accenture

MODERNIZE FOR IMPACT @ SPEED @ SCALE

Digital Studio
Session 1

JAKE: Good morning.

EVERYONE: Morning.

JAKE: Thank you for being here. I'm Jake Brody, managing director here at Accenture Federal Services. On behalf of our of CEO, John Goodman and our leadership team, and the over nine thousand colleagues of ours across the Accenture Federal here both in Washington DC, Northern Virginia, and Maryland, I want to welcome you to our Accenture Fjord Digital Design Studio and the expansion of the services we deliver here today. You're sitting in 20 thousand square feet solely dedicated and in focused on driving innovation and design to serve our federal customers, their clients, their employees and the stake holders, and obviously our country and our fellow citizens. The work the that we do here, as you walked in the room you probably saw the sign in the back, is really all about design at the heart of it and design at the heart of innovation and how we drive solutions for the mission of our federal clients and their customers.

Okay, that's really what is all about here at Accenture. It's around delivering the missions that matter to our customers and our clients. It's about delivering and solving the most challenging problems that they face. It's about delivering outcomes that help change the way the world works and lives. We got a great program for you today. We are joined by a number of our community partners. We talked to some folks from Onramps To Careers. We got some students from McKinley high here in the audience who, I believe, I heard earlier, we are the largest providers of summer internships through that program here in the district of Columbia. We got folks in the Washington Board of Trade Jack [indistinct] my classmate from [indistinct] Washington. I think I saw some folks from the North of Virginia chamber of commerce here, as well as the partnership for public service in the Atlanta counsel.

We are also joined — this is really exciting for us—from federal leaders from over 26 agencies. I see Cece Coates from the department of state in the back room. I see some folks from the Census Bureau and commerce and some colleagues that are here in the front of the room from International Trade Administration. This is a wide cross section of folks. I'm glad you are here. I'm glad you believe in design of a heart of innovation and solutions and the work that we are doing here today. This program—we call it Modernizing for Impact at Speed and at Scale. It's what where really all about here at Accenture Federal. How do we move at a different pace to deliver solutions for our clients? We are going to have a discussion with some two innovative people, two talks, one around on artificial intelligence, and another around trends that are impacting businesses and technology.

You'll hear from our CTO, and I'll be happy in a few moments to introduce Dr. Daniela Rus as well from MIT who is a very noted roboticist, so there's going to be a little story I'm going to jab down about in a second. Before we get started, I want to invite Randy Rodriguez who is our group design director for our Accenture Federal FJORD Design Studio to walk you into this space as well. Randy.

RANDY: I have two minutes. Firs, welcome, I'm going to try to summarize three years in two minutes, which is nearly impossible, but I will give my best shot. Over the last three years, I've been amazed in, when we were six or seven in a room [indistinct] thinking about when we moved into this location, Cece, who brought us on board early on and we started working with department of state till today. Today for me is not only a time to celebrate, but a time of reflection as I think about the 27 agencies who I work with, the 130, 137 project that we have done and we are still

doing it today. The trust that you guys have, your partners, our clients, have put in us to give us some amazing challenges that we're dealing with today and have dealt with in the past.

As I walk around the hall and I get to meet with the teams, for one second I'm talking to the team who is helping the department of education so far trying to figure how to bring better information to parents and students who make loan decisions, to a different team who is helping the immigration office with their initiatives, to another team who's working with the G2 Intel group from the army. That's just within 30 minutes of just walking around. What we were three years ago, and we were talking about bringing this and helping our clients think different and work different, today is just a great manifestation of not only the trust that you guys have put in us, but how hard the team has worked to be a 120 of us today in two locations and to the challenges that we are facing today.

We are extremely passionate about bringing great experiences to citizens and employees alike in arm forces. As you get a chance to walk around; you are going to see a lot of what is happening; now that we are including prototyping and data into our project. Some of the things that are happening are really fascinating and ever seems to inspire me and amaze me what is happening here at a daily basis. I am blessed to see what is happening here, and I get the chance to work with the various teams. On behalf of 125 of us, we say welcome and thank you for always giving us the opportunity to go in the journey with you with the challenges that you are facing. Thank you.

JAKE: Thank you Randy for that. You can sense the passion when Randy talks about the work that we do here, that his colleagues do here; it's really the way I think about professional services in a way that has transformed in the past 20 years. This is what is really is about. It is how do we work with human beings—that's who we're all about—and how do we derive solutions that are human centered. If you are not getting that then you should do something differently, and that's my personal opinion. This is really fundamentally what professional service is, the delivery of solutions of clients is all about. I'm going to introduce and bring on the stage Dom Delmolino. Dom is our chief technology officer, and the Professor Daniela Rus from MIT come on up. Dom I learnt the other day—so little known facts—so Dom will not eat lunch until he's walked a mile. I guess his calculator there's about four [indistinct] within every quarter block onwards.

I thought that kind of interesting, and then I thought, you're going to be out of lunch soon because Doctor Rus is probably going to be designing some artificially intelligent food delivering service that you'll be pressing a button. I know it's journey, but with that, take it away Dom.

DOM: Thanks, Jake. Thank you all for being here. I have a great honor to have a chance to speak with Doctor Daniela Rus from MIT. To give you a little background on Doctor Rus, you'll understand why I'm so excited and I hope that you'll be as well. Doctor Rus is the Andre and Erna Viterbi professor of electrical engineering and computer science, as well as the director of computer science and artificial intelligence lab up at the MIT. Now, I geeked because I know who Viterbi is because you all know the Viterbi algorithm, and, so for me that was just an exciting moment to understand as well. Doctor Rus is a class of 2002 MacArthur fellow. She's a fellow of the Association for Computing Machinery, Association for the Advancement of Artificial Intelligence and IEEE.

She's a member of the National Academy of Engineering, and the American Academy of Arts and Sciences. She's also a recipient for the Engelberger Award for robotics. Her research interests

are in robotics and artificial intelligence. The key focus of her research is to develop the science and engineering of autonomy. Last, but not least, and also cool for me as well, she's a fellow Cornelian. She earned her PHD in computer science from Cornell University. Daniela, welcome to our studio.

DANIELA: Well, thank you so much Dom. Hello everyone. Congratulations to Accenture, to the team here, and to the broad Accenture team. This is an amazing facility, and I wish you continue great success in making the world a better place.

DOM: Thanks Daniela. I mentioned that computer science and artificial intelligence lab up at MIT. Can you give us a little background on the lab, what its goals are, what goes on there?

DANIELA: Well, CSAIL is how we named the lab. It's a place where many of the wild and crazy ideas that change the world take place. In fact, we have a very proud history. CSAIL has two parts: CS for computer science and AI for artificial intelligence. AI goes back to 1956 when Marvin Minsky was a young professor at MIT, and one day he decided to gather his friends, they went to New Hampshire, they hiked, they talked, no doubt they drink wine, and when they came out of the woods, they told the world that they invented a new academic discipline, a new field of study called artificial intelligence, which is about creating machines with human like characteristics in how they see, how they talk, how they play games, even how the learn.

Since 1956, our laboratory has been deeply engaged in thinking about the next great advancements in AI. The computer science side has an equally extra ordinary history. In 1963, the big dream was to get two people to use the same machine at the same time, and those machines were about as big as this room. Just think about the extra ordinary in the field from 50 years ago when we were dreaming about sharing a machine, to today when computing is so pervasive, we don't even notice how depend on it. Along the way, again, our faculty, our researchers, have made critical advancements. The first mobile robots were invented in our organizations, the first computer vision systems, the first speech translation systems, the world wide web. Tim Berners-Lee, the founder of the web is with us. Cryptography which allows us to do online shopping, the RSA algorithm comes from CSAIL. All in [indistinct] is on reverse too, still roams around the hallways of CSAIL and has been devoting the last decade of his life to making voting more secure, and is now deeply interested in climate change. A lot of the fundamental ideas that we kind of take for granted and are part of everyday life started in ,academia as kind of wild and crazy ideas and then found their ways in companies.

DOM: That's so cool. I know today a lot are interested in artificial intelligence and when we were are kind of talking earlier, I asked you when you tell someone you do research in artificial intelligence, how do they react? What kind of question do you get and how do you answer them?

DANIELA: Okay, Dom. I get usually two types of reactions. There is the group who get's anxious and starts cracking jokes about Sky Net and asks when the robots will take over their jobs. Then there is the group that asks me when the car will be self driving. Of course, I belong to the second group; although, I'll tell you that cars are not safely self driving yet. I actually think it is very important to understand the anxiety of the first group and find ways to provide perspectives for how to see things differently. It starts with understanding that AI machine-leaning robotics are tools.

They are just tools by the people for the people. They are incredibly powerful tool, but like any other tool, they are not inherently good or bad. They are really what we choose to do with them. We can do so many incredible things. We can make transportation safe. We can make healthcare customized and personalized by better engineering medicine and monitoring and healing people. We can ensure instantaneous conversations between people no matter what language they speak. We can transport people and goods better and good better and more effectively. We can make better governing decisions. We can address climate change. We can solve so many problems big and small.

DOM: Awesome. I'm often hopeful that the next car I buy is going to be the last one I actually have to drive myself. I'm excited for that teaching as well. We also talked about how artificial intelligence is changing the nature of work. How have you seen some of the people you've talked to ask about and the impact of how artificial intelligence is changing the nature of the work that people do?

DANIELA: The big dream is that with AI and robotics, we will provide support for cognitive tasks on the AI side and physical tasks on the robotic side, just like computation is providing us with support for computing tasks. In order to understand what is happening, I just want to make sure that everyone understands the connections between AI machine learning and robotics. AI is about making machines with human-like characteristics, making machines that reason, making machines that communicate. Robotics is about putting computation in motion. Machine learning cuts across both AI and robotics. Today, machine learning is about using data to find patterns, to make predictions, and sometimes to provide advice for what to do, and in the sense every field that has data can take advantage of the latest technologies.

I like the example of medicine because it highlights something very important. It highlights the fact the future is not about people or machines; it's about people and machines working together, with people doing what they are best at and with machines doing what they are best at. I like to think about machines as having chips and people as having hearts. That means machines have speed and we have wisdom. Let me tell you a quick example, if that's okay, about medicine. In a very recent study, machines and people were given scans of lymph node cells, and they were asked to classify them as cancer or not cancer. The error of the human doctor was 3.5 percent as compared to the error of the machine at 7.5 percent. But when people and machines worked together, the error dropped by 80 percent, which incredible, to 0.5 percent. This is because people are better at some things and machines are better at other things. Putting it all together will empower people to be more effective workers.

Another example I can give you is in customer service support, where machines called cognitive assistance are able to memorize a lot of information, and through this process, they are able to provide human agents the tips or the right tidbits that make those human agents empowered to give quick answers to their customer. Essentially, with the advancements in natural language understanding, machines can memorize entire libraries of documents and use that information to provide meaningful tips, meaningful answers just in time. This applies to everything. It applies to customer service agencies, it applies to lawyers, it applies to any field that requires knowing stuff and similarly with patterns, it's the same thing. The way to think about machines, it's kind of like interns, very valuable interns of course, running around, investigating, and bringing up useful and interesting patterns for the decision makers to act on.

It's not the machines that are currently empowered to make decisions. One more thing I want to say is when we think about the future of jobs, of course, everything is changing. In fact, the latest reports on the future of jobs from the World Economic Forum predicts that by 2022 seventy-five million jobs will disappear, but 132 million jobs will get created. It's important to keep this in mind because as the technologies get introduced, these technologies also open the door to new types of possibilities, to new jobs. Just think about the fact that 10 years ago, there was no cloud, there was no smart phone, there was no social media. If you think about the employment in these fields, it's absolutely extra ordinary.

DOM: Can you give us an example of a job that has been created by AI. Are there any robots therapists? What kind of an imagining of the jobs.

DANIELA: Well, look, I mean, over the past 10 years we created so many different job types in social media, and in cloud. In the future as the technologies are evolving, we will need people to configure the systems and manage the systems. For instance, in manufacturing, we will need robots engineers that will be responsible for monitoring robots. In the future, the medical profession will change. In fact, my mother has been in a rehabilitation hospital over the past few weeks, and I've been talking a lot with the therapist who tell me, "Yeah, we have half an hour. We spend 10 minutes going to the hospital room to go the patient, and then we get 10 minutes in the gym, and another ten minutes doing the drive back. What if we had a robot that could just bring the patient? Then we would have 30 minutes instead of 10 minutes with the patient.

We would be more excited because we want to apply our expertise, and the patient will get more from us." It's important to think about not just which professions go away, but which tasks within a profession can be automated. If you think about what we do all day, we spend time applying expertise, interacting with stake holders, counseling clients, doing data tasks, doing predictable physical works, and doing unpredictable physical work. The tasks that are likely to be automated are the ones that involve data, activities, and predictive physical work. I think that every field will change somehow. That means that we really have to get empowered by the knowledge that will allow us to understand how the new tools help our field.

DOM: When we saying earlier, I saw you react to Sander Canes comment about education and his passion for that. And you reacted very strongly to that. It sounded like you had some really strong opinions about the best way to get educated on artificial intelligence and computer science. You want to share some of that with us? How do you get prepared? How do you learn? How did you get started?

DANIELA: Well, I believe that in the twenty-first century, technology should be part of literacy. Those of us who know how to make things and breath life into them through programming have superpowers. Because we can map all of our dreams into reality, so I believe that computational making for us which is essentially learning how to make things and computational thinking, which is essentially the art of problem solving with computers should be part of every school education, starting even in kindergarten. I used to say high school, but I actually believe that we can get kids on these tracks from very early on. I want to give a shout out to the high school kids who have actually embraced those ideas.

DOM: Let's explore some of your passion around robotics. Now, we talked about artificial intelligence. For a lot of people, a robot is almost is a different physical manifestation of computing

device, but you had some really interesting thoughts about computing on the go and how do we interact with that kind of device, how do they become helpful for us. I loved the examples you gave to me about different kinds of ways to imagine what a robot would be. Can you share some of those examples with the audience here?

DANIELA: Well, the first robot was introduced in 1961. It was called the Unimate, and it was an arm that could do different pick and place tasks. Since 1961, industrial automation has grown tremendously to the point where there are now 31 million industrial robots around the world. Again, that's an explosive growth. Today's robots are these human-inspired machines, so either arms, or humanoids, or maybe machines on wheels. These robots usually stay isolated from people on the factory floors because they are heavy, and unsafe, and essentially not good to be around. I believe that in the future robots could be extensions of who we are. We could thing of machines as being augmentations for many different physical tasks that we have to do.

I also believe that the future machines could take inspiration not just from the human form, but from the entire animal kingdom and the built environment for that matter. Maybe your chair could become a robot in the future to help you with posture during an exciting talk like this. In our lab, we are trying to advance these ideas, we are trying to advance the notion that we could design machines using program, and that the machines could be made out of anything. For instance, we have a little robot we call the mini surgeon. This little robot is made out of sausage casing. You can literally swallow it in the form of an ice pill. You can embed the sausage casing robot, you can compress, it you can freeze it with ice.

The idea that when it gets to your stomach, the ice melts, the robots deploys and if you have an MRI-like field around the robot you could externally direct the robot to correct tissue sample, to deliver medicine in a very precise way, to patch a wound or to remove a foreign object like a button battery that gets lodged into the stomach. Imagine the future with robots surgery where there are no incisions, no risks of infections, and no pain. This would be extra ordinary. This is a food robot, for example. We can make robots out of anything. As said, your chairs could become robots. Anything in our world could become, in some sense, programmed.

DOM: Yeah, I think you had an example too about too of printed robots, where you literally have the 3D printing machine build a robot on demand using that kind of form in any kind of way you program it. That's really cool.

DANIELA: We used to call this project robo-kinkos, but then we learned we couldn't use Kinko's because it's trademarked. We called it 24-hour robot manufacturing. Imagine being able to walk into a store and imagine being able give the store some description of a task you want to do and within a day, imagine being able to obtain machine that is configured for exactly what you need. Our approach to computation design and computation fabrication is enabling this kind of future. Using rapid prototyping machines, we are now able to print not just static objects, but objects that have built-in actuators, objectors that have embedded sensors and computational systems. Pretty soon, we will actually have robots that can walk themselves out of a printer.

DOM: Yeah. I liked the example you shared with to was that the octopus style. To imagine an octopus which is amazing. It can go through a hole this big and it had no bone structure that can print a robot with that capability is amazing.

DANIELA: The octopus is such an interesting creature. It's got a distributed brain. The brain is in the tentacles and all over it. It's able to do amazing things. We don't really understand the intelligence system of the octopus, just like we don't understand how our brains work. In the future, we hope, at least at MIT, we have started a program we call The Quest for Intelligence where the objective is the develop signs and engineering of intelligence while bringing together neuroscientist and cognitive scientist and computer scientist to try to advance our understand of how the brain works and then to come up with new algorithms that are rooted in how natural systems work. Because you should know that today's extraordinary machine learning systems are actually making use of decades old technology. As computer scientists, we need to advance the set to tools that is available to us for better computations.

DOM: What are some of the limitations of today's artificial intelligence, and how are you working to overcome them and go beyond those limitations?

DANIELA: Most of the great successes you read about in papers today are due to a technique called deep neural networks. Deep neural networks are rooted in an algorithm that was invented decades ago. The idea is you have a kind of a graph; it has millions of nodes and edges, and you present this graph with millions of manually labeled data points. From these data points, the network learns the weights, and then in the future when you show different data points to the network and this data point was not part of the initial training set, the network in principle should be able to classify the new data item correctly. This in itself is magical because it can do so much more than we can do in terms of pattern recognition with our naked eyes, but we need huge data sets.

Today's techniques require millions and millions of manually labeled data. Some fields have it. Some fields don't. If you don't have it, then imagine how much labor is involved in doing that manual labeling, so that's one limitation. Another limitation is that the networks provide answers that look reasonable, but they don't actually give us any sense of how they came up with that answer. The networks do not explain the suggestions or the answers they come up with, so that's another significant limitation. The networks are only as good as the data you use to train them. If you have bias in the data used to train the network, you will have bias in the functioning of the network. Additionally, we have to kind of have a clear sense of what it means for a network to learn.

If I show my network a picture of my phone, and then the network processes it and says, that's an Iphone. The network simply matches the pixels in my picture against other images that other people said where phone. The network has no idea what an Iphone is. It has no idea what you do with it. What do you do with an Iphone? Do you eat it? Do you throw it? Do you play with it? No idea, but when we learn with the way we do with seeing objects for the first time, with seeing variations for the first time, we know all these things. These are some of the fundamental limitations. Of course, the community is working to address them. With respect to size, we are working on compression algorithms for making the data set smaller and much more pointed.

We are also working on different models for what a neural network is. We are working on algorithms that make the performance of the network more robust and trustworthy, and we're also looking at different approaches to bring reasoning, not just pattern recognition in the performance of a network. There are so many exciting opportunities for the future.

DOM: Great, so that's the limitation. Let's end with I'd love you thoughts on what the future holds for AI. What are you most excited to see emerge in the field maybe in the next 5, maybe 10 years?

DANIELA: Well, I'm very excited about a world where with AI and machine learning and robotic technologies, all the routine tasks are removed out of our plates. Here's one of my fantasies, imagine garbage bins that take themselves out, and then automated infrastructure make the garbage go away, and robots help recycle everything in a way that is correct and good for the planet. Or imagine drone deliveries where fresh produce shows up on your doors every morning. Or imagine intelligent assistants, whether they are embodied or not, that help you optimize all aspects of your life to help you live well, you have a healthy life that maximizes your well being, but you also work effectively. These are extraordinary opportunities, but they also bring a lot of interesting questions like how are we going to live? How are we going to commute? What are really going to do? And how are we going to ensure that the advances are for everyone?

DOM: Everybody. Yeah, good answer. Thank you so much. Folks, please join me in thanking Doctor Rus for spending time with us today.

JAKE: That was awesome. That was plain and simply awesome. I'm struck with a couple of things I heard you say. You know, large date sets. I was thinking about the folks in the audience. Who doesn't have large data sets, but many of you are in the federal government. Massive amounts of data. Whether it's the supply chain data, census data, trade date, patent data, defense department data, think about the possibilities of artificial intelligence. I also heard digital trust and how we lead with the natural world and not just machine world and how to bring those things together. Again that is back to the core. We are talking about design at the heart, and the human centric at that aspect. Then fundamentally, for me, it's just exciting to think about being able to imagine a world we want to live in and trying to leverage technology to create it.

How do we drive to new places from the old? I think that a lot of things I heard there that just gets me kind of excited around. I love the garbage one because my 17 year old is going to stop doing it next year as he heads out to college, and my daughter is not doing it, so I need that one sooner rather than later. As we think about the future, that adage that future is now, it couldn't be more true.