The NTU Presidential Postdoctoral Fellowship provides the opportunity for early career scientists, engineers and scholars from Singapore and around the world to conduct independent investigations in any discipline at NTU. In this series, eight Postdoctoral Fellows are sharing with us their groundbreaking research relating to the topics of Life & Environmental Sciences, Computational Science and Humanities. This provides a platform for our audiences and researchers to co-create ideas, generate network and foster research collaborations in future.

**KEYNOTE SPEAKER:**

Prof Michael Khor  
Director, Talent Recruitment & Career Support (TRACS) Office  
9.15am - 10am, **SMPS LT 4**  
'Collaboration Network Analysis of Early Career Researchers (ECR): Detecting Signals for Future Success'

### PARALLEL SESSION SPEAKERS:

#### SESSION A: LIFE & ENVIRONMENTAL SCIENCES / HUMANITIES  
@ **SPMS MAS EC RM 1**

- **Dr Karen Lythgoe, EOS**  
10.30am – 11am  
'Seismic Investigations in SE Asia for Subsurface Imaging and Earthquake Hazard Assessment'

- **Dr Maiko Uesaki, SSS**  
11am – 11.30am  
'Anatomy of the Optic-Flow Selective Sensory Areas: Cortical Network and White Matter Connections'

- **Dr Serafino Teseo, SBS**  
11.30am – 12pm  
'A Social Perspective on the Microbiota-Gut-Brain Axis: Ants as a Model Organism'

- **Dr Samuel Perks, SOH**  
12pm – 12.30pm  
'Global Cities in World Literature'

#### SESSION B: COMPUTER & COMPUTATIONAL SCIENCE AND APPLICATIONS  
@ **SPMS MAS EC RM 2**

- **Dr Jerry Zhu, EEE**  
10.30am – 11am  
'Defense against Adversarial Vision Perturbations via Subspace Diagnosis'

- **Dr Nguyen Ta Toan Khoa, SPMS**  
11am – 11.30am  
'Privacy-Preserving Post-Quantum Cryptography'

- **Dr Kokil Jaidka, WKWSCI**  
11.30am – 12pm  
'Quasi-Experimental Methods for Social Media Analysis'

- **Dr Soujanya Poria, SCSE**  
12pm – 12.30pm  
'Evolving Sentiment Analysis: from Textual to Multimodal, from Monologue to Dialogue, from Analysis to Generation'

For more information and registration, scan QR code or visit [https://goo.gl/h4vpgo](https://goo.gl/h4vpgo)
Professor Michael Khor is Director, Talent Recruitment and Career Support (TRACS) Office & Bibliometrics Analysis at NTU, Singapore. He is concurrently a Professor at the School of Mechanical & Aerospace Engineering. He was Associate Provost (Research) from 2009 to 2011, and thereafter re-designated as Director, Research Support Office & Bibliometrics Analysis. From 2008 to 2009, he was seconded to the National Research Foundation (NRF) as Director (Projects). He joined NTU (then NTI) in June 1989.

Professor Khor’s research interests are in advanced materials processing; thermal sprayed coatings; spark plasma sintering, nano-bioceramics and nano-composites for artificial cornea implants, orthopaedic and dental implants. Since 2011, he has embarked on research and analysis into research collaboration networks, research topics analysis, development of research performance metrics for universities and international collaborations of global young universities. He has published over 370 journal and conference papers and edited several international conference proceedings.

ABSTRACT

Title: Collaboration Network Analysis of Early Career Researchers (ECR): Detecting Signals for Future Success

9.15 am - 10am, SPMS LT4

Research collaborations has increased significantly over the past two decades, and this has created new dynamisms in various research fields, ranging from materials science to particle physics and infectious disease studies. Early career researchers (ECR) are a strong driving force in many emerging trends due to the ability of quickly form networks and high degree of mobility. This talk will cover the collaboration network analysis of various research trends of key research topics and the collaboration patterns of universities and early career researchers. The international research collaborations of NTU and the Nanyang Assistant Professors (NAP) as well as National Research Foundation (NRF) Fellows form the basis of the analysis. Results show that funding is a key component to the growth of research collaborations. Another factor is the participation in a network (based on a topic) during previous position and the subsequent carry on of activity in the new position. This could give rise to the development of a broader level of collaborations involving consortia of research centers or institutes.
Dr Karen Lythgoe is a seismologist at the Earth Observatory of Singapore, NTU, which she joined in November 2018. She received her PhD at the University of Cambridge, where she studied the structure and dynamics of Earth’s inner core using seismology and theoretical modeling. Karen then joined BP’s seismic imaging research lab where she developed advanced imaging techniques and acquired leading-edge seismic data. At NTU, Karen’s focus is on using seismology to tackle a range of questions across SE Asia, from earthquakes in Indonesia to the nature of the subsurface and seismic hazard in Singapore.

**Title:** Seismic Investigations in SE Asia for Subsurface Imaging and Earthquake Hazard Assessment

**10.30am – 11am, SPMS MAS EC RM 1**

In recent years a revolution in seismic instrumentation presents the opportunity for better, faster, more efficient seismic surveys. Small seismic detectors known as nodes, which are versatile, lightweight and affordable, can be used in a variety of terrestrial environments across SE Asia, allowing many previously unanswered questions regarding subsurface structure and seismic hazard to be addressed.

Given its limited land area, Singapore is increasingly looking below the ground for resources such as geothermal energy and underground city construction. To better understand Singapore’s subsurface structure, as well as background seismicity, we are currently acquiring a seismic survey of the island (that comprises of about 100 nodes), which is the first survey of its kind here. The dense array data (acquired over ~ one month) will be used to better constrain the crustal scale velocity structure beneath Singapore and the very shallow (e.g. ~ a few hundred meters) structure around each seismometer. The improved velocity structure will shed new lights on the potential geothermal resource, as well as the site responses that are critical for earthquake engineering. The survey will also assess the seismicity experienced by Singapore, which is expected to be from large nearby earthquakes (for example in Sumatra), any small local earthquakes, as well as man-made seismicity from underground development.

In this talk I will describe our ongoing seismic survey of Singapore, as well as share insights into the tectonics of SE Asia and our future seismic experiments in the region.
After graduating from the University of York with a BSc in Psychology, she completed her PhD at Kyoto University. During her PhD, she also spent time at Charité – Universitätsmedizin Berlin, and Stanford University. She then worked at Ritsumeikan University, before joining the Visual Perception Lab in 2018. Her interests include visual motion processing, multisensory integration, self-motion perception and navigation. Here, she will be looking at areas in the intraparietal cortex in terms of their anatomy and roles in navigation, using combinations of behavioural measurements, functional MRI and diffusion MRI.

**Title:** Anatomy of the Optic-Flow Selective Sensory Areas: Cortical Network and White Matter Connections

**11am – 11.30am, SPMS MAS EC RM 1**

A network of cortical sensory areas has been shown to respond selectively to the retinal motion arising from the observer's movement (i.e. optic flow). The processing of optic flow is essential for accurate perception of self-motion and successful navigation. Here, by combining functional responses from the cortex and anatomical measures in the white matter, we discuss how optic-flow information is represented and communicated within the network and to other areas of the brain for perception of self-motion and locomotion.
Serafino Teseo is a behavioural ecologist specialized in the evolution of social behaviour in insects. He has obtained his PhD at Paris 13 University, France, in 2013. Here at NTU, he explores the role of gut microbes in social behaviour using ants as a model system. He believes that studying such mini-brained highly social organisms may help understanding how the gut microbiota affects socially relevant behaviours in all animals, including humans.

Title: A social perspective on the microbiota-gut-brain axis: ants as a model organism

11.30am – 12pm, SPMS MAS EC RM 1

Disentangling the microbiota-gut-brain intertalk is a compelling challenge in behavioural neurosciences. However, most experimental work in this field is limited to individuals without considering social dynamics. Animals and humans live instead in societies where they iteratively adjust physiology and behaviour to social interactions. Therefore, to integrate the group-level dimension in our investigation, we need obligate social animal models living in stable symbioses with microbes, and that can be easily manipulated. In my research, I disrupt the symbiosis between Camponotus carpenter ants and the bacterium Blochmannia to investigate how microbes shape the behaviour of individuals and how this translates into effects on social interactions and collective behaviour.
Sam Perks is a Presidential Postdoctoral Fellow in the School of Humanities. At the University of Leeds he completed his PhD on Singapore historical fiction, and he completed MA and BA programmes at the University of York. His research interests include world-systems theory, environmental humanities and postcolonial and world-literary theory.

Title: Global Cities in World Literature

12pm – 12.30pm, SPMS MAS EC RM 1

For a global city, ‘the world is its hinterland’. Global cities host a concentration of multinational corporations’ headquarters and attract people, capital, and resources from across the world. Whilst the dynamic between global cities and their global hinterlands has been conceptualised in economic and sociological theory, the ways in which this relationship is imagined in literature have not been explored in such depth. This project highlights the social realist fiction of global cities in order to examine representations of global city metabolism, from a world-systemic and literary-critical perspective. It shall interrogate how the global city’s relation to its hinterland imagined.

If global capitalism configures global cities, then we must also account for capitalism’s ‘dynamic of dispersal and of centralization’, in Saskia Sassen’s words. The centralisation is visible in the form of concrete and chrome structures in global cities, since ‘the built forms arising from [...] linkages become tangible evidence of them, operating as textual actors’, according to Jini Kim Watson. However, the dispersal endemic to global capitalism must be made visible, and the social realist novel form has the capacity to represent the flows and linkages that sustain combined and uneven development. Of course, there is no need for texts to track movements of resources and labour between kinds of sites, but global-scale ecological dynamics of urban in-flows and out-flows often underpin the action of novels, and form part of texts’ unconscious. As a result, ecological links between fictionalised global cities and their hinterlands remain implicit and ripe for analysis. This project will examine the various ways in which authors figure these systems, represent resources in relation to each other, and narrate individuals’ navigation through ecological systems with varying degrees of mobility.
Title: Defense against adversarial vision perturbations via subspace diagnosis

Deep neural networks are powerful learning architectures in the field of industrial applications like automatous vehicles. However, recent studies have found that deep learning paradigms are vulnerable to input samples crafted with adversarial perturbations. Adversarial samples are quasi-imperceptible to humans but can easily fool those deep models in the deploying phases, which may raise high risks in safety and security critical conditions. In view of that, this talk proposes a novel real-time detection countermeasure called subspace diagnosis. First, principal component analysis has been utilized for feature subspace representations of images. After then, all extracted dimensions are divided into multiple clusters with a predefined scheme for the generation of unified monitoring statistics in various feature subspaces. For deciding the normal boundaries, Gaussian mixture model is considered and the Bayesian inference mechanism has been developed for adversarial example detection. Finally, to evaluate impacts from various attacks quantitatively, a subspace contribution index is further constructed for multi-space perturbation diagnosis. The effectiveness of the entire diagram has been extensively demonstrated on several datasets.
Dr Khoa Nguyen received his PhD degree in cryptography in 2014, at Nanyang Technological University (NTU), Singapore. His research interests are in the area of post-quantum cryptography, especially the design and analysis of privacy-preserving cryptographic protocols from lattices and codes. Among his publications, 12 papers have been published at conferences held by the International Association of Cryptologic Research (IACR), such as EUROCRYPT, CRYPTO, ASIACRYPT and PKC. He has been co-supervising 4 PhD students and has been serving in the Program Committees of more than 10 international conferences in cryptography and security, including ASIACRYPT 2017, 2018 and 2019.

**Title:** Privacy-Preserving Post-Quantum Cryptography

**11am – 11.30am, SPMS MAS EC RM 2**

In this talk, I will give a brief overview of post-quantum cryptography and discuss my current research projects which aim to design practical post-quantum cryptographic systems that protect both security and privacy of users in the long-term future.

Cryptography is the science of securing information and is ubiquitously used nowadays to secure all kinds of electronic communications. Most of these applications, however, crucially rely on a class of cryptosystems that will become insecure once large-scale quantum computers become a reality. To thwart this threat, the community is paying special attention to post-quantum cryptography, i.e., cryptosystems that are believed to remain secure even in the presence of quantum computers.

Along with security, protecting users’ privacy is a prime concern in the digital era. To address this problem, privacy-preserving cryptosystems, i.e., advanced algorithms guaranteeing both security and privacy, have been proposing since the early 1980s but have not been well-prepared for the upcoming transition to post-quantum cryptography. My projects aim to develop new cryptographic tools that can be used for the design of practical privacy-preserving cryptosystems in the post-quantum setting.
Dr. Kokil Jaidka is a Presidential Postdoctoral fellow at Nanyang Technological University and is working on profiling users and communities based on their digital footprints. Previously, she was a postdoctoral fellow in Computer Science at the World Well-being Project for two years, and a Senior Computer Scientist with Adobe Research for about three years. Kokil obtained her PhD in Information Studies from Nanyang Technological University in 2014. She has published her work in the proceedings of premier computational linguistics and computational social science conferences and peer-reviewed communication research journals, and is co-inventor on nine patents.

**ABSTRACT**

**Title: Quasi-Experimental Methods for Social Media Analysis**

*11.30am – 12pm, SPMS MAS EC RM 2*

This talk demonstrates how rigorous methods from empirical economics can be applied to establish causality for problems in computer science, even when experimental data or randomized controlled trials are not available. It applies quasi-experimental methods to Twitter data to investigates the impact of a change in social media design features on the linguistic characteristics of political discussions in social media. Findings suggest that doubling the permissible length of a Tweet led to more polite, less informal, more analytical, and overall healthier discussions online. However, the declining trend in the political relevance of these tweets raises concerns about the implications of the changing norms for the quality of political deliberation.
Soujanya Poria holds a Ph.D. degree in Computer Science from the University of Stirling, UK. He is a recipient of the prestigious early career research award called 'NTU Presidential Postdoctoral Fellowship' in 2018 which offers him a research grant worth US$150,000. Before taking up his presidential fellowship position at NTU, Soujanya was a scientist at the A*STAR and the Temasek Laboratory, NTU. He is also (co-)PI of multiple academic and industrial grants with the amount totaling to US$ 250,000. Soujanya has co-authored more than 60 papers, published in top-tier conferences and journals such as ACL, EMNLP, AAAI, NAACL, Neurocomputing, Computational Intelligence Magazine, etc.. He is also an adjunct faculty at Indraprastha Institute of Information Technology, Delhi, India and an adjunct scientist at A*STAR, Singapore. Soujanya served as a senior PC member at AAAI 2019, IJCAI 2019 and often serve as a PC member in reputed conferences such as ACL, EMNLP, IJCAI, NAACL. He was an area co-chair of the sentiment analysis track at NAACL 2019 and a publicity chair at *SEM 2019. Soujanya has given several invited talks at venues like CICLing 2018 which is a large international NLP conference. Soujanya has Google Scholar citations of more than 3700 and his h-index is 35. Three of Soujanya’s papers are listed as Web of Science highly cited papers in the field of Computer Science. Recently, in an article published in the Journal of Information Sciences, Soujanya has been listed as one of the most prolific and impactful researchers from 2000 to 2016 in the field of sentiment analysis.

Title: Evolving Sentiment Analysis: from Textual to Multimodal, from Monologue to Dialogue, from Analysis to Generation

12pm – 12.30pm, SPMS MAS EC RM 2

Sentiment analysis initially aimed at understanding the author’s sentiment and emotions from the text he or she produced. Due to its broad application in e-commerce, business, healthcare, and cybersecurity, this is a trending and fast-growing research area receiving significant interest from both industry and academia. Recently, some researchers, including myself, have extended sentiment analysis technology from texts to videos, i.e., multimodal data including voice as well as facial expressions and body language. What is more, we extended the analysis from single-author or monologue setting to conversations of two or more people. In comparison with text-only sentiment analysis, multimodal sentiment analysis is more challenging, because systems need to handle multiple modalities, extract information from them, and finally fuse the retrieved information in a meaningful way. Analysis of conversations poses even more challenges, such as keeping track of individual speakers’ mood and inferring the sentiment clues from the way people interact. In our latest work, we move on from the mere analysis to applications of sentiment modeling to emotion-aware generation in human-computer conversation.

In my presentation, I will introduce state-of-the-art methods for textual and multimodal sentiment analysis and its specific sub-tasks, such as sentiment classification, aspect extraction, aspect-based sentiment analysis, and sarcasm detection, briefly addressing deep-learning and symbolic approaches. Further, I will explain the role of sentiment and emotion recognition in building an affective dialogue system that interprets and generates dialogue with emotional coherence. This requires understanding the sentiment and affect in conversations, which largely depends on such factors as context and the state of each speaker. In particular, I will introduce three important methods to detect sentiment and emotion in conversation based on the context, memories, and recursive neural networks. Finally, I will outline the short-term and medium-term prospect for the development of the sentiment analysis field and suggest future work directions.