香港城市大學
City University of Hong Kong

OIST OKINAWA INSTITUTE OF SCIENCE AND TECHNOLOGY
沖縄科学技術大学院大学

School of Energy and Environment
香港城市大學
City University of Hong Kong

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City University of Hong Kong

Hong Kong Institute for Clean Energy
香港清潔能源研究院

Advanced Biomedical Instrumentation Centre
先進生物醫學儀器中心

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CITYUHK–OIST RESEARCH SYNERGY: SHAPING THE FUTURE THROUGH SCIENCE AND INNOVATION

Online Workshop

4 June 2025 (Wednesday)

09:00am – 04:30pm (Hong Kong SAR, China Time)
10:00am – 05:30pm (Okinawa, Japan Time)

Registration

Enquiry
see.enquiry@cityu.edu.hk

WORKSHOP PROCEEDINGS

About CityUHK – OIST Online Workshop

City University of Hong Kong (CityUHK) and Okinawa Institute of Science and Technology (OIST) are pleased to co-host the CityUHK–OIST Online Workshop, an initiative aimed at strengthening academic and research partnerships between the two institutions. This workshop represents a significant step forward in promoting scientific innovation and fostering impactful research collaborations. By facilitating knowledge exchange, interdisciplinary dialogue, and forward-thinking research discussions, the workshop serves as a dynamic platform for advancing joint efforts to address global sustainability challenges. Participants are encouraged to engage actively, share ideas, and build connections for future collaborations. This partnership underscores CityUHK and OIST's shared commitment to scientific excellence and to driving research that contributes to a more sustainable and resilient world.

ORGANISERS

香港城市大學 City University of Hong Kong

OIST OKINAWA INSTITUTE OF SCIENCE AND TECHNOLOGY 沖縄科学技術大学院大学

CO-ORGANISERS

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Advanced Biomedical Instrumentation Centre 先進生物醫學儀器中心

MODERATORS

(The following list is arranged in alphabetical order.)

Prof. Angus Yip	Associate Director, Hong Kong Institute for Clean Energy (HKICE), CityUHK
Prof. Keshav Dani	Professor, OIST
Prof. Paola Laurino	Associate Professor, OIST
Prof. Xuneng Tong	Assistant Professor, School of Energy and Environment (SEE), CityUHK

WORKSHOP RUNDOWN

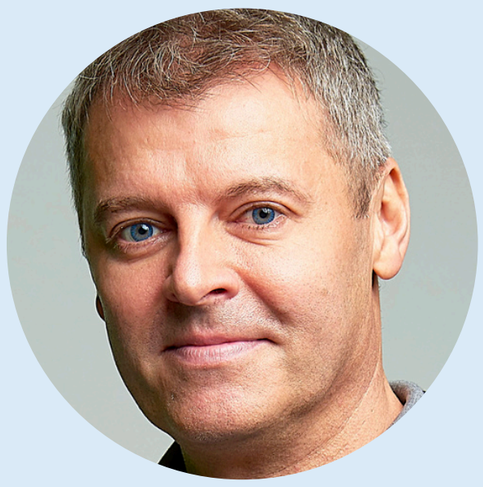
Hong Kong Time (HKT)		Speakers
09:00 - 09:10	OPENING REMARKS	Prof. Benjamin Horton *Dean of SEE, CityUHK* Prof. Paola Laurino *Associate Professor, OIST*
09:10 - 09:30	Sea-Level Science in Singapore and Southeast Asia	Prof. Benjamin Horton *Dean of SEE, CityUHK*
09:30 - 09:50	Every Sample Counts: Statistical Efficiency in the Age of Climate Responsibility	Prof. Amedeo Roberto Esposito *Assistant Professor, OIST*
09:50 - 10:10	From Screens to Marine: Environmental Release, Migration, Fate and Ecotoxicological Impacts of Emerging Pollutants Liquid Crystal Monomers	Prof. Henry He *Assistant Professor, SEE, CityUHK*
10:10 - 10:30	Polymeric Turbulence	Prof. Marco Edoardo Rosti *Associate Professor, OIST*
10:30 - 10:45	Q & A SESSION	
10:45- 11:05	Modelling Approach to Understanding the Nexus of Waterborne Pathogens, Water Security and Climate Change	Prof. Xuneng Tong *Assistant Professor, SEE, CityUHK*
11:05 - 11:25	Modeling Ocean Processes in the Lab	Prof. Amin Chabchoub *Associate Professor, OIST*
11:25 - 11:35	Q & A SESSION	
11:35 - 13:30	LUNCH BREAK	

Hong Kong Time (HKT)		Speakers
13:30 - 13:50	Interaction-based Droplet Sorting for High-Throughput Cell-Cell Interaction Screening	Dr. Eric Ziyu Han *Advanced Biomedical Instrumentation Centre*
13:50 - 14:10	Epigenetic Regulation of Plant Genomes	Prof. Hidetoshi Saze *Professor, OIST*
14:10 - 14:20	Q & A SESSION	
14:20 - 14:40	Solar Innovations: New Materials for Unconventional Photovoltaic Applications	Prof. Angus Yip *Associate Director, HKICE, CityUHK*
14:40 - 15:00	Investigating Solar-Driven Variability in Earth's Weather and Climate Systems	Prof. Hiroko Miyahara *Associate Professor, OIST*
15:00 - 15:20	Intelligent Building Envelopes: Paving the Way to Carbon Neutrality	Prof. Edwin Tso *Associate Dean of SEE, CityUHK*
15:20 - 15:40	Spintronics for Energy-efficient Information Processing	Prof. Shu Zhang *Assistant Professor, OIST*
15:40 - 15:55	Q & A SESSION	
15:55 - 16:30	CLOSING REMARKS	Prof. Edwin Tso *Associate Dean of SEE, CityUHK* Prof. Keshav Dani *Professor of OIST*

SPEAKERS

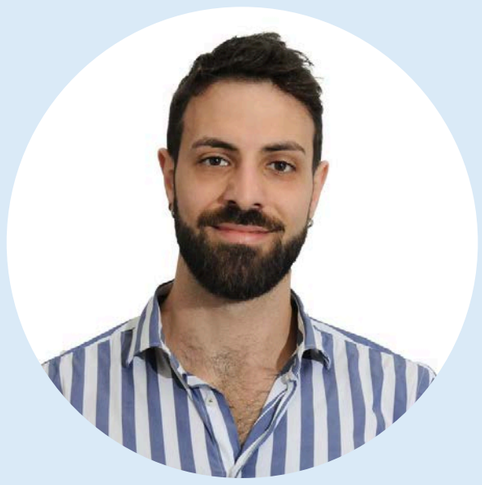
MORNING SESSION

(The following list is arranged according to the order of the presentation.)



Prof. Benjamin Horton
Dean of SEE, CityUHK

Topic: Sea-Level Science in Singapore and Southeast Asia

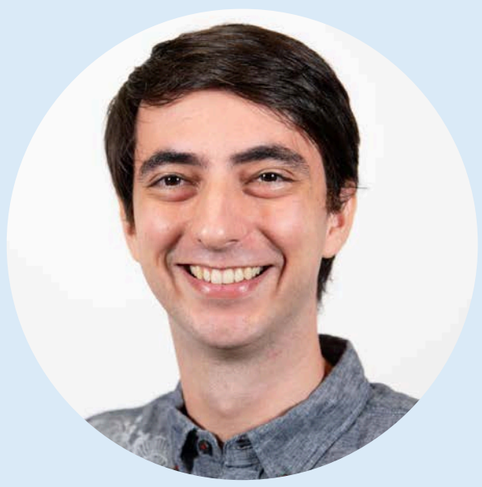


Prof. Amedeo Roberto Esposito
Assistant Professor, OIST

Topic: Every Sample Counts: Statistical Efficiency in the Age of Climate Responsibility

Prof. Henry He
Assistant Professor, SEE, CityUHK

Topic: From Screens to Marine: Environmental Release, Migration, Fate and Ecotoxicological Impacts of Emerging Pollutants Liquid Crystal Monomers

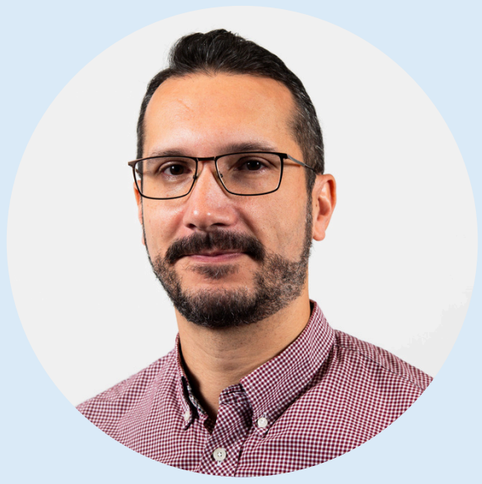


Prof. Marco Edoardo Rosti
Associate Professor, OIST

Topic: Polymeric Turbulence

Prof. Xuneng Tong
Assistant Professor, SEE, CityUHK

Topic: Modelling Approach to Understanding the Nexus of Waterborne Pathogens, Water Security and Climate Change



Prof. Amin Chabchoub
Associate Professor, OIST

Topic: Modeling Ocean Processes in the Lab

SPEAKERS

AFTERNOON SESSION

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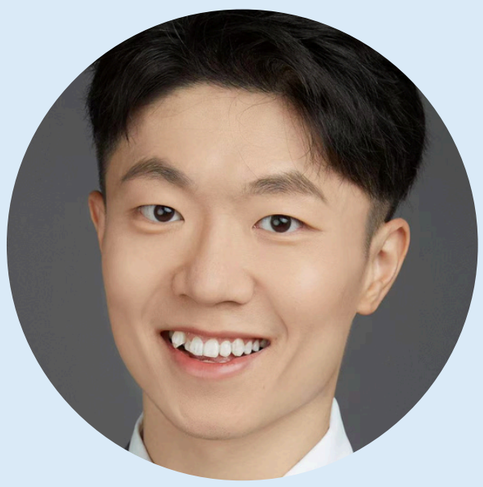


Dr. Eric Ziyu Han

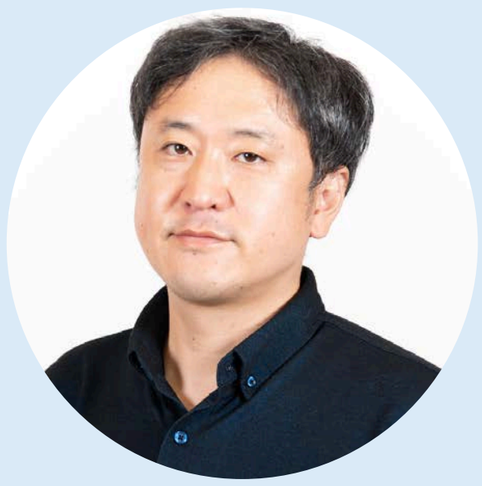
Advanced Biomedical Instrumentation Centre

Topic: Interaction-based Droplet Sorting for High-Throughput Cell-Cell Interaction Screening

Prof. Hidetoshi Saze

Professor, OIST

Topic: Epigenetic Regulation of Plant Genomes



Prof. Angus Yip

Associate Director, HKICE, CityUHK

Topic: Solar Innovations: New Materials for Unconventional Photovoltaic Applications

Prof. Hiroko Miyahara

Associate Professor, OIST

Topic: Investigating Solar-Driven Variability in Earth's Weather and Climate Systems

Prof. Edwin Tso

Associate Dean of SEE, CityUHK

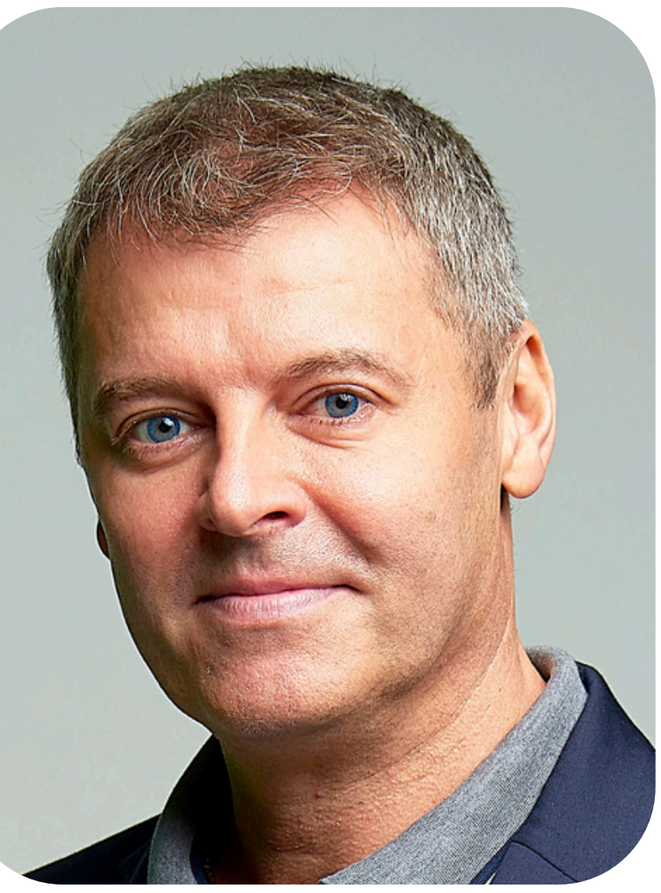
Topic: Intelligent Building Envelopes: Paving the Way to Carbon Neutrality

Prof. Shu Zhang

Assistant Professor, OIST

Topic: Spintronics for Energy-Efficient Information Processing

Speakers' Biography & Presentation Abstracts



Prof. Benjamin Horton

Dean of SEE, CityUHK

About the Speaker

Prof. Benjamin Horton is the Dean of the School of Energy and Environment (SEE) at City University of Hong Kong (CityUHK). Prior to becoming Dean at SEE, he was the Director of the Earth Observatory of Singapore and a Professor in Earth Science at the Asian School of the Environment in Nanyang Technological University (NTU). He has been appointed the AXA Chair in Natural Hazards.

Prof. Horton is distinguished for his research into sea-level change, significantly enhancing our understanding of the mechanisms that have determined sea-level changes in the Earth's past, and which will shape such changes in the future. By developing new quantitative models of sea-level change and through leadership of major international research teams he has been able to formulate and test models of sea-level change in Europe, North America and Asia in both current and future climate change scenarios. His assessment of the timing of sea-level events, and the rates of sea-level rise and fall, has challenged paradigms and set up significant new research directions in the field. Investigation of how carbon storage and coastal ecosystem stability are affected by sea-level rise have further established him as a leader in the field and to become a significant contributor to climate science communication in wider society.

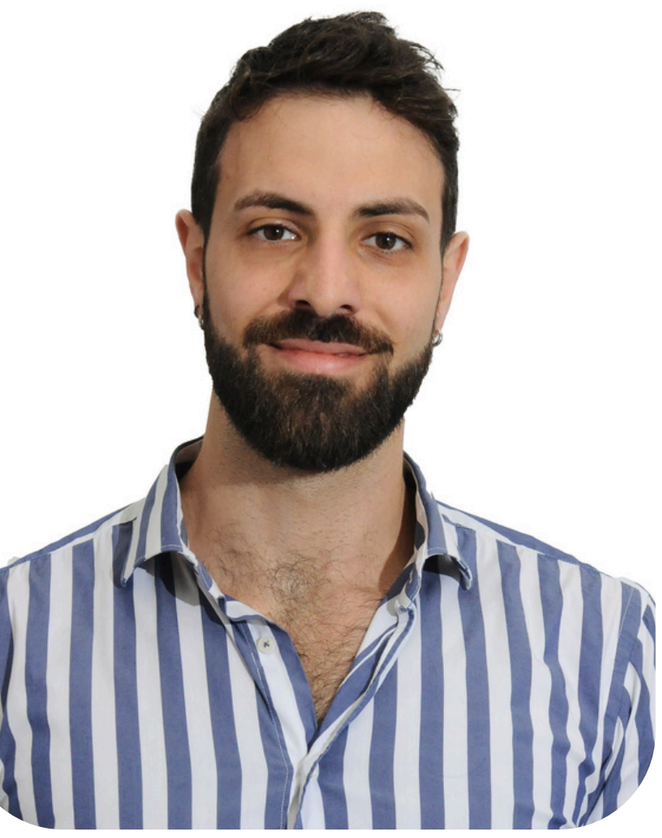
Topic: Sea-Level Science in Singapore and Southeast Asia

Abstract

No matter how quickly nations lower emissions now, the world is looking at about 15 to 30 centimeters of sea-level rise through the middle of the century, given the long-drawn impact of climate change on the oceans and ice sheets. Even under a stable climate, sea-level rise is expected to continue slowly for centuries. Beyond 2050, sea-level rise becomes increasingly susceptible to the world's emission choices. If countries choose to continue their current paths, greenhouse gas emissions will likely result in ~3 °C of warming by 2100, and a sea-level rise of up to 0.8 meters. Under the most extreme emissions scenario, rapid ice sheet loss from Greenland and Antarctica could lead to a sea-level rise approaching 2 meters by the end of this century and over 5 meters by 2150.

Here we illustrate the ways in which current methodologies and historical and geological data sources from Southeast Asia can constrain future projections, and how accurate projections can motivate the development of new sea-level research questions to mitigate and adapt to climate change.

1. We showed periods of rapid ice melting accelerated sea-level rise ~14,500 and ~11,500 years ago that significantly reduced land area and forced early human migration across the region. During these periods, thresholds of coastal habitat survival were also surpassed resulting in large-scale losses. Singapore became an island at approximately 9,000 years ago.
2. We ran an ensemble of Glacial Isostatic Adjustment (GIA) models that highlight how Southeast Asia experienced sea levels higher than present-day between 7,000 and 4,000 years ago, producing a mid-Holocene highstand. Variability in the high stand magnitude is controlled by solid Earth parameters while the timing is controlled by ice sheet melting history.
3. We developed a new fusion method for estimating high end sea-level rise, providing a more reliable assessment of scientific uncertainty. We estimate that by 2100, global sea levels will likely rise between 0.3-1.0 m under low emissions and 0.5-1.9 m under high emissions.
4. We focus on the implications of rising sea levels for coastal ecosystems. Under high emissions, nearly all salt marshes, most mangrove forests, and a considerable number of coral reef islands would be beyond their sea-level rise tipping point for survival.



Prof. Amedeo Roberto Esposito

Assistant Professor, OIST

About the Speaker

Dr Amedeo Roberto Esposito is an Assistant Professor at the Okinawa Institute of Science and Technology (OIST). He received his PhD from the School of Computer and Communication Sciences at EPFL, following a Bachelor's and Master's degree from the Università degli Studi di Salerno.

His research sits at the crossroads of Information Theory, Probability, Statistics, and Functional Analysis. He is particularly interested in the study of information measures and their foundational role in both classical and contemporary problems, including learning from data, estimation, concentration of measure, and hypothesis testing.

Topic: Every Sample Counts: Statistical Efficiency in the Age of Climate Responsibility

Abstract

For over a century, the theory of mathematics and statistics has been shaped by a set of foundational assumptions, such as asymptotic regimes, independence, and Gaussianity. These assumptions simplified complex problems, enabling elegant and powerful characterisations. However, in the face of modern challenges, these classical frameworks often prove inadequate.

Today's problems, particularly in machine learning and the development of large language models, demand a new perspective. Models are trained and used for inference on massive datasets, often continuously and at scale. This comes at a steep cost, not only computationally but also in terms of energy consumption and carbon emissions.

To address these challenges, it is increasingly important to go beyond traditional assumptions. In this talk, we explore how finite-sample analyses in estimation and learning can offer sharper, more efficient alternatives. By focusing on extracting only the necessary information from data, these approaches open the door to more sustainable and theoretically grounded methods for learning and inference in the age of data abundance.

Prof. Henry He

Assistant Professor, SEE, CityUHK

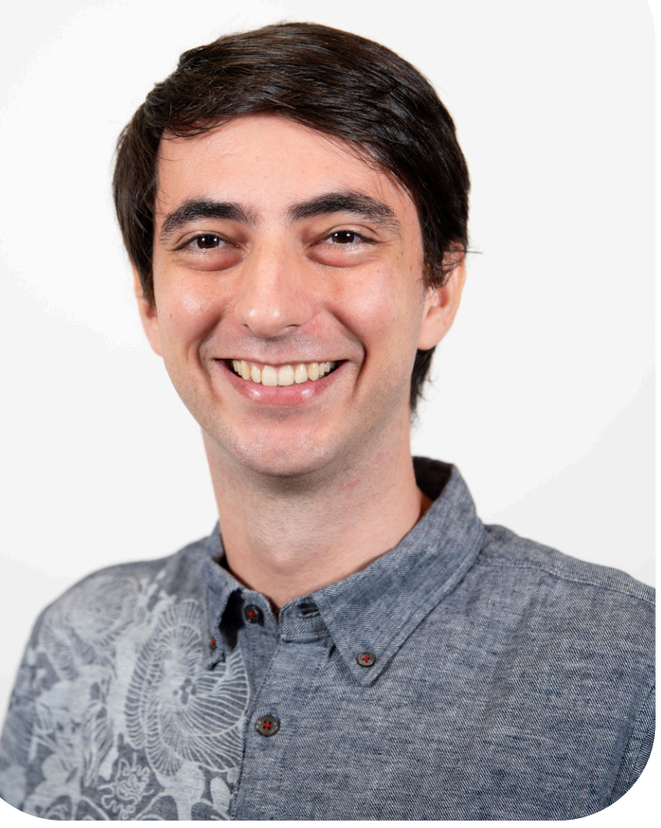
About the Speaker

Dr. Yuhe (Henry) He is currently an Assistant Professor at School of Energy and Environment, City University of Hong Kong. He is also the deputy leader of Strategic Research Theme of Eco-safety and Environmental Risk Assessment, State Key Laboratory of Marine Pollution. Dr. He's research focuses on characterizing the occurrence, distribution, transformation, and fate of emerging contaminants in aquatic environments, and how aquatic organisms respond when exposed to these contaminants. In particular, Dr. He's research combines a variety of chemical and toxicological tools to understand the exposure and toxic mechanisms that lead to maladaptive responses in exposed in vitro and aquatic organism models. Since joining CityUHK in 2019, Dr. He has secured multiple research grants, including three GRF/ECS, one NSFC, one Marine Enhancement and Ecology Fund, one Marine Conservation and Enhancement Fund, and among others, total up to HK$6.5M. Up to now, Dr. He has published more than 60 journal articles in Nature Communications, Applied Catalysis B: Environment and Energy, Environmental Science & Technology, Water Research, and Journal of Hazardous Materials, with a total citation of 3142 and h-index of 30.

Topic: From Screens to Marine: Environmental Release, Migration, Fate and Ecotoxicological Impacts of Emerging Pollutants Liquid Crystal Monomers

Abstract

The widespread use, recycling and disposal of electronic devices (e-devices) result in the release of numerous hazardous substances into the environment. Liquid crystal monomers (LCMs), which are key materials in the manufacture of liquid crystal display (LCD) panels, have recently raised significant concerns as a class of emerging contaminants related to e-waste. LCMs have been detected in sediment samples collected near e-waste recycling facilities. However, LCMs can be emitted at various stages throughout the lifecycle of e-device, including production, routine use, recycling, and disposal, leading to a significant input of environmental LCMs into aquatic environments. Using Hong Kong and the Pearl River Estuary as examples, we have demonstrated that LCMs emitted from household e-devices can enter the municipal sewage system and be discharged through the effluent from wastewater treatment plants, leading to the widespread occurrence of these harmful e-waste pollutants in coastal environments. Further investigation is urgently needed to assess the ecological impact of environmental LCMs on marine ecosystems and to develop active treatment and control measures for LCMs in sewage systems.



Prof. Marco Edoardo Rosti

Associate Professor, OIST

About the Speaker

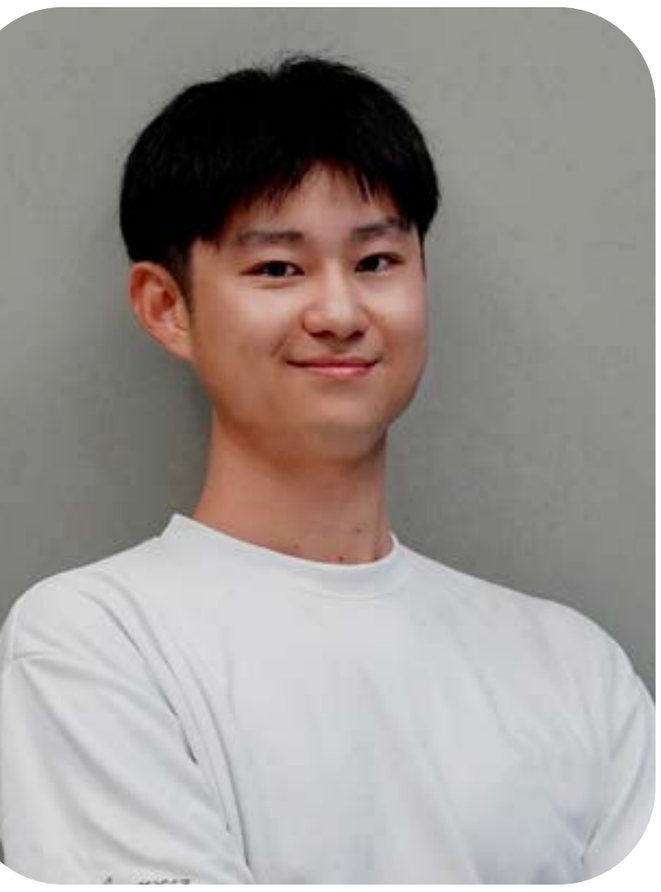
Prof. Marco Edoardo Rosti is an Associate Professor at the Okinawa Institute of Science and Technology (OIST), Japan. He received a Masters in Aeronautical Engineering from Politecnico di Milano in 2013, and PhD in Aeronautical Engineering at City, University of London in 2016. Before joining OIST, he spent time as postdoctoral fellow at the KTH Royal Institute of Technology, Sweden, and at the University of Tokyo, Japan. Marco's research interests are in the general area of multiphase turbulence and complex fluids. He was the recipient of the RYUMON Award for distinguished young researcher in fluid mechanics, by the Japanese Society of Fluid Mechanics in 2021, and the Andrea Prosperetti Award by ICMF in 2025.

Topic: Polymeric Turbulence

Abstract

Turbulent flows containing modest amounts of long-chained polymers have remained an intriguing area of research since the discovery of turbulent drag reduction. Here, we perform direct numerical simulations of statistically stationary, homogeneous, and isotropic turbulent flows of dilute solutions of polymers at various Reynolds and Deborah numbers. At large Re, we present evidence that there is a range of scales over which the energy spectra and the structure functions show new elastic scaling consistent with recent experimental results, while at small Re, we uncover an hidden intermittent behaviour.

Speakers' Biography & Presentation Abstracts



Prof. Xuneng Tong

Assistant Professor, SEE, CityUHK

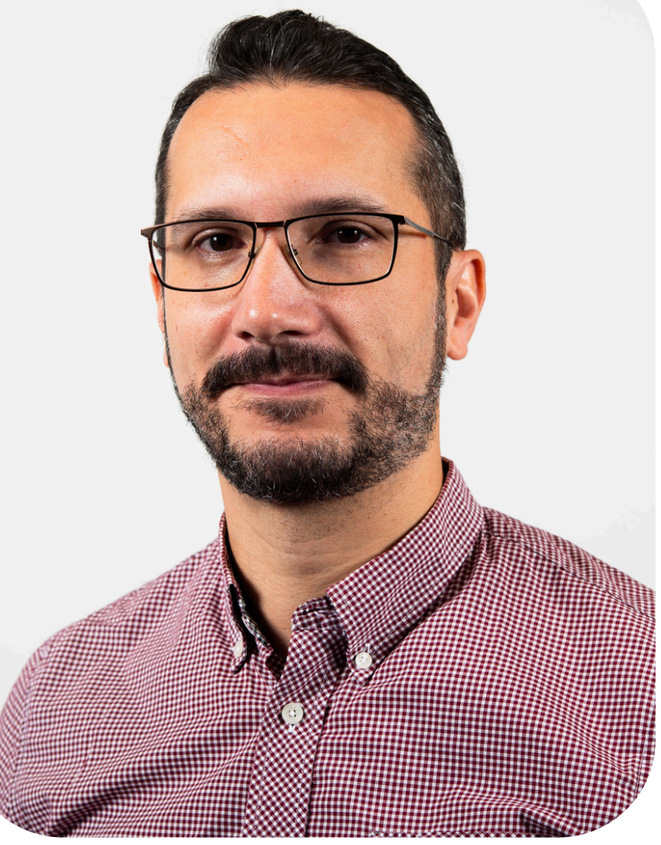
About the Speaker

Dr. Xuneng Tong is an Assistant Professor at City University of Hong Kong. Dr. Tong obtained his Ph.D. from Department of Civil and Environmental Engineering, National University of Singapore and his Bachelors from Hohai University. During his academic journey, Dr. Tong received numerous prestigious awards, including Chinese Government Award for Outstanding Students Abroad and Lee Seng Lip Medal and Prize, among others. Dr. Tong currently serves as an early-career editorial board member for Journal of Hazardous Materials Advances, Ecosystem Health and Sustainability, and River. Dr. Tong's research specialization lies in water quality and ecosystem processes, with a particular focus on understanding and predicting the transport and fate of emerging microbial and chemical contaminants in aquatic environments, using a combination of process-based and data-driven hydro-environmental modelling approaches.

Topic: Modelling Approach to Understanding the Nexus of Waterborne Pathogens, Water Security and Climate Change

Abstract

Waterborne pathogens are disease-causing microorganisms, including bacteria, viruses, and parasites, that contaminate water sources. These pathogens can cause a variety of illnesses when ingested or come into contact with the human body. Climate change has significantly influenced the spread of waterborne diseases, which affect environmental quality and human life. Numerical modelling approaches provide a powerful toolbox for understanding the complex interactions between waterborne pathogens and climate change. These approaches complement field monitoring and laboratory experiments by offering insights into processes difficult to capture empirically while enabling scenario-based evaluations. This talk will present a holistic framework that combines process-based and data-driven methods to (1) simulate waterborne dynamics, (2) identify high-risk zones, and (3) develop targeted mitigation measures. Furthermore, the talk will explore how integrating diverse hydro-environmental models with climate projections can enhance risk assessment and guide sustainable water management strategies. By bridging disciplinary gaps, this talk provides a proactive strategy to address waterborne pathogen threats and protect global water resources in a changing climate.



Prof. Amin Chabchoub

Associate Professor, OIST

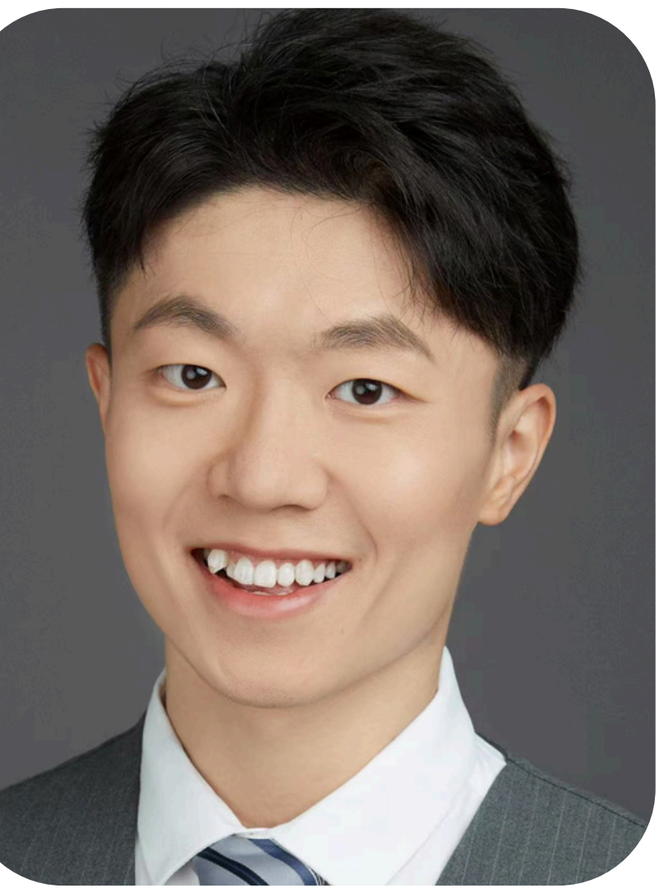
About the Speaker

Prof. Amin Chabchoub received his PhD from Hamburg University of Technology (Germany) in 2013 and is currently Associate Professor at Okinawa Institute of Science and Technology (Head of the Marine Physics and Engineering Unit). He also holds an Honorary Associate Professor appointment at the Department of Infrastructure Engineering of the University of Melbourne - Ocean Engineering Group (Australia). He is a Kyoto University Hakubi Fellow and was Associate Professor in Environmental Fluid Mechanics at the School of Civil Engineering of the University of Sydney (Australia), and Assistant Professor of Hydrodynamics at the Department of Mechanical Engineering of Aalto University (Finland). Prior to these faculty roles, he was a Postdoctoral Researcher at Imperial College London (UK), Swinburne University of Technology (Australia), and The University of Tokyo (Japan). His areas of expertise and research interests include extreme waves, nonlinear dynamics, ocean engineering, and physical oceanography.

Topic: Modeling Ocean Processes in the Lab

Abstract

Ocean dynamics encompass a wide range of fundamental processes, many of which are complex and challenging to model. Among the most intriguing and hazardous phenomena are so-called rogue waves, which are unexpectedly large surface gravity waves that pose significant threats to ships, offshore platforms, coastal infrastructure, and renewable facilities. The various mechanisms believed to contribute to the formation of rogue waves as well as key numerical simulations and laboratory experiments, designed to unravel their origins, will be elaborated upon. Moreover, the interdisciplinary nature of the research, as well as practical applications to real-world challenges, will also be discussed in detail.



Dr. Eric Ziyu Han

Advanced Biomedical Instrumentation Centre

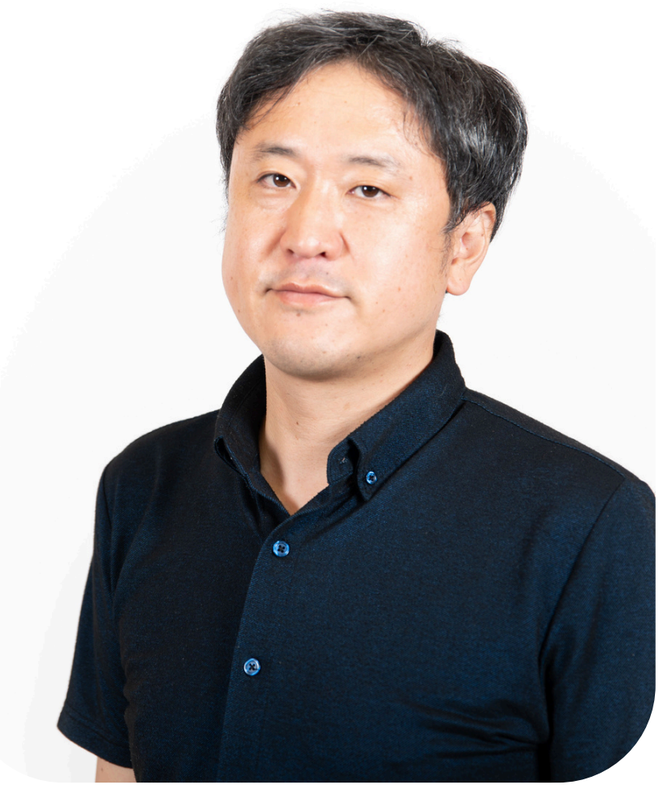
About the Speaker

Dr. Ziyu Han (Eric) is a postdoctoral research fellow in Advanced Biomedical Instrumentation Centre under the supervision of Prof. Anderson H. C. Shum. He obtained his Ph.D. in Instrument Science and Technology from Tianjin University in 2022. His research interest focuses on droplet microfluidics, high-throughput cell/drug screening and instrumentation.

Topic: Interaction-based Droplet Sorting for High-Throughput Cell-Cell Interaction Screening

Abstract

Cell-cell interaction plays an important role in regulating critical biological activities. Studying cell-cell interaction at large-scale will not only deepen our understanding of biological systems, but also drive innovations in clinical applications, e.g., regenerative medicine, immunotherapy, and drug development. In this talk, I will introduce a droplet microfluidics-based system for high-throughput cell-cell pairing at single-cell resolution, and its applications for large-scale cell-cell interaction screening.



Prof. Hidetoshi Saze

Professor, OIST

About the Speaker

Prof. Hidetoshi Saze received his M.Sc. from Kyoto University, Japan, and his Ph.D. in Botany from the University of Basel, Switzerland. He is currently a Professor at the Okinawa Institute of Science and Technology (OIST), where he leads the Plant Epigenetics Unit. His research focuses on the epigenetic mechanisms that distinguish genes from transposable elements (TEs), and on understanding their biological significance in environmental adaptation and genome evolution. In addition, he is conducting research aimed at contributing to the sustainable development of Okinawa by applying plant genomics to address critical challenges facing the local community.

Topic: Epigenetic Regulation of Plant Genomes

Abstract

Our research explores the epigenetic regulation of genes and transposable elements (TEs) in plant genomes. In plants, genome defense mechanisms silence TEs through epigenetic modifications such as DNA cytosine methylation, small RNAs, and histone protein modifications. In contrast, these repressive marks are generally excluded from actively transcribed genes. The primary goal of our work is to uncover how epigenetic mechanisms differentiate between genes and TEs, how specific chromatin modifications are targeted and established, and to elucidate the biological significance of these processes in environmental adaptation and genome evolution. We use a range of plant models, including Arabidopsis, rice, and mangroves, to address these questions.

Prof. Angus Yip

Associate Director, Hong Kong Institute for Clean Energy, CityUHK

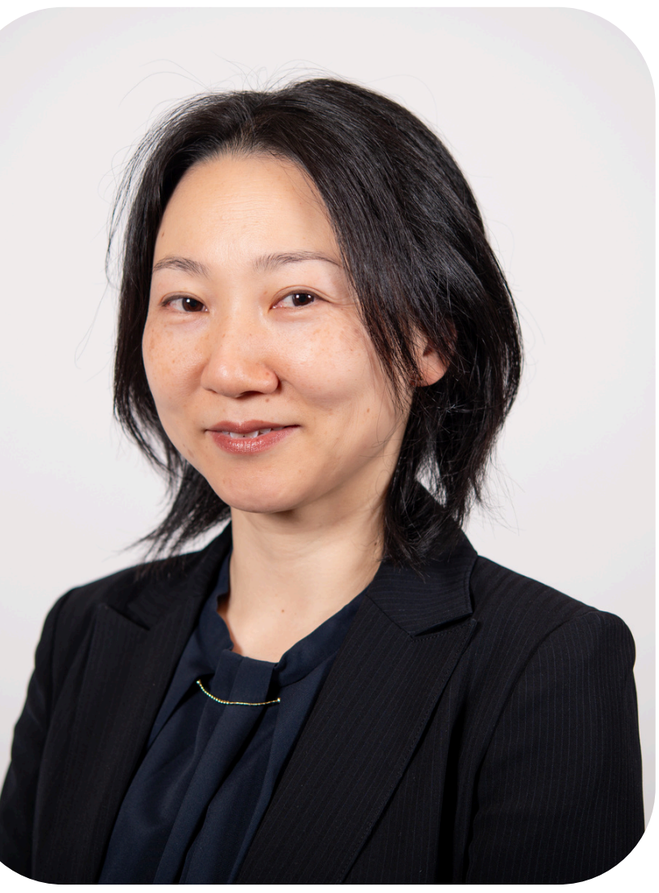
About the Speaker

Prof. Angus Yip earned his Ph.D. in Materials Science from the University of Washington and holds MPhil and BSc rees from the Chinese University of Hong Kong in the same field. He was a faculty member at South China University of Technology from 2013 to 2020 before joining City University of Hong Kong (CityUHK) in 2021. At CityUHK, he is a Professor in the Department of Materials Science and Engineering and the School of Energy and Environment, and serves as Associate Director at the Hong Kong Institute for Clean Energy. His research focuses on improving polymer and perovskite optoelectronic devices through integrated materials, interface, and device engineering. He has authored over 300 publications, holds an H-index of 109 with more than 48,000 citations, and has been a Clarivate "Highly Cited Researcher" from 2014 to 2024. His achievements include young memberships in the Hong Kong Young Academy of Sciences and the Hong Kong Academy of Engineering Sciences, receiving the IUMRS-FMYS Award in 2023, and fellowships with the Royal Society of Chemistry and the Hong Kong Institute of Engineers (Materials Division). He also won the Hong Kong Engineering Science and Technology Award in 2023.

Topic: Solar Innovations: New Materials for Unconventional Photovoltaic Applications

Abstract

This presentation discusses innovative solar energy technologies, focusing on advanced materials and device engineering to expand photovoltaic applications beyond conventional uses. Breakthroughs in printable perovskite and organic solar cells, including tandem configurations and transparent photovoltaics, demonstrate high efficiency, scalability, and adaptability for diverse environments such as urban buildings, space, agriculture, and marine systems. Using advanced modeling techniques like high-throughput optical simulations, solar cell architectures can be optimized for performance and integration. Such printable PV technologies with low production costs also enable affordable solar films for electricity generation in rural areas, addressing global energy access challenges. Supported by the UNESCO-endorsed "Fostering Innovation for Resilience and Sustainable Transformation" (FIRST) programme, these innovations align with the UN's Sustainable Development Goals, fostering international collaboration and capacity building. These advancements emphasize scalable production, cost-effectiveness, and long-term stability, paving the way for broader photovoltaic applications and supporting a sustainable energy transition toward global carbon neutrality goals.



Prof. Hiroko Miyahara

Associate Professor, OIST

About the Speaker

Prof. Hiroko Miyahara is an associate professor at Okinawa Institute of Science and Technology (OIST) in Japan. She earned her PhD from Nagoya University and worked as an assistance professor at the Institute for Cosmic Ray Research, the University of Tokyo. After that, she continued her research at Musashino Art University while engaging in science education. In April 2025, she joined OIST and launched the Solar-Terrestrial Environment and Climate Unit. Her research interests include the long-term variability of solar activity, extreme solar proton events, changes in the heliospheric environment and galactic cosmic rays, and the influence of solar and cosmic-ray variations on the Earth's climate system.

Topic: Investigating Solar-Driven Variability in Earth's Weather and Climate Systems

Abstract

Along with the ongoing long-term trend of global warming, various short-term perturbations are superimposed on this trend, affecting climate and meteorological phenomena. Some of these perturbations are thought to be linked to solar activity. Solar influence is expected to manifest across a wide range of timescales, from multi-millennial down to monthly scales. However, the underlying mechanisms remain poorly understood and are not currently incorporated into weather or climate prediction models. Improving our understanding of these mechanisms is crucial for enhancing the predictability of such perturbations and mitigating climate-related hazards. In this talk, I will introduce several mechanisms regarding the solar impact on the Earth's climate system currently under investigation.

Prof. Edwin Tso

Associate Dean of SEE, CityUHK

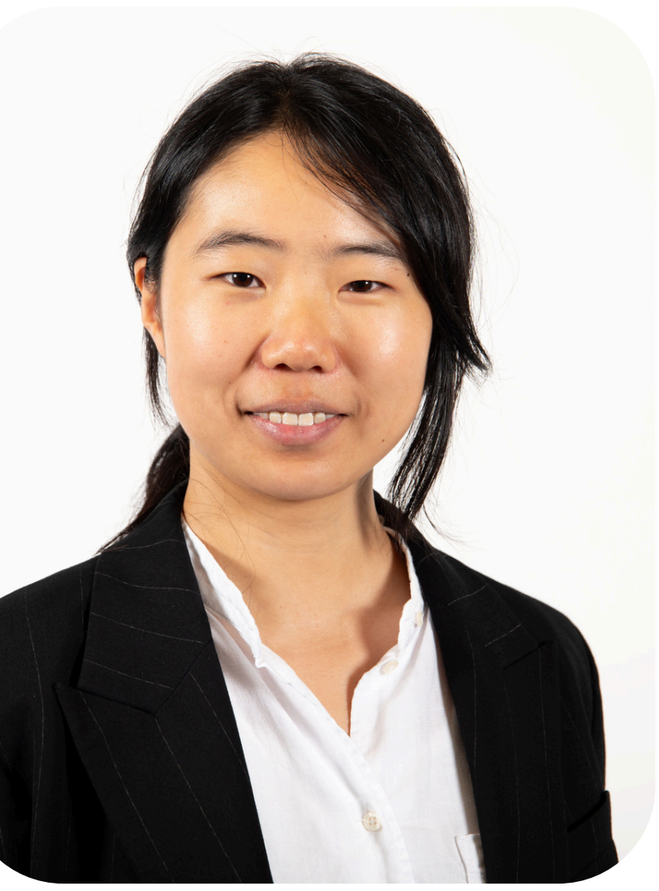
About the Speaker

Ir Prof. Edwin Tso is the Associate Dean (Internationalisation and Outreach) and an Associate Professor at the School of Energy and Environment, City University of Hong Kong (CityUHK). He received his BEng (First Class Honours), MPhil, and PhD from The Hong Kong University of Science and Technology (HKUST), and was a Fulbright–RGC Fellow at the University of California, Berkeley in 2014. His research focuses on heat transfer, energy conversion, and engineered materials, with applications in green buildings. He has published over 100 journal articles in leading journals, including Science, Science Advances, Nature Communications, and Advanced Materials, and is ranked among the top 2% of the world's most cited researchers in Mechanical Engineering. Ir Prof. Tso has secured over HK$140 million in funding as Principal Investigator or Project Coordinator across 31 projects, including GRF, ECS, ITF, and consultancy grants. Recently, he was named an RGC Research Fellow and received the Hong Kong Engineering Science and Technology Award. Beyond academia, he has filed 17 patents and founded the startup i2Cool Limited, which has raised over HK$140 million and successfully commercialized passive radiative cooling technologies. He actively mentors a large research team, and his former students have gone on to hold leadership positions in academia and government. Ir Prof. Tso is a Chartered Engineer and Registered Professional Engineer, as well as a member of HKIE, CIBSE, IMechE, and ASME, reflecting his strong engagement with the engineering community.

Topic: Intelligent Building Envelopes: Paving the Way to Carbon Neutrality

Abstract

As climate change accelerates and urban areas face rising temperatures, the building sector is under increasing pressure to adopt sustainable innovations. This talk explores next-generation intelligent building envelope technologies that operate across multiple scales to enhance energy efficiency and advance carbon neutrality. Cutting-edge solutions such as passive radiative coolers and thermochromic smart windows harness principles of optical physics to enable zero-energy thermal regulation—either by emitting heat into space or dynamically modulating solar transmittance. These technologies exemplify how foundational materials science can be translated into practical, high-impact building systems. At larger scales, these materials integrate into façades and roofing systems, enhancing occupant comfort while significantly reducing air-conditioning loads. When deployed across urban environments, they offer promising strategies for mitigating urban heat island effects through collective cooling impacts. Beyond architecture, these materials show potential in a range of sectors, including transportation, wearable technology, and industrial thermal management. However, realizing their full potential hinges on overcoming key challenges in manufacturing scalability and system integration. This presentation highlights both the scientific breakthroughs enabling these materials and the engineering pathways necessary for their commercialization. By bridging laboratory innovation with real-world deployment, intelligent thermal management materials have the potential to play a transformative role in decarbonizing the built environment and fostering sustainable development across industries. Their advancement represents a critical intersection of materials science, building physics, and environmental responsibility—offering scalable solutions to some of the most urgent challenges of our time.



Prof. Shu Zhang

Assistant Professor, OIST

About the Speaker

Prof. Shu joined Okinawa Institute of Science and Technology since April 2025 as a tenure-track Assistant Professor and the PI for research unit "Collective Dynamics and Quantum Transport". She obtained her Ph.D. in theoretical condensed matter physics from Johns Hopkins and was a Graduate Fellow at Kavli Institute for Theoretical Physics in University of California, Santa Barbara. She has previously held academic positions as a postdoc in UC Los Angeles, a Distinguished PKS Postdoctoral Fellow at Max Planck Institute for the Physics of Complex Systems, and a Junior Group Leader in Leibniz Institute for Solid State and Materials Research, Dresden, Germany. Shu's research focuses on emergent dynamic and transport phenomena in various quantum materials and platforms.

Topic: Spintronics for Energy-Efficient Information Processing

Abstract

The increasing energy consumption by information technologies is one of the biggest challenges in our society. Spintronics, leveraging electron spin, rather than just charge, for information processing, offers promise for more energy-efficient computing and data storage by mitigating energy waste in the form of Joule heating. In this talk, I will briefly introduce a few aspects in the research frontiers of spintronics and their potential applications in energy storage, information transmission, and spin-based neuromorphic computing platforms.

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