

Research opportunities abound at ADSC for international students while enrolled in the SINGA program. Below is a listing of potential PhD projects that you could become an integral part of the research team. Listed are the Potential PhD Project Title/Area Opportunities, the University the PhD degree would be awarded from, the faculty and lead researchers involved/supervising the project and their contact information.

Feel free to explore these opportunities by contacting the supervisors listed of if you have more general questions, or contact Asghar Mirarefi at mirarefi@illinois.edu.

Select up to three proposed PhD Projects, from the list above, on your application submission.

[Advanced Digital Sciences Centre \(ADSC\) \(Website\)](#)

Interactive & Digital Media

Potential PhD Project Title/Area	Degree Awarded By	Supervisor	Email Contact
Visual Modelling and Analytics for Large-Scale Dynamic Environments	NTU	- Jiangbo Lu	jiangbo.lu@adsc.com.sg
		- Jianfei Cai/Prof at SCE, NTU	asifcai@ntu.edu.sg
Visual Modelling and Analytics for Large-Scale Dynamic Environments	NUS	- Jiangbo Lu	jiangbo.lu@adsc.com.sg
		- Michael Brown/Prof at SoC, NUS	brown@comp.nus.edu.sg
Scalable, Real-Time Analytics for Challenging Data. This project will strengthen the safety and security of Singapore through computation technologies for urban systems that is scalable, flexible and provides real-time response at reasonable costs with the goals to support real-time next-generation analytics over streaming data; enable rapid recovery from disruptions; provide a generic streaming analytics framework and system to handle challenging data.	NUS	- Marianne Winslett/Adj Prof at SCE, NTU	winslett@illinois.edu
		- Richard Ma/Asst/Prof, SoC, NUS	tbma@adsc.com.sg
		- Zhenjie Zhang	zhenjie@adsc.com.sg
Distributed streaming query processing: Designing and implementing new generation of distributed streaming analytic engine, to support reliable real-time analysis on fast streaming data. The application domains can be text data, image data and video data.	NTU	- Zhenjie Zhang	zhenjie@adsc.com.sg
		- Cong Gao/Asst/Prof at NTU	gaocong@ntu.edu.sg
BigSocial -- a social media data analytic platform focusing on supporting entity-centric analytics. It aims to support two key functionalities: 1) monitoring social data relevant to real world entities of interests; 2) profiling social users to enable rich demographic targeting and segmentation.	NTU	- Kevin Chen-Chuan Chang A/Prof at CS, UIUC	kcchang@illinois.edu
		- Vincent Zheng	vincent.zheng@adsc.com.sg
		- Cong Gao/Asst/Prof at NTU	gaocong@ntu.edu.sg
Emerging Multimodal-Data Analytics - to explore the benefits of emerging sensing modalities for multimedia analytics and to develop a fundamental mathematical approach to systematically extract and process the novel discriminative signal features that will allow for more accurate analytics. This will enable and enhance a wide range of applications, e.g. human activity recognition, tracking, surveillance, gaming, web visual data indexing, identification, and retrieval. The core applications of interest in this project include activities of daily life, physical therapy, and patient monitoring.	NTU	- Pierre Moulin	moulin@adsc.com.sg
		- Gang Wang/Asst/Prof at EEE, NTU	WangGang@ntu.edu.sg
Perception modeling and video quality assessment for high-dynamic range and stereo/3D content	NTU	- Stefan Winkler	Stefan.winkler@adsc.com.sg
		- Weisi Lin/Prof at SCE, NTU	wslin@ntu.edu.sg
Multimodal profiling analytics: categorize people based on demographics and interactional behavior as well as their affective states, using multiple media modalities (text, audio, visual, internet and mobile data) as well as multiple information sources (e.g., face, posture, gait, etc.) to infer the above, analyze their psychophysiological and emotional conditions, and make informed decisions about their interests and intentions.	NUS	- Stefan Winkler	Stefan.winkler@adsc.com.sg
		- Shih-Cheng Yen/Prof at ECE, NUS	shihcheng@nus.edu.sg
		- Mohan Kankanhalli/Prof at Soc, NUS	mohan@comp.nus.edu.sg
		- Shengdong Zhao/Asst/Prof at SoC, NUS	zhaosd@comp.nus.edu.sg
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		- Junsong Yuan/Prof at EEE, NTU	JSYUAN@ntu.edu.sg
		- Gang Wang/Asst/Prof at EEE, NTU	WangGang@ntu.edu.sg
		- Justin Dauwels/Asst/Prof at EEE, NTU	JDAUWELS@NTU.EDU.SG
Sky/cloud imaging and analysis. Estimating cloud cover, cloud types, cloud density, cloud movement, cloud altitude and other parameters from ground-based sky images and additional sensors.	NTU	- Stefan Winkler	Stefan.winkler@adsc.com.sg
		- Yee Hui Lee/Prof at EEE, NTU	eyhlee@ntu.edu.sg
Action and event recognition in videos	NTU	- Narendra Ahuja/Prof Emeritus at ECE, UIUC	narendra@adsc.com.sg
		- Jagannadan VARADARAJAN	viagan@adsc.com.sg
		- Gang Wang/Asst/Prof at EEE, NTU	WangGang@ntu.edu.sg
Action and event recognition in videos	NUS	- Narendra Ahuja/Prof Emeritus at ECE, UIUC	narendra@adsc.com.sg
		- Jagannadan VARADARAJAN	viagan@adsc.com.sg
		- Leow Wee Kheng/Prof at SoC, NUS	leowwk@comp.nus.edu.sg
Acoustic and audio event detection, localization, and classification. Acoustic scene understanding. Real-time analysis of audio streams and detection of anomalous or novel events. Insonification (alternate presentation of data, such as visual scenes for blind people) through sound. Audio human-computer and brain-machine interfaces.	NTU	- Douglas Jones/Prof at ECE, UIUC	jones@adsc.com.sg
		- Gan Woon Seng/Prof at EEE, NTU	ewsgan@ntu.edu.sg
Audio surveillance: acoustic audio event detection and classification Direction of arrival estimation in reverberation environment 3D audio capture and reproduction through headphone and loudspeakers.	NTU	- Shengkui ZHAO	shengkui.zhao@adsc.com.sg
		- Gan Woon Seng/Prof at EEE, NTU	ewsgan@ntu.edu.sg

Computer Science

Supervisor	Email Contact	Potential PhD Project Title/Area	Degree Awarded By
Scalable, Real-Time Analytics for Challenging Data. This project will strengthen the safety and security of Singapore through computation technologies for urban systems that is scalable, flexible and provides real-time response at reasonable costs with the goals to support real-time next-generation analytics over streaming data; enable rapid recovery from disruptions; provide a generic streaming analytics framework and system to handle challenging data.	NUS	- Marianne Winslett/Adj Prof at SCE, NTU	winslett@illinois.edu
		- Richard Ma/Asst/Prof, SoC, NUS	tbma@adsc.com.sg
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		- Vincent Zheng	vincent.zheng@adsc.com.sg
		- Cong Gao/Asst/Prof at NTU	gaocong@ntu.edu.sg
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		- Cong Gao/Asst/Prof at NTU	gaocong@ntu.edu.sg
Efficient and resilient communication mechanisms for distributed cyber-physical systems.	NUS	- Binbin Chen	Binbin.chen@adsc.com.sg
		- Haifeng Yu/Prof at SoC, NUS	haifeng@comp.nus.edu.sg
Cyber-physical system design and implementation: 1. Security, safety, and privacy of automated demand-response in smart grids. 2. Security assessment and intrusion detection for networked digital control of cyber-physical systems. 3. Sensor networks and analytics for green building energy monitoring and optimization.	SUTD	- David Yau/Prof at SUTD	david.yau@adsc.com.sg
Quality of Service (QoS) for networked multimedia applications. Study of the Internet Ecosystem, its Economics and Evolution.	NUS	- Richard Ma/Asst Prof at SoC, NUS	tbma@adsc.com.sg

Security of enterprise networks Adaptive attack mitigation (particularly SDN-based solutions to change the attack surface and defeat repeated attacks), honeypots and sandboxing (attract live attacks possibly for infiltration and defense against zero-days), attack trace back and attribution (e.g., traffic watermarking), botnet/trojan/DDoS detection & defense. Useful knowledge & skills include computer & network security, network protocol design & analysis, signal processing, data analytics. Tool building and empirical studies are particularly interesting.	SUTD	- David YauProf at SUTD Xinshu Dong	david.yau@adsc.com.sg xinshu.dong@adsc.com.sg
Multi-language High Level Synthesis via High Level Intermediate Representation Transformations Energy and Reliability optimization of GPU and FPGA architectures GPU Compiler optimization for performance, energy and reliability Task and resource scheduling for heterogeneous resources Next-Generation Compilers & Architectures for Computation Acceleration with Energy Efficiency	NTU	- Deming Chen A/Prof at ECE, UIUC - Kyle Rupnow - Nachiket KapreAsst Prof at SCE, NTU	dchen@adsc.com.sg k.rupnow@adsc.com.sg nachiket@ntu.edu.sg
Security of Internet-of-Things (IoT). In this project, the candidate will study approaches to detecting, identifying, and mitigating cyberattacks against industrial IoT systems. In particular, we will use urban railways as our case study systems. The candidate will contribute to a national level research project in Singapore that aims to develop cybersecurity enhancement to Singapore's Mass Rapid Transit (MRT) system. The research area will be in the systems security, IoT, and cyber-physical systems.	NTU	- Subhash Lakshminarayana - Rui TanAsst Prof at SCE, NTU - David NicolProf at ECE, UIUC	subhash.l@adsc.com.sg tanrui@ntu.edu.sg dmnicol@illinois.edu
Security of Internet-of-Things (IoT). Using cutting-edge sensing and computing techniques to develop novel approaches to improve the resilience of various fundamental functions (e.g., clock synchronization, data timestamping) of IoT systems against cyber-attacks, and to extend the functionality of distributed IoT systems. The candidate will contribute to a national level research project in Singapore which aims to enhance the cybersecurity of the largest power plant system of Singapore. The research area will be in the system security, IoT signal processing, wireless sensor networks and pervasive computing.	NTU	- Yang Li - Rui TanAsst Prof at SCE, NTU	yang.li@adsc.com.sg tanrui@ntu.edu.sg
Improving Data center Energy Efficiency using Advanced Wireless Sensing and Data Analytics. Cooling systems contribute to a large portion of the electricity bill of a data center. This project will deploy wireless sensors in a data center to monitor various environment conditions (temperature, air flow, etc). Advanced data analytics will be applied to derive the most energy-efficient control solution for air conditioning and server workload allocation. The research can be directly applied to Singapore's data center industry that suffers from high energy consumption for cooling due to the tropic climate.	NTU	- Subhash Lakshminarayana - Rui TanAsst Prof at SCE, NTU	subhash.l@adsc.com.sg tanrui@ntu.edu.sg

Computational Architectures

Potential PhD Project Title/Area	Degree Awarded By	Supervisor	Email Contact
Multi-language High Level Synthesis via High Level Intermediate Representation Transformations Energy and Reliability optimization of GPU and FPGA architectures GPU Compiler optimization for performance, energy and reliability Task and resource scheduling for heterogeneous resources Next-Generation Compilers & Architectures for Computation Acceleration with Energy Efficiency	NTU	- Deming ChenA/Prof at ECE, UIUC - Kyle Rupnow - Nachiket KapreAsst Prof at SCE, NTU	dchen@adsc.com.sg k.rupnow@adsc.com.sg nachiket@ntu.edu.sg

Smart Grid

Potential PhD Project Title/Area	Degree Awarded By	Supervisor	Email Contact
Resilient Smart Power Grid: Testbed for Design, Analysis, & Validation of Power Grid Systems. This project will determine how to ensure a reliable and secure operation in presence of accidental failures and malicious attacks with the goals to incorporate a system-wide solution that reduces physical and cyber vulnerabilities; enable a rapid recovery from disruptions; and minimize impact on performance.	NTU	- Ravishankar IyerProf at ECE, UIUC - Zbigniew KalbarczykProf at CSL, UIUC - Hoay Beng GooiA/Prof at EEE, NTU	rkiyer@illinois.edu kalbarcz@illinois.edu EHBGOOI@ntu.edu.sg
Enhancing Power Grid Reliability With High Penetration of Renewable Energy. The project will investigate techniques to enhance power grid reliability while considering the impact of high penetration of distributed renewable energy generation, with particular focus on stabilizing voltage and frequency fluctuations. Useful knowledge and skills include stochastic control and optimization. In addition, there will be emphasis on validating the proposed algorithms by conducting extensive simulations using the IEEE benchmark bus systems and power grid test-beds.	SUTD	- Subhash Lakshminarayana - David YauProf at SUTD	subhash.l@adsc.com.sg david.yau@adsc.com.sg
Security and Privacy in Smart Grids. In this project, the candidate will analyze security of the control systems in smart grids and the impact of user privacy on the grid operation efficiency in the coming era of demand response. The candidate will develop strong analytical skills in optimization theory and control theory. The research area will be in cyber-physical systems, optimization theory and application, distributed algorithm.	NTU	- Xin Lou - Rui TanAsst Prof at SCE, NTU	lou.xin@adsc.com.sg tanrui@ntu.edu.sg
Electricity expenditure contributes a significant portion to data center's operational expenses, and reducing it has become important. The proposed research will examine solutions to cut data center electricity bills by intelligent workload scheduling, and modelling its interactions with the electricity market, e.g. by participation in demand-response (DR) program. The proposed solution will be adapted to the recently introduced DR program in the National Electricity Market of Singapore (NEMS). Tools such as stochastic control, optimization, and data analytics will be utilized in the proposed research.	NTU	- Subhash Lakshminarayana - Rui TanAsst Prof at SCE, NTU	subhash.l@adsc.com.sg tanrui@ntu.edu.sg

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Advanced Digital Sciences Center

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