

PhD in Computer Science PhD in Information Systems

Technology and management research
for real-world impact



SINGAPORE MANAGEMENT
UNIVERSITY

RESEARCH
DEGREES

SCHOOL OF
INFORMATION
SYSTEMS

Aims of Programme



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 the Information Technology (IT) and business sectors 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 information systems that impact business processes or management, 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 technology 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 five areas that have high market demands – **Computer Science:** Cybersecurity, Data Science & Engineering, Intelligent Systems & Optimisation, and Software & Cyber-Physical Systems; **Information Systems:** Information Systems & Management.

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 information systems 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

Best
Applications
Paper Award
(2019)

Meghna
LOWALEKAR

International
Conference
on Automated
Planning and
Scheduling

Highly
Commended
Full Paper
Award
(2019)

Bowen XU

International
Symposium
on Empirical
Software
Engineering and
Measurement

Apple Best
Paper Award
(2019)

Meeralakshmi
RADHAKRISHNAN

Sensing Systems
and Applications
Using Wrist Worn
Smart Devices

Distinguished
Paper
Award
(2018)

Duy Quoc
Nghì BUI

International
Conference
on Software
Engineering
(ICSE)

Runner Up,
Lee Dirks
Award
(2017)

Kustini
LIM-WAVDE

iConference



In the headlines

The Straits Times, 24 May 2018

Urban living in the age
of smart city

TODAY, 3 Oct 2013

A*STAR, SMU researchers
first to discover
iOS security flaws

The Straits Times, 3 Oct 2013

Singapore team
helps plug flaws in
Apple devices

Lianhe Zaobao, 3 Oct 2013

Local researchers found
three security weaknesses
in Apple's iOS operating
system (Translated)



Selected Graduates' Professional Appointments after SMU

Faculty

Chinese University of Hong Kong
New Mexico State University, USA
Queen's University, Canada
RMIT University, Vietnam
University of Melbourne, Australia
University of Saskatchewan, Canada
University of Engineering and Technology,
Vietnam National University
Singapore University of Social Sciences
Singapore University of Technology and Design

Software Engineer

Alibaba, China
Huawei, China

Research Scientist

EY, San Francisco, USA
Institute for Infocomm Research
(I2R), A*STAR, Singapore
DSO National Laboratories, Singapore
IBM, Singapore
TCS Innovation Labs, Bangalore, India

Data Scientist

Booking.com, Netherlands
Grab, Singapore
NTUC Enterprise Co-operative
Limited, Singapore
Pindrop, USA
Primer AI, San Francisco, USA
United Overseas Bank Limited, Singapore
Twitter, Singapore

Students' Experiences

Internships



Jianfei YU
Intern
(May-Aug 2017)
Alibaba Group
Hangzhou, China

During my internship at Alibaba Group in Hangzhou, China, I worked on the FAQ-based Chatbots. I wrote a research paper about the work I undertook at Alibaba Group, which had been accepted by WSDM 2018, a premier international conference on web-inspired research involving search and data mining. Although the internship was only for three months, I gained a lot of experience working on challenging projects, and interacting with, and learning from team members. This experience provided me with research freedom, which enhanced my SMU PhD journey.



Nguyen Loc HUYNH
Intern
(Jul-Dec 2018)
Microsoft Research,
Redmond,
United States
of America

During my internship at Microsoft Research Redmond, I was fortunate to participate in the 'WatchFor' team whose mission is to transform the live video streaming using computer vision algorithms. My work focused on creating fast algorithms to analyse the video streams and improving deep neural network models for vision tasks in terms of accuracy and inference time. I learned a lot from the team, from conducting challenging research problems to creating end-to-end application services. The experience was valuable, and has helped to enhance my PhD journey, as well as my career in the future.

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

CYBERSECURITY

- On-the-fly Android Static Analysis with Applications in Vulnerability Discovery (Daoyuan WU, 2019)
- Advanced Malware Detection for Android Platform (Ke XU, 2018)
- Secure Enforcement of Isolation Policy on Multicore Platforms with Virtualization Techniques (Siqi ZHAO, 2018)

DATA SCIENCE & ENGINEERING

- Feature-Based Transfer Learning In Natural Language Processing (Jianfei YU, 2019)
- Preference Learning and Similarity Learning Perspectives on Personalized Recommendation (Duy Dung LE, 2019)
- Question Answering with Textual Sequence Matching (Shuohang WANG, 2019)
- Context Recovery in Location-based Social Networks (Wen Haw CHONG, 2018)

INFORMATION SYSTEMS & MANAGEMENT

- From Digital Traces to Marketing Insights: Recovering Consumer Preferences for Digital Entertainment Services and Online Shopping (Ai Phuong HOANG, 2018)
- Music Popularity, Diffusion and Recommendation in Social Networks: A Fusion Analytics Approach (Jing REN, 2018)

INTELLIGENT SYSTEMS & OPTIMISATION

- Modeling Movement Decisions in Networks: A Discrete Choice Model Approach (Larry LIN Jun Jie, 2019)
- Reinforcement Learning for Collective Multi-agent Decision Making (Duc Thien NGUYEN, 2019)
- Proactive Sequential Resource (Re)distribution for Improving Efficiency in Urban Environments (Supriyo GHOSH, 2018)

SOFTWARE & CYBER-PHYSICAL SYSTEMS

- Exploiting Mobility for Predictive Urban Analytics & Operations (Kasthuri JEYARAJAH, 2019)
- Multimodal Mobile Sensing Systems for Physiological and Psychological Assessment (Nguyen Phan Sinh HUYNH, 2019)



I graduated as a Computer Science student from the SMU PhD in Information Systems programme. I am grateful that the programme trained me to become an interdisciplinary faculty member of a Business school. The programme's diverse courses, interdisciplinary projects and co-supervision provided me with a comprehensive perspective for understanding my research field, and selecting and working on interesting and valuable research topics. The research support provided by SMU had given me many opportunities to attend international conferences, and I also visited Carnegie Mellon University for an exchange programme. The professors were good listeners and supported me well. Moreover, they helped me to form a correct and positive attitude as a researcher and teacher. I believe what I have gained during my PhD journey will always help me in my future academic career.



Jing REN
Lecturer,
School of Business,
Singapore University of
Social Sciences





I completed the SMU PhD in Information Systems programme in 2019. My research area of concentration was Cybersecurity. The four years' experience that I gained at SMU was wonderful, and it has created a great impact in my life. I would like to share several aspects that I enjoyed the most.

Firstly, there is a large research student centre at the SMU School of Information Systems (SIS). This provides PhD candidates with an active and collaborative research environment. Whenever I wanted to, it was easy for me to find fellow students to discuss and share our research work with, as well as have opportunities to engage in casual talk.

Secondly, SIS' PhD programme is very well-organised, with students given clear targets to achieve each semester. The PhD courses are also well-designed, including the opportunity to take up cross-disciplinary courses. For example, I was able to collaborate with other professors and published two papers with them. These were of research projects that they were working on.



Daoyuan WU
Research Assistant
Professor,
Department
of Information
Engineering,
Chinese University of
Hong Kong

Thirdly, SIS has a team of world-class faculty members. My supervisors always encouraged me to aim high, and helped me improve my work through critical thinking. Without their dedicated and selfless guidance, I would not have been able to secure a faculty position in Hong Kong upon graduation.



I did both my undergraduate and postgraduate degrees at SMU, and those have been the best years of my life so far. I met amazing friends who are talented and full of drive, as well as mentors who are very supportive and nurturing.

I had the opportunity to travel to Switzerland for an international conference, took classes at Carnegie Mellon University, and interned at Samsung Research America.



Su Mon KYWE
Assistant Manager,
Information Security,
Singapore Airlines,
Singapore

I am very appreciative to each and every professor, staff member, teammate, classmate and friend from SMU for making me become who I am today.



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.

Good TOEFL or IELTS scores.
For applicants whose medium of instruction at the Bachelor's/Master's level was not 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/sis-phd>.

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

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 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 in Computing

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

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 Multidisciplinary Doctoral Fellowship

The SMU Multidisciplinary Doctoral Fellowship* is awarded to existing PhD students whose research output show the use of techniques from two or more fields of research. This Fellowship is also a one-year award.

Details of other scholarships/financial assistance schemes can be found at <https://smu.sg/sis-phd-sfa>.

* The stipend rates are published at <http://smu.sg/phd> and are subject to change.

A Unique University in Vibrant Singapore



SMU has been designed to provide a different model of university education in Singapore.

A Strong and Innovative Research Culture

- Internationally recognised for its world-class research and distinguished teaching conducted by faculty members who joined us from top universities.
- Faculty members collaborate on cross-disciplinary work to generate impactful and real-world relevant ideas, over and above research in their own disciplines.
- Faculty members establish research centres and institutes to conduct problem-driven research and influence industry practice across a wide range of topics.

A Different Learning Approach

- Faculty members encourage an interactive learning environment through inquiry, participation and teamwork.
- Seminar-style teaching in small classes optimises student-instructor interaction.

State-of-the-Art Infrastructure

- Research support includes proprietary and published databases.
- SMU's library provides access to many scientific journals, electronic books and other necessary publications and materials.

Being in the heart of the city, students will have easy access to industry partners who provide research data and validation platforms.

Each School has dedicated personnel to take care of students' administrative needs. Furthermore, many SMU research centres and institutes provide post-doctoral fellowships and/or research assistantships that add value to students' research experience.

Areas of Research Concentration



Cybersecurity

Data Security & Privacy

Mobile Platform & Application Security

IoT Security & Privacy

Computer & Software Security

Cloud Computing Security

Human Behaviour-Based Security

Security Policy & Management



Data Science & Engineering

Knowledge Discovery & Data Mining

Machine Learning & Deep Learning

Computer Vision & Multimedia

Spatial & Context-Aware Data Management

Recommender Systems & Preference Analytics

Natural Language Processing & Text Mining

Crowdsourcing & Human Computation



Information Systems & Management

Economics of IS & Technology

Social Media Marketing & Digital Strategies

Platform, Networks & Markets

Cloud Computing & Information Security Policy

IT & Supply Chain Management

Financial IS & Disruptive Technology

Digital Innovation Management & Entrepreneurship



Intelligent Systems & Optimisation

Autonomous Agents & Multi-Agent Systems

Behavioural Modeling & Reinforcement Learning

Game Theory & Mechanism Design

Heuristic Search & Optimisation

Planning & Scheduling

Operations Analytics

Simulation & Decision Support in Transportation & Logistics



Software & Cyber-Physical Systems

Mobile, Wearable & IoT Systems

Interactive & Wearable Computing Interfaces

Physical Sensing & Analytics

Software Mining, Testing & Analysis

Empirical Software Engineering

Human-Agent Interaction

Edge & Cloud-Assisted Computing

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 four 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. In addition, students will attend the advanced course in one of the breadth areas.

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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