SMU: a world-class university centered on the world of business and management, for the private and public sector.

SMU: an urban university in the heart of downtown Singapore
**SIS 1st Decade 2003 – 2012: Accomplishments & Distinction**

1. **Achievement of niche strength and distinction within 1) Research, 2) Education, and 3) Application & Practice**

2. **Creation of rich linkages**
   - Across the three dimensions, across our five faculty areas

3. **Recognition as a capable, innovative, and well-connected place by**
   - Computer Science groups
   - i-Schools
   - Business School IS groups
   - Industry (via multinationals, regional & local firms)
   - Public sector in Singapore

4. **Attainment of meaningful scale for numbers of faculty, students and staff**

5. **Creation of a distinctive culture and high performance work environment for faculty, staff and students**

6. **A very different type of school within SMU** (design, software, prototypes, Computer Science + Management Science) yet also an integral and indispensable part of the university

---

**SIS Fast Facts**

**Students Enrolled**

- BSc (ISM): 1044
- MITB: 191
- PhD (IS): 54
- MAIS: 10
- MSc (IS): 3

**Alumni**

- BSc (ISM): 1223
- MITB: 165
- PhD (IS): 12
- MAIS: 2
- MSc (IS): 7

**Faculty**

- RC: 37
- ICLI: 54

**Instructors**

- BSc (ISM): 11
- MITB: 6

---

Gov’t approval for SIS creation: Oct 2002

1st student intake: Aug 2003, 93 students for BSc (ISM)
### SIS Programmes and Areas

#### Educational Programmes

<table>
<thead>
<tr>
<th>Undergraduate</th>
<th>BSc (IS Management)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Post-Graduate:</td>
<td></td>
</tr>
<tr>
<td>Professional Degrees</td>
<td></td>
</tr>
<tr>
<td><strong>Master of IT in Business, MITB</strong></td>
<td></td>
</tr>
<tr>
<td></td>
<td>• MITB (Financial Services) track</td>
</tr>
<tr>
<td></td>
<td>• MITB (Analytics) track</td>
</tr>
<tr>
<td>Post-Graduate:</td>
<td></td>
</tr>
<tr>
<td>Professional Development</td>
<td></td>
</tr>
<tr>
<td>Continuing Education, Non-Degree</td>
<td></td>
</tr>
<tr>
<td><strong>Financial IT Academy@SMU, financial sector</strong></td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Analytics, for all sectors</td>
</tr>
<tr>
<td></td>
<td>• IT management, for all sectors</td>
</tr>
<tr>
<td>Post-Graduate:</td>
<td></td>
</tr>
<tr>
<td>Research Degrees</td>
<td></td>
</tr>
<tr>
<td><strong>PhD in Information Systems (coursework + PhD thesis)</strong></td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Master of Applied Information Systems, MAIS (coursework + applied project)</td>
</tr>
<tr>
<td></td>
<td>• MSc in Information Systems (coursework + MSc thesis)</td>
</tr>
</tbody>
</table>

#### Areas of Research & Faculty Hiring

<table>
<thead>
<tr>
<th>Data Management &amp; Analytics</th>
</tr>
</thead>
<tbody>
<tr>
<td>Info Security &amp; Trust</td>
</tr>
<tr>
<td>Info Systems &amp; Management</td>
</tr>
<tr>
<td>Intelligent Systems &amp; Decision Analytics</td>
</tr>
<tr>
<td>Software Systems</td>
</tr>
</tbody>
</table>
## School of Information Systems Areas and Faculty Size

<table>
<thead>
<tr>
<th>Research Area</th>
<th>Research Track</th>
<th>Education &amp; Practice Track</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Data Management &amp; Analytics</td>
<td>8</td>
<td>3</td>
<td>11</td>
</tr>
<tr>
<td>Information Security &amp; Trust</td>
<td>5</td>
<td>0</td>
<td>5</td>
</tr>
<tr>
<td>IS &amp; Management</td>
<td>8</td>
<td>5</td>
<td>13</td>
</tr>
<tr>
<td>Intelligent Systems &amp; Decision Analytics</td>
<td>4</td>
<td>4</td>
<td>8</td>
</tr>
<tr>
<td>Software Systems</td>
<td>6</td>
<td>7</td>
<td>13</td>
</tr>
<tr>
<td>Total</td>
<td><strong>31</strong></td>
<td><strong>19</strong></td>
<td><strong>50</strong></td>
</tr>
</tbody>
</table>

| Percent                            | **62%**        | **38%**                   | **100%**|

*Faculty totals as of 15 April 2014*
## Update on SIS Faculty Member Headcount by Main SIS Areas

<table>
<thead>
<tr>
<th>Tenure Track 32 Full-Time</th>
<th>T-Track of 51 Total = 63 % of Full Time total PLUS 1 visitor</th>
<th>Education &amp; Practice Track 19 Full-Time</th>
<th>E/P Track of 51 Total = 37% of Full time total PLUS Self-financed Additions</th>
</tr>
</thead>
<tbody>
<tr>
<td>JIANG Jing</td>
<td>CHU Chao Hsien (Visitor)</td>
<td>CHOKSHI Seema</td>
<td>BAUMGARTNER Ilse</td>
</tr>
<tr>
<td>LAUW Hady</td>
<td>DENG Robert</td>
<td>KAM Tin Seong</td>
<td>CHEONG Michelle</td>
</tr>
<tr>
<td>LIM Ee-Peng</td>
<td>DING Xuhua</td>
<td>SHIM Kyong Jin</td>
<td>BOESCH Chris</td>
</tr>
<tr>
<td>MOURATIDIS Kyriakos</td>
<td>GAO Debin</td>
<td>NARASIMHALU Desai</td>
<td>BAUMGARTNER Ilse</td>
</tr>
<tr>
<td>PANG Hwee Hwa</td>
<td>LI Yingjiu</td>
<td>CH'NG Enoch</td>
<td>CHEONG Michelle</td>
</tr>
<tr>
<td>SHEN Jialie</td>
<td>MA Dan</td>
<td>LEE Wee Leong</td>
<td>BOESCH Chris</td>
</tr>
<tr>
<td>ZHENG Baihua</td>
<td>TANG Qian</td>
<td>MILLER Steven</td>
<td>CHEONG Michelle</td>
</tr>
<tr>
<td>ZHU Feida</td>
<td>WOODARD C Jason</td>
<td>NARASIMHALU Desai</td>
<td>BOESCH Chris</td>
</tr>
<tr>
<td></td>
<td></td>
<td>TAN Kar Way</td>
<td>CHEONG Michelle</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Patrick THNG</td>
<td>BOESCH Chris</td>
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<td></td>
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<td>BOESCH Chris</td>
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<td>BOESCH Chris</td>
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<tr>
<td></td>
<td></td>
<td></td>
<td>BOESCH Chris</td>
</tr>
</tbody>
</table>

Updated 15 April 2014
# SIS Research Areas

## Data Management & Analytics
- Data Mining & Machine Learning
- Network Analytics
- Information Retrieval
- Spatial & Mobile Database Systems
- Recommendation Systems
- Data Visualization
- Data Security & Privacy

## Information Security & Trust
- Mobile Platform & Application Security
- RFID, IoT Security & Privacy
- Computer & Software Security
- Multimedia Content Security
- Cloud Computing Security
- Security Management & Risk Analysis

## Information Systems & Management
- Economics of Information Systems & Technology
- Social Media Marketing & Digital Strategies
- Platforms, Networks & Markets
- Information Products & IT Services
- IT & Supply Chain Management
- Financial IS & Technology
- Innovation, Strategy & Design

## Intelligent Systems & Decision Analytics
- Autonomous Agents & Multiagent Systems
- Learning & Adaptation
- Heuristic Search & Optimization
- Planning & Scheduling
- Business Simulation & Serious Gaming
- Urban Logistics, Transportation & Sustainability
- Decision Support Systems

## Software Systems
- Mobile Applications, Systems & Testbeds
- Software Mining & Program Analysis
- Interactive & Wearable Computing Interfaces
- Empirical Software Engineering
- Software Testing & Debugging
- Cyber-Physical Software
- Cloud Platforms for Urban Computing

## Integrative Collaboration via Strategic Themes & Testbeds
- Living Analytics Research Centre
  with Carnegie Mellon University
- LiveLabs
  Urban Lifestyle Innovation Platform
- Urban Management Analytics Lab
- iCity Lab
  (TCS – SMU)
- Green Transformation Lab
  (DHL – SMU)
- Financial IT Academy
  @ SMU

## Education & Practice
- Projects and Outputs
- Learning & Information Systems
Beyond our 5 Faculty & Disciplinary Areas to 9 Strategic Cross Cutting Themes and Competencies
<table>
<thead>
<tr>
<th>S/N</th>
<th>NAME</th>
<th>FOUNDING SPONSOR</th>
<th>LEAD RESPONSIBILITY</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Living Analytics Research Centre (with Carnegie Mellon)</td>
<td>NRF via IDMPO</td>
<td>Research Faculty</td>
</tr>
<tr>
<td>2.</td>
<td>LiveLabs</td>
<td>NRF via IDMPO</td>
<td>Research Faculty</td>
</tr>
<tr>
<td>3.</td>
<td>Urban Management Analytics Lab</td>
<td>Includes project collaborations with A*STAR, MHA, DHL</td>
<td>Research Faculty + Ed/Prac Faculty + Prof’l Staff</td>
</tr>
<tr>
<td>4.</td>
<td>Pinnacle Lab</td>
<td>Ping An Group</td>
<td>Research Faculty</td>
</tr>
<tr>
<td>5.</td>
<td>Fujitsu Corp Lab @SMU</td>
<td>Fujitsu, A*STAR &amp; SMU Center of Excellence</td>
<td>Research Faculty?</td>
</tr>
<tr>
<td>6.</td>
<td>RFID Security &amp; Privacy Lab</td>
<td>SMU Internal</td>
<td>Research Faculty</td>
</tr>
<tr>
<td>7.</td>
<td>Advanced Analytics Education Lab</td>
<td>SAS</td>
<td>Prof’l Staff &amp; Ed/Prac Faculty</td>
</tr>
<tr>
<td>8.</td>
<td>Financial IT Academy @SMU</td>
<td>IDA &amp; Institute of Banking &amp; Finance within MAS &amp; IDA</td>
<td>Prof’l Staff &amp; Ed/Prac Faculty</td>
</tr>
<tr>
<td>9.</td>
<td>Green Transformation Lab</td>
<td>DHL</td>
<td>Research Faculty + Ed/Prac Faculty + Prof’l Staff</td>
</tr>
<tr>
<td>10.</td>
<td>iCity Lab</td>
<td>Tata Consultancy Services</td>
<td>Prof’l Staff + Ed/Prac Faculty</td>
</tr>
<tr>
<td>11.</td>
<td>iLab</td>
<td>Standard Chartered</td>
<td>Prof’l Staff &amp; Ed/Prac Faculty</td>
</tr>
<tr>
<td>12.</td>
<td>T-Lab</td>
<td>Alexandra Health-KTPH</td>
<td>Prof’l Staff &amp; Ed/Prac Faculty</td>
</tr>
</tbody>
</table>
### Additional SMU Institutes, Centres, Labs, Initiatives (ICLI’s) 
under consideration that would be managed by SIS

<table>
<thead>
<tr>
<th>S/N</th>
<th>NAME</th>
<th>COMMENTS</th>
</tr>
</thead>
</table>
| 13. | Consumer and Social Analytics related -- Building on LARC + LiveLabs | • Ongoing in-depth discussions with several potential partners to expand our research affiliates network  
• Ongoing in-depth discussions with a key global player for a major collaboration |
| 14. | Cyber Trust                                                          | • Ongoing in-depth discussions with Singapore government R&D sponsors and a key global player                                           |
| 15. | Secure Mobile Computing Lab and related consortia                    | • Ongoing in-depth discussions with Singapore government R&D sponsors and various potential partners as research affiliates           |
| 16. | Analytics Institute @ SMU                                            | • Ongoing effort to establish resources for professorships, research visitors, PhD students and staff to further strengthen SMU’s Analytics Area of Excellence |
LiveAnalytics (LARC + LiveLabs): New Concepts, Methods and Tools for Consumer & Social Insights that are

**LARC**
- Experiment-driven
- Closed-loop, and iterative
- Network-centric
- Observing complex behaviors via digital traces
- Progressively real-time
- Progressively societal-scale
- Combining field realism & complexity with lab control

**Plus LiveLabs**
- Context aware via mobile phones
- Using real-time context triggers for automating behavioral interactions
- Combining usage-adaptive 4G network management with end-user behavior
Project Settings

Data Sets

**Category A:**
Behavioural data from on-line and virtual world settings...

**Category B:**
Behavioural data from societal-scale consumer settings...

**Category C:**
Tourism & Leisure Communities

**Category D:**
Deep context test bed with richer observation of context and behavior

Behavioural Data Settings

**On-line & Digital Media Content Settings + Social Media Settings**

**On-line Multiplayer Game Settings**

**Consumer focused data from Telco and Financial Service Providers**

**Consumer focused data from market and consumer analytics specialty firms**

**RWS and Sentosa Island**

**LiveLabs@The Malls**
**LiveLabs@Sentosa**

**LiveLabs@SMU**
Research Summary:
From Analytics to Experimentation

Living Analytics Systems for Experimentation and Response

- Twitalytics
- BuzzCity
- LiveLab
- RWS
- Sentosa
- Citibank
- Starhub

LASER

Closed loop
Fast turnaround
Use of open source
Component driven
Research friendly
Bridging LARC and LiveLabs
An integrated software platform for

- Randomized controlled closed-loop user experiments
  - User selection into treatment and control groups
  - Network experiment support
- User response tracking
  - Minimal intrusion on existing application code
  - Tracking code snippet generation
- Experiment control
  - Realtime monitoring of experiments using dashboard
- User response analytics
  - Online analytical processing of user responses

LASER = Living Analytics System for Experimentation & Response
Types of Experiments

Randomized Controlled

- Co-experimentation with LARC industry partner
  - Agreement from partner and their users
  - LASER enabled experimentation
    - Experimentation performed using LASER and/or partner’s proprietary system
  - Non-LASER enabled experimentation
    - Experimentation performed using partner’s proprietary system only

- Experimentation with public social media users
  - Terms of Use to solicit user permission to use their data

- Co-experimentation with LiveLabs & Location Partners
  - Agreement from students + consumers
LiveLabs Urban Lifestyle Innovation Platform

Testing Context-Enabled Mobile Services on Real People in the Real World

Real-time Mobile Sensing
(Activity, Indoor location, Browsing, SMS ...)

Real-time Individual and Server Group Analytics
(Dynamic Group Detection, Queuing, Preferences)

Context-Driven Interventions
(Incentives, Promotions, Recommendations ...)

Intervention Execution Engine

Contextual Analytics Engine
LiveLabs: Scale and Scope

30,000 opt-in consumers

Key Technology Thrusts

- Trials for usage-adaptive wireless network technologies
- Energy-Efficient deep context collection and real-time analytics
- Real world, privacy-conscious experimentation

Multiple Urban Venues, Lifestyle Verticals and Key Partners

- Telco & IDM
- SMU
- Plaza Singapura
- Retail & Consumption
- Changi Airport
- Leisure & Tourism
- Sentosa

Logos: StarHub, Microsoft Research, CapitaMalls Asia, Changi airport group, Sentosa
LiveLabs Technologies

Key Research Challenges

1. Deep, energy-efficient, continuous, context collection

2. Continuous indoor location tracking in public spaces

3. Derive Deep Analytics from Context

4. Run automated social experiments on mobile devices

5. Handle transient network traffic loads

Current Innovations/Capabilities

• Clients for Android, iOS, Phone 8
• Server-controlled capture of phone events (e.g., SMS, URLs) & sensor data

• Client-side ±3m accuracy for Android.
• Server-side tracking for all platforms (e.g., iOS, Phone 8)

• Real-time Queue Detection System.
• Detection of Dynamic Groups from Spatiotemporal trajectories*

• Intervention Management Portal (v1) allows location & time-based delivery of ads/promotions.

• Use of TV Whitespace and real-time RF Mapping technologies under investigation

*LARC+ LiveLabs
**LiveLabs Videos**  (click on image to view)

**A Day With LiveLabs**
- Illustrates the vision of different context-driven applications at different LiveLabs testbed venues.

**Smarter Retail & LiveLabs**
- Illustrates the use of real-time context for innovative context-driven promotions and incentives in shopping malls.

**Practical Queuing Detection**
- Illustrates a working system that uses smartphone sensors to detect queuing behavior in real time in the real world.
LiveLabs Ecosystem: Key Features

• Opt-in participants
  ✓ Explicit consent for participation, with incentives

• Software platform for user interaction and experiments
  ✓ Easy-to-use UI for intervention specification by authorized partners.

• Supporting R&D for context-based user interaction

• Mobile apps that take advantage of LiveLabs capabilities
  ✓ Both in-house and by selected research partners

• Protection of information security and data privacy
  ✓ Compliance with Singapore’s PDPA legislation

• Integration with LARC
LiveLabs – LARC Integration

**LiveLabs** Urban Lifestyle Innovation Platform

- **Internet Cloud**
  - **Real-time Mobile Analytics Server**
  - **Experimentation Server**
  - **LiveLabs Results Server**

- **LiveLabs Context Collection application installed in participant smartphones**

- **High-level context triggers**

- **Investigators**
  - Specify Interventions

- **LARC & LASER**
  - Experiment Planning & Design
  - Statistical Analysis of Experimental Results
  - Strategy & Methods for Experiment iteration

- **Uploaded mobile context data (e.g., events & sensors)**

- **Relevant Interventions delivered on mobile devices**

- **Observed user responses & actions**

- **In-house analytics to enhance experiment**
LARC-LiveLabs Interconnect Example

**Group & Location-Aware Recommendations**

- Group and Location-Aware recommendation experiments

**LASER enabled experimentation**
- Experimentation with public users
- Randomized Controlled

**LASER**

1. Group Detection
2. Prediction of Future Location

**LARC Spatiotemporal Analytics Service**

**LIVE Labs Location DB**

**LiveLabs@SMU**

**Smuddy: LiveLabs Location-Aware Messaging & Search App**

**Experiment Plan**
- Phase 1: Q4, 2013.
- Phase 2: Q1, 2014.
Framework for LiveAnalytics (LARC & LiveLabs)

- Observe complex behaviors in natural consumer and social settings via digital traces
- Progressively real-time
- Progressively societal-scale

- Experiment-driven
- Closed-loop, and iterative
- Network-centric
LiveAnalytics Vision (LARC + LiveLabs)

Analytics that combine realism, complexity and dynamics of social and consumer behavior observable in the field with experimental control and causal inference capability of the lab in a network-centric world
Skill Sets Required for LiveAnalytics
(LARC + LiveLabs)

**Area A: Intelligent Systems for Analytics**
- Data Mining
- Machine Learning
- Automated Planning
- Adaptive Decision Making

**Area B: Social Science & Management**
- Social Science
- Management Science
- Consumer & Social Behaviour
- Behavioural Economics
- Business Value

**Area C: Statistics & Experimentation**
- Randomise Experiments with Controls
- Network-Centric Experimentation
- Closed-Loop, Iterative Experimentation
- Experimentation and Learning

**Area D: Security, Data Fusion & Privacy Preservation**
- Secure Computing Environments
- Data Privacy & Protection
- Data Fusion & Record Linkage

**Area E: Systems & Infrastructure**
- Next-Gen Mobile Sensing for Context-Aware Analytics
- Computing for Real-Time Analytics
- Computing, Storage, & Network Infrastructure

Secure, Privacy Protected, Distributed Work-Flow
- For Administration and Planning
- For Big Data Processing
Urban Management Analytics Lab at SIS

Resource Planning and Coordination for Sustainability

Congestion

Crowds

Queues

More Queues
City Logistics:
Last-Mile Freight Delivery Coordination

Multi-party coordinated planning of last-mile delivery operations
- Higher Truck Load Factor
- Lower Transportation Cost
- More Environmental Friendly
- Less Congestion
Mobility (Public Transportation): Taxi Fleet Movement Coordination

- Intelligent matching of supply and demand
- Taxis are self-interested vehicles, (which are mostly ignored in traditional traffic simulation studies)
- Auction mechanism for last-mile ride-sharing
- New policies and control mechanisms are evaluated using an agent-based simulator

A dynamically formed queue based on request (e.g., last-mile service provided at MRT station)
Health-Care:
Dynamic Queue Control for Emergency Departments

- Adaptive matching of demand and supply
- Dispatch strategies to dynamically prioritize patients in the queue in real-time, taking historical data and real-time demand into consideration
Leisure:
Crowd Coordination at Theme Parks

Visitor Personal Info

Real-time Ride Status, Queue Times, Show Schedules

Operator Monitoring and Intervention
Security:
Randomized Patrol Scheduling in Network
## Opportunities for SMU and SIS in Analytics

### Intersection of Infocomm with Big Data with Social & Behavioural Science and Management

#### SMU & SIS Research Excellence

**Become a Global Leader in Computational Social Science**

<table>
<thead>
<tr>
<th>Make the large-scale Testbeds successful</th>
<th>◆ LARC (in partnership with Carnegie Mellon)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Build Analytics for Business, Consumer &amp; Social Insights into SMU wide Area of Excellence</td>
<td>◆ LiveLabs Urban Lifestyle Innovation Platform</td>
</tr>
<tr>
<td></td>
<td>◆ iCity Lab (with TCS), Green Transformation Lab (with DHL)</td>
</tr>
<tr>
<td>Make SMU a global innovator and leader in Computational Social Science</td>
<td>◆ Getting more of SMU involved; Linking research, education, practice, outreach</td>
</tr>
<tr>
<td>Informatics applied to Management, Business &amp; Social Science + Big Data</td>
<td>◆ Ability to protect proprietary data from private and public sector partners</td>
</tr>
<tr>
<td></td>
<td>◆ Proactive compliance with Singapore’s new Personal Data Protection Act (PDPA) and IRB requirements</td>
</tr>
<tr>
<td></td>
<td>◆ Go beyond Analytics for Business, Consumer &amp; Social Insights</td>
</tr>
<tr>
<td></td>
<td>◆ Leverage on CMU Partnership for LARC</td>
</tr>
<tr>
<td></td>
<td>◆ Expanded partnership network for as work in Computational Social Science expands</td>
</tr>
</tbody>
</table>
## Envisioning an Analytics Institute@SMU (Future Plan)

<table>
<thead>
<tr>
<th>Planned Analytics Institute@SMU</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Live Analytics</strong> Consumer &amp; Social Analytics, Experiment-Driven, Network-Oriented</td>
</tr>
<tr>
<td>✓ LARC (SMU, CMU, Partners)</td>
</tr>
<tr>
<td>✓ LiveLabs (SMU, Partners)</td>
</tr>
<tr>
<td><strong>Urban Management Analytics</strong></td>
</tr>
<tr>
<td>✓ Green Transformation Lab (DHL, SMU)</td>
</tr>
<tr>
<td>✓ Analytics and Optimisation for Urban Security &amp; Safety (MHA)</td>
</tr>
<tr>
<td>✓ A*STAR Collaborative Urban Logistics consortium</td>
</tr>
<tr>
<td>✓ iCity Lab (TCS, SMU)</td>
</tr>
<tr>
<td><strong>Analytics for Business, Consumer &amp; Social Insight</strong></td>
</tr>
<tr>
<td>✓ Already designated as an SMU Area of Excellence</td>
</tr>
</tbody>
</table>

### Social & Policy Analytics (including Urban & Regional Policy Analytics)
- Rooted in theory, questions and data from Economics, Sociology, Political Science and Applied Policy Analysis
- Natural links with forthcoming SMU Nathan Institute, with Public Sector

### Foundation Methods for Analytics across Research and Practice
- From computer science, machine learning, statistics, econometrics, management
- Theory and methods for integrating Computation + Social Science + Management
- Applications and practice for integrating Computation + Social Science + Management

### Analytics Education across Research, Practice and Outreach
- ✓ Bachelors, MITB (Analytics), Masters by Research, PhD + Continuing Education

### Ongoing activities
- Plans for new activities
Key SIS Research Areas & Capabilities In Information Security

Cybersecurity Key Research Areas

- Data Security & Privacy
  - Data security & privacy in cloud computing
  - Query privacy in databases
  - Multimedia security
  - Authentication of query results
  - Privacy-preserving data analytics
  - Data applications security
  - Social network security

- RFID and IoT Security
  - RFID security & privacy
  - Secure EPCGlobal network
  - Tamper Detection in the EPC Network
  - RFID privacy issues in healthcare
  - IoT security & privacy

- Mobile Platform & Applications; Systems Security
  - Mobile platform security
  - Software attack analysis & defense
  - Trusted computing
  - Intrusion detection
  - Leakage resilient password systems
  - Human factors in user authentication
  - Computer & cyber forensics

Established Areas of Capability and Strength

New Opportunity Areas Combining Management, Policy & Technology

- Cybersecurity Management and Policy
  - Cybersecurity & Data Privacy Laws
  - Security & risk management
  - Organizational info security & privacy
  - Personnel data security & privacy
  - Security audit & compliance
  - Business continuity & incidence response
  - Cybersecurity policy management

Cybersecurity Expertise, Projects, and Research Publications

- RFID privacy issues in healthcare
- Tamper Detection in the EPC Network
- IoT security & privacy
Key Research Problems to Pursue in Data Security & Privacy

- How to specify security requirements and create corresponding security solutions for data-centric applications?
- How to perform access control on encrypted data stored in untrusted servers?
- How to block direct access to privacy-disclosing data items and control indirect access to such items while minimizing the impact on the scope and accuracy of data analytics?
- How to verify that users’ query results are complete and authentic?
- How to design search engines that can accurately return relevant documents while safeguarding the true user intention?
- How to balance user privacy control and business functionalities in social networks?
Key Research Problems to Pursue in Mobile Platform, Application & System Security

- How to design and implement trustworthy mobile computing platforms and software?
- How to effectively and efficiently detect intrusions in mobile platforms?
- How to design and evaluate mobile platform and application security techniques for context-aware applications?
- How to perform fuzz testing and dynamic taint analysis of mobile apps?
- How to perform security analysis on binary programs for malware identification and detection?
- How to design and evaluate secure and usable user authentication systems on mobile platforms?
## Top Tier Publications Across All SIS Areas

<table>
<thead>
<tr>
<th>SIS Area</th>
<th>Conferences</th>
<th>Journals</th>
</tr>
</thead>
<tbody>
<tr>
<td>Data Management &amp; Analytics</td>
<td>• ACL Conference&lt;br&gt;• ACM Multimedia Conference&lt;br&gt;• ACM SIGIR Conference&lt;br&gt;• ACM SIGKDD Conference&lt;br&gt;• ACM SIGMOD Conference&lt;br&gt;• ICDE Conference&lt;br&gt;• ICDM Conference&lt;br&gt;• VLDB Conference&lt;br&gt;• WWW Conference</td>
<td>• ACM Transactions on Information Systems&lt;br&gt;• ACM Transactions on Database Systems&lt;br&gt;• IEEE Transactions on Multimedia&lt;br&gt;• IEEE Transactions on Knowledge and Data Engineering&lt;br&gt;• IEEE Transactions on Mobile Computing&lt;br&gt;• IEEE Transactions on Circuits and Systems for Video Technology&lt;br&gt;• Pattern Recognition&lt;br&gt;• VLDB Journal</td>
</tr>
</tbody>
</table>

SIS faculty, PhD students and research staff in these areas have recently published in these conferences and journals.
### Top Tier Publications Across All SIS Areas, cont’d

<table>
<thead>
<tr>
<th>SIS Area</th>
<th>Conferences</th>
<th>Journals</th>
</tr>
</thead>
</table>
| **Software Systems**              | • ACM Conference on Embedded Networked Sensor Systems  
• ACM International Joint Conference on Pervasive and Ubiquitous Computing  
• ACM SIGCHI Conference on Human Factors in Computing Systems  
• ACM SIGSOFT Symposium on the Foundations of Software Engineering  
• International Conference on Mobile Systems, Applications, and Services  
• IEEE International Conference on Computer Communications  
• IEEE International Conference on Pervasive Computing and Communications  
• International Conference on Software Engineering  
• SIGPLAN Conference on Object-Oriented Programming, Systems, Languages, and Applications                                                                                                                                 |
|                                  |                                                                                                                                                                                                            | • ACM Transactions on Sensor Networks  
• ACM Transactions on Computer-Human Interaction  
• IEEE Transactions on Mobile Computing  
• IEEE Transactions on Services Computing  
• IEEE Computer  
• IEEE/ACM Transactions on Networking  
• IEEE Journal of Selected Areas in Communications                                                                                                                                 |
| **Intelligent Systems & Decision Analytics** | • International Joint Conference on Autonomous Agents and MultiAgent Systems  
• National Conference on Artificial Intelligence (AAAI Conference)  
• International Conference on Intelligent Agent Technology                                                                                                                                                                                                 | • IEEE Transactions on Automation Science and Engineering  
• IEEE Transactions on Systems, Man, Cybernetics  
• Annals of Operations Research  
• Journal of Autonomous Agents and Multi-Agent Systems |

SIS faculty, PhD students and research staff in these areas have recently published in these conferences and journals.
### Top Tier Publications Across All SIS Areas, cont’d

<table>
<thead>
<tr>
<th>SIS Area</th>
<th>Conferences</th>
<th>Journals</th>
</tr>
</thead>
<tbody>
<tr>
<td>IS &amp; Management</td>
<td>• ACM Conference on Electronic Commerce</td>
<td>• Communications of the ACM</td>
</tr>
<tr>
<td></td>
<td>• Americas Conference on Information Systems</td>
<td>• Decision Support Systems</td>
</tr>
<tr>
<td></td>
<td>• International Conference on Information Systems</td>
<td>• Journal of Management Information Systems</td>
</tr>
<tr>
<td></td>
<td>• International Workshop on Information Systems and Economics</td>
<td>• Journal Electronic Commerce Research &amp; Applications</td>
</tr>
<tr>
<td></td>
<td>• Hawaii International Conference on System Sciences</td>
<td>• IEEE Transactions on Engineering Management</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Information Systems Research</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• International Journal of Electronic Commerce</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Management Science</td>
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<tr>
<td></td>
<td></td>
<td>• MIS Quarterly</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Strategic Management Journal</td>
</tr>
</tbody>
</table>

SIS faculty, PhD students and research staff in this area have recently published in these conferences and journals.
SIS Educational Programmes

**Master of Applied Information Systems**
A research masters with a major Information Systems application project component

**MSc in Information Systems**
A research masters with a thesis component

**BSc (IS Management)**
Our comprehensive undergraduate experience

**Master of IT in Business**
A professionally oriented, course-work based programme with a Capstone Project
BSc (Information Systems Management) Curriculum

**INFORMATION TECHNOLOGY & SYSTEMS**
- IS Software Foundations
- Object Oriented Application Development
- Software Engineering
- Enterprise Integration
- Enterprise Web Solutions
- Interaction Design & Prototyping
- IS Application Project
- IS Depth Electives (4)
- Seminar on IS Management
- Data Management
- Process Modelling & Solution Blueprinting
- Information Security & Trust
- Architectural Analysis

**16 Courses**

**MANAGEMENT & 2ND MAJORS**
- Business Oriented Electives (4)
- Additional Second Major Electives (Courses from the other SMU Schools or from SIS)

**4 Courses for ISM Major** (With +2 to +4 for 2nd major)

**SMU BROAD BASED**
- SMU Foundation (3)
  - Academic Writing
  - Intro Economics
  - Calculus
- SMU Common University Core (6)
  - Analytic Skills (1/2)
  - Creative Thinking (1/2)
  - Biz, Gov & Society
  - Management Comm.
  - Ethics and SR
  - Tech& World Change
  - Leadership & Team Building
- General Education (3)
  - GE elective #1, #2
  - Comp. Thinking for SIS
- Global & Regional Studies (2)
  - Elective 1
  - Elective 2

**2 Courses**

**QUANTITATIVE THINKING**
- Computer as an Analysis Tool (CAT)
- Intro Statistics
- Computational Thinking (counted as a General Ed elective)

**14 Courses**

**Internship (at least 10 continuous weeks) & Finishing Touch**

**Community Service (at least 80 hours)**
Second Majors for BSc (ISM) students

2nd Majors Offered
- School of Accountancy
- Lee Kong Chian School of Business
- School of Economics
- School of Information Systems
- School of Law
- School of Social Sciences
- Across SMU schools

advanced business technology

- Accounting
- Actuarial Science
- Applied Statistics
- Arts & Culture
- Corporate Communication
- Economics
- Finance
- International & Asian Studies
- Legal Studies
- Management
- Marketing
- Operations Management
- Organizational Behaviour & Human Resources
- Political Science
- Psychology
- Public Policy & Public Management
- Quantitative Finance
- Sociology
- Strategic Management
Program Structure for Undergrad Analytics 2nd Major at SMU

Analytical Foundation Requirements
2 Courses

Track Specific Requirements and/or Electives
3 Courses

Additional Electives
2 Courses

Analytics Practicum
1 Course

Operational Analytics Track
Management Science; High Performance Warehousing & Fulfillment; Computer Simulation by Modeling Business Systems; Managing Process Improvement; Supply Chain Process & Technology Solutions; Enterprise Analytics for Decision Support

Advanced Technology Analytics Track
Advanced Data Management; Data Warehousing & Business Analytics; Data Mining & Business Analytics; Visual Analytics & Business Intelligence; System Dynamics & Business Gaming; Intelligent Business Gaming; Applied Regression Methods

Marketing Analytics Track
Marketing Information Systems; Marketing Research; Social Analytics; Search Engine Technologies

Urban & Regional Analytics Track
Geospatial Analytics for Business Intelligence; Social Networks; Sociology & Political Science Research Methods

Accounting Analytics Track
Accounting Information Systems; Enterprise Accounting Systems; Data Management

Total of 8 Courses
Students are able to Graduate with Bachelors + Analytics 2nd Major within 39 Courses
# Master of IT in Business Programme (MITB)

<table>
<thead>
<tr>
<th>A. Banking Technology &amp; Operations</th>
<th>B. Analytics Technology &amp; Applications</th>
<th>C. Information Technology Management</th>
<th>D. General Management for Technology &amp; Operations</th>
</tr>
</thead>
<tbody>
<tr>
<td>A.2 Retail Banking Technology &amp; Operations</td>
<td>B.2 Data Analytics Lab</td>
<td>C.2 Spreadsheet Modeling for Technology &amp; Operations Decisions</td>
<td>D.1C * Management Accounting for Technology &amp; Operations Managers</td>
</tr>
<tr>
<td>A.3 Corporate Banking Technology &amp; Operations</td>
<td>B.3 Customer Analytics &amp; Applications</td>
<td>C.3 IT Project &amp; Vendor Management</td>
<td>D.2 * Strategy &amp; Organisation</td>
</tr>
<tr>
<td>A.5 Trading Technology &amp; Operations</td>
<td>B.5 Cloud and Big Data Analytics</td>
<td></td>
<td></td>
</tr>
<tr>
<td>A.6 Payment Technology &amp; Operations</td>
<td>B.6 Visual Analytics &amp; Applications</td>
<td></td>
<td></td>
</tr>
<tr>
<td>A.7 Assets Management Technology &amp; Operations</td>
<td>B.7 Text Analytics &amp; Applications</td>
<td></td>
<td></td>
</tr>
<tr>
<td>A.8 Lifecycle Implementation of Banking Products</td>
<td>B.8 Social Analytics &amp; Applications</td>
<td></td>
<td></td>
</tr>
<tr>
<td>A.9 FS Operational Risk I: Foundation &amp; Framework</td>
<td>B.9 Mobile Analytics &amp; Applications</td>
<td></td>
<td></td>
</tr>
<tr>
<td>A.10 FS Operational Risk II: Technology, &amp; Systems</td>
<td>B.10 Business Analytics Practicum</td>
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</tr>
</tbody>
</table>

* = ½ credit course, 7 sessions per term

Bold = New courses phasing in from Aug 2013 onward

## E. Capstone Project

E.1 Capstone Project
- Project Definition, development and critique workshops
- Industry expert seminars and company suite visits

E.2 Project Delivery
### A. Banking Technology & Processes

- A.1 Banking Products & Processes
- A.2 Retail Banking Technology & Operations
- A.3 Corporate Banking Technology & Operations
- A.4 Financial Markets Technology & Operations
- A.5 Trading Technology & Operations
- A.6 Payment Technology & Operations
- A.7 Assets Management Technology & Operations
- A.8 Lifecycle Implementation of Banking Products
- A.10 FS Operational Risk II: Technology, & Systems

### B. Analytics Technology & Applications

- B.1 Analytics Framework & Business Context
- B.2 Data Analytics Lab
- B.3 Customer Analytics & Applications
- B.4 Operations Analytics & Applications
- B.5 Cloud and Big Data Analytics
- B.6 Visual Analytics & Applications
- B.7 Text Analytics & Applications
- B.8 Social Analytics & Applications
- B.9 Mobile Analytics & Applications
- B.10 Business Analytics Practicum

---

**Powerful ability to pursue business, consumer and social analytics with banking and financial services**
The new SMU Financial IT Academy@SMU, the national “lead provider” for Financial Services IT Manpower Development

Banking & Financial Services Technology, Operations, Processes & Service Innovation (TOPS)

Professional Short Courses

Core Technology Skills for Financial Service applications

Hybrid IT-FS Skills spanning IT applications, processes, and business operations

Emerging IT Skills for Financial Services

Advanced Management Skills for FS IT Professionals

- Funded by Monetary Authority of Singapore (MAS) and Infocomm Development Authority (IDA)
- Officially announced on 28 May 2013 at the Institute of Banking & Finance Industry

Part of Singapore’s national competency development efforts for both IT and Financial Services
SIS Post-Graduate Professional Programmes: Leveraging Our Full Ecosystem for Expertise, Scale and Synergy

Banking & Financial Services  
**T & O:** Technology, Operations, Processes  
& Service Innovation (TOPS)

<table>
<thead>
<tr>
<th>Masters Level</th>
<th>Masters Level</th>
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</thead>
<tbody>
<tr>
<td><strong>Professional Short Courses</strong></td>
<td><strong>Professional Short Courses</strong></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Undergraduate Level</th>
<th>Undergraduate Level</th>
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</thead>
</table>

Analytics for Business, Consumer & Social Insights:  
Data, Processes, Technology & Business Applications

Joint effort with industry to develop business oriented IT professionals in strategic areas

**ATTRACT**  
**PREPARE**  
**RETAIN**
PhD in Information Systems
Our Goal

• To develop researchers/educators
  – Who address deep technology challenges in real information systems that impact business processes or management, or
  – Who develop tools and methodologies to translate business goals to technology solutions.

• PhD graduates will be capable of
  – Collaborating with faculty members from different research areas,
  – Designing technology solutions for real-world problems and applications,
  – While still producing top-rate academic publications.
Our PhD in IS students receive a well-rounded education

Our PhD students:

- Produce high-quality research that generates impactful and real-world relevant outcomes
- Learn from eminent faculty members and internationally-renowned visiting academics
- Undertake research assistantships in SMU research centres and overseas institutions (e.g. CMU)
- Undertake teaching assistantships and internships
Our PhD students conduct high-quality research

Our PhD students have received **Best / Distinguished Paper Awards** for their outstanding research papers.

Chee Meng TEY & Payas GUPTA

**Best Paper Award** at the Network & Distributed System Security (NDSS) Symposium 2013

*I Can Be You: Questioning the use of Keystroke as Biometrics*

Qiang YAN & Jin HAN

**Distinguished Paper Award** at the NDSS Symposium 2012

*On Limitations of Designing Leakage-resilient Password Systems: Attacks, Principles and Usability*

Kiat Wee TAN

**Best Paper Award** at the Workshop on Mobile Gaming (MobiGames), in conjunction with ACM SIGCOMM 2013

*Adaptive Display Power Management for OLED Displays*
Our PhD graduates have good employment prospects

KOH Noi Sian
Lecturer
Nanyang Polytechnic

HU Meiqun
Research Scientist
A*STAR I2R

FU Na
Research Fellow
Living Analytics Research Centre

HAN Jin
Research Scientist
A*STAR I2R

Payas GUPTA
Postdoctoral Fellow
New York University, Abu Dhabi
PhD Students Expected to Graduate in YR2013

**TAN Kar Way**  
**Year of Admission:** AY2007-08, Term 1  
**Research Area:** Intelligent Systems & Decision Analytics  
**Research Advisors:** Associate Professor LAU Hoong Chuin & Associate Professor (Education) Venky SHANKARARAMAN

**DAI Hanbo**  
**Year of Admission:** AY2008-09, Term 1  
**Research Area:** Data Management & Analytics  
**Research Advisors:** Professor LIM Ee-Peng & Assistant Professor ZHU Feida

**Lindawati**  
**Year of Admission:** AY2008-09, Term 1  
**Research Area:** Intelligent Systems & Decision Analytics  
**Research Advisors:** Associate Professor LAU Hoong Chuin & Assistant Professor David LO

**YAN Qiang**  
**Year of Admission:** AY2008-09, Term 1  
**Research Area:** Information Security & Trust  
**Research Advisors:** Professor Robert H. DENG & Associate Professor LI Yingjiu

Placement: **Researcher at Google R&D Labs, Zurich Switzerland (as of September 2013)**

Placement: **Placement: Faculty at Hubei University, Computer Science Dept., Hubei Province, China**

Placement: **Academic Director, Green Transformation Lab (DHL – SMU collaboration) and SIS Education/Practice track faculty, as of October, 2013**
We offer competitive Fellowships & Scholarships

Full Scholarships
- Cover tuition and registration fees, and provide monthly stipends (S$2000 to S$2500).
- Renewable yearly, up to Year 4, based on good academic performance.

Presidential Doctoral Fellowships
- Exceptionally qualified PhD students.
- Renewable yearly, up to Year 4, based on good academic performance.
- Higher monthly stipends (S$3000 to S$3300).
Master of Applied Information Systems (MAIS)

Program Objective
Enhance students’ knowledge and skills by providing them with a broad view of information systems, in addition to valuable hands-on experiences.

Program Highlight
Students need to complete industrial strength projects with our partner centres, institutes, or industry collaborators, as an essential component of the curriculum.

Tracks Offered

Technology Tracks
- Data Management & Analytics Track
- Information Security & Trust Track
- Software Systems Track

IT-Enabled Innovation & Entrepreneurship Track

Program Structure
- Full time (1 to 1.5 years), or
- Part time (2 to 3 years)
- Three terms per academic year
- Two intakes every year (Aug, Jan)
Overview of SMU SIS Professional Programmes for Continuing Education and Training (CET)

<table>
<thead>
<tr>
<th>Content Base for SIS CET Courses</th>
<th>Delivery Model and Channel</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Short Version Through NTUC Next U – SIS Partnership (Open Enrolment)</td>
</tr>
<tr>
<td>BSc (Information Systems Management) Courses</td>
<td>Possible</td>
</tr>
<tr>
<td>MITB (Financial Services) Courses [Series A]</td>
<td>No</td>
</tr>
<tr>
<td>MITB (Analytics) Courses [Series B]</td>
<td>For Selected Courses</td>
</tr>
<tr>
<td>MITB IT &amp; Project Management Courses [Series C]</td>
<td>Possible</td>
</tr>
<tr>
<td>SIS PhD Courses</td>
<td>No</td>
</tr>
<tr>
<td>Financial IT Academy@SMU</td>
<td>No</td>
</tr>
</tbody>
</table>
SMU SIS Professional Education Programme – Special Programmes

• Special programmes for companies in the areas of:
  a. Financial Services Processes, Operations, Technology and Transformation; or
  b. Business, Consumer & Social Analytics

• Technology & Operations Graduate Education Program – June 2011
  – Client was extremely pleased with the program outcome and they wish to collaborate again to execute a 2nd run on a larger scale for twice as many of their graduate executives (to be conducted in two sections) in 2012

How has one month campus training prepared you for your job?

Since I am an engineering graduate, my knowledge of finance and banking is limited. In the one month training, I learnt a lot about banking products and processes. Besides the knowledge, my soft skills have also improved which really prepared me for the job rotations.

– A participant of the Technology & Operations Graduate Education Program