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(Jessica) Hey everybody

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welcome to what do scientists do today I'm joined by our very special guest could you

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give us your name and your pronouns please?
(Matt) Sure hello my name is Matt Peachey

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my pronouns are he and him
(Jessica) And Matt what do

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you study or do that's science related?
(Matt) Sure so I am a computer scientist and

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one of the things that I study that I'm hoping to talk to you about today is called machine
learning

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(Jessica) So what is machine learning?
(Matt) So machine learning is pretty

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simply it's how we make computers be able to make decisions without explicitly

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telling them what exactly we want them to do.
(Jessica) So instead of giving them code and

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they do the code you set them up so that they can then make their own decisions that's really

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wild I think Lindsey talked about it a little bit in our episode on biomedical engineering actually

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which was very cool but what are some other examples of how you could use machine
learning?
(Matt) So one interesting application of machine learning is called a classifier and we use it to make decisions about the type of thing that something is and so a great example is if you were to show a computer a picture of a dog would it be able to know it was a dog or if you showed a picture of a cat would it be able to know that it was a cat? um or thirdly if you showed a picture of some other animal like a whale would it be able to know that it's not a cat and it's also not a dog?

(Jessica) That's super cool and have you gotten to play with machine learning at all? What do you study specifically?

(Matt) Right so what I study specifically with machine learning is how machine learning can be used to interact with musical instruments and specifically digital musical instruments.

(Jessica) So what does that look like? How could it help out I guess musicians? Is that the people who would use what you're learning?

(Matt) Certainly so that's definitely one of the things that can be done um like I said machine learning can be used uh to make decisions with computers without telling them exactly what you want them to do so one way you could think about that is if a user or a musician was to play with an
instrument in a certain way the machine learning would then be able to then generate or decide
what type of music it would want to play without you actually telling it I want you to play
maybe some noise that sounds like a piano it would be able to figure that out for itself.

(Jessica) And you may or may not be able to answer this question but how do the computers
learn?

Because computers are just machines right?
(Matt) Yeah so that's a great point and is
actually one of the most interesting parts about machine learning and the so the way that works is

it works by giving the computers lots and lots and lots of examples so thinking about the cat and dog
again just for a second the way it works is if you were to show the computer a picture of a dog
you could then use code like you talked about to tell the computer recognize this picture of a dog.

But then the issue is what happens if you say show it a picture of a different dog whether
it's a different breed or a different type maybe a different size? Then the computer
wouldn't recognize that one particular image and so what you have to do is give it a picture
or a whole bunch of pictures of many types of different dogs from all sorts of different angles,
as many pictures of dogs as you can show it and say these are all a dog. And so then when you show it a new dog hopefully if you've trained your machine learning to recognize what a dog is it'll be able to tell you that yes this is a dog.

(Jessica) Yeah so for listeners at home one of my majors is psychology and that sounds very similar to how people learn obviously it's a little more complicated than just that but I mean people learn by just looking at a ton of different examples. I love developmental psychology which is studying how we learn and grow up and babies do very similar things where they look at tons and tons of examples and they might at first think that the cats and dogs are the same but later on they figure out they're not the same.

So it sounds very similar to people to me which is very interesting. Do you have a favourite science related thing that you've ever done?

(Matt) So one thing I can think of is another interesting use of machine learning which is you're able to use cameras to recognize what they call pose estimation and basically what that means is it can tell if you're standing and looking at the camera if you're waving your arms or if you're shaking your head. It's very similar
for anyone who's used it to the Xbox Kinect and so it's using very similar technology to track your motion. And the interesting thing that I've worked on is what you can do is you can take the motion that you've captured and then apply it onto virtual avatars of people or other creatures in either virtual reality or augmented reality or video games and what you're able to do then is to see the same motion that you've made in your camera on a virtual screen.

(Jessica) That's super cool is that how video games like Just Dance and stuff work? Or is that different?

(Matt) So it's very similar and it depends very much on the game. I'm not familiar with every single one but I know for sure that some games definitely do. Especially newer games as machine learning's become more popular.

(Jessica) That's super cool I'm just thinking of now in movies when they do the motion capture and they have to have all the sensors on them and then they turn Benedict Cumberbatch into a dragon um is that the same technology or is this a better version where you
wouldn't need to wear all the sensors?
(Matt) So I don't know if I would call

it a better version but it's a different version in that you're right you don't have
to wear all the sensors and instead with the way the sensors work is it's actually locating
the sensors and then using the computer to simply map where those sensors are
exactly but then with pose estimation what you're doing is using machine learning and the
computer

is predicting and estimating uh where you are without any markers at all so two different
ways of doing it but achieve similar results
(Jessica) Yeah that's super cool you can kind of
do more with less in a way like somebody could film stuff in their living room and a computer
could turn it into motion instead of needing a whole studio or something or fancier equipment.

And how did you end up studying this thing Matt? What does it

look like to do this kind of research too?
(Matt) Sure so I started um by doing just regular

old programming in my computer science degree at Dalhousie and one of the things you learn
about is

how you can apply and use computer coding as well as some statistics to make machine
learning work.
And so there's a whole bunch of fancy programming and computer coding that you can do to make it work but essentially what it comes down to is just like I said giving it lots of examples uh showing it what you want it to do and then letting it learn about how you do it. And so there's lots of interesting research being done in this topic both at Dalhousie and at all sorts of other universities and companies all over the world. (Jessica) Yeah so what's interesting is you do this as research right? In the same way that a scientist in a lab might be trying to answer a research question by with like test tubes and pipetting when they have the liquid going into tubes but you do computer science research which is different from people or might often be different from people who do it for a company. What's the difference between those kinds of computer science jobs? (Matt) Sure so like you said the main difference is really that research is very experimental in that you're trying to find out new things, how things work, how things don't work is an okay result of research. But typically when you're with
a company you're trying to develop some sort of product. Something maybe like a self-driving car

or some other application that uses machine learning. And in those cases it wouldn't

necessarily be okay for it not to work you would need it to work all the time. And so that's

definitely one big difference between the two.

(Jessica) That's super cool do you have

any advice for people who might be super interested in going into computer science?

(Matt) Sure for sure the the biggest piece of advice that I could give is to not be intimidated

by programming, by math, by any of the things that computer science you think about because

like a lot of other things no matter how old you are or what your background is with a

bit of practice you're able to get very good at doing it and very quickly as well. So following

up with that advice it's certainly there's lots of resources available, lots of opportunities to

learn, and so just start slow and you'll be uh you'll be getting there very quickly for sure.

(Jessica) Yeah and things like we mentioned this in Shane's episode but things like scratch

if you're i mean if you're anyone scratch is fun but if you're a kid you should still be able to

use the website scratch I think it's scratch.edu and it is made for people who would know
nothing about computer science and you could still play around with it

and even make video games and do all sorts of cool things. I'm someone who doesn't have very much experience with coding at all and so I still have fun when we do scratch things at Supernova because

I'm learning as well along with the kids who might be doing activities. Well thank you so so much for joining me today Matt that's super cool

(Matt) Thank you very much for having me as well

and hopefully everyone takes the opportunity to learn more about

machine learning as they find it interesting.

(Jessica) And as always a big big thank you to everybody listening. For more science fun you can check out our past episodes at

bit.ly/whatdoscientistsdo or you can find us on Twitter or Instagram @scientistsdopod . Do you have a question that you'd like answered by one of our experts? Send us an email or a voice recording at whatdoscientistsdo@superstaff.ca and we might answer your question on the show!

Thank you so much for listening and i'll see you next episode. Bye for now!

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