What Makes Me a Strong Candidate

2026 Dean's Award for Excellence in Research by a Research Fellow · Faculty of Engineering, Monash University

Yuefeng Yin — Research Fellow   Department of Materials Science and Engineering

I am a computational condensed-matter physicist who designs the materials behind the next generation of low-power, high-speed electronics. My work answers one question: *can we engineer materials whose electrons carry information faster, cooler, and more robustly than anything we have today?* Answering it means moving fluidly between Hilbert-space mathematics, atomistic simulation, high-performance code, and close partnership with the experimentalists and industry partners who grow, measure, and ultimately manufacture these crystals. Over the past two years that approach has produced a concentrated burst of high-impact results and, crucially, has carried discovery out of the lab and toward the factory floor.

1 · EXCELLENCE AND IMPACT

14	7	17	A$2.35M
ORIGINAL RESEARCH ARTICLES (2024-)	FIRST-AUTHORED/CO-FIRST-AUTHORED/CORRESPONDING PAPERS (2024-)	H-INDEX (2022-)	FUNDING LED AND PARTICIPATED (2025-)

Scholarly Excellence — Consistent top-tier output

During the last two years, I have maintained producing high-quality research in quantum materials and condensed matter physics, with outcomes appearing in prestigious journals and advancing the field by providing critical modelling insights. Highlights include:

- **Completion of my “Bismuth trilogy”**, consisting of three original theory papers investigating the electronic structure of two-dimensional bismuth spanning from 2021 to 2025, published in *New Journal of Physics* and *Materials Today Physics*. These studies provide innovative perspectives on realising low-energy electronic transport through new materials architectures based on atomically thin films. They also form the theoretical foundation of my recent grant success and patent application.
- **Revealing new physics at materials interfaces.** I have made extensive and decisive theoretical contributions to studies on tuning materials interfaces to uncover unconventional electronic transport and achieve better contacts in electronic device fabrication. These findings are critical to realising the potential of two-dimensional materials for future low-energy electronics, and have been published in high-impact journals including *Nano Letters* and *ACS Nano*.
- **Challenging conventional materials design principles** by showing that disorder is not necessarily detrimental, but can strongly enhance device performance. Using multiscale modelling methods, I have worked with experimental collaborators to explain how disorder can be designed and incorporated to make better and cost-effective electronic devices. These investigations have led to publications in *Matter* and *Nature Communications*.

Sectoral Impact — A story of “from lab to fab”

My research excellence extends beyond academic publications. In the last two years, I have achieved a rare milestone among computational materials scientists: translating innovative modelling ideas into real-world technology on a path towards commercialisation.

In 2025, I submitted a patent application (US63/848,509) with the Australian start-up TQ Transistors on a new class of two-dimensional materials structures for semiconductors, based on my modelling results. In 2026, I successfully secured Australia’s Economic Accelerator (AEA) Ignite funding, **”From Lab to Fab: Advancing a New Low-Energy Transistor Towards Large-scale Manufacturing”** (IG250200225), with A$650K to further develop the technology and assemble an experimental team for practical fabrication.

Recently, I also shared success with Prof. Michael Fuhrer (Physics) and Prof. Nikhil Medhekar (MSE) in their successful Linkage Projects bid, **”Prototyping a Breakthrough Low-Energy Transistor”** (LP250200919). I played a pivotal role in the application process and will be a key participant in the A$1.7M funding package.

Growing from computational models to a large team involving both modelling and experimental talents, I have left a strong research footprint in developing next-generation low-energy electronics in Australia.

Societal impact

Computing already consumes a significant and fast-growing share of global electricity. The materials I design target the root cause—the energy dissipated every time a transistor switches—offering a route to electronics that are dramatically cooler and lower-power. I make this work legible beyond academia: my research has been featured by the **Australian Research Council newsletter**, ***Materials Australia***, and the FLEET Centre, and I am committed to translating dense physics into plain language for students and the public.

2 · LEADERSHIP QUALITIES

Building capability — mentoring the next generation

I have mentored or co-supervised **ten PhD researchers** across Monash and partner institutions, four of whom I am actively co-supervising today (Hanqi Wang, Minh Tien Le, Rahul Awale, Tung Huynh). Several have gone on to first-author papers in *Nature Communications*, *ACS Nano*, and *Nano Letters* with my guidance. As a Lecturer in the joint Monash–Central South University program since 2017, I teach Computational Materials Science and release my full lecture notes openly, fostering talent well beyond my immediate group.

Impact at Monash beyond my own group

My role is intrinsically connective: I sit across the **Department of Materials Science and Engineering and the School of Physics and Astronomy**, and serve as the computational engine for experimental teams who would otherwise lack first-principles support. These collaborations span Monash, ANSTO, Victoria University of Wellington, IIT Bombay, Shandong University, Tongji University, and the University of Southern Queensland—empowering others by giving their measurements predictive, mechanistic explanations and forward-looking design guidance.

Thought leadership, integrity, and open science

I lead with generosity and reproducibility. I develop and freely share universal DFT–tight-binding workflows and open, citable computational notebooks designed to *lower the activation energy* for newcomers—from a first DFT calculation to a Berry-curvature pipeline in under 200 lines. Releasing inputs, scripts, and post-processing notebooks alongside each publication is, to me, a matter of scientific integrity and accountability: it lets any group—regardless of resources—verify and build on my work, advancing equity in a computationally intensive field.

In summary

Over the defining one-to-two-year window of this award I have combined **exceptional, internationally peer-reviewed research** with **tangible sectoral translation** and **generous, open, capability-building leadership**. I would be honoured to represent the Department of Materials Science and Engineering for the Dean's Award for Excellence in Research.