

PhD in Computer Science PhD in Information Systems



Creating Computing Knowledge and Systems
for real-world impact

POSTGRADUATE

SCHOOL OF
COMPUTING AND
INFORMATION SYSTEMS

Aims of The Programmes



MISSION

Singapore Management University (SMU) offers the PhD in Computer Science and PhD in Information Systems programmes. The programmes produce PhD graduates with expertise that straddles between computing technology and solution development for Research and Development (R&D) units and applied academic institutions.

GOAL

The programmes develop researchers and educators who address deep technology challenges in real-world computing systems that impact society, or who develop tools and methodologies to translate business goals into technological solutions.

Our PhD graduates are capable of collaborating with researchers from different disciplines and designing technological solutions for real-world problems and applications, and producing top-rated academic publications.



OUR VALUE PROPOSITION

Interdisciplinary Work

Our PhD students are trained to work across research areas. The curriculum covers three selected areas that have high market demands – Artificial Intelligence and Data Science, Human-Machine Collaborative Systems, and Information Systems and Technology.

Applied Research

The programmes provide opportunities for students to work with industry data sets and commercial platforms. Students will learn to conduct their research in the context of real computing and information systems, societal challenges, and business goals.

Industry-relevant Training

Our PhD students will acquire professional skills that are important in industrial R&D, such as intellectual property management. Students will have opportunities to network with academic researchers and industry practitioners.

Employment Prospects of Graduates

R&D units require PhD graduates with an integrated view of business and IT to complement graduates from other institutions who are trained to work on component technologies.

Academic institutions, particularly software schools, require PhD graduates with skills in application and systems building, as well as in management.

Industry requires PhD graduates capable of developing tools and methodologies that translate business goals into technology requirements, and who can build technology-based solutions that contribute to revenue growth or cost reduction.

Students' Achievements



DISTINGUISHED / BEST PAPER AWARDS

ICAPS Best Dissertation Award (2022)

Meghna LOWALEKAR

The 32nd International Conference on Automated Planning and Scheduling (ICAPS 2022)

Best Applications Paper Award (2019)

Meghna LOWALEKAR

International Conference on Automated Planning and Scheduling

Distinguished Paper Award (2020)

Trung-Hoang LE

International Joint Conference on Artificial Intelligence (IJCAI)

Distinguished Paper Award (2018)

Duy Quoc Nghi BUI

International Conference on Software Engineering (ICSE)

Apple Best Paper Award (2019)

Meeralakshmi RADHAKRISHNAN

International Symposium on Empirical Software Engineering and Measurement

Highly Commended Full Paper Award (2018)

Bowen XU

International Symposium on Empirical Software Engineering and Measurement



STUDENTS WITH EXTERNAL FELLOWSHIPS

A*STAR Scholarship

LIU Ran

MACK Zhi Wei, Vincent

AISG Research PhD Fellowship

TIO Xi Rong, Sidney

MAS Scholarship

ANG Meng Kiat, Gary

Salesforce-SMU Talent Programme

WOO Jiale, Gerald

Vingroup Young Talent Scholarship

TRAN Nhu Thuat



SELECTED GRADUATES' PROFESSIONAL APPOINTMENTS AFTER SMU

Faculty

Chinese University of Hong Kong, Hong Kong

National University of Singapore, Singapore

New Mexico State University, USA

Queen's University, Canada

RMIT University, Vietnam

Singapore University of Social Sciences, Singapore

Singapore University of Technology and Design, Singapore

The University of New South Wales, Australia

University of Engineering and Technology, Vietnam National University, Hanoi, Vietnam

University of Maryland Baltimore County, USA

University of Melbourne, Australia

Research Scientist

Amazon Science, USA

DSO National Laboratories, Singapore

EY, San Francisco, USA

Institute for Infocomm Research (I2R), A*STAR, Singapore

Microsoft Research, USA

TCS Innovation Labs, Bangalore, India

Data Scientist

Booking.com, Netherlands

Grab, Singapore

NTUC Enterprise Co-operative Limited, Singapore

Oversea-Chinese Banking Corporation Limited, Singapore

Pindrop, USA

Primer AI, San Francisco, USA

Twitter, Singapore

United Overseas Bank Limited, Singapore

Software Engineer

Alibaba, China

Huawei, China

Students' Experiences

INTERNSHIPS

“ During my PhD, I was fortunate to work as a research intern with Salesforce Research and Facebook Research, and had the chance to work with very talented research teams coming from very diverse backgrounds. I was able to apply my knowledge of the research domains that I have focused on at SMU into broader contexts in the industry. The attention towards AI/machine learning research has gone beyond academic institutes and spread across many industries. Therefore, joining these research internships has significantly helped me to widen my research focus and enrich my professional network. ”



Nguyen Loc HUYNH

Intern

Facebook AI Research, USA

(Aug-Dec 2020);

Salesforce Research Asia, Singapore

(Aug-Nov 2019)

“ My internship was with Amazon, where I joined the Product Graph Team based in Seattle, USA. The project was about generating a short-text explanation for a given set of product recommendations on the Amazon.com retail website. Although I was working remotely due to the COVID-19 pandemic, I gained a lot of experience and (re)discovered my strengths and weaknesses. This internship also provided me with perspectives of the research environment in the industry, which is more hands-on, directly applicable, and of a faster pace as the business moves. Undoubtedly, it was a worthwhile experience that has enhanced my PhD journey at SMU. ”



TRUONG Quoc Tuan

Intern

Amazon.com, Inc, USA

(May-Jun 2021)

Other students have also completed internships at:

- Google Inc. (Mountain View, California, USA)
- Hewlett Packard Research Labs (Palo Alto, California, USA)
- Huawei (Singapore)
- IBM Ireland Product Distribution Limited (Ireland)
- IBM Research Lab (New Delhi, India)
- Nokia Bell-Labs (Cambridge, United Kingdom)
- Salesforce Research Asia (Singapore)
- Samsung Information Systems America, Inc. (Santa Clara, California, USA)
- Shen Zhen SOBUG Information Security Technology Co Ltd (China)
- Yahoo! Research Lab (Barcelona, Spain)

Selected Dissertations

ARTIFICIAL INTELLIGENCE & DATA SCIENCE

- Efficient Algorithms for Trajectory-Aware Mobile Crowdsourcing (HAN Chung-Kyun, 2021)
- Deep Learning for Real-World Object Detection (WU Xiongwei, 2020)
- Online Spatio-Temporal Demand-Supply Matching (Meghna LOWALEKAR, 2020)
- Preference Learning and Similarity Learning Perspectives on Personalized Recommendation (LE Duy Dung, 2020)
- Scalable Multi-Agent Reinforcement Learning for Aggregation Systems (Tanvi VERMA, 2020)
- Using Knowledge Bases for Question Answering (LAN Yunshi, 2020)

HUMAN-MACHINE COLLABORATIVE SYSTEMS

- Vision-based Analytics for Improved Real-World AI-driven IoT Applications (AMIT, 2021)
- Enhanced Gesture Sensing using Battery-less Wearable Motion Trackers (TRAN Huy Vu, 2020)
- Exploiting Approximation, Caching and Specialization to Accelerate Vision Sensing Applications (HUYNH Nguyen Loc, 2020)
- Gesture-based Profiling of Commonplace Lifestyle and Physical Activity Behaviors (Meeralakshmi RADHAKRISHNAN, 2020)
- Multimodal Mobile Sensing Systems for Physiological and Psychological Assessment (HUYNH Nguyen Phan Sinh, 2020)

INFORMATION SYSTEMS & TECHNOLOGY

- How Do Monetary Incentives Influence Prosocial Fundraising? An Empirical Investigation of Matching Subsidies on Crowdfunding (GAO Zhiyuan, 2021)
- Machine Learning Based Approaches Towards Robust Android Malware Detection (XU Jiayun, 2021)
- Novel Deep Learning Methods Combined with Static Analysis for Source Code Processing (BUI Duy Quoc Nghi, 2021)
- Novel Techniques in Recovering, Embedding, and Enforcing Policies for Control-Flow Integrity (LIN Yan, 2021)
- Statistical and Deep Learning Models for Software Engineering Corpora (HOANG Van Duc Thong, 2021)
- A Virtualization based System Infrastructure for Dynamic Program Analysis (HONG Jiaqi, 2020)
- Raising Funds in the Era of Digital Economy (Deserina SULAEMAN, 2020)
- When Keystroke Meets Password: Attacks and Defenses (LIU Ximing, 2020)

“ The years I spent at SMU working on my interdisciplinary PhD degree were very fulfilling, professionally and personally. I am grateful to have received abundant support and guidance from the world-class faculty members and peers I met and interacted with during my PhD journey at SMU. They have helped me to grow as a researcher and educator. The diversity of courses offered and the allowance for students to take some courses from other schools outside their home school have enriched my PhD journey. This has helped me to approach problems from interdisciplinary perspectives.

The experience I gained throughout my PhD journey at SMU will always stay with me wherever I am in my career.”



Deserina SULAEMAN
Lecturer,
Business School,
National University of Singapore,
Singapore

“ I completed my PhD in computer science in 2020. The environment was very supportive, friendly and promoted collaboration. The different courses and research projects helped me in exploring new research directions and broadening my knowledge. I learned a lot from the talented faculty members and fellow students.

Due to the excellent research guidance and support provided by my amazing supervisors, my research work received the best application paper and best demo award at prestigious conferences. I also got the rare opportunity of observing the impact of my research in the real world when it was deployed as part of the driver guidance system in Singapore. I am grateful to all the professors, SMU staff and fellow students for giving me the wonderful memories which I will always cherish.”



Meghna LOWALEKAR
Data Scientist II,
Swiggy, India

“ I am a true-blue SMU student who has spent nine years in SMU to obtain the full suite of qualifications; Bachelor, Masters, and PhD Degree in Information Systems. I have greatly enjoyed my journey in SMU, where I have met amazing friends and great mentors that made my university life fun, productive, and colourful!

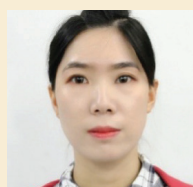
The PhD programme has allowed me to explore research topics that I am passionate about and prepared me well for an academic career. I had the opportunity to travel and attend multiple top research international conferences in seven countries. These conference experiences had allowed me to interact with many researchers around the world and form research collaborations that helped advanced my academic career.

In sum, the SMU School of Computing & Information Systems' (SCIS) PhD programme offered a vibrant and supportive research ecosystem that had equipped me with the hard and soft skills required of a computer science faculty.”



LEE Ka Wei, Roy
Assistant Professor,
Information Systems Technology and Design
Pillar, Singapore University of Technology
and Design, Singapore

“ I received my PhD from SMU SCIS in 2018. My PhD study in SMU was a wonderful time. I was trained from various aspects, such as critical thinking, conference presentation and academic socialisation. Through these training opportunities, I learned how to demonstrate the novel parts of my research work, how to collaborate with the other researchers, and how to socialise with the other colleagues to build up potential collaborations. Moreover, during the PhD study period, I also visited Cylab of Carnegie Mellon University. The exchange experience helped me understand how the other research lab works and met a number of talented researchers. Faculty members at SMU are really experienced and patient.”



MA Siqi
Senior Lecturer,
School of Engineering and Information
Technology, University of New South Wales,
Australia

Admission and Application

ADMISSION REQUIREMENTS

At least a good Bachelor's degree.

A Master's degree is useful but not required.

Good GRE or GMAT results.

May be waived for SMU, NTU, NUS and SUTD graduates.

Good TOEFL or IELTS scores.

For applicants whose medium of instruction at the Bachelor's/
~~Master's~~ level was not in English.

Submission of the following documents:

Copy of Identity Card/Passport

Latest Curriculum Vitae

Copies of Degree Certificates and Transcripts

Personal and Research Statements

Recommendation and/or Reference Letters



APPLICATION INFORMATION

The PhD in Computer Science and PhD in Information Systems are full-time programmes. Part-time study* is available for Singapore citizens and permanent residents. The University's application windows are listed below.

Intake	Opening Date for Application	Closing Date for Application
August	1 August (of prior year)	31 January (of intake year)
January	1 February (of prior year)	30 June (of prior year)

A successful candidate who applies early may be provided with an early offer.

Details of programme fees and application procedure can be found at <https://smu.sg/scis-phd>.

* Refer to <https://smu.sg/scis-phd-part-time> for more information.

College of Graduate Research Studies (CGRS)

UNLOCK OPPORTUNITIES THROUGH INTERDISCIPLINARY RESEARCH

The College of Graduate Research Studies (CGRS) trains students to **uncover new knowledge and develop novel solutions that are relevant to some of today's most challenging issues.** This will be undertaken at the intersections of disciplines, cultures and industry.

Our community of learners benefit from **the diversity of expertise, disciplinary and interdisciplinary knowledge and perspectives** so that they are well-equipped to create significant impact.



CREATE
Significant Impact
Across Disciplines



TACKLE
Challenging Issues
With Confidence



BUILD
Strong Connections
Within Our Community

Transformative & Holistic Learning

- Through Interdisciplinary Programmes.
- Through the Graduate Research Interdisciplinary Topics (GRIT) comprising the training in curated topics spanning across two or more disciplines, to ensure students are well grounded.
- Through the Graduate Research Professional Development (GRPD) programme which consists of a suite of credit-bearing courses, workshops and seminars to ensure career-readiness.

Fostering a Sense of Belonging

- Through the Graduate Research Student Society (GRSS) to deepen interactions among students with academic exchanges and social activities.
- Through Graduate Research Alumni Chapter (GRAC) to enhance lifelong engagement and affiliation among the graduates.
- Through meaningful engagement events and activities between students and graduates.

Financial Assistance Schemes

SMU awards four types of scholarships and fellowships on a competitive basis. We assess applicants for different award schemes either at the time of admission based on qualification and suitability for these schemes or during their PhD journey based on their outstanding academic performance.

SMU RESEARCH SCHOLARSHIP

The scholarship covers registration and subsidised tuition fees. This scheme also provides successful recipients with monthly living stipends.* The scholarship is renewed yearly, conditioned on good academic performance, for a maximum duration of four years. Beyond the scholarship duration, students who have been on the scholarship may receive continued support through research and teaching assistantships or industry grants.



SMU PRESIDENTIAL DOCTORAL FELLOWSHIP

The SMU Presidential Doctoral Fellowship* is awarded to existing PhD students who have outstanding academic performance. The Fellowship is a one-year award.

SMU PRESIDENTIAL DOCTORAL FELLOWSHIP IN COMPUTING

The SMU Presidential Doctoral Fellowship in Computing* is provided to exceptionally qualified students, who are offered candidatures into SMU School of Computing & Information Systems' PhD programmes. The Fellowship is a one-year award that is renewed annually, for up to four years.

SMU INTERDISCIPLINARY DOCTORAL FELLOWSHIP

The SMU Interdisciplinary Doctoral Fellowship* is awarded to existing PhD students who have shown exemplary pursuit of research that crosses traditional disciplinary boundaries. This Fellowship is also a one-year award.

* The stipend rates are published on the SMU PhD website and are subject to change.

Areas of Research Concentration

CORE RESEARCH AREAS - CREATE COMPUTING TECHNOLOGY AND SYSTEMS



ARTIFICIAL INTELLIGENCE & DATA SCIENCE

Data Management & Mining

Decision Making & Optimization

Machine Learning & Intelligence



HUMAN-MACHINE COLLABORATIVE SYSTEMS

Pervasive Sensing & Systems

Multimedia Systems

Human-Computer Interaction



INFORMATION SYSTEMS & TECHNOLOGY

Software Engineering

Cybersecurity

Information Systems Management

INTEGRATIVE RESEARCH AREAS - DIGITAL TRANSFORMATION IN ACTION



COMPUTING PRACTICE & EDUCATION

Technology-Enhanced Learning

Computing Curriculum & Pedagogy

Analytics & Decision Support Practice

IT Practice-Methodologies, Architectures & Framework



URBAN SYSTEMS & OPERATIONS

Crowd Management

Urban Mobility & Smart Commuting

Urban Logistics & Sustainability

Maritime Traffic Management



ACTIVE CITIZENRY & COMMUNITIES

Community Crowdsourcing & Crowdtasking

Job & Skill Intelligence

Lifestyle & Wellness Intelligence

Urban & Social Analytics



SAFETY & SECURITY

Optimisation of Security & Civil Resource Deployment

Security of Digital Platforms & Devices

Privacy-Preserving Data Sharing & Analytics

Cybersecurity Regulations & Policies

Students can undertake their PhD studies in any of these research areas. SMU encourages research activities that integrate several of these areas. Students under the Information Systems & Management core research area will graduate with PhD in Information Systems degree. Students under the other different technology research areas will graduate with the PhD in Computer Science degree.

Curriculum Structure

Both PhD in Computer Science and PhD in Information Systems are direct PhD programmes, with a maximum candidature period of five years for full-time students. The curriculum comprises coursework (12 Course Units) and a dissertation (28 Course Units).

Graduate Coursework: In the first two years of study, students enrol in intensive courses to build their research depth and breadth, as well as professional skills.

Depth Requirements: Students enrol in the advanced course in their respective primary areas and undertake research apprenticeships with their primary advisors. Each advanced course covers important research papers on key topics and techniques that students need to be acquainted with in order to undertake area-specific research.

Breadth Requirements: Students attend courses in the five areas of research concentration shown above. These requirements are intended to help PhD students establish their networks and to expose them to industry practices.

Professional Skills: To round up the PhD training, the curriculum includes workshops on English Communications; Information Systems Research Methodology; Intellectual Property Management; Research Writing and Presentation; and teaching skills.



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