Ep.22 - Dr. Weisong Shi

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SPEAKERS

Announcer, Ed Clemente, Dr. Weisong Shi

A **Announcer** 00:01

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E **Ed Clemente** 00:28

Welcome to The Michigan Opportunity brought to you by the Michigan Economic Development Corporation. Hello, my name is Ed Clemente. I'm your host today for the show and we're very fortunate to have an expert Dr. Weisong Shi, he and you've got a long title here, but for I'm gonna say you're a professor of computer science at Wayne State University; but then you're also a Charles Gershon Distinguished Faculty Fellow. You're an Associate Dean for College of Engineering, and all at Wayne State, correct?

D **Dr. Weisong Shi** 00:58

Yes.

Ed Clemente 00:59

Well, thank you, Dr. Shi, for being here today. I've really enjoyed finding out more about you and what you do at the university. But also, I think, you know, if you're at a party, and you don't know anybody else, and they say, "What do you teach?" And they don't know anything about any of your subjects, What do you kind of tell them you do?

Dr. Weisong Shi 01:18

Well first, thank you Ed, for having me. Right. So normally, this is what we always do, particularly in, in Michigan, when I run into a party, people ask, I will first say, you know, I'm at Wayne State teaching Computer Dcience. That's a very generic, and more specifically, I work - you know, mobile computing, cloud computing, edge computing. And, you know, related topics; so I teach a distributed system, computer networking courses while I was at Wayne State. If you're talking to anybody over 40, they still won't know what you're talking about. But people are under 40 know better. I'm over that age, but I think I understand it. I'm gonna in fact let's start right into that, if you don't mind. Could you give sort of a definition, like, what is sort of the difference between edge computing, or quantum computing or even cloud computing? They're three different things, aren't they? Oh, yeah, there are definitely three different things here. So in particular, namely, starting with quantum computing, because other words, far away different from the cloud and edge computing, because, you know, quantum computing was most recently starting talking about a new mechanism, you know, how do you solve the problem language, the quantum principle behind it, and that is very different from the traditional computer science. So, in traditional computer science, the basically is, you know, you normally people get used to such as you getting a laptop at home, and then you know, you doing, you store your stuff there, and then you run some program against this data. So it is sort of like are the data processing kind of a model, you know, cloud computing, basic idea is you collecting a lot of data, for example, your photos and etc, it automatically stored in the, in a far away in the cloud, in a sort of data centers, data storage there, edge computing is most reasonably was became a hot topic is because of there is a lot of data generated at the edge of the network, quite easy to understanding is close to the, you know, the users, for example, picking vehicles example on a vehicle, you generate a lot of data, no, four terabytes of data per day, and then you don't have...

Ed Clemente 03:43

Terabytes?!

Dr. Weisong Shi 03:43
Yes.

Ed Clemente 03:44
Oh, my, I didn't know the vehicles produced that much.

Dr. Weisong Shi 03:47
They do, they do. You know, if you're looking for the future, you know the the vehicles you have the LIDAR cameras, and also, you even for for bigger truck, you saw, they have a 280 sensors, you know, monitoring the behavior of the engine. So imagine that every second, you generate this amount of data, so you don't have the bandwidth to sending all this data back to the cloud. And then you probably don't need the to because of the cost for the bandwidth, as well as the privacy concerns. So in this case, you can do this processing the data on the vehicle. So this is the easiest way to understand and what is edge computing. So basically, you process the data as close as possible to the data sources. So this way, you can get the real time response. And also you can save the cost. So that was sort of like edge computing. But I will say edge computing and the cloud computing or not, well, you know, one over another. Its they complement each other, you still need to have a cloud, you know, there, to do the centralized processing. But at the same time, you also have this, you know, edge computing will be in particular, in recent years. You're going to see more and more, you know deployment here.

Ed Clemente 05:01
So, um, I know for cloud computing, Google just did a big announcement out in California. And they talked about how that is really, we're gonna, it's gonna be a big production for them, I think to start making as a cost center, because they want to, you know, like every laptop, we get now had less storage on it right than the last laptop, is that because they're driving us more toward because more and more high profile, more data driven, that's why we have to sort of have smaller memory on our computers kind of?

Dr. Weisong Shi 05:36
Right, you are right, because, you know, today, compared with 20 years ago, that, there's a way we using computer is changing significantly, although you probably see still like a you hold a laptop with you. But the thing is, I pick a wide example, you will realize that today, if you are if you want to buy a new laptop, and then when you migrate from a current laptop to another one is probably just taking less than an hour you were doing,

you will be completely done. Because you don't need to install pretty much any applications anymore. Because all these applications are on the cloud, right? So even your email, you are not going to download it to the laptop as well. So you just, you know, configure a couple of, you know, online clients, online, username, password, you access everything. So I think that's the beauty of the cloud computing. In the near future, I will say next decade or something, you will still see the cloud computing will be dominated, penetrated into our life. Very important.

E Ed Clemente   06:41

Well, you touched on this a little bit you got two programs I'm going to ask you about but let's talk about MIST first, and you used Mobile Internet Systems Laboratory. And that's something you head up at Wayne State, correct?

D Dr. Weisong Shi   06:54

Yes. That's an interesting story. You know, before about 19 years ago, before I, I was a postdoc at NYU, in New York City. So on my way, moving from New York, to Detroit, Michigan, I took a road go to on Niagara Falls, to watch to watch the falls and then come down, you know, to Michigan. Now you see there's a huge mist, you know, always running on top of Niagara Falls. So I actually even took a picture of that, use that as a logo during my earlier days of this MIST group, Yes, that MIST there was I founded in 2002. So basically, at that time, that, you know, mobile computing is just started, imagine that about 20 years ago. So the internet, WiFi internet is going to the wireless. So mobile computing is very important, because people need to talk about energy efficiency, you know, how you're going to deal with, you can keep a phone, can continue to running for like, a day and the list and laptop, how do you save the energy etc. And then the mobile computing is, you know, you working with through the internet, even that was funded before in cloud computing was, you know, was there. So basically, we talk about the distributed, you know, you have a cloud, you have mobile device, and how you're going to be assemble your stuff onto the cloud, maintain the consistency, you know, that was a little bit of juggling in in computer science. But the key idea here is you have a copy on your local machine. And then you also have a copy in the cloud, and you might have multiple machines, and then how do you maintain consistency is a big deal. So during that time, a lot of research is on here. So once we you solve these two completely math today, you have Box, OneDrive, Dropbox, all this the core idea behind all these services is consistency. How do you maintain the consistency among all these kind of multiple applications? That was the major the research that we have been doing, during, during the for the MIST Group is a I would say is a core computer science.

Ed Clemente 09:01

So is that an actual course you teach, or is it also something you do in tech transfer with? Or is it both?

Dr. Weisong Shi 09:08

Well, the lab's name is just called MIST. And then in the class, for example, when I teach a distributed system class, we will talk about mobile computing, talking about internet and etc. So that was covered in our distributed system class, where I talk at Wayne State and the most recently when we talk about the connected autonomous vehicle, you will see that the connectivity became a very important that's also naturally, you know, we cover in the class such as a computer networking, we talk about that.

Ed Clemente 09:39

And I want to jump over to the Connected Autonomous Driving laboratory, also known as CAR and that's yours as well, right? You're pretty busy guy over there.

Dr. Weisong Shi 09:50

Right, so that was about four years ago. So when I looking for the new research directions, I realized that you know we are in Michigan, you know, that vehicle, automotive is is the, you know, is a key foundation of the Michigan economy. But we, as a computer scientist, I haven't really do anything related to a vehicle before that. And then when we, we, you saw the trend of the, I will say, in the sometime, when I give a talk, I recall that when I give a talk in the in the first year introduces this, you know, the CAR lab, we do a little bit of comparison with in our first 100 years in 1900, you know, earlier 1910, 1911 when Ford to have this Model T so basically 100 years, you know, basically Michigan is the leader of the transportation, but focus here is on the vehicle. But now, if you're looking for the next century, the other vehicles will not be alone. So vehicle has to be connected. So you can rely on this, you know, infrastructure, even cloud computing, edge computing will play a significant role for the future of this other vehicle and the transportation. So that's give us idea why we want to start this cAR lab here. Although there's I noticed there's a CAR lab in Michigan called the Center for Automotive Research C.A.R. The reason we pick this is we we think that is connected autonomous driving, we picked R there is you know, it's sort of like in same CAR, but it's different CAR that's why we are intentionally using the same name here, but we have a different meaning for the for for the next big thing here.

A   **Announcer**   11:40

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E   **Ed Clemente**   11:56

You mentioned this word a little earlier. But I find it fascinating, LIDAR, and how LIDAR might actually be better than like radar and a lot of the other, you know, what is involved with autonomous vehicles. I first heard a lie of LIDAR from archeology, when people were you know, using it to find ancient structures under dirt and things like that. But can you tell a little bit what LIDAR is?

D   **Dr. Weisong Shi**   12:21

Yes, you know, because LIDAR now is spelled as L-I-D-A-R. So basically, it's more like, how will you to define where you are, is a location it's a location; because when you do when you do the autonomous driving, the one of the key most important things, you need to know - where this vehicle is at any particular moment. So the LIDAR as you can see in some of the vehicles is on the putting on the top. So basically is keeping you know, rotating here, so that you can in real time to decide that where the, you know, the location of the vehicle is. So it is very important for the autonomous driving.

E   **Ed Clemente**   13:06

I know, it's it's a term that hear more and more, but I'm fascinated by it. But, you know, when you talk about autonomous devices, you know, devices, are you also working sort of on drones, or things that are going into space or things that are in water is that are those things that would be like that transfer of technology could go to all those applications as well?

D   **Dr. Weisong Shi**   13:33

Yes, absolutely. I think as you asked you that, I will say you know, when we talk about autonomous we we usually means something like drones is a flying - you know that they also have multiple drones, they need they need to autonomously running each other. They talk they need to have a protocol talking to each other. And then although majority of the people are thinking about it on the ground because you know, we talked about automotive and even on the ground you have two things the one is outdoor, the other one is the indoor - indoor is is different from the outdoor scenario because indoor you need to

be more accurate, you know, the location at a particular the LIDAR technology is useful for outdoor that they can help you to, you know, LIDAR detection and ranging detecting objects and etc. For example, for the indoors that you don't have a GPS will come with it so that you might need to have something else you know that to build a...

E Ed Clemente   14:30

So like in a factory like something that's like a automation, you know, like Amazon uses a lot of in in-house robots.

D Dr. Weisong Shi   14:38

Yeah, yeah, because otherwise your GPS will not work. So you have to rely on something else to determine the location.

E Ed Clemente   14:45

So they're using like RFID or something or radio frequency or something else, right?

D Dr. Weisong Shi   14:51

Right. Right. Yeah, that itself is a very interesting is another topic. How do you determine the localization again, its localization related similar, and then the last thing you mentioned is on is in the water. So I think Michigan has such a large water and resources here is a good is a very good opportunity that, you know, for us to look at even, you know, water, one of my colleagues is in Mechanical Engineer is, his group is working on autonomous, you know, the boat so that boat to carry on this rivers and etc.

E Ed Clemente   15:26

You touched on this just a little bit, but I know it's a hot topic, especially not too long. The cybersecurity, and I know that ties in to some of what you're talking about when you're collecting all this data, you know, of cars, you're worried about getting hacked in, especially if they're autonomous, right. So that's got to be pretty, pretty big chunk of what you got to work on too, right, cybersecurity prevention kind of things.

D Dr. Weisong Shi   15:49

Exactly, as you know that the news in the last less than a month, right, the Colonial Pipe,

and then most have recently the JBS, the largest food production, all of them are shuttered the plant due to this a cyber attack, seemingly, that the vehicle also have the same thing. So that once a vehicle has been connected, although you can create a lot of advantages to the to the vehicle, however, you also expose yourself to the attackers. So that's why that, you know, you we have some ongoing project is a collaboration with some companies DOE funded is talking about, for example, electrical charging, charging network. If the charging network has been attacked, okay, we imagine that all the all of the vehicles, we can't move anywhere, because because you can't really charge your vehicle anymore. Assume presumably, by the year 2035, if all of the vehicles are electrical, and then this network has been attacked that what do we get we're going to do with this. So I think a cybersecurity is a very important topic, and at Wayne State we also have in the Cybersecurity Graduate Certificate Program. Basically, is we need to educate, you know that next generation workforce, even you are not expert on this area, but you need to be aware of that there's a potential, you know, risk here, you have to deal with.

Ed Clemente   17:17

And that's part of the purpose of the podcast, I might add is that, you know, things move so fast anymore. We're trying to also make sure that this podcast is somewhat educational, for anyone that might be involved in any of these kind of pursuits, because you got to be aware as you invest money, and, you know, you don't want to be leapfrogged by technology, because you forgot to do something. And that's why people got to pay attention to folks. You know, you brings up we're getting I'm getting down in the last couple of questions here. But one thing I really want you to touch on a little bit, though, is your wireless health. I know that you have done a lot in the sort of, I don't know if there's interest in wireless health and telemedicine, but I think they're similar, but maybe not the same?

Dr. Weisong Shi   17:59

Okay, yeah, I'm glad that you asked you this, that this is, again, we come from the technology side. So by about wearable sensors, you know, this technology is also fast with developing at Wayne State we have several colleagues working on biosensors, putting in your ear, you know, non-invasively measure your heartbeat and etc. So now with this devices, we can do a lot of things, for example, in the senior homes, you don't need to monitor everybody measure the temperature, there's a camera sitting here, everybody will you pass by we can we can sort of get in this, you know, what was the temperature of the of this individual. So with this kind of sensory, you know, sensor data available, that you need to collect this data, combined with some other factors like an EHR, and then you do this either edge computing such as on the you know, on on the hospital, or maybe you

doing in a cloud computing is done no matter where you do, but eventually this can help to make some meaningful decisions or suggestions go back to the to the to the customer. So this was something I started in 2011. And one of my former call your colleague who is right now, he is a Department Chair at Michigan State in family medicine, and their nurse. And he and I, we sort of started this, you know, wireless health at Wayne State. Yeah, this is a trend, now myself is also the Editor in Chief of a journal called the Smart Health and basically dedicated looking for how the technology can can help to reshape the future of health healthcare.

E Ed Clemente 19:35

I even noticed it in recently, my aunt had to wear heart monitor, but it's so much smaller and lighter. Remember, they used to be really heavy and big. So but now they couldn't even transpond information then. They had to wait he got yjrm back and then they'd have to analyze, you know what was on it. So it sounds like what you're doing will be instantaneous, right? So people will know and then can make recommendations, you better go to the ER right now, whatever, you know, you get people ahead of the scale. Just a couple more questions for you. And one is the, the kind of, you're hitting on a lot of the topics, but if you were going to talk to some kids in high school, based on what you know right now, and if you could talk to yourself back when you were in high school, maybe you were already way ahead of the curve, but what would you tell kids to get into right now so that'll be a field that could be viable for a while for them as a career?

D Dr. Weisong Shi 20:32

Well, that's, that's a big question, because I do have a high school kids at home. So that is, I think that, you know, technology is changing our life significantly, you know, that we all for other kids, I would like them to no matter whether or not you're interested in STEM, you know, which stands for science, technology, engineering, and math and mathematic, you need to be, at least lay a good foundation for this. Because even you want to do business, in a partnership, you still need the understanding, you know, how computer science works, the computer science I view them today is more like just like a math, you know, as a very fundamental to all the all of your future careers. So encourage them to take at least some sort of like a basic programming courses, and etc. And then down the road, you there's many things you can do, you could do, you know, development for the new robotics, technology, you know, autonomous vehicle, obviously, here and healthcare, because those are the fundamental fundamental technologies here, it can be used to stimulate even policies, you know, you can work out how these insurance companies are going to work because insurance company, you're going to run into a big changing down the road, you know, because of this, you know, driverless vehicles, so who's going to be

responsible for that? There's a lot of things you can do, but you need to make sure that you're understanding the trends, you know, looking for the future, not not what, you know, in the past.

E Ed Clemente 22:00
Yeah, I wish I would have taken you for a class prior with the college. So I would have got that advice. So the, and I know, people might not but I know you and I talked ahead of time, but you did get your PhD in China, correct? (Yes, I do.) And so this question is more of a Michigan question. So I you've lived here big chunk of your life now. Correct. So you say 25 years or...

D Dr. Weisong Shi 22:25
I've been here are like 19 years in Michigan 19 years, Michigander now.

E Ed Clemente 22:30
So you've got kids here everything so what do you like best about living in this area? Either Detroit area or Michigan or you've been here long enough to know now what do you like?

D Dr. Weisong Shi 22:39
Yeah, I think that too. I will say Michigan is a very bannister you know life. Although reputation-wise we are we as together we need to working harder to your post our reputation outside. But once you stay here, you realize that, you know you have very beautiful pure Michigan and natural resources on one side, and on the other side, you have the Detroit district, you have the four major sports here, pretty much you know, and also there's filters. So I really like that, you know, housing is affordable. And there you have the world -lass, you know, education facility here, and is great, you know, is a penance life. I will say I welcome you know, other people coming to Michigan to living here, you know, that are working here and working together to make the beautiful future of Michigan.

E Ed Clemente 23:28
I always love to hear people were came from other places, and they fall in love with Michigan, so I'm glad you're one of them. And we appreciate you being a professor at Wayne State. Once again. It's Dr. Weisong Shi, he is a professor for computer sciences at Wayne State University. And Dr. Shi, we really appreciate you taking time to do this.

There's so many more topics I'm sure we could have covered. But obviously your field is very fast and growing and the technology is cutting all the time. We appreciate you taking time to explain it to us. And maybe we'll see you again in the future, okay.

D   Dr. Weisong Shi   24:04
Sure. Thank you Ed for having me. I'm very happy to be part of this.

A   Announcer   24:10
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