Executive Summary

I present my case for promotion to Associate Professor with tenure, demonstrating **a peak of excellence in research** alongside **demonstrated quality in education** and **meaningful service contributions**. Since joining the National University of Singapore (NUS) as a tenure-track Assistant Professor in July 2019, I have established the **Multi-Agent Robotic Motion (MARMot) Lab** and promoted it into an internationally recognized research group, developed an innovative teaching practice consistently rated above departmental and faculty averages, and contributed substantively to curriculum development and institutional service. The evidence presented in this dossier demonstrates both the impact of my contributions to date and their sustainability over the long term.

1. Research Excellence: Peak Achievement

My research addresses a fundamental challenge in robotics and artificial intelligence (AI): enabling large-scale autonomous systems to coordinate intelligently in real-world environments. The central problem unifying my work is the *curse of dimensionality*: as the number of agents or degrees of freedom increases, traditional planning becomes computationally intractable. My approach breaks down this complexity through hierarchical, decentralized, and distributed control frameworks powered by deep reinforcement and imitation learning. This research program, developed entirely independently of my doctoral and postdoctoral advisors, has achieved international recognition through prestigious awards, sustained funding, and editorial leadership in the field's top journals and conferences (see **Research Statement** for all details).

Importantly, my research is both theoretical and experimental: while my group and I develop foundational algorithmic and mathematical advances for multi-robot and articulated robotic systems, we consistently validate these contributions on physical robots under real-world conditions, bridging the gap between theory and practice. Furthermore, as my work lies at the interface of robotics and AI, two fields where the pace of progress is such that conferences often serve as the primary and most timely dissemination channel. Hence, my publication record deliberately balances high-impact journal articles with full-length papers at the field's top conferences, where peer review is rigorous and acceptance rates are low.

1.1 Recognition and Impact

The quality of my research is evidenced by recognition at the field's most prestigious venues:

Best Paper Awards at ICRA 2025, the flagship robotics conference, including both a **Best Student Paper Award** and **Best Paper Award on Multi-Robot Systems** for our work on 10,000-agent coordination (SILLM). Only four Best Student Papers were selected from 1,606 accepted papers (top 0.25%), representing exceptional recognition. Additional Best Paper Awards at DARS 2021 and DARS 2022 (the leading conference for distributed multi-robot systems) further demonstrate sustained excellence (see **Key Supporting Information, Section G**).

An **Amazon Research Award (2022)**, a highly competitive international grant (~$80k USD + $20k Amazon Web Services credits), recognized my early-career contributions and research direction on distributed learning for human-aware multi-agent pathfinding. Recipients are selected globally from top researchers across academia. Complementing this external recognition, I received an **NUS College of Design and Engineering (CDE) Outstanding Early Career Award in 2023**, a faculty-wide distinction recognizing exceptional contributions across research, teaching, and service. I was one of only three recipients that year, and the sole awardee from Mechanical Engineering, underscoring that my contributions are recognized not only internationally but also as outstanding within my own institution.

I have been appointed **Area Chair for RSS 2026** (Robotics: Science and Systems), arguably the most selective robotics conference, and serve as **Associate Editor for the International Journal of Robotics Research** (IJRR, Scopus Top-1%, IF 9.3), one of the most prestigious journals in robotics. I also serve as Associate Editor for IEEE Robotics and Automation Letters (RA-L, Scopus Top-10%, IF 5.3) and have been Associate Editor for ICRA since 2022 (see **Key Supporting Information, Sections H and K**).

1.2 Publication Record and Bibliometric Standing

My scholarly output during this tenure-track period includes **53 peer-reviewed conference papers,** of which 41 as sole/first/last/corresponding (SFLC) author, and **20 journal articles**, of which 14 as SFLC author, including 10 in Scopus Top-10% venues. My cumulative citation count exceeds 2,600 with an h-index of 24 on Google Scholar (see **Key Supporting Information, Sections C–D**). A per-paper citation analysis (Google Scholar, 11 March 2026) further underscores my growing trajectory and impact: papers published before I joined NUS averaged 0.91 citations per year per paper, while my NUS-period papers average 1.21 citations per year per paper (a **35% improvement**), despite being considerably more recent and thus less likely to have yet reached their full audience.

Key bibliometric indicators further demonstrate the impact and quality of my research. My Scopus **Field-Weighted Citation Impact (FWCI) of 2.72** (2019-2026) indicates that my work receives nearly three times the citation attention of the global average for similar publications. Additionally, **72% of my publications appear in top-10% journals**, and **24.6% of my papers rank in the top 10% by citation count**. A detailed comparison with recently promoted associate professors at leading research universities confirms that my research profile compares favorably with, and in several key dimensions exceeds, those of recently tenured faculty at peer or aspiring institutions (see **Self-Comparison with Peers** for full details).

Independent field-wide rankings further corroborate this standing. Roboranking.org, a newly established, community-adopted benchmark for robotics research productivity modeled after the influential csrankings.org for computer science, ranks me **3rd among all NUS robotics faculty** over the 2019–2026 period corresponding to my tenure track. Roboranking scores each faculty member based on each of their publication's venue prestige and author count (rewarding both quality and independent contribution), then aggregates faculty scores at the institutional level. Under this approach, and restricting the comparison to the core robotics venues listed in Roboranking's primary selection (i.e., excluding computer vision conferences such as CVPR, ICCV, and ECCV, which fall outside the scope of my research program), I rank immediately behind two senior, internationally established full professors, David Hsu (SoC) and Marcelo Ang (ME). Thus, my individual ranking helps place NUS at **rank 16 worldwide** (as of 16 March 2026) in the Roboranking institutional standings, ahead of many highly-ranked research universities with far larger robotics faculties. This corroborates that my output is not only internationally competitive in absolute terms, but also disproportionately impactful relative to my career stage.

1.3 Research Funding

My research has attracted over **S$8 million (USD ~6.3M)** in funding as PI (excluding Co-PI and Co-I roles), spanning grants from Singapore's Ministry of Education (MOE Tier 1), the National Research Foundation (NRF), Temasek Laboratories, Singapore's Ministry of Defense, and Singapore's Defense Science Organization (DSO), as well as industry partners including ST Engineering, Cisco Systems, Amazon, and the Singapore Maritime Institute. Active grants as PI exceed S$3M, ensuring sustainability (see **Key Supporting Information, Section I** for the complete grant list).

Most significantly, in January 2026, I was selected to lead NUS's contribution to a landmark **S$1.5M trilateral research initiative** with ST Engineering and Singapore's Home Team Science and Technology Agency (HTX), partnering with Carnegie Mellon University and the University of Pennsylvania for next-generation autonomous civilian swarm defense systems.

1.4 International Recognition and Collaboration

My expertise is regularly sought through **keynote invitations at leading venues**, including CVPR 2025, AAMAS 2024, IROS 2024, and AAAI 2023, as well as invited seminars at the University of Pennsylvania's GRASP Lab, Stanford's Multi-Robot Systems Lab, CMU's Robotics Institute, Caltech, MIT, Cambridge, EPFL, and ETH Zürich (see **Key Supporting Information, Section J** for a full list).

Strategic international collaborations with Prof. Auke Ijspeert (EPFL) on bio-inspired locomotion, Prof. Mac Schwager (Stanford) on collaborative manipulation, and Prof. Jiaoyang Li (CMU) on scalable pathfinding have allowed me to start multiple high-impact, cutting-edge projects, resulting in publications at RSS,

CoRL (oral, ~5% acceptance), and ICRA (dual Best Paper Awards). These partnerships were initiated by me and involved students I supervised visiting partner labs on competitive NUS fellowships.

1.5 Research Training and Student Placement

I have graduated **7 PhD and 2 MEng students** and several exceptional undergraduate students, with placements at Stanford (postdoc with Prof. Mac Schwager), MIT (PhD), TikTok, Alibaba, and other top career destinations. I currently supervise 15+ graduate students and postdoctoral researchers. My students' achievements include **Best Paper Awards** (ICRA 2025, DARS 2022), NUS Research Scholarships, NUS Overseas Research Immersion Awards (ORIA) supporting visits to Stanford and EPFL, and admission to CMU's prestigious RISS program (see **Key Supporting Information, Section R**; **Education Statement, Section 3**).

2. Educational Contributions: Demonstrated Quality

Teaching is a primary motivation for my academic career on the tenure track. Since joining NUS, I have developed a distinctive teaching practice centered on student engagement, practical application, and continuous improvement through systematic inquiry. My teaching effectiveness scores have **consistently exceeded departmental and faculty averages**, with recent scores reaching **4.6-5.0/5**, among the highest in my department. I have either designed from scratch or substantially updated every course I teach (see **Education Statement** for complete details).

2.1 Course Development and Innovation

ME5418 (Machine Learning in Robotics): A solo course I proposed and created entirely from scratch through NUS's Centre for Teaching, Learning and Technology (CTLT) Module Design Institute in 2023. The course serves 100–150 Master's and senior undergraduate students per offering and has become a key elective in the MSc Robotics program. It uses a **fully flipped classroom format**: students acquire theoretical content through pre-class videos and readings, while class time focuses exclusively on hands-on consolidation through code reviews, live demonstrations, and practical exercises. A central pedagogical goal is training students to evaluate when AI/data-driven methods are genuinely needed versus when first-principles approaches are more appropriate. This is a crucial skill for engineers who will likely encounter substantial hype around AI in their careers and will need to decide when and how to incorporate it in their work. The course features **scaffolded formative assessments** (65% of the grade) including weekly quizzes, peer-reviewed project proposals, and three intermediate deliverables ensuring students receive feedback throughout rather than only at the end. Student feedback has risen each year to **4.8/5 teacher effectiveness** (see **Education Statement, Section 1.3**).

ME3241 (Microprocessor Applications): I completely redesigned this undergraduate elective around a final project where students implement their own arcade game for a physical Game Boy Advance console. The course is structured around progressively challenging practical exercises, with students consistently noting that despite initial difficulty, they are incredibly proud of their final achievement. Scores rose steadily as the course matured, achieving a perfect **5.0/5 teacher effectiveness** in AY2023-24.

ME5405 (Machine Vision): I updated this postgraduate elective to introduce modern techniques that have become industry standard, including feature extraction methods, object detection and classification algorithms, and deep learning-based approaches. These updates contributed to consistently above-average feedback scores, reaching **4.6/5 teacher effectiveness** by AY2022-23.

ME5406 (Deep Learning for Robotics): Co-proposed and designed with A/Prof. Peter Chen in 2021 to address growing graduate student interest in AI for robotics. Using a half-flipped format with pre-class videos freeing lecture time for live demonstrations and hands-on coding exercises, this module has grown to serve approximately 150 students annually and has become a cornerstone of the MSc program (latest **teacher effectiveness: 4.5/5**).

RB2301 (Robot Programming): A new core course for the BEng in Robotics and Machine Intelligence that I co-designed and taught in its inaugural offering (AY2025-26). Students apply concepts through progressive group projects culminating in full autonomous navigation on ROS-enabled ground robots with 2D LiDAR (**4.8/5 teacher effectiveness**).

2.2 Curriculum Leadership

My most significant educational leadership contribution was serving on the **CDE taskforce that designed the new Bachelor of Engineering in Robotics and Machine Intelligence (RMI)** at the Dean's request. I conducted benchmarking research on comparable programs worldwide, participated in designing the curriculum structure and elective pathways, and fully proposed two new modules (RB3301 and RB3302). The program received Ministry of Education approval and launched in AY2025/26 (see **Education Statement, Section 2.1**).

2.3 Educational Scholarship

I am currently participating in the **Reflective Inquiry in Teaching (RITE) Program (2025–2026)**, investigating the impact of a brief in-class intervention on students' research proposal writing skills. Drawing on James Lang's *Small Teaching* principles, I designed a 15-minute workshop comprising an interactive exemplar comparison activity followed by a mini-lecture on methodical writing. I am collaborating with CTLT on a pre-post evaluation using the AAC&U Critical Thinking Value Rubric to formally assess this intervention's impact (see **Education Statement, Section 4**). My professional development trajectory, which started with CTLT's Professional Development Programme (2019–2020) and continued through the Course Design Institute (2023) and currently the RITE Program, reflects deliberate progression from foundational teaching skills toward systematic inquiry into teaching practices.

3. Service Contributions

While service expectations for junior faculty are typically modest, I have sought meaningful opportunities to contribute to our academic community; particularly in areas where my expertise in robotics and multi-agent systems could support strategic initiatives in education, outreach, and recruitment (see **Service Statement** for complete details).

Department-level: I have contributed to faculty recruitment by serving on ten faculty position interview committees (six remote, four on-site), helping shape the future of our department. I served as committee member and judge for our department's PhD Research Excellence Award 2024, and regularly represent the department at NUS commencement ceremonies (annually since 2021, twice in 2025).

Faculty-level: My involvement in creating the new RMI undergraduate program represents a lasting contribution to NUS's educational offerings. I have served as a reviewer on Singapore's Ministry of Education Tier 1 Academic Research Funds grant panel since 2022, evaluating research proposals and contributing to the allocation of competitive research funding. Since March 2026, I serve as Area Director for Robotic Platforms for NUS' Advanced Robotic Center, overseeing inventory, sharing, and strategic acquisition of the center's robotic infrastructure.

University-level: I co-created the **NUS Internship and Research Immersion in Singapore (NUS IRIS)** summer school, which welcomed 30 international students in its inaugural 2025 iteration. I participated in NUS Graduate School's outreach initiative in Germany (November 2025) and regularly contribute to NUS Open House events and local showcases with robot demonstrations.

National and broader impact: I was invited to serve as a **Panel Reviewer for the European Research Council (ERC) Starting Grant 2026 Call**, one of the most prestigious and competitive funding bodies in the world: a recognition of my standing in the international research community. I am also currently serving as a judge for the Singapore Science and Engineering Fair 2026, have demonstrated our research to Senior Minister of State for Defence Mr. Heng Chee How at Singapore's Amazing Flying Machines competition (SAFMC 2025), and have contributed to public understanding of robotics through CNA's "Why It Matters" documentary series which covered my lab's work (Season 5, Episode 5, 4 January 2022; video link (segment starting at 18min10s)). In early 2025, my lab's research was also featured on promotional banners across Singapore's SMRT network (metro lines) to advertise the new RMI program, showcasing our collaborative robots in a search and rescue scenario to a broad public audience.

4. Sustainability and Future Trajectory

The evidence presented demonstrates not only current achievement but **clear indicators of long-term sustainability** in the advancement of research, education, and service:

Research sustainability is ensured through: (1) over S$3M in active grants as PI; (2) established international collaborations (EPFL, Stanford, CMU, ETHZ); (3) a growing research group of 15+ PhD students and postdocs; (4) a pipeline of high-quality publications (RSS 2025, CoRL 2025 Oral, T-ITS 2026); and (5) new major initiatives including the S$1.5M ST Engineering/HTX trilateral collaboration (2026–2029). My research is progressively shifting toward foundation models for embodied AI, which positions my lab at the forefront of emerging directions in robot learning.

Beyond traditional grants, I have cultivated **sustained industrial partnerships** with local and international companies, including ST Engineering, Cisco Systems, Amazon, and the Singapore Maritime Institute, and managed to build a strong reputation for my lab as a reliable partner for industrial Research and Development. These collaborations provide not only funding but also real-world deployment pathways and access to practical constraints that ground my research in industrial relevance.

My funding portfolio also reflects a **deliberate long-term strategy**. While a significant portion of my early grants comprised smaller seed-type projects, I intentionally used these opportunities to establish my team, build credibility, and develop the preliminary results needed to compete for larger awards. This strategy has clearly paid off: my collaborations with Temasek Laboratories/DSO and ST Engineering have evolved from initial engagements into sustained, multi-year partnerships, with each successive project growing in scope and ambition, culminating in the landmark S$1.5M trilateral initiative described above. Looking further ahead, I currently serve as PI on two MOE Tier 3 proposals submitted in 2026 (each in the S$10–20M range): one led by a colleague from NUS' School of Computing (SoC), with colleagues from SoC and Electrical and Computer Engineering as additional PIs; the other project involves a joint NUS-NTU team, led by a colleague from NTU. Both proposals have cleared their respective institutions' internal selection processes, and their white papers have been submitted to MOE for the first phase of shortlisting. Should either be funded, it would represent a transformative step in the scale and impact of my research program.

Educational sustainability is evidenced through: (1) consistently improving teaching scores across all courses; (2) systematic engagement with pedagogical scholarship through NUS CTLT; (3) newly designed courses (ME5418, ME5406) that form cornerstones of the MSc Robotics program; and (4) my role in the new RMI undergraduate program, which will continue to benefit from my expertise.

Service sustainability is demonstrated through: (1) increasing editorial responsibilities (IJRR AE, RSS 2026 Area Chair); (2) ongoing involvement with IRIS and student recruitment; and (3) deepening engagement with national initiatives.

5. Conclusion

The evidence presented in this dossier demonstrates that I have achieved **a peak of excellence in research**, which positions me as an established scientist in high-dimensional robotic systems. This is evidenced by Best Paper Awards at ICRA 2025, an Amazon Research Award, editorial leadership at IJRR and RA-L, Area Chair appointment at RSS 2026, over S$7.7M in competitive funding, bibliometric indicators exceeding recently tenured peers at leading institutions, and publications at the field's most selective venues (RSS, CoRL Oral). I have simultaneously demonstrated **quality in education** through consistently above-average teaching evaluations (reaching 4.6-5.0/5 recently), innovative course design using evidence-based pedagogical approaches, curriculum leadership in creating the new RMI program, and systematic engagement with pedagogy experts within NUS. My service contributions span departmental, faculty, university, and national levels, with particular impact through teaching program creation, and extensive participation in outreach efforts.

The sustainability of these contributions is assured through active funding, established academic and industrial collaborations, a strong research group, and continued pedagogical development. I am confident that my record meets the standards for promotion to Associate Professor with tenure at NUS.