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**Mike:** From the Center for Occupational Research and Development, welcome to Preparing Technicians for the Future of Work. I'm your host Mike Lesiecki. In each podcast we'll reach out to people who are actually on the front line of the future of work and hear what they have to say. That means interviews with industry, interviews with working technicians, forward thinkers in the field. We'll do some background research, and we'll curate that research to make sure you have the most up to date and relevant information. And in every episode, we'll suggest action that you can take. We want to inspire you to take that action.

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Our guests today are Carlos Contreras from the Intel Corporation and Professor Bassam Matar from Chandler Gilbert Community College.

Carlos, welcome. You're the Senior Director Americas, Global Partnerships and Initiatives at Intel. Carlos, what does that mean? What do you actually do at Intel?

**Carlos:** Hi, Mike. Thanks for having us. And thanks for the opportunity to talk about this artificial intelligence. So, in a nutshell, what I do is interact with government agencies, educational institutions, and partner to help bring in this new phase of technology that we're seeing around artificial intelligence. As a technology leader, we're actually building this technology that runs

artificial intelligence. And we see velocity in terms of the technology. And our concern or our initiative that we have around this is workforce. And we'll talk more about it, but what kind of work skills are going to be needed in the future? How do we make this technology more inclusive for as many people as we can? And that is one of the things that I spend most of my time with is not only working with the folks here in Maricopa but also other community colleges in the US.

**Mike:** Well, thanks, Carlos. Now, Bassam, let's turn to you. You're a Professor of Engineering at Chandler Gilbert Community College in the Phoenix area. Tell us a little bit about your background and what you do there.

**Bassam:** Okay, thank you, Mike. Thank you for having me. So, my background is in the area of electrical engineering and as we stated I've been teaching with Maricopa Community College District or with Chandler Gilbert Community College for the past 30 years as a residential faculty, engineering faculty, and I also teach at Arizona State University in Tempe as an adjunct faculty for the past 20 years in the Department of Electrical Engineering.

So, what I bring to the table with this AI program, and with the partnership with Intel— many years ago, I worked with Intel to develop an Associate Applied Science in the area of Semiconductor Manufacturing. So, we've done a lot of partnership with Intel. And I was very much excited about this opportunity here. And I was hired recently to be as the program manager to run the AAS in the area of artificial intelligence and machine learning.

**Mike:** Good, Bassam. That's our topic for today: artificial intelligence and machine learning. So, let's talk about that for a minute. Carlos, let me turn back to you. I'd like to hear your perspective from the industry side. Earlier in 2020, Intel and the Maricopa Community Colleges put out joint press releases announcing this partnership that they've created to launch the first Associate Degree program in Artificial Intelligence and Machine Learning. So, here's some questions for you, Carlos, from your industry side: What's driving that? And why is it so important?

**Carlos:** Yeah, thanks Mike. We're very lucky to have such a great partner as Maricopa on this project. Last year, we initiated a new set of Corporate Social Responsibility Goals. One of the big ones that we have, that we put on the

table, for us and that we challenge ourselves is: How do we make our technology more inclusive? And how do we expand the digital readiness of the education folks, the students, the workers around "digital readiness." And those were the two goals in the spirit of this collaboration.

And for us, to put a marker on the table that we're an engineering company, we love numbers, we like to have goals. And our goal by 2030 is to reach 30 countries, 30,000 institutions and get 30 million students skilled in artificial intelligence. We feel a sense of urgency around this technology. Unlike other technologies, or like other previous technologies, AI is coming into different industry areas, and it's coming in at a faster clip than other technologies. So, partnerships, such as these with educational institutions, where they're the experts, as you mentioned, Mike, we bring the industry perspective. And a collaboration model is what's needed because of the speed of the transition. And we've been very lucky to have Maricopa, kind of in our backyard here in Arizona, that we can collaborate with on this.

**Mike:** You know, Carlos, you mentioned international, right? Other countries. I don't believe this is the first one. There's other countries that Intel is working with that are doing similar initiatives. Are we ahead of the curve? Are we behind the curve? What's your thoughts on that?

**Carlos:** Yeah, this program actually started overseas—actually started in Singapore, in South Korea—the program that we brought to the US. Other countries are a bit more ahead of us from a policy perspective, understanding the importance of the AI skills in their workforce, and they've started to make significant investments in their educational systems. And from that perspective, Mike, we're a bit behind these other countries. But luckily, we do have really good institutions in this country that we can catch up. But at the federal level, at a national level, we've fallen a bit behind in terms of investment in these types of programs, if you compare us to other countries, such as South Korea, India, Singapore, where it's a higher priority for them to put these types of skills.

**Mike:** Sure. It's interesting, of course, that we're talking about skills at the technician level, right? Obviously, some people think...they think AI...well, that's a university, a four-year degree program. But here the focus, not only in United States, but in other countries as well,

is at the technician level. So, let me turn to Bassam for a moment. Now, here at Chandler Gilbert Community College, you're the faculty lead on the college side. And tell us a little bit about what this program looks like. I mean, folks out there are listening. They're thinking, hmm, could I possibly do something like that here at my community college? So, give us a sense, Bassam, of what it looks like from a community college standpoint.

**Bassam:** Sure, Mike. Thank you. So, after working with Intel and the district curriculum office, what we did with the program, we figured that we need two options. One is for students coming out of high school or considering going to the college, and they want to pursue an Associate Degree. So, we created an AAS degree, a special Applied Science Degree in that space, and also a Certificate. So, if you will, let me kind of walk you through the Associate Degree and the Certificate and kind of explain to you what it involves and what courses we have in there.

So, in the Associate Degree, we have obviously required some math courses. That includes statistics, linear algebra, and calculus, and some introductory engineering courses and an intro to Python. And then the rest of the technical courses are really artificial intelligent machine learning courses, and if I can list them to you...

So, we have one course, which has to deal with Introduction to AI.

**Mike:** Yes.

**Bassam:** Another course: Introduction to Machine Learning. We have a course in AI for Computer Vision. Another course in NLP (natural language processing). Then we have the last two courses in the degree, one has to deal with AI for Business Solution and a capstone class. And the rest of the courses in that program is simply like any associate degree will be the English, Humanities, and Communication classes. This certificate, however, only requires the six AI courses that I listed.

Mostly, this certificate is designed to provide the industry professional with the knowledge and skills in a variety of fields that will be useful in AI. So, really, if you look at the prerequisites for the program and the certificate, as soon as the industry people will be coming with that background, you don't need to take the prerequisite, but for the Associate Degree will be some

computer information classes, and obviously the math and the Python.

**Mike:** Sure

**Carlos:** Mike, can I add something here? With the sequence that Bassam laid out, the intro class was designed specifically to have no prerequisites. And we want to make sure that everyone has an opportunity to learn what the technology does.

And, from an ethical perspective, to learn the ethical issues or possible pitfalls that it might also bring. Because we want the general public to have a level of education around these technologies. Because at some point in time, they're going to encounter it in their work. It doesn't matter if you're going to be selling houses, taking care of patients, or fixing cars. Everyone's going to have some sort of an AI technology assist program next to them.

I'm kind of old, so I remember the days before the Internet. Kind of similar to what happened in that transition, right? We all had to learn what it was, what kind of information. It's the same type of deal with artificial intelligence.

So, for those listeners from other community colleges, I would encourage at least offering that intro class. Because I think there is a lot of value for the students to get exposed to just the basics of what the technology is able to do and what the future holds. So that they make some choices as they pick different careers, and they start their long workforce in the future.

**Mike:** Sure. Bassam, let's stay focused on this intro class for a moment. You've started teaching that at the community college now. What's been your experience with it, so far?

**Bassam:** Yeah, Mike. So, that class is really a lot of fun, because you're introducing the new technology that is out there, including the 5G. And, also, to focus a lot on the issue surrounding AI in ethics, bias, regulation, and professional expectation. So, we offered that class in the fall last semester, and we had 16 students enroll in it. And we kind of start marketing it late in the summer, and we got only 16. This semester, in the spring, the one section that we offered at Chandler Gilbert, it was full two weeks ago. And now we're getting an override for a student that wants to take that class. And we're offering another section at another campus, called Estrella

Mountain, which is on the opposite side—on the west side of Phoenix. And that class was started the second eight weeks of the semester.

So, the student coming to that class is really a variety of backgrounds, we got a couple of students actually from Intel, taking the class, and we have students that are pursuing maybe computer science. And once they found out about this course, they want to get a flavor of what AI is about. Keep in mind, because as you said earlier, the only place probably you get knowledge or education about AI would be in your senior year, or maybe undergraduate at university level. So, having this at a community college has opened a lot of opportunity for students to get the awareness of what AI is all about. And we have students that literally have a BS, or even a Master's Degree in Computer Science and taking the class. And we got type of student that already working in the field as electrical or other disciplines. And they are also enrolled in the class.

**Mike:** Interesting. Carlos, let me turn back to you. Here's a question. Can you give us an example, for our listeners, of what an AI technician—that's, let's say, someone that might be in a company like yours, like Intel, or maybe other companies that you know about—what would that technician actually do? What is the role of an AI technician?

**Carlos:** Thanks, Mike. That's a great question. The way I think about this, in the way I would encourage listeners to think about this, is everything's kind of becoming a factory of data, right? Cars are spitting out large amounts of data. Medical equipment is spitting large amounts of data. Every day—and I had to look this up—every day, there's about 2.5 quintillion pieces of data that get produced, that's a number with 18 zeros on it!

**Mike:** Yeah.

**Carlos:** And there is a lot of value in terms of that data that's being generated. And going back to your question about, well, what can you typically do with that information? If you take a retailer, for example, knowing what your customers are interested in, using machine language to figure out inventory levels and supply levels with real time, and not try to guess what SKU you're going to put in your store. For us, everything from our factories that we have here in Arizona, our semiconductor factories that we have, in terms of looking at how materials moving through your factory. Doing predictive analytics on equipment in

terms of whether something has a probability of going down. And so, you want to go in there fix things before the machine goes down. Supply chain issues. So, just this whole notion of having more data available to do your job. And shifting your focus, if you're a worker, in terms of using that information and that data to make sense of it. And to interact with either a customer or do something that's more value added to something like a factory.

And so, we're just kind of on the tip of this, Mike. And the AI tools that Bassam is going to help teach the students are really going to be like the basic and the fundamentals of "How do I know that this algorithm doesn't have a bias?"

**Mike:** Sure.

**Carlos:** "How do I know my data set is clean?" So, those types of basic skills are going to be the type of skills that are going to be really important.

**Mike:** Bassam, listening to what Carlos said about the skills that students are getting—it must be wonderful to work with a company like Intel. But not every one of your students will go into that world. Maybe they'll go into healthcare. Maybe they'll go into finance. Do you see that? These other options for students as well?

**Bassam:** Yeah, absolutely. Actually, our Advisory Committee for the program is gonna have in it you know, AI is not just used at Intel, obviously. As Carlos mentioned, it is used in retail and e-commerce, used in healthcare and medicine, education, marketing, you name it. It's funny. I read an article that says, "Whoever leads in artificial intelligence in 2030, will rule the world in 2100!" It's a very broad use of AI. And so, Wells Fargo in Phoenix area is very interested in this. Northrop Grumman (with the aerospace) is interested in that as well. So, we're having different companies to be a part of the Advisory Committee. And they're going to be contributing to the curriculum that we teach in our classes.

**Mike:** Carlos, I like that. Bassam said, we're gonna rule the world starting in 2030. I like that.

**Carlos:** Get him a crown or something. [laughing]

**Mike:** I have a question though for you, Carlos. I'm not sure how exactly to phrase this. But do you think AI will cause "technological unemployment?" And what I mean is, do you

think industry will need fewer or more skilled technicians as a result of this AI infusion that we're talking about?

**Carlos:** I think if you kind of look at previous disruptions, where the technology has brought in...

**Mike:** Yes.

**Carlos:** ...what we've seen is there's been a shift in the skills. And I see that happening. It's starting to happen already, where the skills that Bassam talked about are going to become more important. So, am I going to need, for example, someone to log data? Probably not, because the machine is going to do that. But we are going to need someone to analyze the data, and make sense of it, and take next steps, in terms of where you create value.

And that traditionally has been the shift that you see with new technologies—is that the jobs, the skills, kind of shift. Because something that's automated—there's no jobs there anymore. However, the analytical piece of it, the problem-solving piece of it, the collaboration piece of it—is still going to stay there. The thing that is definitely going to shift is the skills.

Which is why community colleges are so important because they play such an important role in reskilling workers—people coming back and picking up new skills. And this technology is going to have an impact on everything: automotive, healthcare (as Bassam mentioned), manufacturing. And you kind of see that from our local industries, because of the demand that they're seeing for these skills.

And so, I don't have a crystal ball, Mike, in terms of whoa, what does that mean at the end of the day? There's a lot of press, and there's a lot of studies around this, and how everything kind of seems to balance out at the end of the day. But what's important is that people need to get reskilled. Because if you don't get reskilled, then you can't go into the next phase of job growth. And that's the big worry that everyone has. And that's one of the big reasons why we're doing these types of programs. Because we want to make those skills available for people to go back and get reskilled.

**Mike:** You know, Carlos, let me make a comment here with our own project, Preparing Technicians for the Future of Work. We've seen, over and over, talking to industry, and people like yourself, that it's that reskilling their current

**Episode 23, A Partnership for Artificial Intelligence and Machine Learning Education**

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employees, keeping them up on that technology side of things. That's one of the key things. So, I'm pleased to hear your comments there.

Now let me turn back to Bassam. I have a question for you. Suppose I'm at a community or a technical college. Suppose I'm a faculty member. What would I need to do to start a program like this one? How would I get started? Bassam, what should I do?

**Bassam:** I think the most important, obviously, you need the faculty to lead this. And what I mean by that—you need to have a faculty in your campus that is willing to get the proper training, and start developing, working with local industry or even other colleagues, to put the curriculum together, and teach it. Obviously, you need the support of your administrator, including the dean, the president of the college, you have to have a budget, because you have to have computers and software to run the program. And most definitely find somebody locally, like from the industry, to kind of "buy in" into the program and kind of support you, hopefully, either through their engineers, or technicians, or as well as money-wise. So, those are the four things that I think that is very important.

**Mike:** Now, Carlos, Bassam mentioned getting industry support. You're from industry. So, let me ask you this. How do you make a decision to work with an educator, you've got to find some value there? What is the value proposition that an educator can give to you to get you connected? To help out? Carlos, what do you think?

**Carlos:** Yeah, it's excellent question. When we approached Bassam and his team with this program, from my end, I looked at it from "Are they ready? Are they serious?" And they jumped on it! And it was part of their plan already. They were thinking about it. And the community college district poured resources in it. So, I appreciate that. Because there's a certain sense of urgency with this. And the speed that they reacted is something that I really look at. And as I mentioned, we've been talking to a lot of different community colleges across the nation. And you see the difference between those that are serious and they want to go in. Because I don't have a lot of time to waste. If somebody's gonna tell me six months, two years—too late.

**Mike:** Sure.

**Carlos:** Too long. We feel this sense of urgency to get going on this. And so that, for us, was big. And, of course, the capability that exists there is just fantastic. And people willing to learn in that journey has been great. So, nothing but good things to say about Bassam and his team in this collaboration.

**Bassam:** Thank you.

**Mike:** So, you appreciate that responsiveness. I think that's a key thing. Bassam, from your standpoint, one of the things that Carlos mentioned was expanding the reach of programs like this to all kinds of populations. What type of students do you have there at Chandler Gilbert? What are they like?

**Bassam:** So, as I indicated in the previous question, the type of questions we have at the college, we have different programs in engineering, we have computer science, we have software engineering, we have students just coming out of high school and coming to the college to pursue technical degrees or non-technical degrees.

So, like this semester, we're literally doing something like a learning community between English, Psychology, and the Intro to AI, where, how is AI used in the area of psychology? and so on. So, it's not just technical, but it is broad. And, as I mentioned before, the students that come into the program, especially with the Intro to AI, because it doesn't have any prerequisite, they are different backgrounds.

**Mike:** You know, today, it's been fascinating for me—talking to both of you. Because this is such a new development. And, as Carlos mentioned, and Bassam emphasized, everyone has to know something about this. It's going to be an expectation.

We talked about the drivers. Carlos, you mentioned the huge amount of data that's flowing in from business sectors, whether it's finance or manufacturing, data that's coming from sensor networks, or any other place. And the role of these technicians is to really play a key role in managing that data.

And something else you said really struck me. It's important. Not just the data, but they have to know that the integrity of the data is there. They have to be able to understand what's coming out of an algorithm. Is the data clean? I think those are important things that a technician can do.

And Bassam, you talked about creating this program that you've started. I wrote one thing down, in my own notes, is you've got to have a committed faculty member who wants to make that change. And they've got to increase their own skills. They're not likely to necessarily come to the game with those skills.

And finally, of course, strong industry partners. I guess that's true for any new program, but particularly here.

Bassam, here's the tough question. When are you going to have all of those six courses developed in your ideal world?

**Bassam:** Well, our goal and our projection is we'll have everything done by Spring 2022.

**Mike:** All right.

**Bassam:** So, we're offering two of these courses this semester—in the spring. We'll be offering four courses in the Fall of '21. And all the courses will be offered in Spring of 2022.

**Mike:** Carlos, you mentioned having a program that's responsive, especially in a time sensitivity. That's a pretty aggressive timeframe. So, that sounds good.

We certainly see this whole area, AI and machine learning, as part of the future of work. Carlos, thank you for attending today. I appreciate your taking time out of your busy schedule.

**Carlos:** Thank you, Mike.

**Mike:** And Bassam, great talking to you again. Good luck with getting those students through those classes.

**Bassam:** Thank you, Mike. I appreciate having us.

**Mike:** That's it for today, listeners. We heard about the drivers, and challenges associated with artificial intelligence and machine learning, training, and education. And importantly, how a strong partnership between industry and education can really make a difference as we approach those challenges.

I want to encourage you today. I want to offer these challenges for you. Number one, increase your own knowledge of artificial intelligence and machine learning. There's a variety of online ways you can do that. And number two, consider offering an Intro to AI course with your colleagues, in your own program, in some collaborative

fashion, perhaps, that would work at your institution. Consider that for 2021.

In the show notes, I'll put links to a lot of the things that were mentioned today, including Bassam's mention of the article that says, "by 2030, AI will rule the world." Now that's really saying something.

You can find our podcasts on Apple podcasts or Google Play. Or actually go right to the website [PreparingTechnicians.org](http://PreparingTechnicians.org) and download the podcast right from there. I want to thank our Audio Engineer, our production head, John Chamberlain at CORD. Thank you, John, for all your work. And Ann Claire Anderson, who leads the project. Thank you, Ann Claire. And thank you, our listeners for Preparing Technicians for the Future of Work.

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