Bruke Kifle: This is ACM ByteCast, a podcast series from the Association for Computing Machinery, the world's largest education and scientific computing society. We talk to researchers, practitioners, and innovators who are at the intersection of computing research and practice. They share their experiences, the lessons they've learned, and their own visions for the future of computing. I'm your host, Bruke Kifle. The rise of computing, data science, and artificial intelligence is transforming fields across the board from how we understand the complex relationships within biological, economic, and social networks to how we tackle real-world challenges like climate change and cancer. At the forefront of these advancements is a visionary leader who has pioneered interdisciplinary research and innovation. Our next guest, Dr. Jennifer Chayes, is the dean of the College of Computing, Data Science, and Society at UC Berkeley, where she led the establishment of this new college, the first of its kind at Berkeley.

Dr. Chayes' journey began in academia as a professor of mathematics at UCLA and evolved over two decades at Microsoft as a technical fellow where she founded and directed research labs across New England, New York City, and Montreal. Her interdisciplinary labs pushed the boundaries of core computing and AI, tackling problems at the intersection of mathematics, physics, biomedicine, and social sciences. As a member of the National Academy of Sciences and the American Academy of Arts and Sciences, Dr. Chayes is widely recognized for her transformative research and leadership. She's authored over 150 scientific papers and co-invented 30 patents, including foundational contributions in network modeling and graph algorithms, and is one of the inventors of the field of graphons, widely used in machine learning. Her recent work centers on generative AI and machine learning theory and its applications in areas like cancer, immunotherapy, ethical decision-making, and climate change. Dr. Chayes, welcome to ByteCast.

Dr. Chayes: Thank you so much, Bruke. I'm thrilled to be here.

Bruke Kifle: I think your experience and your biography just speaks so much to the wealth of experiences that you've had and the impact that you've had across industry, across academia. Certainly, I'm sure there are a set of experiences or inflection points over the course of your personal and professional journey that have inspired you to pursue a career in computing, and specifically at your field of study today. And so could you maybe walk us through some of these key experiences?

Dr. Chayes: Sure. I'm going to start with really early experiences, because I think it's very important for people to understand where others came from and to know that others' path didn't always follow this straight and narrow. So I am the daughter of two Iranian immigrants to the United States, and my mom's mom got married at the age of nine, and my mom couldn't add fractions, and yet I somehow had this mathematics going on in my head. But where I came from and what my parents stood for has always been incredibly important to me in trying to provide opportunities for others to realize their potential. So that was just super important for me. Now, I started out a long time ago, and I first was a pre-med, a biology major. Then bizarrely, I fell in love with physics, which most pre-meds hate. And I did a physics major and then I did one course shy of a math major and one course shy of a chem major at Wesleyan University.

Oh, and I forgot, before that I dropped out of high school and I was on the streets of New York City. So that's a pretty important point. So that also made me very, very tough. So I embraced risk in ways that many other people don't because I know I can pick myself up. So that was an earlier time when all you had to do was score well on boards and you could get into college. And I went to a high school for dropout, scored very well on my boards and got into a lot of colleges. So in college, as I said, I did biology, I did physics, I did one course shy of a chem major, one course shy of a math major at a liberal arts institution. I treated it like MIT on steroids. And then I decided that I wanted to do my PhD in mathematical physics.

I loved proving theorems and I loved modeling the physical world. But I also was really concerned that I wanted to do things that were highly theoretical because I had some of my formative years during, early formative years during the Vietnam War, and I didn't want to do anything useful that could be misused. So that changed later in life, but that was really important to me at the time. And I did postdocs at Harvard and Cornell. Oh yeah, I got married really young. I got married at the age of 19, so that's kind of interesting. And my ex-husband and I went through undergraduate together and went through graduate school together, went through postdocs at Harvard and Cornell together, and three and a half years out of grad school at Princeton, we had seven joint tenured offers in mathematics and physics departments. And we decided to accept the offer from UCLA in mathematics.

So when I was 30, I was a tenured professor in mathematics at UCLA. I loved interdisciplinary work. I loved bringing together mathematics and physics. This was a time when interdisciplinary work was frowned on in many ways. The NSF was uncomfortable with it and you didn't have joint appointments. And so I tried to build up a lot of ties with the physics department at UCLA, and then I got divorced, and that also changed my life in a lot of ways. And it's funny because I've talked with other women, computer scientists who've gone through things like this in their lives and about how good it was for me in some ways to kind of reinvent myself. And so then a couple of years later, I actually got together with a wonderful person who is my husband now. So that was well over 30 years ago.

Christian Borges, he was a professor in Leipzig, and I was a professor at UCLA and we commuted for four years between LA and Leipzig. I spent two of those years at the Institute for Advanced Study in Princeton, and he spent one year at the institute, so that helped a little bit. And then we decided we wanted to go on the job market together because we didn't like the commute. And turns out that friend of mine in grad school in physics, Nathan Myhrvold, was the first CTO of Microsoft and tried to convince me not to go to a university but to go to Microsoft. I had taken one computer science class as a freshman and learned Fortran and Pascal, and that was it. And had not done anything in 20 years, anything in computer science. But I went and visited just for the heck of it, and they kept asking me what I wanted to go there.

Nathan somehow thought I was smart and it would be good if they got me to go to Microsoft, and I think I was supposed to ask for a lot of stock options, but I was a UC professor, so I didn't know any of that. So what I asked for was to be able to hire six researchers, including very senior people if I wanted, to be able to hire six postdocs, and to be able to have six lines for sabbatical visitors in any subject I wanted. And they said, "Sold." And so I went, I convinced my husband we should do this. I think he thought I was a little crazy, but I wanted to build interdisciplinary groups. And they said, "Go for it. Build anything you want to build." So we brought together math and physics and started with theoretical computer science. We called it the Theory Group.

I was going to call it the Math, Physics, and Theoretical Computer Science Group and Nathan said, "No, just call it the Theory Group." And so we did that. So hired one young person out of Bell Labs who just won a big award in Combinatorics. Second hire was Mike Friedman, who was a Fields Medal. Our third hire was László Lovász who won the Wolf Prize a couple of weeks after we hired him. So we were off to a really nice start. And over time, it turns out that the internet and the World Wide Web networks, these random networks that were becoming increasingly important in computer science mathematically, looked just like the representations of disordered magnetic systems that we had studied. And so it just turned out my boss said to me, "Hey, there's this guy, John Hopcroft." Whom I should have known, but I didn't know computer science very well.

And he said, "He is talking about the internet and the World Wide Web, it sounds like what you do." And so John started visiting and we did a lot of work together on that. We started doing a lot of graph algorithms because in my mind, it was all just math anyway, I was good at math. Then I became increasingly interested in applications also during that time, so László Lovász, who is a phenomenal computer scientist and discrete mathematician. I mean, he's winner of the Abel Prize, and he's just phenomenal. And I was doing all this stuff on graphs and being a physicist, it seemed to me and Christian Borges that there should be a limit of graphs just like thermodynamics is a limit of statistical physics or differential equations are the limit of particle systems.

And so we went to him and we said, "So what's the limit of graphs?" He said, "What are you talking about?" And so over a period of four or five, six years, we developed the theory of graphons. And there are an infinite number of ways to define a limit of graphs. And if you make the limit to weak, everything converges to the same point. And if you make it too strong, everything converges to a different point. And so what was the just right point? And we came up with about six different definitions, which we all thought were meaningful from a computer science perspective and a mathematics perspective, and proved that they were all the same in the limit.

And so that was like, "Okay, we're really onto something." It's kind of become a new branch of mathematics, but it's also used now throughout computer science to model all kinds of real and other systems, which are networks in which there are entities interacting with each other, but they're not physical. And it's also used a lot in the machine learning of large scale networks because it's a limit. And so you can get kind of the gross properties, and if you have the graphon of the system, you can generate new realizations and you can test them. So it turned out to be really, really useful.

Meanwhile, during this time, I'd gotten very interested in applications of economics, algorithmic game theory, that kind of thing. And we went to Steve Ballmer and we pitched that we should open up a lab for Microsoft, it started in Redmond, that we should open up a lab in Cambridge, Massachusetts, because some of the best economists were there at MIT and Harvard and the National Bureau of Economic Research. And when I talked to Steve, I told him that you can't just slap the business model on at the end, and that as we're doing these things, we should be studying them. And so he said, go for it. And so we opened that lab in 2008, Microsoft Research New England.

Bruke Kifle: And at the time, the vision for that lab being what, at least from your perspective?

Dr. Chayes: So the vision for Microsoft Research New England was at the time at which we opened it, bringing together computing, mathematics, other things with the social sciences. First economics, and then more broadly with some of the interpretive social sciences like sociology and anthropology and communications. And so that turned out to be really interesting because we hired Danah Boyd, who founded the Social Media Collective at the lab, and those were the people who really began already in 2008, 2009, 2010, thinking about fairness, accountability, transparency and ethics in these technological systems, which became then several years later, fairness, accountability, transparency, and ethics in AI.

So this crazy thing that we did of hiring all these qualitative people and people at Microsoft scratching their heads and saying, "Why are you doing this?" I think really, really paid off for us. And then I opened a lab in New York City, which was a very data science focus lab with economics and data science and computing, social sciences, and the fairness, accountability, transparency, and ethics really grew there. Timnit Gebru was one of our postdocs and Timnit, while she was our postdoc, she and Joy Buolamwini did a paper, a very important paper in which they found that the image recognition algorithms did not recognize Black faces.

Bruke Kifle: Yes.

Dr. Chayes: And so this was just incredibly important. And unlike some other places which had other reactions to Timnit's disturbing revelations, we got really excited about it. And we took it to the C-suite at Microsoft and we said, "This is really important. It should give everyone caution." Microsoft actually walked away from a big contract with a police department for image recognition because they realized, oh my, there would be racial bias if they did this. So the image recognition was not ready for prime time. And also Microsoft product groups came to everybody in research and said, "Do you have ways of mitigating this bias in search and other things?" And Timnit talks about how she opened the web page and Microsoft is boasting about her and Joy's paper, which is unlike some other reactions she got later.

Bruke Kifle: Certainly, certainly.

Dr. Chayes: So anyway, so that was happening at the same time. We were starting to do things in biomedicine and health because sitting in Cambridge, Massachusetts, there's a lot of that. And I personally lost during that time, an uncle I really adored, and he was young. He was 69 when he got brain cancer and 70 when he died. And I said, okay, got to start working on biomedicine. And even earlier than that, my dad had been hospitalized for a long time, and some of the folks in the lab started doing a lot of biomedicine as well. And so I got into that. The lab got into that. We had partnerships with the Mayo Clinic, we had partnerships with big healthcare providers. We brought in a lot of people at the boundary of healthcare and economics. So that also became a really robust part of that lab.

Susan Athey, who's a professor in the Stanford Graduate School of Business, was at that time at Harvard. She was Microsoft's chief economist. And we founded this first group at the boundary of microeconomics and machine learning, which is now just a thriving area in which so much of business is done according to that model. So here I was doing all these things, then I had a smaller lab in Israel that was doing a lot of really incredible stuff in many domains, some of them healthcare related, some of them algorithms related. And then we had a company that we had acquired in Montreal, which is a fantastic AI NLP company. And I got to turn that into another Microsoft research lab, Microsoft Research Montreal. There was really a thriving AI community in Montreal. And so we worked closely with them. I started at that time thinking about climate change. Yoshua Bengio and I had this incredibly impactful Chinese dinner with a lot of other people there, in which we said, "Well, what could we do using AI for climate change?" And we started to work on it.

And one of the things that came out of that was a long paper, very long paper tackling climate change with AI. And we listed, I don't know, something on the order of 100 problems that maybe computer scientists could work with domain experts to try to solve. We ranked them according to our perception of their difficulty and our perception of their impact. And we founded Climate Change AI, which is a wonderful organization. And that really started opening me up also to doing climate change research. So during that period of time, I started working on cancer immunotherapy, and I started working on fairness, accountability, transparency and ethics in AI.

And I started working on how to use AI to address climate change. And so that was really, I just saw all of this richness of applications. And I also felt like that the universities were not necessarily preparing people to do this. And so even though people have been coming to me for many, many years, "You want to come and do this or come and do that at a university?" And other companies were coming to me too, because I was okay at running research labs. I seriously began to think about where I should go to help to build a model for the education that I thought should be done in the world around computing, particularly AI, inference, causal inference, and all these other disciplines.

Bruke Kifle: And if I may, actually, I think first of all, I just want to say the life experience and stories that you've shared, first and foremost, thank you. And I think it's just so deeply inspirational. It's one of, as you described it, embracing risk. It's one of resilience. It's one of just such inspirational accomplishment and impact. Specifically in a lot of the work, before we move on from some of your contributions and your time at Microsoft, I think a lot of the successful outputs or a lot of the successful sort impacts of the research groups, the fate group, the success that you've been able to see by bringing together people of different backgrounds, of different trainings, mathematicians, with social scientists, with economists, with ethicists, has clearly been evident in a lot of the successes of all three labs. But surely I would assume there are some challenges associated with bringing together people of such different backgrounds. So at least in your time as head of these labs, what were some of the toughest challenges that you navigated and how did that shape or influence your approach to how to do interdisciplinary research?

Dr. Chayes: Well, I think the most important thing is disciplinary respect and we often don't have that. My PhD is in physics, so I can say we physicists walk in a room and think we're smarter than anyone else. I mean, that's just the... And we say, "Oh, I'll just take that problem and I'll model it. I'll have a simple model of it. And oh, here's the answer." And of course, a model threw out the baby with the bath. And so I was trained in that tradition of we can solve everything, which is of course, as far from the truth as it can be in problems in the real world. I was very careful, we were very careful in hiring people who had disciplinary respect for others. I didn't want the really arrogant people who thought their methods were the only way, nor the social scientists who said, "You guys understand nothing."

And so I think what I learned was that the most important thing was not learning each other's language. A lot of people think it's learning each other's language. And I remember when MIT Schwarzman College, which was a great college, came about, and I was on its board for the first five years, and I remember when it was forming and they said, "We're going to create bilinguals." And I said, "Well, at least multilinguals." But I think the much bigger thing is multicultural. And so what that involves much more than each other's language, is learning what the problems of the other discipline are, what's important to the other discipline and why. And we naturally, I know this because I keep going into different fields and it's a human reaction. It's part of our innate tribalism where we separate ourselves from others on whatever dimensions we can when we first walk into a room, and then we have to walk that back in our minds. We have to force that wall down.

And there is disciplinary tribalism in which we assume that the other field, which has been studying these kinds of problems sometimes for hundreds of years, has somehow, they're asking the wrong questions. And so really the most important thing is understanding the questions other fields are asking and why those are important, and what has been almost the lived experience of those fields that has created these as the important questions and the important goals. So it is really a multi-culture that you must build. Not everyone has to know every language. You need to understand the values, the issues that are of importance and the aspirations of other fields. And not just know them, but feel them, feel them. And that is when phenomenal interdisciplinary work happens.

Bruke Kifle: ACM ByteCast is available on Apple Podcasts, Google Podcasts, Podbean, Spotify, Stitcher, and TuneIn. If you're enjoying this episode, please subscribe and leave us a review on your favorite platform. Very interesting. And I think very much well said. And I think certainly it's that model and that vision for how you founded and led those research labs across three cities that I think has ultimately led to a lot of the great successes that we've seen with the Microsoft research labs.

Dr. Chayes: And we should not forget all the people who went through as interns and post-docs, who have gone out into either universities or industry and see the world through a different lens than people who have not been deeply immersed in interdisciplinary work. I think it's for Microsoft, but I also think, I mean, I see these folks out in the world and I just love it.

Bruke Kifle: Yeah, certainly. And I think a lot of these core principles, and I know I stopped you earlier as you're talking about sort of the transition to education and your views on how we think about better equipping or preparing the next generation of competing professionals. I know shortly after your time, you did go on to found the College of Computing, Data Science, and Society at UC Berkeley, which we briefly chatted is a monumental step is the first time a college was established within the university in over half a century. And so to begin with, what inspired you to take on this initiative and what were some of the core values or goals that you embedded in its foundation?

Dr. Chayes: A lot of places were doing this. Berkeley had actually, I think the first one was CMU in the early '80s, and then there was Georgia Tech in the late '80s, and then other places, Schwarzman College, and somewhere in there Irvine formed. So I had phenomenal colleagues here in computer science and statistics who said, "Please come help us." So why did I choose Berkeley? Because there were a lot of options open at that time for me. I thought I could make the most difference here because they seem to be struggling the most. But also Berkeley is excellent in almost all fields, so the potential for interdisciplinary work was phenomenal. Berkeley has tremendous scale. I mean, you look at the other three top rated computer science departments at MIT and CMU and Stanford, and they do not have the scale of Berkeley as a university.

And then there is this commitment to service to a public vision. Almost every faculty member here could be at a private where they would probably get higher salary, they would have better facilities, they would teach smaller classes, and the students who are here are often working really hard, working at work as well as in school. So almost everyone here has sacrificed in some way for the public mission, both the faculty and the students and the staff who have to carry so much more of a burden here. And so the human capital at Berkeley is just the most phenomenal I have ever seen anywhere. What we might lack in financial capital, we more than make up for it in human capital. And truly, I mean, I've been a leader in industry, in hiring great people. I was a very good recruiter. Talent is everything. Talent is everything.

This place is filled with talent. And in fact, the reason I came to a public university is because the world is filled with talent and we need to offer an education which enables people to develop those talents, to not only develop, but to discover and develop those talents. So we need to let people come in here not having any idea what they're going to do with their lives. And then we have an intro data science class. So we had our first graduating class last May because college took about four years to form, which I hear is a record. Everything moves very slowly in a bureaucracy like this and we graduated about 20% of the students at Berkeley in our three majors, CS, DS, which is data science and statistics. And we have so many people who came in not thinking of themselves as STEM type people at all, not thinking of themselves as mathematically talented and they walk into this big intro data science class that we teach now in classes of 2,100 students.

It's called Data 8. And the whole program, it has four components. It has computer science, they do all the same lower division as the computer science major, and then they do some upper division computer science. They do all the same lower division as the statistics major. So they learn more inference, causal inference, that kind of thing than computer science majors do, and some upper division. Human context and ethics, which has been developed by ethicists and historians. And it's all about how these things manifest themselves and play out in the real world and what we should be watching for. And a disciplinary emphasis, which is three classes, one undergraduate, two graduate, no, sorry, one lower division, two upper division in one of about 35 different disciplines. It can be certain kinds of environmental science, it can be criminal justice, in many, many fields.

And so students walk into this data aid class, which they're required to take as they're starting out doing psychology or they're starting out doing economics, something else, and they discover their aptitude and affinity. They had no idea they were this good, they had no idea that they would like it this much. And it's like, "Oh my God, this is for me and I'm for this." And when I think about that, I think about my brilliant mother who could not add fractions, who participated deeply in the civil rights movement in the '60s and did all these really influential things, but was never given the keys to that kingdom, never allowed to discover whether or not she liked that kingdom.

And so I think of that, and we have so many discoverers, and so that's a revelation and a gift. But because I came from a platform company that reached over a billion people graduating 20% of the class at Berkeley last year, in our first year, 20% of all undergraduates got their degrees from our college, around 2,000. That's not scale. The world is very big. So actually, I don't know if you know who Safiya Noble is, she wrote “Algorithms of Oppression.”

Bruke Kifle: Algorithm, yes.

Dr. Chayes: So she's a very good friend of mine. And today we were on a Zoom call working together. We have a class called Data 6, which is a more social science oriented, requiring a little less technical background, but also more social science oriented. And we have that and we have a partnership with Tuskegee, and we're doing it there and we're working with a community college here. And Safiya has agreed to work with us to help create a version of this course, which has a four week module on generative AI, which is what's going to happen in the world, what is happening in the world, and how do we protect ourselves from it, learn to interrogate it or learn how to question it, and how do we use it to empower individuals to basically create their own team to solve what their problems are.

And so we just had that call this morning, and I'm just signing a partnership with the Chancellor of the California Community Colleges, which have 2 million students, and we want to roll out this class for them. So Berkeley, which graduates 9,000 students a year or so is not scale, but a community college which is graduating a million or whatever fraction of the ones who graduate, graduate a year, that begins to be scale. And so how do we do that so that we both inoculate people against the possible dangers and empower people with the incredible tools of generative AI? So I want to do it there. And then, by the way, our data science curriculum, our regular curriculum is open to everyone. It's on a Jupiter platform. It's used by over 300 other colleges, universities.

Bruke Kifle: Oh, wow.

Dr. Chayes: Yeah.

Bruke Kifle: Wow.

Dr. Chayes: So that's scale, okay, that scale's. So people said, "Well, why did you leave Microsoft? You could reach all these people." And it's like, "We'll figure out a way to do it." Berkeley can be a leader in this, and Berkeley can show that you don't need as many resources as you might've thought. You need to do this, and we'll give you the curriculum and we will create more curriculum. So we were brainstorming with Safiya on what social justice problems we might try to have people try to create agents to help them solve. And it is, I think, as I said, coming from a technology company, a platform company, I know that impact requires scale. And so we will, and we are building platforms that scale everything we do.

Bruke Kifle: And when you think about that, I mean, I think you described it so perfectly when building this platform and when trying to achieve scale. Of course, one of the core things here is best equipping and best preparing the next generation of computing professionals, especially given some of the rapid advancements that we're seeing in fields like AI as you described. So from your perspective, what are the core skills or mindsets that you believe are essential for future leaders in computing? And how do you ensure that students are well-prepared, not just for impactful, but also ethical careers as computing professionals?

Dr. Chayes: Well, I mean, as I said, I love our data science curriculum because human context and ethics is a huge piece of it. And I don't just like to say, okay, you go take your one course on it and then you're done. So I think first of all, we have to prepare people for a rapidly evolving world. Coding is not going to be as important as it has been, which is in a way a good thing because it gets rid of an aspect of elitism of computer science. It enables the rest of the world to participate more easily. What we really need to train people to do is to look at the problems in our world and create enhanced tools that are domain specific for those problems, because there will always be huge problems in this world.

And no matter how the generative AI is, the LLMs are, creative human beings will always be the last mile of that. Always. We are going to make the technology do what it can't do yet with our creativity, with our openness, with our resilience. I am right now, I fell into working on creating new materials for climate change a couple of years ago because we got a gift on this. We started, and I'm working with Omar Yaghi, a phenomenal chemist. He's won the Wolf Prize and so many other prizes who grew up as a Palestinian refugee in Lebanon, and very much agrees with me that we have to enable everyone. He's an experimental chemist. We started working together. We started using LLMs to help us create these materials that pull carbon dioxide out of the air or pull water out of desert air. And it would typically have taken two to three years to synthesize one of these in his lab. And we've trained seven LLMs to be working with human beings in fast iterative cycles to do it in two weeks.

And a lot of the people who helped create this weren't even computer scientists. Some of them are. Matei Zaharia has worked with us on some of it. He's CTO and co-founder of Databricks. So we have great computer, but we also have people coming from chemistry who knew very little and now are just phenomenal. So I think the ability to work across boundaries on important problems and not to tie yourself to any one technology is the be-all and the end-all. A computer science education is a wonderful education that teaches you how to think in deep and logical ways about the problems at hand. And that coupled with an ability to take risk and to work with people across disciplinary boundaries, solving the world's most urgent problems. I mean, you'll have a lifetime full of highly productive, impactful, and fulfilling and fulfilling work.

So I believe that the thinking that goes into computer science is invaluable, and we should couple that with awareness of how this could interact with other things, and of course with the ethical frameworks, because the flip side of very empowering is that it can be very damaging, and the world has always dealt with these two sides of technology. And I don't want the models to be locked down and closed to protect us because I worry that then we will not get the upside of these models empowering people to solve their own problems. I believe if properly used, generative AI can finally start to bridge the digital divide, but we have to be deeply cognizant of the potential harm. So that's why I am working with Safiya Noble and others so that we enable people, people who have been disenfranchised, who have been marginalized to use these incredibly powerful tools to level the playing field, while at the same time being very aware of their biases.

Bruke Kifle: I think that's just so well put. And to your point, I think historically over decades we've seen technology being an enabler, but also a lot of the downsides of technology that's not properly designed, that's not made inclusively, that's not made to be fair. And I think there are a range of interest in case studies across different kinds of technology. But I think sort of the proliferation and acceleration of AI has been a particularly interesting case, both from classical machine learning where we've seen some of the core principles around fairness and accountability and transparency. But I think a newer class of harms and concerns as it pertains to generative AI and LLMs and prompt injection attacks. And so I think the general landscape has slightly evolved, but the core principle that you described of this technology being a core enabler and a potential tool to equalize the playing field so long as it's designed in a way that's mindful of some of the potential harms as well, I think captures it so, so well.

Dr. Chayes: Yeah, and I'm actually very happy because Governor Newsom asked me and Fei Li, whom probably many of your listeners know the godmother of AI and Tino Quellar, who is the leader of the Carnegie Endowment for International Peace, to help lead the state in figuring out how to do safe and responsible AI, the state of California to do safe and responsible AI while encouraging its implementation in ways that will bridge the digital divide. So I'm very excited that I get to participate in that in some way.

Bruke Kifle: That is very exciting, and I think it's for the greater good of the community and society at large to have someone so grounded and accomplished like you helping drive some of the progress in this field as well. I would love to maybe turn to just sort of a final question or two. You're involved in such a wide range of interdisciplinary work across the computing aspects, across the intersection with the arts, the sciences. What do you see as the future direction of the field of computing in the next five, maybe 10 years, particularly with a lens for interdisciplinary search? Are there specific emerging areas that you believe hold the most promise for societal impact?

Dr. Chayes: Well, I look around and I ask, what are the most urgent problems of our time? Because I think especially, I mean, I'm old. I won't be here forever. Many of you will be here a lot longer. If we don't stop climate change, we are just, I mean, we will have to put all of our resources into trying to adapt with so few options before us. And so I think the interface of computing and climate change is an incredibly important area. And there are so many levels of it. I mean, there's the economic aspects of it, and there are the biological diversity aspects, and there are the material science aspects. There are so many aspects of it. So that I think is really important. Biomedicine and health is an urgent problem, especially when we think about world health. And I believe now that we are going to be able to do health interventions in a much more personalized and efficient way due to generative AI.

And yes, we'll be able to do an incredible amount for the privileged view in the us, those of us in the US who have hospitals available. But I believe that we will also be able to do much more in the public health arena with these new tools. And then finally, I think about human welfare and public service, and how do we better deliver our limited resources and our services to the people of this country and the world? And I believe, again, that this boundary of generative AI is, and these fields is going to be transformative. So I believe computing is going to be at the heart of transformations in everything, also business models. But if you say, "Oh, I'd like to do something for the most urgent problems of our time." You as a computer scientist are incredibly well-equipped to do that.

Bruke Kifle: I think that's well put and certainly well encouraging for those in this field. And I think I would love to wrap up with a question I think that you kind of touched on. We have a lot of folks, listeners who are potentially in their studies, maybe early career professionals or maybe who've been in the field for quite some time. What advice would you give particularly to young practitioners, professionals, researchers who are interested pursuing a career in computing and specifically with a focus on interdisciplinary work?

Dr. Chayes: Well, what I have always done is, I've grabbed the brass ring when it's come my way. I say to people that opportunity always comes at the most inopportune time. So I think sometimes we hear about things, but, oh, we can't do that because I'm doing this now and I'm doing that now. And it's not like you should just be a dilettante to do a little bit of this and then go off and do something else. But I do believe that there are opportunities out there, opportunities for interdisciplinary work. They're almost always higher risk than staying within the discipline.

And I will let you guys know something I hadn't said before, which is that I have a horrible case of the imposter syndrome. I came from a non-academic family, but I don't listen to that voice. I act as if that voice is not there and I take risks. And my interdisciplinary opportunities have always entailed more risk than following a discipline. So I would say that take those risks, because even if you fail at this, you can actually get back up and be much better equipped to do something else. And when you take those, try to understand the culture of the other discipline with which you're interacting. What do they care about? Why do they care about it? What are their aspirations?

Bruke Kifle: I think that's so well put. Take risk and approach problems and disciplines with a desire for understanding and a deep sense of empathy. I think those are great principles as a academic, as a practitioner, and I think more generally just as a human. So thank you for those nuggets, Dr. Chayes. We really appreciate your time and we look forward to all the exciting contributions you will continue to have in the field.

Dr. Chayes: Thanks so much, Bruke. This has been fun.

Bruke Kifle: ACM ByteCast is a production of the Association for Computing Machinery's Practitioner Board. To learn more about ACM and its activities, visit acm.org. For more information about this and other episodes, please visit our website at learning.acm.org/bytecast.