columbia that are working in AI, using AI, or during research and development in AI. We're forming this network with people at D-Wave and Quadrant and 1QBit and so on, as well as the big players like Microsoft and SAP, to form a not for profit that will be an advocate for AI within the province and nationally, to raise the profile, but also to encourage more collaboration between the universities and industry.

I think that's where the Canadian Digital Technology Supercluster, comes in because they explicitly have AI as one of their mandates as well as AR and VR and so on, blockchain. There will be projects and part of our networking effort is to allow people to form collaborative groups that were put in for funding from the Supercluster. We need to bring in people from UBC Okanagan, which we're doing and from SFU, Surrey and from UVIC and from UNBC so on. There are people everywhere, AI is just hot.

Everyone is excited about the potential. I think some of it is hype, but a lot of it is real. We need to pay attention, we need to put our resources behind it. Canada, as a country, needs a better national strategic plan and I intend to be part of that conversation and I hope you will be too.

Santa: We will be. Alan, thank you so much for being a pioneer, understanding and having the vision of where AI was headed before it was even called AI. Thank you for your leadership in positioning this university in this region, to be a leader. Thank you so much for being on, Blue and Goldcast, today.

Jennifer: You can find links to Professor Mackworth's work at our website, blueandgoldcast.com.

Santa: I'm Santa Ono.

Jennifer: I'm Jennifer Gardy.

Santa: You're listening to Blue and Goldcast, a podcast from the University of British Columbia. Back in one minute.

[music]

[ringing]

Voicemail: Hi, you've reached the voicemail box of the Blue and Goldcast. We can't come to the phone right now, but if you're an artist or musician at UBC, please, leave us a message telling us about your work right after the beep.

Missy D: Hi, it's Diane Mutabaruka, also known as Missy D.

[music]

Missy D: I'm a hip hop, rap, and soul artist. I did go to UBC before. I used to be a student, I graduated from a bachelor of science. Hip hop is what I love, what I do, and what I'm about.

[music]

Missy D: I try to mix it up, whether it's the trappy vibe, whatever 2018 sound to what I used to listen growing up, the Tupac Shakur.

[music]

Missy D: I used to say it's my side hustle, but really, it's become like my second job. I wanted to go to the point where I'm able to invest back into my music. Yes, I believe in that and I believe in dreams and making them happen. Let's do it.

[music]

Santa: Welcome back to Blue and Goldcast. I am Santa Ono.

Jennifer: I'm Jennifer Gardy. Now, in the back part of each episode, we take a moment to talk about ongoing projects here at UBC. Santa, we've recently had a pretty special time on campus, it was the first day of classes. Were you able to get out there and meet all our new students?

Santa: Absolutely. Actually, I interact with all 7,266 first-year students at Imagine day at the pep rally-

Jennifer: A hug for everybody.

Santa: - at the ice hockey arena. It was fantastic, the energy that's evident there is just infectious. It's a great way to start off the year, here in the Vancouver campus. We have this very similar kind of pep rally in the Okanagan called Create. I'm still excited about the energy that was in those two auditoriums.

Jennifer: I just love the buzz on campus, around the first day of school. I've always liked the week leading up to that, where you can feel the palpable energy amongst the faculty and the staff like, "Oh, they're coming, we better get ready for the students." Then on the first day, it's just this tremendous release, there's all this enthusiasm and excitement and cheers and packs of roving students. The campus is just a gorgeous, buzzing, incredible place on that first day.

Santa: Absolutely. Right after the Imagine day, as you know, all the students are on Main Mall and there are several hundred booths of different clubs and organizations that they can join. Their energy's amazing, on Main Mall and also in the Okanagan. What happens is that, you have all kinds of groups. You have groups that are involved in athletics and recreation, they actually welcome all the students, they have this huge arch and they give everybody high fives and there's that kind of energy.

There are also very serious groups that are focused on sustainability and support for sexual assault victims, for example, as well as organizations that are involved in all kinds of cultural activities. It's really a great way to start off the year.

Jennifer: I remember my first day on the UBC campus, it was September 1996. We didn't have any of these big campus-wide events, but it was still incredibly exciting. Feeling like you were part of a new community and that you had four years of adventures in front of you.

Santa: I'd say that one of my greatest joys is to see the smiles on their faces. There's something, like they're in a candy shop as a little kid, as they walk around from booth to booth. As you know, they've worked very hard to be admitted at a school like UBC, their parents are proud of them. It's mixed also, with a little bit of being scared. What I'd like to say to the students is that "If you're feeling a little bit scared, it's normal, that means you're about to do something very brave."

I remind them about the first time they had to ride a two-wheel bike without training wheels and when their parents let go of the seat and how eventually, they learned how to do it. I tell them that the same thing is going to happen here at university, though they might be scared and they might feel homesick and things might not be perfect, for the first set of homework assignments or even exams, but to believe in themselves because we believe in them and that we're here to support them.

Jennifer: What's your wish, for all of these students as they go for it in their time at UBC?

Santa: My wish is that they will learn much more about themselves, allow themselves to be who they are, to allow themselves to be the best version of themselves as opposed to what someone else might want them to be, to really find their gift and their passion and to pursue that. While they're here, that they transform themselves into someone who can take that gift that they've found and discovered here and give it away.

[music]

Jennifer: That does it, for the October edition of Blue and Goldcast, you can find links to our guests work as well as previous additions of the show at blueandgoldcast.com.

Santa: You can also subscribe to our podcast on iTunes or anywhere you get your podcasts. Just search, Blue and Goldcast. While you're there, give us a rating and review, it helps more people discover the show and learn about UBC.

Jennifer: If you have a topic you'd like us to cover, an artist you'd like us to feature or you just want to ask me or Santa a question, send us an email at feedback@blueandgoldcast.com. You can also tweet at us. Santa is @ubcpres with a Z and I am @jennifergardy.

Santa: We're back with a new episode next month, thanks again for listening.

[music]

Santa: We're back with a new episode next month, thanks again for listening.

Speaker 6: That's great. Give me one more, "Thanks for listening."

Santa: Thanks for listening.

Speaker 6: One more.

Santa: Thanks for listening.

Speaker 6: Okay.

[laughter]

Jennifer: That was so cute.

[crosstalk]

Santa: Was the last one better?

Jennifer: That was beautiful.

Speaker 6: The last one was better.

Jennifer: It's golden.

Santa: But not perfect.