

Office of Research & Development

Development of Ultra-High-Speed SerDes ICs

Dr. Jerry Lee and his team developed an innovative circuit design and system architecture technology for SerDes (Serializer/Deserializer) wired communication chips which offers lower power consumption, cheaper cost, and higher information conversion rate. Moreover, the team is currently working on the development of 112Gb/s and 224Gb/s chips. They also set up a company, named Midasmicro, which is approx. worth NTD 450M.

Prof. Jri Lee: jrilee@ntu.edu.tw

Nanosized Drug Delivery Systems

To protect cancer drugs from being cleared by the body before reaching their target, a good drug carrier works like the invisible coating on a stealth fighter. The team of Professor Chung-Yuan Mou, Department of Chemistry, developed such a carrier (mesoporous silica nanoparticle) able to encapsulate and protect cancer drugs till they reach the targeted cells, thus maximizing cancer medication.

Prof. Chung-Yuan Mou: cymou@ntu.edu.tw

Inorganic Composite Membrane Filters

To facilitate the circular economy, the team of Professor Kuo-Lun Tung from the Department of Chemical Engineering developed an inorganic membrane material which integrates the wastewater and waste gas management of a factory. Through this filter, wastewater and waste gas or biogas can be easily separated to be then recycled and reused.

Prof. Kuo-Lun Tung: kltung@ntu.edu.tw

Office of International Affairs

Growing Strategic Partnerships and Delivering Global Impact

In 2014, NTU embarked on a seed-funded program to establish Strategic Partnerships with seven top universities all around the world. To strengthen NTU's global impact, these strategic partnerships play a vital role in clustering innovative and multidisciplinary academic cooperation as well as providing students with excellent academic opportunities through international joint degree programs.

Facilitating Global Mobility and Multiple Learning Opportunities

The OIA provides students with multiple learning opportunities through facilitating student exchanges, short-term programs, and international internships as well as providing information and advice for international and NTU students alike. In 2019, the OIA welcomed around 2,300 international students to NTU, while 1,250 NTU students were sent abroad. Currently, NTU offers 671 student exchange programs with 389 universities.

Cultivating Global Talents

To attract international talent to study at NTU and promote campus internationalization, the OIA organizes information sessions in overseas high schools in Asia and Europe and attends international educational exhibitions. Moreover, the OIA invites outstanding overseas high school students to join short-term programs and international competitions to firsthand experience NTU's excellence in teaching and research.

OIA: <https://oia.ntu.edu.tw/>

NTU: <https://www.ntu.edu.tw/>

College of Electrical Engineering & Computer Science

Deep Learning on Cellular Resolution Tomogram

High-speed tomography with cellular resolution is promising to replace excision biopsy for cancer diagnosis. Technically transferred from NTU, Apollo Medical Optics has raised USD 14.2M and has clinical collaborations with major medical centers worldwide. Recently, AMO was selected by Business Weekly as one of the most promising biomedical device startups.

Prof. Sheng-Lung Huang: shuang@ntu.edu.tw

Next-generation Internet of Things (IoT) and Communication Technologies

Several advanced projects are undergoing, including the first long-distance multi-camera 8K VR real-time transmission for AIoT, one of the first EU-Taiwan Horizon 2020 projects and next-generation mobile video platform by AI and cloud computing, electromagnetic compatibility technologies, etc. In addition, two new startup firms (Omni-eyes and EMPass) are initiated based on the developed communication technologies.

Prof. Tzong-Lin Wu: tlwu@ntu.edu.tw

Quantitative Imaging of the Hemodynamics of the Biological Tissues In Vivo with Multifunctional Optical Imaging Technologies

This study demonstrated quantitative optical imaging methods for identifying changes of the microvascular network hemodynamics during tumor progression with optical coherence tomography angiography technologies. We have developed imaging processing algorithms, allowing us to extract parameters such as flow speed, microvasculature density, and morphologies associated with tumor progression.

Asst. Prof. Hsiang-Chieh Lee: hclee2@ntu.edu.tw

College of Law

The Development of Digital Technology and the Future of Law

Our research theme The Development of Digital Technology and the Future of Law is a joint project with Hamburg Law School emphasizing topics on important issues such as self-driving, financial technology, social media and democratic processes, digital communication and privacy, and artificial intelligence. Discussion derives from various aspects of jurisprudence, media law, commercial law, criminal law, evidence and procedural law.

Prof. Jen-Guang Lin: andrewlin@ntu.edu.tw

Legal Integrity Safeguards for State Institutions and National Public Officials

Legal Integrity Safeguards for State Institutions and National Public Officials is a collaborative study with Radboud University and the University of Hong Kong, which implements a comprehensive discussion of the anti-corruption and clean government issues.

Prof. Jen-Guang Lin: andrewlin@ntu.edu.tw

Comparative Law

Comparative Law has long been our law school's main research focus. More recently, our research trend emphasizes the possibility of regional legal integration, such as Civil Law or Contract Law in the developing East Asian countries and courts, comparative analysis of the similarities and differences in Taiwan, Japan, South Korea, and China.

Prof. Jen-Guang Lin: andrewlin@ntu.edu.tw

College of Life Science

Unveil the Molecular Basis of Visual Circuit Development

The study discovered a new mechanism underlying visual circuit development. In developing retinal neurons, phosphorylation of a specific molecule can regulate the strength and patterns of the entire retinal activity, further inducing global effects on retinal connection to the central brain. Thus, the modification of retinal molecules regulates visual circuit formation.

Prof. Chih-Tien Wang: chihchienwang@ntu.edu.tw

Dispersal Pathways of Japanese Glass Eel in the East Asian Continental Shelf

The Japanese eel *Anguilla japonica* is an important aquaculture fish species in Japan, China, Korea, and Taiwan. Understanding its recruitment patterns is important. By combining otolith larval ages, simulated drifting paths, and main fishing seasons in each location, we identify five main recruitment blocks in the East Asia Continental Shelf.

Prof. Yu-San Han: yshan@ntu.edu.tw

Molecular Understanding of Plant Stress Responses

Researchers in IPB aim to understand the molecular mechanisms underlying plant responses to various stresses, leading to our knowledge enhancement and crop improvement. To date, we have gained outstanding achievements from the understanding of gene expression regulation, the establishment of wound signaling network, and the increase of lycopene levels in tomato fruit.

Prof. Hsu-Liang Hsieh: hlhsieh@ntu.edu.tw

Office of Academic Affairs

NTU International Study Group Project

This project encourages students practicing collaborative learning through interacting with peers outside NTU. It helps students understand different cultures, enrich their international perspectives, and improve their communication, presentation, and leadership skills. Current partner universities include Kyoto University, Kyushu Institute of Technology, Kobe University, and University of Tsukuba.

Prof. Chien-Mo Li: cmlil@ntu.edu.tw

NTU International College First Cross-Disciplinary Bioagricultural Graduate Program

NTU International College will be established and serving as the next key driver of NTU's globalization effort. The first distinctive cross-disciplinary English-taught program is "Master Program in Global Agriculture Technology and Genomic Science", leveraging the formidable strengths and resources of NTU to cultivate the global bioagricultural talents.

Prof. Shu-Jen Wang: shujen@ntu.edu.tw

Taiwan's first GIP-TRIAD Joint-degree Program among Three Universities in Three Countries

The Global Innovation Joint-Degree Master Program (GIP-TRIAD) is a "Triad" among the National Taiwan University, the University of Tsukuba, and the University of Bordeaux, aiming to cultivate professionals who bridge societal unmet needs with research and development to solve global-scale problems in public health care and food security.

Prof. Tsai-Kun Li: tsaikunli@ntu.edu.tw



Research
Highlights at
NTU 2019.9
<https://oia.ntu.edu.tw/RHL>

College of Liberal Arts

The Taiwan Indigenous Collections Housed at the Overseas Museums

The Department of Anthropology is devoted to the preservation of Taiwan's heritage. Observing the appreciation of cultural diversity (SDGs 4,7), the late Prof. Chia-Yu Hu published the "Local Aesthetics with Foreign Perceptions: The Taiwan Collections Housed at the British Museum (2018)". It offers a glimpse at the encounter between Taiwan and the world during the 19th and 20th century.

A.P. Kai-Shyh Lin: openlin@ntu.edu.tw

Tradition and Innovation in Sinology

The Department of Chinese Literature has directed world-class research and teaching in collaboration with institutes worldwide, such as the University of Harvard. Professors have offered award-winning open courses on Chinese classics. With this concerted effort, NTU is set to maintain a pivotal role in sinology.

Prof. Chia-Ling Mei: meicl@ntu.edu.tw

Language Processing as a Window into the Mystery of Human Brain

The Graduate Institute of Linguistics conducts advanced research to assess the neurobiological basis of the moment-to-moment changes in brain responses during reading over the lifespan. Their findings help us to understand the optimal orchestration across the brain hemispheres to enhance language processing when the system is developing or deteriorated.

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College of Science

A 2700-yr Tropical Rainfall Record in Northern Tropics

Prof. Chuan-Chou Shen et al. reported a 2700-yr rainfall record in the northern tropics (PNAS, 2019 August). The millennial-scale rainfall decrease is opposite to southern records. This see-saw pattern is driven by changes in hemispheric summertime insolation. Another highlight is the possible impact of floods on the disappearance of the Angkor civilization.

Prof. Chuan-Chou Shen: river@ntu.edu.tw

Experimental High Energy Physics

High-energy physics investigates the smallest fundamental building blocks of nature and the associated interactions. Researches always rely on close cooperation between international groups and world-class laboratories. NTU's team significantly contributes to Belle/BelleII/E391a/KOTO experiments in Japan, CMS experiment at the CERN LHC, and Dayabay/Juno experiments in China. Fruitful results have been produced and led to Nobel prizes in physics for CP violation (2008) and Higgs boson (2013).

Prof. Kai-Feng Chen: kfjack@phys.ntu.edu.tw

Ocean Buoys Reveal the Evolution of Typhoons

Two functional-improved buoys, designed and deployed by NTU, survived Super Typhoon Nepartak in the western North Pacific, and recorded crucial air and sea variables within the typhoon. The unprecedented dataset provides new insights into the evolving processes of typhoon's strength, which is published in Nature Communications in April 2019.

A.P. Yiling-Jang Yang: yjyang67@ntu.edu.tw

College of Social Sciences

Risk Society and Policy

The Risk Society and Policy Research Center (RSPRC) began collaborating with other East Asian academics on book publications on the SDGs since 2016, and in 2017, also signed a memorandum of understanding with the Institute for Advanced Sustainability Studies in Germany to organize biennial exchanges in Taiwan on SDG-related topics.

Prof. Kuo-Hui Chang: changk@ntu.edu.tw

Prof. Kuei-Tien Chou: ktchou@ntu.edu.tw

Asian Barometer Survey (ABS)

The ABS project is led by NTU's Hu Fu Center for East Asia Democratic Studies. It aims to gauge public opinion on issues such as political values, democracy, and governance across Asia. Launched in 2001, the project is currently in its fifth wave, covering fourteen countries and territories in East Asia plus Australia.

Prof. Min-Hua Huang: mhhuang5103@ntu.edu.tw

Behavioral and Data Science

The Behavioral and Data Science Center at NTU was established to integrate all the economic and statistical databases owned by NTU College of Social Sciences. A recent fruit of this database integration was to help the researchers successfully predict Trump's victory in the 2016 United States presidential election.

Prof. Ming-Jen Lin: mjlin@ntu.edu.tw

College of Medicine

Triple Therapy in the First-line Treatment of Helicobacter Pylori

Eradication of Helicobacter pylori reduces the risk of gastric cancer. However, the efficacy of standard triple therapy is decreasing due to the rising prevalence of antibiotic resistance. The Wu team standardized the use of sequential therapy and bismuth quadruple therapy in the first-line treatment of H. pylori infection.

Prof. Ming-Shiang Wu's Group: mingshiang@ntu.edu.tw

The Genetic Mystery Behind Lung Cancer - A Risk Allele for Lung Adenocarcinoma

Lung cancer is the leading cause of death among malignancies. However, lacking obvious symptoms and smoking history, early diagnosis of lung adenocarcinoma is of great difficulty. After a series of screening, one allelic key mutation of the oncogene YAP1 was identified by the Yang group.

Prof. Pan-Chyr Yang's Group: pcyang@ntu.edu.tw

Risk of Aortic Dissection and Aneurysm in Patients Taking Oral Fluoroquinolone

Using the large Taiwanese National Health Insurance Research database to test the association between fluoroquinolone therapy and aortic aneurysm, the Chang team uncovered a nearly 3-fold increase in the risk of aortic aneurysm and dissection in users of fluoroquinolone, a widely used antibiotic for the treatment of bacterial infections.

Prof. Shan-Chwen Chang's Group: changsc@ntu.edu.tw

College of Engineering

Earthquake Resisting Performance Experiments of Steel Structure

Since the 2000s, graduate students and faculty in the Civil Engineering Department have collaborated with international teams on seismic testing of structures. Applying advanced facilities in NCREE, findings from experiments are adopted in international model building design codes. Results advance the design, analysis, and applications of various types of steel structures worldwide.

Prof. Keh-Chyuan Tsai: kctsa@ntu.edu.tw

Blue Light Activates Hair Follicle Stem Cells Through the Eyes

Professors Sung-Jan Lin and Shih-Kuo Chen found that blue light can activate hair follicle stem cells through eyes via retinal intrinsic photosensitive retinal ganglion cell (ipRGCs). They demonstrated that ipRGC-SCN-sympathetic nervous circuit is an important gateway for the communication between internal stem cells and the external environment.

Prof. Sung-Jan Lin: drsjlin@ntu.edu.tw

Innovative Hollow Metal Fiber for Carbon Dioxide Adsorption / Catalyst Conversion System

Our team developed the innovative hollow metal fiber adsorber as a rapid temperature swing adsorption (HCFSS-RTSA) device. Plasma spray was further utilized for catalyst coating on the adsorber to add the CO2 conversion function. The HCFSS-RTSA could effectively improve thermal efficiency and optimize the efficiency of adsorption-desorption and catalyst conversion, achieving high efficiency carbon capture & utilization technology and circular economic goal.

Prof. Kuo-Lun Tung: kltung@ntu.edu.tw

College of Bio-Resources & Agriculture

Intelligent Urban Metabolic Systems for Green Cities of Tomorrow: a WFE Nexus-based Approach

This international collaborative project, awarded by Belmont Forum in 2018, conducts interdisciplinary research on the Water-Food-Energy (WFE) Nexus under urbanization, which configures the synergistic utilization of WFE resources in an equal and secure manner through making optimal utilization of resources for achieving healthy urban metabolism and building intelligent green cities.

Prof. Fi-John Chang: changfj@ntu.edu.tw

Crop Molecular Breeding — From Basic Scientific Research to Seed Industry

Molecular-assisted selections facilitate precise breeding systems and increase crop improvement efficiencies based on research efforts. The press conference "Establishment of the Industry-Government-Academia Cooperation Model - Improvement of Taiwan is Seed Industry" was held to manifest the importance of NTU as the key to enhancing the global competitiveness of Taiwan's crop seed industry.

Prof. Yann-Rong Lin: ylin@ntu.edu.tw

The Discovery of the Mythological Birds, Chinese Crested Tern

To track home range and nest site preferences of Chinese Crested Terns, Thalasseus bernsteini, we utilized social attraction and Unmanned Aerial Vehicles. Our results helped us develop a comprehensive breeding habitat research and management plan within Matsu Islands Tern Refuge and Wetlands and Fluvial Delta Plains.

Prof. Hsiao-Wei Yuan: hwyuan@ntu.edu.tw

College of Management

Big Data Analytics for Business Intelligence

Prof. Wei's research focuses on big data analytics for various domains. Specifically, his research on patent intelligence develops machine-learning-based prediction models for identifying patents' offensive level (for technological risk management), detecting core patents for specific technologies (for technological opportunity identification), etc. For drug discovery, they propose a novel drug repurposing method to identify new indications for existing drugs from more than 20 million biomedical research articles.

Prof. Chih-Ping Wei: cpwei@ntu.edu.tw

Taiwan's Auction IPOs

Using complete bidding information for every IPO auction in Taiwan, we examine the behaviors and returns of two groups—institutional and retail investors. We find the bids of institutional investors are generally consistent with the predictions of IPO auction theory for informed bidders, while those of individual investors are not.

Prof. Yao-Min Chiang: yaominchiang@ntu.edu.tw

Scaling Consumer Psychology Up to the Field and Down to the Brain

We aim to combine evidence from the real world and from the neurobiological level, putting consumer psychology to the test. By collaborating with companies and conducting field experiments, we investigate the implications of consumer research practically. Moreover, we use brain-imaging techniques to reveal the neurobiological basis of consumer behavior.

Prof. Yu-Ping Chen: pingchen@ntu.edu.tw

College of Public Health

Community-based Public Health Prevention Model Prolongs Life Expectancy (LE)

Community-based public health prevention programs contributed to 50% significant mortality reduction, leading to the gain of 10 years of average LE in five selected Taiwanese communities. The disparity across geographic areas is attributed to accessibility to and availability of interventions and health care services, providing evidence on geographic health inequality.

Prof. Hsiu-Hsi Chen: chenlin@ntu.edu.tw

Deciphering Metabolomics of Children and Adolescents Exposed to Multiple Industrial Carcinogenic Pollutants

The study identified metabolic perturbations in children and adolescents exposed to carcinogens in a polluted area surrounding the largest petrochemical complex in Taiwan. Purine metabolism was identified as the possible mechanism. It provides new insight into the health effects of childhood and adolescence attributed to exposure to industrial carcinogens.

Prof. Chang-Chuan Chan: ccchan@ntu.edu.tw

Precision Health for Prevention of Cancer

The personalized risk assessment model for illuminating the pattern of dynamic transitions responsible for multiple disease pathways was illustrated by the Correa multiple steps of gastric cancer to precisely classify different risk groups in order to provide precision intervention and treatment.

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