TCS on the Web

BY

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Nutan Limaye[1] is a Full Professor in Theoretical Computer Science at the IT University of Copenhagen. Her research is in computational complexity theory, with a particular focus on algebraic complexity and circuit lower bounds. She has received several awards, including a FOCS best paper award, and she was a keynote speaker at the Computational Complexity Conference 2024.

In this interview, we speak with Nutan about her podcast *Life of a Researcher* which is available on Spotify[2] and on Podcast Addict[3]. The podcast features long-form conversations with researchers across fields and career stages, with a particular focus on the lived reality of research: how people enter the profession, what sustains them, and how diverse backgrounds shape research trajectories. Our conversation explores the motivation behind the podcast, recurring themes that emerge across episodes, how guests are selected, and how topics such as neurodiversity fit naturally into the project.

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[1] `https://www.itu.dk/~nuli/`
[2] `https://open.spotify.com/show/4T8mDPAJdqJw1349X5l8Mt`
[3] `https://podcastaddict.com/podcast/life-of-a-researcher/4111736.`

On the Life of a Researcher

A Conversation with Nutan Limaye

Nutan, thank you for agreeing to do this interview. I enjoy your podcast a lot. To start, could you give our readers a short overview of the podcast?

The podcast is called *Life of a Researcher*. The idea is to talk to researchers and learn why they are in research, how they got there, and what their trajectory was. For example: how they grew up, whether their early experiences influenced what they do now, and more generally how different people end up in research.

One motivation is that many of us grow up with a very stereotypical image of a researcher: someone working alone, not talking to anyone, having a sudden "eureka moment," and discovering something. That is certainly an image I had.

But when you actually do research, you realize it is not like this at all. People have very different backgrounds and perspectives. And in many areas, dynamic interaction is essential: collaboration, understanding other people's ideas, and communicating well. These aspects of research life are rarely part of popular communication about research. That is the viewpoint behind the podcast.

I like that you add dimensions people usually don't talk about, and I think that matters a lot for young researchers. If you had to give a pointer for early-career researchers: is there a particular episode you would recommend as a starting point?

It depends on who you are. Role models can be very important. If you feel alone—for example because you are a woman in a male-dominated field, or you are neurodivergent, or you are LGBTQ+—it can help to hear from people with related experiences.

I have been fortunate to host guests with a broad cross-section of backgrounds and experiences. So rather than naming one or two episodes, I would suggest looking at the short summaries in the episode list and choosing something that resonates with where you are right now.

Looking back at the episodes you have recorded so far: is there a theme or message that keeps coming up?

This is interesting because, by design, I try to capture variety, so the episodes are quite different.

But something that comes up again and again is that many guests have felt, at some point, "I'm not really fitting in." Even people who are now at the top of their research careers describe periods of confusion and self-doubt. And yet they come out on the other side.

This can be inspiring for young people, because they also doubt themselves. Of course, I don't want to paint everything as rosy: there is a selection bias, since I'm interviewing people who stayed in research and built careers. But perseverance comes up a lot. And also: they genuinely seem to enjoy what they do.

I ask guests at the end what they love about their work, and what they would remove from their research life if they could. For the second question, people often have to think hard—there is not an immediate long list. That tells you something.

That leads nicely to the next question. How do you find your guests? Do you have a process?

Since I started thinking about the podcast, I've been on the lookout. Some guests come through my network, of course. But sometimes it's serendipity.

For example, I invited Geraldine Fitzpatrick after attending a leadership course she taught. I was pleasantly surprised by the real rigor with which she offered the leadership course. And her background intrigued me: she works in human-computer interaction, and earlier she trained as a nurse. That combination, and her perspective as a research leader, made me want to have her on the podcast.

So I often look for people with unusual paths or distinctive perspectives, and then I reach out. Some interesting people decline because they don't feel comfortable speaking publicly in this format. That happens too.

One thing I appreciate is that you bring in perspectives beyond TCS. You bring in guests from HCI and beyond. How have these interdisciplinary conversations influenced the way you think about research, or about theoretical computer science as a field?

I'm not sure it has changed how I think about computer science itself, but it has made me more aware of how different the cultures are across fields.

When I interview someone outside TCS, I prepare more. I try to understand what their day-to-day looks like and what matters in their context—maybe grants are more important for them, or workshops, or other practices that differ from ours.

I also think it's useful for a mostly TCS audience to hear about challenges in other areas. It can reduce the "grass is greener" feeling and help us appreciate what works well in our community—while still being able to critique what should improve.

You also cover topics like neurodiversity, ADHD, and dyslexia. You seem to make a deliberate effort to include these experiences. What led you to that, and is there a key learning you would share?

First, it fits naturally with the podcast theme: these are life experiences that can shape what it means to be a researcher.

Second, I've been sensitized to these challenges through personal experience and through teaching. As a PhD student, I had a close friend with clinical depression. At the time, we tried to be supportive, but I don't think we truly understood how hard it was for her to complete her PhD. It is only much later that it really sinks in what that must have taken.

Now, as a professor and teacher, I meet students with a wide range of challenges. I cover basic accessibility practices, but there is a lot we don't know. Having open conversations—when guests are willing—helps build understanding. I'm not trying to push a large agenda; it's mainly about awareness, first for myself and then perhaps for listeners over time.

And in TCS specifically, I feel the research problems themselves can be conducive to different ways of thinking. People with ADHD or other forms of neurodivergence may bring distinctive creativity to combinatorial and abstract problems. Historically, there were many brilliant people with challenges that were unnamed at the time. So I also want the message to be: this is not a disqualifier. You can be an excellent researcher.

Has hosting the podcast changed how you approach your own research, teaching, or mentoring?

Not in a dramatic way—these things take time to internalize. But the conversations keep me open and attentive. And there are practical things I've learned: for example, some guests are excellent at compartmentalizing or multitasking, and their advice—often intended for early-career researchers—is useful for me too.

Is there anything else you want to share about the podcast?

I'm thinking about the next season and making some episodes more topical for early-career researchers—for example: how to write a paper, how to present at a conference or workshop, how to apply for grants, how to handle feedback, how to collaborate on drafts. These are practical deep-dives into aspects of research life.

This might become more TCS-focused simply because it is easier for me to find people in that community whose advice I can trust. But the goal would be resource creation—concrete help.

Before we conclude, could you tell us what your current research is about?

I'm a complexity theorist. Complexity theory studies limitations of resources: given a certain amount of time or space, what can't you compute within those bounds? In that sense it is a kind of dual view to algorithms.

In the last decade, I've worked mainly on algebraic complexity theory. There, you represent computational problems as polynomials and study the complexity of computing those polynomials: how many additions and multiplications are needed?

A core question is understanding the limits of computation for polynomials believed to be hard, analogous in spirit to P vs NP. In algebraic complexity, one famous problem is VP vs VNP. A central example is the permanent polynomial, which encodes counting perfect matchings in a graph. We know exponential upper bounds, but we don't know whether exponential size is necessary; it's widely believed to be.

One of my recent results shows that the permanent is provably hard for certain restricted circuit classes—for example, very shallow (constant-depth) circuits, even when they are highly parallel. The lower bound we get is super-polynomial, showing that polynomial size is not enough under those depth restrictions.

Thank you very much for the interview.