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Shaping Future Researchers: Lessons from My PhD Journey

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My PhD journey did not begin with a perfectly defined plan. It began with curiosity, a sense of purpose, and a willingness to leap into the unknown. Looking back, the most meaningful parts of my research experience were not the perfectly structured milestones but the unexpected moments that shaped me as a researcher and as a person.

My journey began in India, where I completed my Bachelor's degree in Electrical and Electronics Engineering at CSVTU, Bhilai, followed by a Master's in Control and Instrumentation Engineering at Dr B R Ambedkar National Institute of Technology, Jalandhar. Each academic step introduced me to new ideas—from control theory to automation—and I gradually found myself drawn toward the growing intersection of software, systems and safety. Moving from India to Europe to begin my PhD at TU Wien, Austria, was the biggest turning point. It was a 180-degree shift in every sense: culture, academic environment, research expectations, the rhythm of daily life, and even the food (yes!). I arrived in Vienna in October 2020 at the peak of the pandemic, a time when the world felt uncertain and strangely quiet. Navigating a new life during such an unusual time was challenging, but it also built resilience, independence and adaptability much faster than I expected. Every move—every new city, every new lab, every new cultural shift—added something meaningful. It shaped how I think as a researcher, how I collaborate, and how I build connections across different communities.

A few words about my PhD work. My focus was on improving how we test and verify safety-critical

cyber-physical systems (CPS)—systems like autonomous vehicles and medical devices. These systems interact with the physical world and must operate safely in real time. My research combined software engineering and formal verification, exploring ways to diagnose faults early and design more effective fault-based testing techniques. In essence, I worked on methods that help uncover system failures before they manifest in the real world. What I loved about this topic was its intersection of theory and practice: it required both mathematical rigour and an understanding of real-world system behaviour. The more I engaged with this problem, the more I realised that safety in CPS is not just a technical objective. It directly affects human lives, which made the work deeply meaningful to me.

Looking back, one of the biggest reasons I was able to grow during my PhD was the mentorship and collaboration I received. I was fortunate to work with Prof. Ezio Bartocci (Professor, TU Wien, Austria), who was my PhD advisor, as well as Dr Dejan Nickovic (Senior Scientist, AIT Austrian Institute of Technology, Austria) and Prof. Leonardo Mariani (Professor, University of Milano-Bicocca, Italy). They encouraged my curiosity, supported me through difficult phases, and challenged me to refine my ideas. I also had the opportunity to spend three months at Prof. Mariani's lab in Milan, thanks to the KUWI Grant from TU Wien. This opportunity enriched my research, strengthened collaboration, and taught me the value of stepping into new environments to see ideas from different angles. The people you work with truly shape your PhD more than any

other factor, and I remain grateful to my supervisor and mentors every day.

Another essential part of my journey was the role of community. Networking and engagement with the broader research world shaped my PhD in ways I could not have imagined at the beginning. Conferences, workshops, and summer schools were never only about presenting a paper or volunteering. They were about meeting people, exchanging ideas, discovering how others approached similar problems, and building relationships that outlasted the event. Attending SRDS 2022, ISSRE 2022, ESEC/FSE 2022, ICST

2023, ISSTA 2024, and SCHIER 2024 gave me the chance to share my work, receive feedback that strengthened my thinking, and find people who inspired me. These experiences made me more confident, broadened my perspective, and helped me understand the global landscape of my research area. And beyond the academic side, one of the joys of being a researcher is everything that comes with travel: discovering new cities, learning new cultures, walking through unfamiliar streets, experiencing local traditions and tasting new cuisines. Those experiences made the journey richer, more memorable, and a lot more fun.



Drishti Yadav at the ECSS 2025 Leaders Workshop “Shaping Future Leaders: Lessons from Recent Doctorates”, reflecting on extra-curricular experiences, including her participation in IE’s Summer School on Informatics Education Research 2024.

Of course, no PhD journey moves in a straight line. The reality is often far from the idealised version we imagine at the beginning. One of the hardest moments for me was when my first paper was rejected after months of dedicated work. I was heartbroken. But with the support and encouragement of my mentors, I looked at the reviews, refined the work, and resubmitted it. Eventually, it was accepted. That moment taught me something I will carry throughout my career: *Rejections do not define you; they redirect you.* Ups and downs will come, but consistency and belief in your work make the difference. I also realised that

persistence alone is not enough. What helped me just as much was communication. Talking openly with colleagues, friends, supervisor and mentors relieved the pressure and gave me clarity. Equally important was taking breaks and giving time to myself and the people I care about. Time with family and friends—even through phone calls in difficult moments—reminded me that research challenges are only one part of life. What matters is not avoiding obstacles but learning to move through them, one step at a time, trusting that the process will eventually make sense.

A PhD is not only about research. It is about personal growth. Over the years, I learned leadership skills, clearer communication, and even something I call “smart procrastination”. Not every moment needs intense focus. Sometimes a small pause allows ideas to mature in the background. Stepping away from a problem often helps you see it from a new angle. These small resets prevent burnout and keep creativity alive. I also learned the importance of self-care and balance. For me, that came through painting, singing, hiking, and even skydiving—yes, really. Joy outside of research energised me to return to my work with new clarity. Whatever the activity may be, finding something that keeps you grounded and happy makes the PhD journey more sustainable.

If I could tell my first-year PhD self one thing, it would be this: *Trust the process and enjoy the*

journey. Every setback is a setup for growth. Find mentors who lift you up. Build and nurture your network. Stay consistent and committed. Celebrate yourself, because you are your strongest ally. Research is filled with uncertainties, but it is also filled with moments of discovery, connection and transformation.

As I reflect on the years behind me, I see a path that was anything but smooth, but one that taught me more than I expected. I have learned that courage often looks like showing up again the next day a little wiser, a little steadier and a lot more determined. I am grateful to my mentors, colleagues, friends and family, as well as to everyone shaping the next generation of researchers. I am also grateful to myself for never giving up.



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*Drishti Yadav, IE Best Dissertation Award 2025 Runner-up
& Alumni of the 2024 Debut Summer School*



Application expected to open in March–April. Stay tuned!