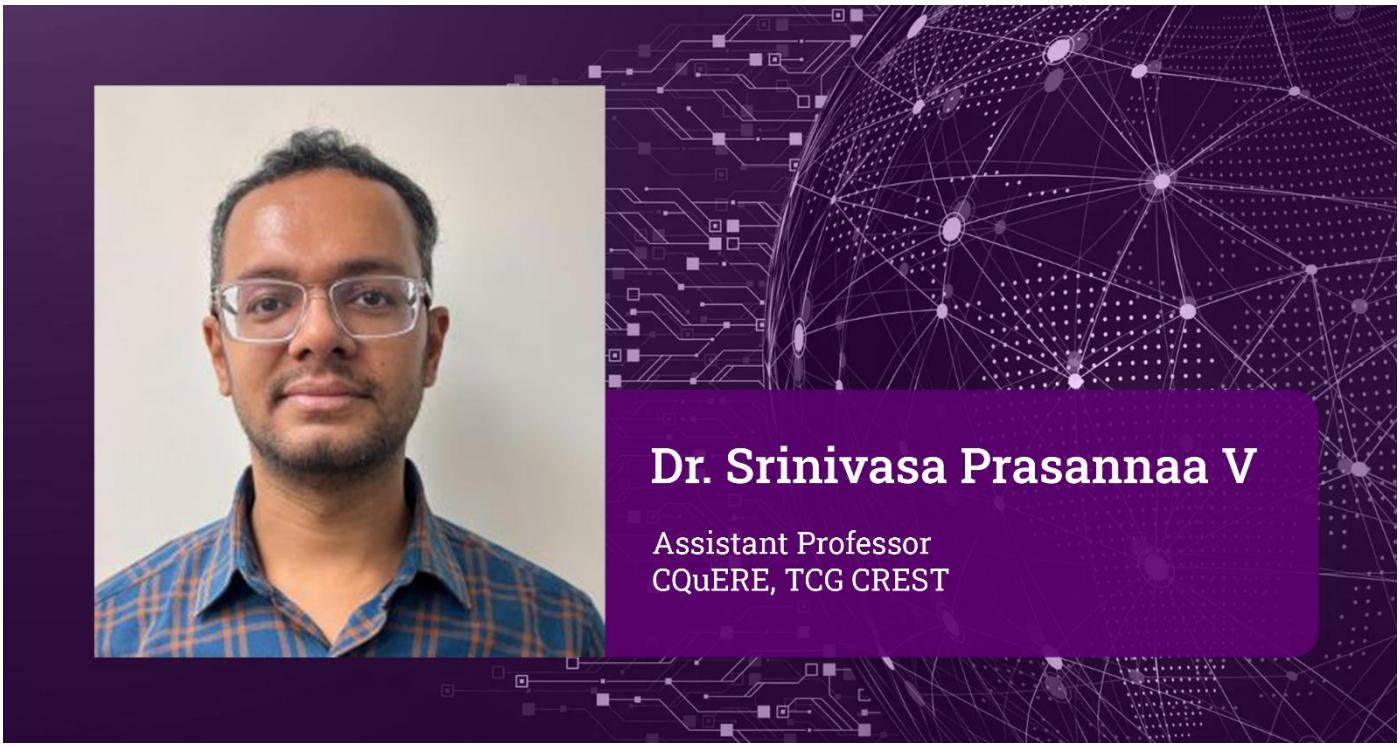
BRIDGING DISCIPLINES:
From Engineering to Quantum Research



Quantum computing stands at the intersection of theory and application, where breakthroughs depend not just on novel algorithms but also on interdisciplinary collaboration. As researchers explore new frontiers, bridging gaps between physics, mathematics, and engineering has become increasingly crucial. But the path to contributing meaningfully to this field isn't always linear. Some of the most innovative thinkers arrive from unexpected academic backgrounds, bringing fresh perspectives that challenge conventional approaches.

Dr. Srinivasa Prasannaa V is one such researcher. With an academic journey that began in mechanical engineering before pivoting to physics and quantum computing, he has navigated disciplines to carve out a space in one of the most cutting-edge areas of research. Now an Assistant Professor at the Centre for Quantum Engineering, Research and Education (CQuERE), TCG CREST, he is engaged in theoretical advancements, interdisciplinary collaboration, and mentoring the next generation of physicists.

In this conversation, he reflects on his transition into physics, the challenges and opportunities in quantum research, and what it takes to balance research, teaching, and leadership in a rapidly growing field.

Could you elaborate on your academic journey, specifically what inspired you to pursue a Master's and Ph.D. in physics after your B. Tech in Mechanical engineering?

From 11th grade, I was convinced that I wanted to pursue research in physics for my career. I opted for engineering due to pressure from my family, and I chose mechanical engineering since I felt that the courses offered were somewhat closer to physics. I was extremely lucky to have two excellent teachers (Prof. S. Lakshmanan and Prof. S. Katte) during my engineering course, who ensured that my interest in physics stayed alive.

I had made a deal with my family before taking up engineering: If after completing my B. Tech degree, I still wanted to pursue physics, they would not bother me any further. Once I got my degree, I promptly said that I still am very much interested in a career in physics.

I joined the Indian Institute of Astrophysics for an Integrated Ph.D. programme. Once again, I was extremely lucky during my Master's (in physics and astrophysics) to have excellent teachers for quantum mechanics, statistical mechanics, electronics, stellar structure, and general relativity. Being in love with a subject is one thing, but one needs to be blessed with great teachers to be trained well in that subject!

Because of them, I never felt like an 'outsider' to physics at any point during my Master's, and had no doubts about pursuing a Ph.D. in Physics upon completing my M.Sc. degree.

What inspired your decision to join TCG CREST, and how do you see its mission complementing your research objectives and professional goals?

Honestly, I fell in love with TCG CREST after joining. Back in 2020, the institute was still very new, and I was actually the first person to officially join CQuERE, so I had no idea what to expect.

My research goals and professional aspirations are pretty simple—I want to do good research, teach to the best of my ability, and contribute to the growth of the Centre by handling my administrative responsibilities with sincerity.

TCG CREST has always been incredibly supportive of my research and teaching, and I couldn't ask for more. A big part of the institute's rapid success in such a short period of time, is, in my opinion, due to some very good people in leadership who have played a major role in making the institute what it is today.

TCG CREST is known for its focus on interdisciplinary collaboration. How does this environment shape your research, and can you share any examples of impactful collaborations?

Yes. Sometimes in research, you take completely unexpected directions, and in such situations, it is of enormous help if the environment is interdisciplinary and fosters collaboration. In two of our ongoing projects, we were faced with some puzzling questions in mathematics. I took the help of Prof. Sayan Chakraborty from IAI, and his inputs were crucial and led to the projects advancing further.

How do you balance your responsibilities as a research group leader along with being an educator? As a new faculty member, have you faced any challenges?

It requires careful planning. But once one has a plan, it is not hard at all to balance the two responsibilities. I have not faced any challenge that I can immediately think of, because of the support that I have received from TCG CREST.

With quantum research being such a rapidly evolving field, how do you stay updated with the latest advancements, and what strategies do you recommend for young researchers to do the same?

The field is growing so rapidly that it is almost impossible to keep up. The best approach is to allocate some time each day—say 30 minutes or so—to browse sites like arXiv or SciRate for the latest preprints on quantum computing. Retaining all that volume of information is another challenge, though!

What do you think are the most pressing challenges in this field, and how can the academic and industry sectors collaborate to address them?

As a theoretician in this emerging field, I see two important directions ahead—one is exploring new applications where quantum computers can truly excel, and the other is refining algorithms to turn new applications into reality.

The former approach is based on the fact that there are some extremely powerful algorithms that are very general in their scope, and thus finding new applications for them is an important direction. As far as the latter consideration goes, every known algorithm has some serious caveats towards practical realisations, and thus it is crucial to work on the algorithmic front to actually make applications in the long-term feasible.

For both of these to happen, it is important for academia and industry to collaborate by taking a long-term approach, and this requires tremendous amounts of patience and supply of resources over extended periods of time.

As India aims to strengthen its position in quantum computing and research, what policy changes or initiatives would you advocate to accelerate this growth?

I'm not sure I have the experience to answer such a question. At 36 years of age, I am still young in academia! However, I do think it is very important to be able to hire more faculty in the field and provide high quality training in quantum computing to interested students.

Reflecting on your own journey, what advice would you offer to students from diverse educational backgrounds, such as engineering, who are considering a shift to physics or quantum research?

Be passionate, don't give up, and never lose sight of the basics. Clearing entrance exams and/or interviews and securing a spot in a Master's or Ph.D. programme at a top institute is just the starting point of the career that we choose for ourselves coming from another background. But keeping these three points in mind and implementing them routinely in the long run is much more difficult than one may think.

That's why it's important to remind ourselves why we took this leap: our deep passion for physics. We also need to check once in a while to make sure we're still on the right track. If we do not, we drift away from what we once aspired to become without even realising it.

For young academics looking to transition into an educator role, what do you believe are the key skills they should develop to effectively mentor and inspire the next generation of researchers? Additionally, how can they maintain a balance between teaching and advancing their research work?

Being a good teacher takes continuous effort, especially in fast-evolving fields like quantum computing, where things change quickly. As far as balancing research and teaching goes, it all relies upon careful planning and execution.

Interview conducted by:

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