NCTS Newsletter

Vol.17 Fall 2025

Director's Message

Dear Friends of the NCTS,

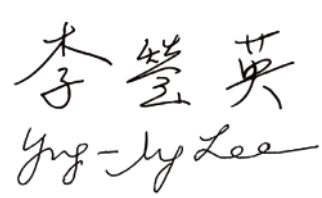
Greetings from the NCTS! Sorry for the delay on the newsletter.

With the devotion and support of many colleagues and friends, the NCTS continues to thrive this year. The cultivation of the Youth is a core mission of the Center. We have very successful undergraduate research programs USRP and URP, offer a big variety of short courses, and provide different overseas opportunities for students including 2-4 months Research Abroad at international institutions. International exchange programs with our partners, and support students to attend SLMath Summer Graduate Schools, PCMI and other schools. Please check the stories in this issue's Newsletter for more details. We mentioned in the last newsletter that we would organize two international summer schools this summer to put the idea of training students together in Asia into action. The Iwasawa 2025 Summer School in Taipei (June 25–27) was a very successful event. It attracted nearly 90 enthusiastic participants and we supported about 25 international students or postdocs from China, Japan, Korea, Europe, the United States, and South America. Although the 2025 NCTS Summer School on Fluid Dynamics and Kinetic Theory (June 2–11) was of a smaller size, the participants and the instructors had very close and intense interactions.

The Center continues to actively organize all kinds of academic events. In 2025, we have so far in total 49 conferences, workshops and special events. Spotlights of them included Iwasawa 2025 that took place during June 30 to July 4 and attracted about 130 participants from around the world. This is the tenth Iwasawa conference following conferences in Besancon (2004), Limoges (2006), Irsee (2008), Toronto (2010), Heidelberg (2012), London (2015), Tokyo (2017), Bordeaux (2019), Cambridge (2023). We were very pleased to host the first visit of many of the speakers and participants to Taiwan.

The Phase V-I of the NCTS will end this year and from January 1 of 2026, it marks the beginning of Phase V-II. My term as the director will also finish on December 31, 2025. I truly appreciate the constant support from all of you and the staff members during my directorship. Thanks again for your encouragement during these years. With your dedication and participation, the NCTS will continue to flourish in the new phase.

All my best regards,



NCTS Mathematics Division Director
Prof. Yng-Ing Lee

Upcoming **Opportunities**

NCTS Nomination for SLMath Summer Graduate School 2026

The NCTS Mathematics Division invites applications from full-time students at universities or research institutions in Taiwan for the Summer Graduate School (SGS) of the Simons Laufer Mathematical Sciences Institute (SLMath), formerly MSRI, in 2026. SLMath is one of the world's premier mathematics institutions, hosting high-quality academic events annually.

As a full member of SLMath's Academic Sponsoring Institutions, the NCTS nominates students to attend these schools. Up to four nominees can receive full local support and up to USD 700 in travel support from SLMath. The NCTS will cover any additional travel costs for these students and may support additional fee students to attend the schools. The 2026 SGS program includes 10 summer schools at SLMath in Berkeley or affiliated institutions worldwide. For the latest details, visit the SLMath SGS website.

The 2026 call for applications closed on October 30, 2025. Interested students are encouraged to prepare their materials and refer to the information provided at:

Students who wish to apply next year are advised to follow the announcement around late August.

Apply Now! 2026 NCTS Postdoctoral Fellows Details

Appointments last 1–2 years, extendable up to 3 years.
Generous funding for travel and research.
Chinese language classes available for international fellows.
Applications welcome from all fields of mathematics, with preference for research aligned with NCTS Topical Programs:

- Number Theory and Representation Theory
- Algebraic Geometry
- Differential Geometry and Geometric Analysis
- Differential Equations and Stochastic Analysis
- Scientific Computing
- Interdisciplinary Studies
- Analysis and Probability
- Mathematical Foundations for AI

Applicants are encouraged to suggest potential NCTS mentors from mathematicians based in Taiwan.

How to Apply
Submit applications via MathJobs, including:

- Cover Letter (indicate start date and relevant Topical Program)
- CV
- 3 Reference Letters

- Research Statement
- Doctoral Dissertation and Reprints/Preprints

Deadlines
Spring 2026 Appointment (starting February 1, 2026) → Deadline: November 15, 2025
Fall 2026 Appointment (starting August 1, 2026) → Deadline: February 28, 2026

More information:

Research Abroad

The NCTS Mathematics Division invites applications for its Research Abroad Program, offering funding and support for 2–4 months of research at international universities or institutes. This program aims to enhance students' research abilities, broaden their vision and competitiveness, and foster international collaboration. Female students are strongly encouraged to apply.

Applicants must be students in mathematics with Taiwan (ROC) nationality and enrolled at Taiwanese universities.
Eligible students include:
Undergraduate students (3rd year or above), Master's and doctoral students.
Program Details:
Funding: Up to NT$150,000 per student.
Program period: June 2026–May 2027.
Students must finalize their materials for applications by October 27, 2025.

The 2026 call for applications closed on October 30, 2025. Interested students are encouraged to prepare their materials and refer to the information provided at:

Students who wish to apply next year are advised to follow the announcement around late August.

Call for Applications 2025–2026 NCTS International Exchange Program

The National Center for Theoretical Sciences (NCTS) invites applications for its International Exchange Program, supporting collaboration between Taiwanese and international mathematicians. The program offers 1–3 month visits to partner institutes for academic exchange.

Exchange program partners include:
- PIMS(Pacific Institute for the Mathematical Sciences), Canada
- RIMS (Research Institute for Mathematical Sciences), Japan
- KIAS (Korea Institute for Advanced Study), Korea
- Fields (The Fields Institute for Research in Mathematical Sciences), Canada
- BMS (Berlin Mathematical School), Germany
- IBS-CGP (The Center for Geometry and Physics of the Institute for Basic Science), Korea

For the full list of partners please refer to https://ncts.ntu.edu.tw/support.php
Although all applications are welcome, priority will be given to junior mathematicians, e.g., assistant professors, postdoctoral fellows, and students.

More information:

Call for Applications 2025–2026 NCTS Research in Pairs

The NCTS invites groups of 2–4 mathematicians from different institutions (including at least one from outside Taiwan) to apply for the Research in Pairs Program. Participants will spend 2–8 weeks at NCTS conducting impactful joint research, supported as visiting scholars (excluding airfare).

Calls are announced every April, August, and December. Priority is given to projects aligned with NCTS Topical Programs, particularly in:
Number Theory and Representation Theory
Algebraic Geometry
Differential Geometry and Geometric Analysis
Differential Equations and Stochastic Analysis
Scientific Computing
Interdisciplinary Studies
Application Requirements:

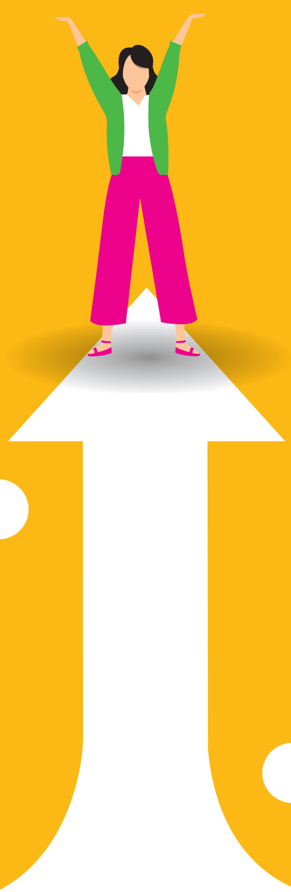
Submit the following to apply_acad@ncts.tw (subject line: "NCTS Research in Pairs"):

a. Cover letter
b. Project proposal (max. 10 pages):
- Overview, background, and known results
- Planned activities and timeline
- Expected outcomes and collaborations

c. CVs of all participants

Apply at least 3 months before the proposed visit.

More information please refer to



Call for Research Assistants

NCTS is actively committed to fostering bachelor's and master's graduates aspiring to pursue research in mathematics. We are now recruiting full-time research assistants. Applicants with backgrounds in mathematics, applied mathematics, or related fields are welcome to apply.

Description:

- Participate in academic activities organized by the center and conduct independent research under the supervision of a professor.
- Each assistant must take part in at least one Topical Program academic activity.
- After discussion with the mentor, submit the NCTS Mathematics Division Research Assistant Semester Study and Activity Plan no later than two weeks before the start of each semester.
- Present research results at the Winter or Summer Research Presentation Meeting during the employment semester.
- Participate in center events, including tea gatherings and other activities.

Application Materials:

Applicants should provide:

- CV (with full contact information, including email and mobile phone number)
- Two recommendation letters
- Academic transcripts
- Research plan and future academic goals (including preferred supervising professor)
- Other supporting documents demonstrating research ability

Deadline: October 31, 2025

More information

Highlight of Events

The 15th Taiwan–Japan Joint Workshop for Young Scholars in Applied Mathematics

Date: March 3-5, 2025

The 15th Taiwan–Japan Joint Workshop for Young Scholars in Applied Mathematics concluded successfully on March 5, 2025. This two-and-a-half-day event brought together numerous undergraduate and graduate students from Taiwan and Japan, fostering academic exchange and collaboration among young researchers in applied mathematics.

The opening ceremony featured remarks by Dr. Ming-Chih Lai, Director of the NSTC Department of Natural Sciences and Sustainable Research, and Prof. Chin-Chun Tsai, Dean of the College of Science at National Cheng Kung University. Both emphasized the vital role of applied mathematics in modern science and encouraged students to take an active part in international research collaboration.

Throughout the workshop, students presented their latest research on topics ranging from mathematical analysis and numerical methods to data science. Seven students received Presentation Awards and eight received Research Awards in recognition of their outstanding work. The final day featured undergraduate presentations and a closing ceremony honoring four additional Presentation Award winners.

The workshop successfully strengthened academic ties between Taiwan and Japan while providing young scholars with a valuable platform to exchange ideas, explore collaborations, and enhance their research experience. The 16th workshop is scheduled to be held in Japan in 2026.

NCTS National Center for Theoretical Sciences

Highlights of Events

Conferences & Workshops

2025

7/8	NCTS Number Theory Day
7/9	NCTS Interdisciplinary Distinguished Lectures Water Waves in the Service of Coastal Engineering and Biology
7/31-8/1	2025 Workshop on Mathematical Modeling and AI in Biological and Medical Sciences
8/11-13	NCTS Tropical Geometry in Taiwan 2025
8/22-23	2025 NCTS Workshop on Computational Mathematics and Scientific Computing for Young Researchers (2025 計算數學薪傳及新苗研討會)
8/25-29	The 11th East Asia Number Theory Conference
9/1-5	Japan-Taiwan Joint Conference on Number Theory 2025
9/8	2025 NCTS Postdoc Symposium
10/14-17	NCTS Workshop on Free Probability Theory and Random Matrix Theory
11/2-5	The 5th Japan-Taiwan Joint Conference on Differential Geometry
11/10-14	2025 Algebraic Geometry in East Asia
11/29	The 28th Taiwan Geometry Symposium

2026

3/6	2026 NCTS South Taiwan Workshop on Scientific Computing, Differential Equations and Applications
4/13-17	2026 Higher Dimensional Algebraic Geometry

More events are still being planned, so please stay tuned to NCTS Events (ncts.ntu.tw/events.php) for more detailed information.

2025 Conference on Advanced Topics and Auto Tuning in High-Performance Scientific Computing (ATAT 2025)

Date: March 21-22, 2025

Organizers:

Ray-Bing Chen
Department of Statistics, National Cheng Kung University
Feng-Nan Hwang
National Central University
Takahiro Katagiri
Nagoya University
Chung Gang Li
National Cheng Kung University
Matthew M. Lin
National Cheng Kung University
Satoshi Ohshima
University of Tokyo
Yu-Chen Shu
National Cheng Kung University
Weichung Wang
National Taiwan University
An-Cheng Yang
National Center for High-performance Computing

The 2025 Conference on Advanced Topics and Auto Tuning in High-Performance Scientific Computing (ATAT 2025) was held on March 21–22, 2025, at the Department of Mechanical Engineering, National Cheng Kung University (NCKU). The two-day event was jointly hosted by the National Center for Theoretical Sciences (NCTS) and NCKU's Department of Mechanical Engineering, with support from the National Center for High-Performance Computing and TWSIAM.

The conference focused on key advances in high-performance computing (HPC) and artificial intelligence (AI), covering topics such as simulation, algorithmic methods, and hardware/software co-design. It attracted over 60 participants from Taiwan, Japan, Italy, and Australia, reflecting its strong international reach. The program included two plenary talks, 18 invited speakers, one AI Forum, and six student presentations.

Prof. Stefano De Marchi opened the conference with a plenary talk on Kernel Approximation and HPC, while Prof. Koji Nishiguchi presented AI-based manufacturing applications using Fugaku, Japan's fastest supercomputer. Invited talks explored a wide range of topics, from optimization of numerical methods and GPU computing to AI-driven auto-tuning and hybrid-precision algorithms. A special forum, "The Role of AI in Computational Education," examined how AI is reshaping teaching models in computational science.

Building on its success, ATAT 2025 strengthened collaboration between the Japanese and Taiwanese HPC communities. The next conference, scheduled for 2026, will expand its focus on practical applications and industry–academia partnerships through a new "*HPC×AI Practical Forum*."

27th Taiwan Geometry Symposium

Date: May 3, 2025

Organizers:

Chih-Wei Chen
National Sun Yat-sen University
Nan-Kuo Ho
National Tsing Hua University
Chung-Jun Tsai
National Taiwan University
Mao-Pei Tsui
National Taiwan University

The Taiwan Geometry Symposium was a one-day workshop organized under the support of the National Center for Theoretical Sciences (NCTS). Since 2010, this event has been held two or three times a year, initiated by Prof. Yng-Ing Lee (National Taiwan University), Prof. Nan-Kuo Ho (National Tsing Hua University), and Prof. River Chiang (National Cheng Kung University). The symposium aims to foster discussions and interactions within the geometry community in Taiwan, offering opportunities for students to explore different aspects of geometry. It also serves as a platform for the differential geometry community to gather and plan future academic activities.

The organizers always strive to include speakers at different career stages. For this session, two one-hour talks were delivered by Prof. Chung-Jun Tsai (NTU), who presented Bernstein Theorem for Calibrated Submanifolds, and Prof. Pak-Yeung Chan (NTHU), who discussed A Family of Kähler Flying Wing Steady Ricci Solitons. Two half-hour talks followed: Dr. Wei-Yi Chiu (NTHU) spoke on Volumetric Minkowski Inequality on Manifolds with Weighted Poincaré Inequality, and Mr. Nobuhiro Morita (NTHU) presented Heat Kernel Asymptotics for Degenerate Weight Functions on C^n.

The symposium took place at NCTS, National Tsing Hua University, and drew approximately 40 participants. The next Taiwan Geometry Symposium is expected to be held in southern Taiwan during the fall of 2025.

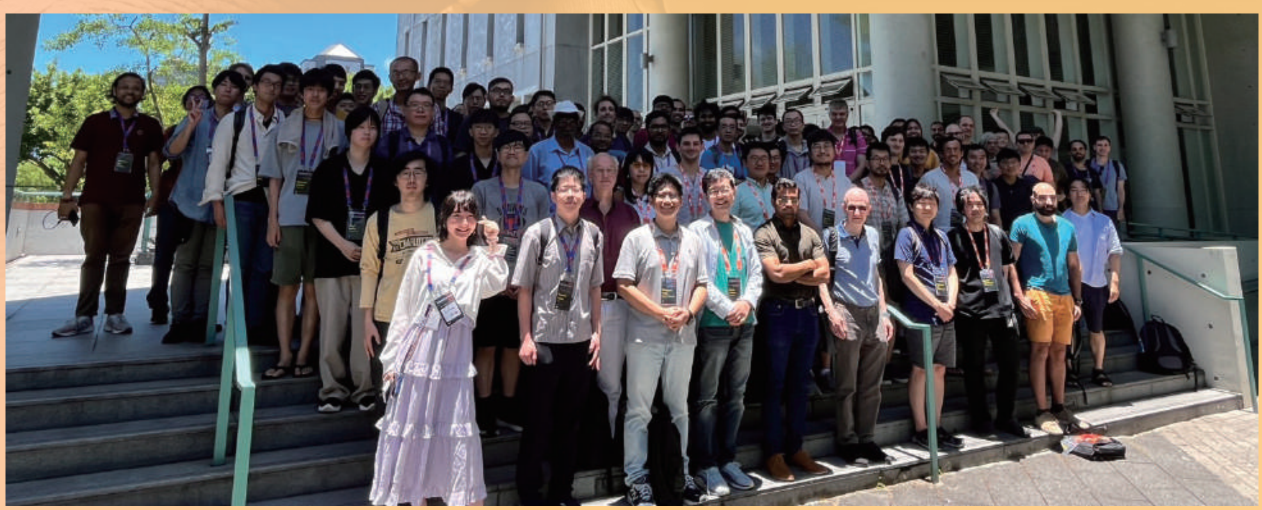
Iwasawa 2025

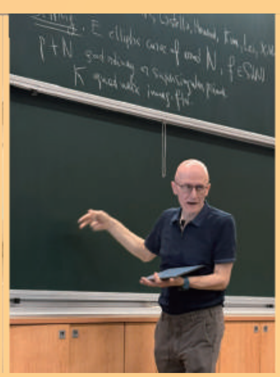
Date: June 30-July 4, 2025

Organizer:

Ming-Lun Hsieh National Taiwan University
Kwok-Wing Tsoi National Taiwan University

The Iwasawa 2025 (including Iwasawa Theory Taipei Summer School) was hosted in NCTS during June 25–July 4, 2025. This is the 10th Iwasawa conference following conferences in Besancon (2004), Limoges (2006), Irsee (2008), Toronto (2010), Heidelberg (2012), London (2015), Tokyo (2017), Bordeaux (2019),





Cambridge (2023). This conference aims to bring together different strands of research in and closely related to the area of Iwasawa theory. Iwasawa theory began with the research on the ideal class numbers along the cyclotomic extensions by Iwasawa. Number theorists found the idea of Iwasawa can be adapted to study arithmetic of p-adic Galois representations in general and has been an active area in modern algebraic number theory. In particular, the solution to the full BSD conjecture in the case of analytic rank less than two heavily relies on the techniques and results from Iwasawa theory for modular forms, and therefore Iwasawa theory is one of the most powerful tools to attack the Birch and Swinnerton-Dyer conjecture, one of the seven Millennium Prize Problems. This series of Iwasawa conferences are the largest and probably the most important conference in Iwasawa theory. For example, there were 265 participants in Tokyo and 164 in Bordeaux.
The scientific committee of Iwasawa 2025 consists of

- Denis Benois (Bordeaux University)
- Henri Darmon (McGill University)
- Ming-Lun Hsieh (National Taiwan University & NCTS)
- Masato Kurihara (Keio University)
- Otmar Venjakob (Heidelberg University)
- Sarah Zerbes (ETH Zürich)

We had eighteen invited speakers, ranging from young and rising researchers to well-established mathematicians, and more than 130 international participants from Japan, Korea, Europe and the United States. The academic exchanges during the conference were highly fruitful. Several new results in the theory for modular forms over imaginary quadratic fields were presented. Exciting methods of constructing Euler systems via the relative cohomology groups were introduced, and a novel approach to the non-abelian Leopoldt conjecture was proposed.

The latest developments about the construction of p-adic L-functions for higher rank groups were also reported in the conference. In addition, we had a very interesting talk in arithmetic geometry related to arithmetic theta lifts and higher Borcherds products. I believe the participants greatly benefited from many new ideas and insights shared during the conference.

More than twenty participants from Taiwan attended the conference. Young Taiwanese postdocs and graduate students engaged in productive mathematical interaction with international researchers, resulting in new collaborations and opportunities for our young people. A Taiwanese female number theorist Chi-Yun Hsu was a speaker of the conference, reporting new results produced from the NCTS Research-In-Pair program in 2024. I think hosting this conference not only promotes the research of algebraic number theory in Taiwan but enhances the international visibility of our number theory community. It was a truly successful event, and I would like to express my heartfelt thanks to NCTS and its staff for their support.
Date: July 31, 2025

2025 NCTS Workshop on Mathematical Modeling and AI in Biological and Medical Sciences

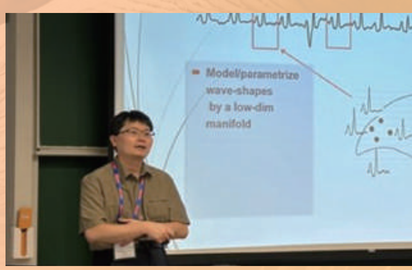
Organizers:

Matthew M. Lin
National Cheng Kung University
Te-Sheng Lin
National Yang Ming Chiao Tung University
Feng-Bin Wang
Chang Gung University

The 2025 NCTS Workshop on Mathematical Modeling and Artificial Intelligence in Biological and Medical Sciences was held in July 2025, bringing together researchers from mathematics, biology, and medicine to explore how mathematical modeling and AI can address pressing challenges in life sciences. The two-day workshop featured 15 speakers-nine applied mathematicians and six experts from related disciplines-who shared their latest research findings and insights.
Prof. Steven Altschuler and Prof. Lani Wu (Uni-

versity of California, San Francisco) opened the event by sharing their personal journeys from pure mathematics to biomedical research, highlighting their pioneering work in drug discovery. Prof. Weichung Wang (National Taiwan University) presented his team's AI-based system PANCREA Saver for pancreatic cancer detection, while Dr. Yu-Chiau Shyu (Chang Gung Memorial Hospital) introduced breakthrough results on rejuvenation using KLF1-edited hematopoietic stem cells. The program also featured real-world data analysis and modeling. Dr. Yu-Ting Lin presented on arterial blood pressure waveforms, and Prof. Naveen Vaidya (San Diego State University) discussed mathematical models of dengue transmission. A panel chaired by Dr. Shu-Jen Tsai addressed early warning systems for rice black bugs in organic farming.

Domestic experts including Profs. Tzyy-Leng Horng, Yu-Hao Liang, Min-Jhe Lu, and others also shared their recent work. With around 50 participants, the workshop fostered vibrant interdisciplinary exchange and marked the first collaborative initiative between NCTS Scientific Programs E and F, advancing modeling and AI research in Taiwan.



NCTS Tropical Geometry in Taiwan 2025

Organizers:

Chih-Wei Chang
National Taiwan University
Jungkai Chen
National Taiwan University
Keita Goto
University of Tokyo
Ryota Mikami
Academia Sinica

The NCTS Tropical Geometry in Taiwan 2025 conference was held from August 11 to 13, 2025, marking an important milestone in fostering collaboration between researchers in Japan and Taiwan. Tropical geometry conferences have long been active in Japan, and with the growing number of scholars in Taiwan working in this field, this event aimed to strengthen academic ties and encourage interaction among young researchers through a poster session.

The conference featured 12 speakers (8 from Japan and 4 from Taiwan), 5 poster presenters, and about 30 participants. The talks covered a wide range of topics, including the algebraic and combinatorial aspects of tropical geometry and its connections with algebraic varieties, non-archimedean geometry, mirror symmetry, and even economics. Despite the diversity of topics, the sessions

were accessible and engaging, with tropical geometry serving as a unifying theme for discussion.
Several talks stood out for their depth and impact. Prof. Shu Kawaguchi presented fundamental results on tropical semi-fields, while Prof. Chi Ho Yuen offered a categorical perspective on Zaslavsky's work on Euler characteristics. Prof. Yuto Yamamoto discussed tropical approaches to the Gamma conjecture, and Prof. Yuki Tsutsui demonstrated the application of tropical geometry to economic equilibrium models.

The event concluded with lively discussions and the promise of a follow-up conference in Japan, further solidifying a vibrant international research network in tropical geometry.

NCTS Tropical Geometry in Taiwan 2025

Date: August 25-29, 2025

Organizers:

Sunghan Bae
Korea Institute for Advanced Study
Liang-Chung Hsia
National Taiwan Normal University
Yuichiro Taguchi
Tokyo Institute of Technology
Fei Xu
Capital Normal University
Chia-Fu Yu
Academia Sinica
Jing Yu
National Taiwan University

The 11th East Asia Number Theory Conference (EANTC) was successfully held on August 25–29, 2025, with generous support from the National Center for Theoretical Sciences (NCTS). Following two virtual editions during the COVID-19 pandemic, this year's conference marked a return to in-person engagement while maintaining a hybrid format to allow online participation. Since its inception in 2008, EANTC has rotated among China, Japan, Korea, and Taiwan, fostering regional collaboration and promoting international exchange in number theory.

The conference featured 20 invited speakers from the four host regions, with most delivering onsite presentations at NCTS and several joining remotely. Over 70 participants registered for the event, including senior researchers, early-career scholars, and graduate students.

Across five days of sessions—three full-day and two half-day programs—the conference hosted 19 research talks spanning a broad range of topics: algebraic and analytic number theory, modular and automorphic forms, Diophantine approximation, L-functions, elliptic curves, arithmetic geometry, Drinfeld modules, and arithmetic dynamics. The diversity of themes encouraged active discussion and interdisciplinary dialogue between analytic and geometric approaches.

The 11th EANTC not only strengthened long-standing ties among East Asian number theorists but also provided young researchers with valuable exposure to leading experts. Looking ahead, the 12th EANTC will be held in Korea in 2027, continuing this tradition of academic exchange and collaboration within the East Asian number theory community.

2025 NCTS Summer School on Fluid Dynamics and Kinetic Theory and 2025 NCTS International Conference on PDEs

Date: June 2-11, 2025

Organizer(s):

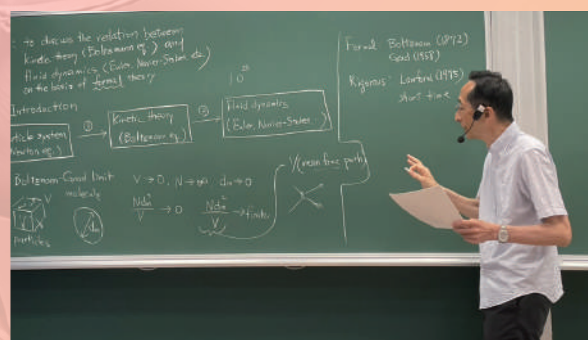
Chun-Hsiung Hsia
National Taiwan University
Jerry L. Bona
University of Illinois at Chicago
Kung-Chien Wu
National Cheng Kung University & NCTS

The 2025 NCTS Summer School on Kinetic Theory and Fluid Dynamics was held in June 2025, aiming to introduce graduate students to kinetic theory and fluid dynamics, with special emphasis on (1) the connection between kinetic theory and fluid mechanics, (2) dispersive water waves, and (3) transonic flows. The program combined introductory lectures with research discussions and open problems.

During the first three mornings, Prof. Kazuo Aoki delivered a series of lectures on the relation between kinetic theory and fluid dynamics, highlighting the historical development of the subject since the early 20th century. He reviewed the Boltzmann equation and explained the Chapman–Enskog and Hilbert expansions, which lead to the compressible Navier–Stokes equations. On June 5, 6, and 9, Prof. Jerry L. Bona presented talks on Theory and Application of Dispersive Wave Equations, introducing modern mathematical results and surveying various physical phenomena modeled by dispersive systems.

The school attracted around 30 participants, including about ten faculty members and numerous graduate students. Afternoon sessions featured student presentations and lively discussions, fostering close academic interaction.

Following the summer school, ten related talks were arranged within the 2025 NCTS International Conference on PDEs, allowing participants to engage further with recent developments in kinetic theory and fluid dynamics. The event significantly strengthened research connections among young scholars, thanks to the generous support of NCTS.



Iwasawa Theory Taipei Summer School

Date: June 25-27, 2025 Organizer:

Ming-Lun Hsieh
National Taiwan University
Kwok-Wing Tsoi
National Taiwan University

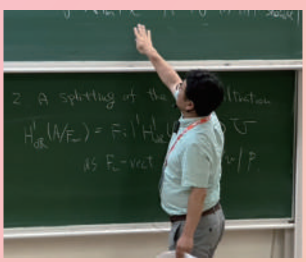
As a part of the Iwasawa 2025 program, the international summer school in Iwasawa theory was hosted by NCTS during June 25-27, 2025. The summer school offered introductory courses on selected important subjects of Iwasawa theory, including the p-adic Gross-Zagier formula, automorphic constructions of p-adic L-functions, Euler systems and congruences among modular forms.

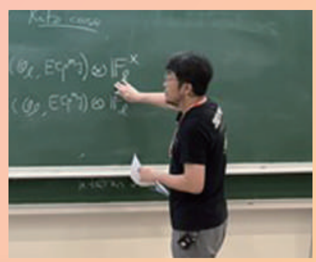
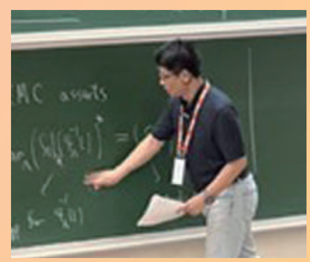
The speakers of the summer school consist of

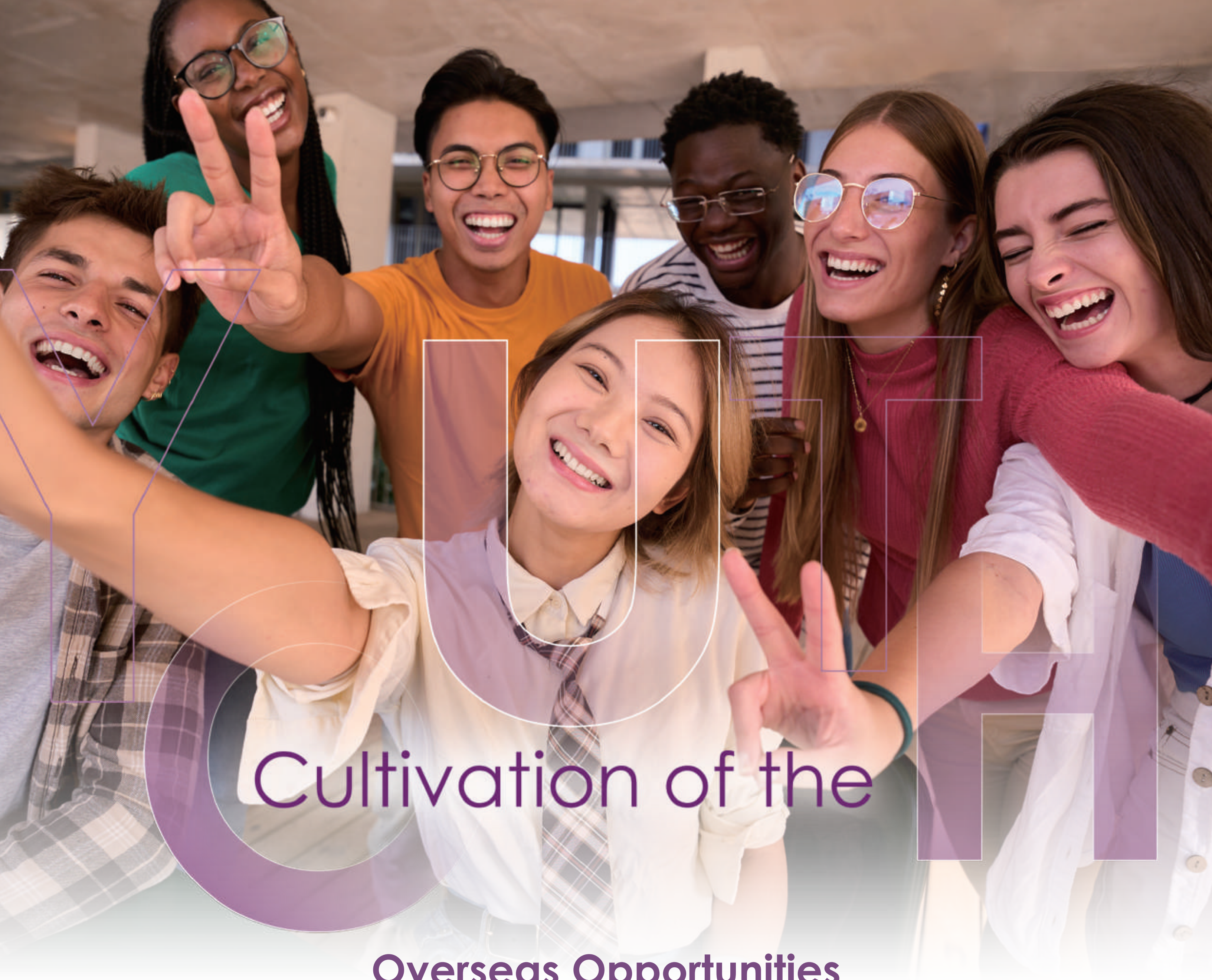
- Shinichi Kobayashi, Kyushu University,
- Zheng Liu, UC Santa Barbara,
- Chan-Ho Kim, Jeonbuk National University,
- Ming-Lun Hsieh , National Taiwan University and NCTS

Each speaker gave four lectures. Shinichi Kobayashi gave a mini-course on *p*-adic Gross-Zagier formula. This formula relates the derivative of a *p*-adic *L*-function to the *p*-adic height of an arithmetic cycle. Several types of *p*-adic Gross-Zagier formulas exist in various settings, but his lecture focuses on the most basic *p*-adic Gross-Zagier formula proved by Perrin-Riou. Many important ideas useful for subsequent generalizations are already contained in its proof, so it is very instructive to understand Perrin-Riou's work. Zheng Liu gave four lectures on *p*-adic *L*-functions. Her courses aim to provide an introduction to *p*-adic *L*-functions, which are *p*-adic avatars of complex *L*-functions and arise from *p*-adic congruences among special values of complex *L*-functions. In the lectures, the constructions and applications of *p*-adic *L*-functions were illustrated through examples (Kubota–Leopoldt *p*-adic *L*-functions, Rankin-Selberg *p*-adic *L*-functions, symmetric square *p*-adic *L*-functions, *p*-adic *L*-functions for GSp(4) × GL(2)). The lectures of Chan-Ho Kim were about Kato's Euler systems and their applications. The purpose of his lectures is to explain the notion of Kato's Euler systems, the methodology of Kolyvagin systems, and how they are used in the arithmetic of elliptic curves. In particular, he also explained the algorithmic aspects and presented numerical examples. Ming-Lun Hsieh gave four intensive lectures on modular construction of Selmer classes. Congruence between modular forms is one of the most effective methods to construct Selmer classes. He explained examples from Eisenstein congruence on GL(2) and endoscopic congruence on GSp(4).

The total number of the international participants of the summer school was more than 70, including local graduate students, young postdocs and PhD students from prestigious institutions such as Princeton University, Imperial College London, University of Chicago...etc. NCTS generously provided the local accommodations for thirty-five selected participants. During the summer school, the participants not only benefited from the lectures but also had the opportunity to interact with one another and establish new academic connections. This was a fruitful summer school, and I am deeply grateful to NCTS and the staff for the support.



Cultivation of the YOUTH

Overseas Opportunities

The NCTS Mathematics Division places strong emphasis on nurturing young mathematical talent, especially at the undergraduate level, with the goal of laying a solid foundation for future researchers. We hope that students with strong interest in mathematics can broaden their horizons and engage with the international community, whether by attending renowned overseas summer programs or receiving short-term guidance from international scholars. Such opportunities not only expand perspectives but also strengthen academic abilities, while sparking meaningful exchanges with peers and faculty worldwide. To achieve this, NCTS not only develops its own talent cultivation programs but also serves as an information hub, bringing together valuable opportunities offered by leading international universities. We warmly encourage students to stay tuned for application deadlines and announcements.

The NCTS Research Abroad Program, launched in 2023, supports outstanding students in conducting 2–4 months research visits at international institutions. Up to 10 students are funded annually, with each student receiving up to NT$150,000. The program aims to enhance research skills, broaden academic perspectives, and strengthen global competitiveness. A total of 7 students have been granted support for the period of June 2024 to November 2025.

As an academic sponsoring institution of the Simons Laufer Mathematical Sciences Institute (SLMath), NCTS nominates students to participate in its prestigious Summer Graduate School (SGS) programs. Selected students receive full local support, travel funding from SLMath, and additional travel subsidies from NCTS, enabling participation in one of 10 summer schools in 2026, held in Berkeley and other international locations.

In addition, the NCTS International Exchange Program provides opportunities for 1–3 months research visits at partner institutes abroad, promoting collaboration between Taiwanese and international mathematicians.

Below we invited three students: Ruey-An Shiu(NTU), Yu-Yo Wong (NYCU), and Yu-Sheng Shih (NTU) to share their experiences with us.

SLMath Summer Graduate Schools

Every summer, the Simons Laufer Mathematical Sciences Institute (SLMath, formerly MSRI) organizes about 10 topic-oriented Summer Graduate Schools, each typically lasting two weeks. Some are held at SLMath, while others take place at partner institutions worldwide.

Ruey-An Shiu attended one of the 2025 SLMath Summer Graduate Schools as a recent graduate of National Taiwan University. Here is his reflection on the experience:

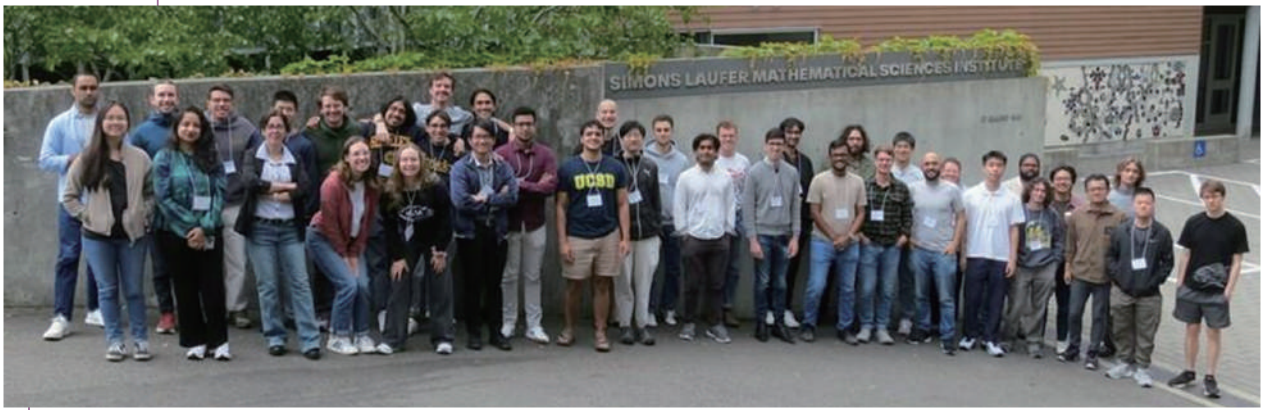
Ruey-An Shiu | 徐睿安

Statistical Optimal Transport
Simons Laufer Mathematical Sciences Institute in Berkeley, California, USA
June 8 – June 22, 2024

I would like to thank NCTS for their support in giving me the opportunity to attend the SLMath Summer School on "Statistical Optimal Transport" at the University of California, Berkeley. The course was taught by Promit Ghosal (University of Chicago), Jonathan Niles-Weed (New York University's Courant Institute), and Marcel Nutz (Columbia University). The discussion sessions were guided by teaching assistants Shrey Aryan (MIT) and Uriel Martínez León (New York University). The lecture notes and video are available here:
https://www.slmath.org/summer-schools/1102#overview_summer_graduate_school
https://sites.google.com/view/promit-ghosal/slmath-summer-school-on-ot

1. Lectures: The lectures were held in the Eisenbud Auditorium on the first floor of the SLMath building. Many distinguished mathematicians have given talks here. For example, Hong Wang, who recently resolved the Kakeya Conjecture, spoke in this very hall. In the lounge there is a large poster of Yitang Zhang, and a statue of Shiing-Shen Chern stands at the entrance. Being there felt like stepping into a kingdom of mathematics.
Over the first two days, Professor Marcel Nutz introduced Optimal Transport and Entropic Optimal Transport. Optimal Transport concerns moving one probability measure to another at minimal cost. Entropic Optimal Transport adds a Kullback–Leibler divergence regularization term to that problem.

On days three and four, Professor Jonathan Niles-Weed discussed convergence rates of empirical measures under various Wasserstein distances. He explained two main methods. The first method, called the primal approach, proceeds directly from the definition. The second method, called the dual approach, is analogous to duality in convex optimization.



It reformulates the original problem as a dual problem that is easier to solve and then identifies conditions under which the dual solution equals the primal solution.

For the remaining lectures, Professor Promit Ghosal presented a wide range of topics. His research spans the KPZ equation, the KPZ relation in discrete graphs, Schramm–Loewner evolutions with connections to quantum field theory, and Optimal Transport. He covered the Sinkhorn algorithm for computing entropic optimal transport and introduced the concept of Wasserstein gradient flows. Due to time limitations, much of the material was presented at a high level.

He then touched on applications to neural networks and Transformer architectures. I did not follow every detail, but my classmates specializing in machine learning were visibly excited. It was inspiring to see how these ideas bridge so many different areas.

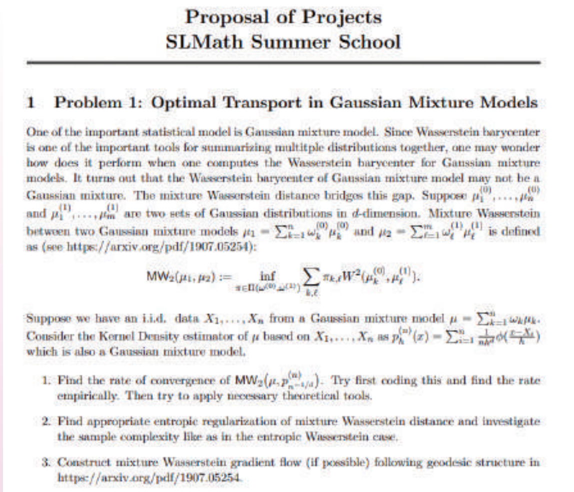
2. Peer Interactions: This was the most rewarding part for me. Between lectures, there was a half-hour tea break, and every afternoon was reserved for open discussion—plenty of opportunities to mingle and learn from one another. Participants came from all over the world (for example, one student completed a music degree in Russia before returning to the U.S. to study mathematics—so cool!). Because the topics spanned optimal transport, PDEs, probability, optimization, machine learning, statistics, and SDEs, everyone approached problems from very different angles, and I thoroughly enjoyed that vibrant, collaborative atmosphere. I found these interactions to be immensely beneficial for my own understanding and growth.

Another highlight was getting advice from the more senior participants. NCTS typically sends undergraduates and master's students, whereas most of the SLMath attendees were PhD candidates. I picked their brains about graduate-school applications and which programs to consider—originally I had only planned to apply in the U.S., but current policy uncertainty has prompted me to develop backup options as well.

I also had especially deep conversations with two students—one working on optimization and another on random matrix theory. What impressed me most was their boundless passion and initiative: after I presented my research on the Kuramoto model one afternoon, by that very night they were already reading the relevant papers and suggesting new directions. I felt humbled by their dedication. We later discovered that we had all read work by the same author, Shuyang Ling, albeit from different perspectives. Since the Kuramoto model minimizes energy at synchronization, it naturally lends itself to an energy-optimization viewpoint. Colleagues are also keen to understand synchronization on random graphs, current conjectures suggest that, for a homogeneous Kuramoto model on an Erdős–Rényi graph, the limit behavior of synchronization mirrors the graph's connectivity threshold as the number of oscillators grows. We spent nearly every evening hashing out these ideas in our apartment and decided to pursue a joint study of the Kuramoto model on both Erdős–Rényi and d-regular graphs. We're excited to see where it leads.

"The foremost objective of this summer school is to create a dynamic learning environment that unites students from diverse backgrounds such as PDE theory, probability, or optimal transport." I believe SLMath achieved this perfectly.

During the summer program, my peers and I tackled Problem 1. We already possess a deep understanding of both the Wasserstein distance and the Wasserstein gradient flow in the pure Gaussian case. This problem seeks to extend those results to Gaussian mixtures. To date, we have obtained numerical findings as well as theoretical results in the simplified scenario where all covariances are identical. We plan to carry this work forward through online discussions.


Proposal of Projects
SLMath Summer School

1 Problem 1: Optimal Transport in Gaussian Mixture Models

One of the important statistical model is Gaussian mixture model. Since Wasserstein barycenter is one of the important tools for summarizing multitple distributions together, one may wonder how does it perform when one computes the Wasserstein barycenter for Gaussian mixture models. It turns out that the Wasserstein barycenter of Gaussian mixture model may not be a Gaussian mixture. The mixture Wasserstein distance bridges this gap. Suppose $\mu_1^{(0)}, \dots, \mu_n^{(0)}$ and $\mu_1^{(1)}, \dots, \mu_m^{(1)}$ are two sets of Gaussian distributions in d-dimension. Mixture Wasserstein between two Gaussian mixture models $\mu_1 = \sum_{k=1}^n \omega_k^{(0)} \mu_k^{(0)}$ and $\mu_2 = \sum_{\ell=1}^m \omega_\ell^{(1)} \mu_\ell^{(1)}$ is defined as (see https://arxiv.org/pdf/1907.05254):

$$\mathsf{MW}_2(\mu_1, \mu_2) := \inf_{\pi \in \Pi(\omega^{(0)}, \omega^{(1)})} \sum_{k,\ell} \pi_{k,\ell} W^2(\mu_k^{(0)}, \mu_\ell^{(1)}).$$

Suppose we have an i.i.d. data $X_1, \dots, X_n$ from a Gaussian mixture model $\mu = \sum_{k=1}^n \omega_k \mu_k$. Consider the Kernel Density estimator of μ based on $X_1, \dots, X_n$ as $p_h^{(n)}(x) = \sum_{i=1}^n \frac{1}{nh^d} \phi(\frac{x - X_i}{h})$ which is also a Gaussian mixture model.

1. Find the rate of convergence of $\mathsf{MW}_2(\mu, p^{(n)}_{n^{-1/d}})$. Try first coding this and find the rate empirically. Then try to apply necessary theoretical tools.
2. Find appropriate entropic regularization of mixture Wasserstein distance and investigate the sample complexity like as in the entropic Wasserstein case.
3. Construct mixture Wasserstein gradient flow (if possible) following geodesic structure in https://arxiv.org/pdf/1907.05254.

Another student Yu-Yo Wong attended one of the 2025 SLMath Summer Graduate Schools as a first-year Ph.D. student in the Institute of Applied Mathematics at National Yang Ming Chiao Tung University. Here is his reflection on the experience:

Yu-Yo Wong | 翁毓佑

Mathematics of Climate, Sea Ice, and Polar Ecosystems (Fairbanks, Alaska)
University of Alaska Fairbanks
June 14 – June 29, 2025

This summer course lasted for two weeks, with ten days of classes. Each day, there were two one-hour lectures. The speakers were professors and research partners from the University of Utah and the University of Alaska. Participants were Ph.D. and master's students from around the world. The course content focused on polar climate, polar ecology, and, more specifically, how to combine field survey results and data for different modeling approaches. A wide variety of mathematical tools were introduced, such as differential equations, probability and random variables, discrete mathematics, and graph theory. The mathematical results from these models were always paired with biological explanations and real-world phenomena.

Additionally, the professors had previously conducted fieldwork in the Arctic and Antarctic using icebreakers. Their engaging teaching style vividly conveyed these experiences. Since the University of Alaska Fairbanks is located near the Arctic Circle, the campus houses many research tools required for polar fieldwork. Besides lectures, we also visited their laboratories to observe instruments and learn how they study sea ice in practice.

Although we were sitting in classrooms, the diversity of the course content gave us an immersive experience in polar ecology, truly fruitful!

During the last two days of the course, the professors asked us to design a small research project (mini project) with our group members, based on what we had learned (polar ecology, mathematical tools, etc.). The project could take the form of a literature review or an initial exploration of an extended problem (establishing research direction, describing methods, and identifying potential challenges).

Our group's mini project was "Tipping in a Plant-Herbivore Model." The mathematical model is as follows:

$$\frac{dP}{dt} = r(t)P - CP^2 - H\,g(P),$$
$$\frac{dH}{dt} = \left(E\,e^{-bP}g(P) - m(t)\right)H,$$

P represents the plant (prey). H represents the herbivore.

My task was to introduce the bifurcation behavior of this model based on relevant literature and to attempt using the numerical continuation software AUTO to simulate how to trace from equilibrium points to different bifurcation points. This allowed us to identify possible interesting dynamical behaviors of the model and provide corresponding biological interpretations. Looking ahead, a potential research direction would be to attempt theoretical proofs of the existence of bifurcation points in this model.

Here are some previous participants in 2025:

Shang-Yu Wu (NTU)
Ruey-An Shiu (NTU)
Yu-Yo Wong (NYCU)
Tzu-Han Chou (NCTS)
Yin-Chien Tu (NTU)

Yu-Sheng Shih | 施佑昇

PCMI Graduate Summer School on Extremal and Probabilistic Combinatorics
IAS/Park City Mathematics Institute
July 5-August 3, 2025

This year, I attended the PCMI Graduate Summer School on Extremal and Probabilistic Combinatorics. Over the three-week program, I took part in nine intensive mini-courses taught by internationally renowned scholars and actively engaged in daily problem sessions, where I exchanged ideas with participants from around the world. In addition to the courses, each day featured invited lectures and a variety of social and academic activities, offering both intellectual stimulation and opportunities for interaction. The lineup of speakers was truly exceptional, including leading figures such as Noga Alon in extremal combinatorics, alongside professors, postdocs, graduate students, and undergraduates from top institutions worldwide. Through the courses, lectures, and activities, the program naturally fostered a cross-level, cross-cultural academic community that encouraged the sharing of experiences and collaboration across different backgrounds and stages of study.

During the program, a wide range of courses were offered across different topics. Among them, I found Matija Bucić's Sublinear Expander Graphs, Imre Leader's Intersecting Families, and Shachar Lovett's From Sunflowers to Thresholds especially impactful. These courses respectively explored the diverse applications of expander graphs in graph-theoretic and algorithmic problems; bounds in extremal set theory arising from intersection structures and sunflower properties; and the use of such combinatorial structures in questions related to computational complexity. They not only revealed the structural beauty of combinatorics but also provided inspiring insights for theoretical computer science, helping me appreciate the deep connections between the two fields.

In the problem sessions for each course, I was able to engage in in-depth discussions with PhD students from around the world, exchanging problem-solving approaches and research experiences, which sparked many new ideas. In addition, the invited talks, experience-sharing sessions, and informal social activities gave me a more comprehensive understanding of the research landscape and international collaborative culture in combinatorics. They also allowed me to expand my academic network and make meaningful connections with foreign scholars, further solidifying my commitment to pursuing research in this field.

Participating in PCMI was an immensely valuable and rewarding experience for me. It significantly enhanced my professional knowledge, research ability, academic perspective, and network, while also helping me more clearly define my future research direction. One regret, however, is that the program does not seem to be widely known at NTU. I only learned about it afterward, and some classmates who are equally passionate about extremal combinatorics unfortunately missed the opportunity. It might be worthwhile in the future to increase the visibility of such international programs and related funding channels on campus, so that more students with similar interests can take part and benefit from them.

Building a Pathway for Future Scholars

NCTS Undergraduate Cultivation Programs

The NCTS Mathematics Division not only supports overseas opportunities but also invests heavily in local training, offering two complementary undergraduate programs that form a coherent research pipeline. The six-week Undergraduate Summer Research Program (USRP) helps students discover interests and build core skills, while the nine-month Undergraduate Research Program (URP) deepens those skills through sustained work on focused topics. Together with the NSTC Undergraduate Research Grant as the advanced step, this pathway supports students from first exposure to competitive, publishable research.

The USRP, held each July, is an intensive entry point into research. The program opens with Boya Lectures to introduce themes and mentors, then continues with weekly faculty- or postdoc-led meetings, collaborative problem solving, and, when possible, co-advising with international scholars. Teams are encouraged to be diverse and interdisciplinary, mirroring real research environments. The aim is to spark curiosity, help students learn the language of mathematics, and gain confidence in working on open questions.

2024 Undergraduate Research Program(2024.10.1-2025.6.30)

The 2024 NCTS Undergraduate Research Program (URP) brought together 14 undergraduate students from universities across Taiwan to participate in long-term research projects under the supervision of leading faculty mentors in mathematics and related disciplines.

A total of eight research groups were formed, covering diverse and exciting areas such as probability theory, random processes, geometric analysis, Lie group representations, deep learning, and quantum information theory.

To enhance the students' research experience, the program included two special activities. The first was a research experience sharing session led by several NCTS research assistants, who discussed their personal research journeys and offered practical advice on how to develop research skills and approach mathematical problems independently.

The second was an inspiring talk by Professor Hao-Wei Huang from National Tsing Hua University, who shared his research experiences and provided valuable guidance on academic presentation techniques and effective communication of mathematical ideas.

The program concluded with a final presentation meeting, where all students presented their research progress and exchanged feedback with mentors and peers. The atmosphere was lively, and the discussions were thoughtful and stimulating. Several groups made notable progress and developed original insights in their respective research topics.

Notably, one student from this program will pursue graduate studies in France after completing the URP — a testament to the program's success in nurturing young researchers.

The NCTS 2024 URP provided a vibrant and supportive platform for undergraduate students to experience the excitement of mathematical research, cultivate collaboration, and strengthen their foundation for future academic pursuits.

Building on this momentum, the URP, running from October to June, provides structured mentorship and steady growth. Students craft a study plan, report progress mid-year and at the conclusion, and submit a final English report. URP emphasizes reading foundational papers, formulating questions, and communicating results.

2025 Undergraduate Summer Research Program (2025.7.7-8.15)

The 2025 NCTS Undergraduate Student Research Program (USRP) brought together 19 students across 5 research groups, supervised by faculty mentors from National Taiwan University, National Tsing Hua University, National Central University, National Cheng Kung University, Tamkang University, and National Taiwan Ocean University(Department of Hydraulic and Ocean Engineering).

This year's program also welcomed two students from Hong Kong and one student from Singapore, adding an international dimension to the research community. Over the summer, students engaged in diverse and stimulating projects, exploring topics that ranged from representation theory and algebraic geometry to kinetic theory, variational modeling, and tensor analysis with engineering applications.

As part of the program's enrichment activities, students had the opportunity to meet with Professors Lani Wu and Steven Jeffrey Altschuler from the University of California, San Francisco on July 30, 2025. In their talk, titled "Our Journey from Mathematics to Biomedical Research: Searching for Low-Dimensional Representations of Complex Biological Problems," Professors Wu and Altschuler shared their inspiring career paths and interdisciplinary research connecting mathematics, data science, and biomedical systems. The discussion encouraged students to think broadly about how mathematical reasoning can illuminate complex scientific questions.

During the final report presentation, participants engaged in lively and thoughtful discussions. Each group presented their progress, reflected on challenges, and shared their discoveries. Notably, several teams made original findings and meaningful advances in their respective research areas, demonstrating both creativity and depth.

The NCTS USRP program continues to provide an inspiring platform for young researchers—fostering collaboration, curiosity, and the joy of discovery in mathematics and its connections to the sciences.

The full loop culminates with the NSTC Undergraduate Research Grant, which allows students to refine topics and produce deeper results. By the following February, many reach a level sufficient for short research papers and competitive submissions, such as the Mathematical Society's Outstanding Undergraduate Award. Through this training ladder, NCTS strives to cultivate future mathematicians with both global vision and solid foundations. NCTS thus serves both as a training hub and an information platform for high-value opportunities at leading universities worldwide. Interested students are warmly invited to watch the NCTS website for calls and timelines and to discuss potential topics with faculty mentors.

NCTS Courses: 2025 Highlights

The past year has been a fruitful one for the NCTS Mathematics Division, with an array of inspiring courses across diverse fields. In May, we had the honor of hosting Prof. Yujiro Kawamata, who delivered a Mini-course on Deformation Theory, focusing on advanced topics in the deformation theory of algebraic varieties.

In September, to complement the visit of Prof. Ching-Li Chai, Prof. Chia-Fu Yu organized two preparatory short courses—A Short Course on Complex Abelian Varieties and Introduction to Dieudonné Theories. These served as groundwork for Prof. Chai's ongoing course Moduli of

The List of NCTS Courses

2025

1/3-5/9	Lectures on WKB methods of 2nd order complex ODE
2/17-18	Integration of Simulation, Data, and Machine Learning on a Heterogeneous Supercomputer System
2/24-3/17	Taiwan Mathematics School: Geometry, Algebra, and Topology with a view towards application and computation
2/27-6/12	Taiwan Mathematics School: From Differential Geometry to tt* Geometry-(2)
4/2-23	Limit theorems: from Lindeberg principle to SPDEs
5/2-9	Mini-course on Deformation Theory: Topics in deformation theory of algebraic varieties
5/19-28	Parameter and structure estimations in statistical physics
6/2-11	2025 NCTS Summer School on Fluid Dynamics and Kinetic Theory
6/10-20	A short course on complex abelian varieties
6/16-19	Facets of Symplectic Geometry
6/25-27	Iwasawa Theory Taipei Summer School
7/4	Expanders, Cayley Graphs, and Representation Theory of Finite Groups
7/9- 15	Introduction to Dieudonné theories

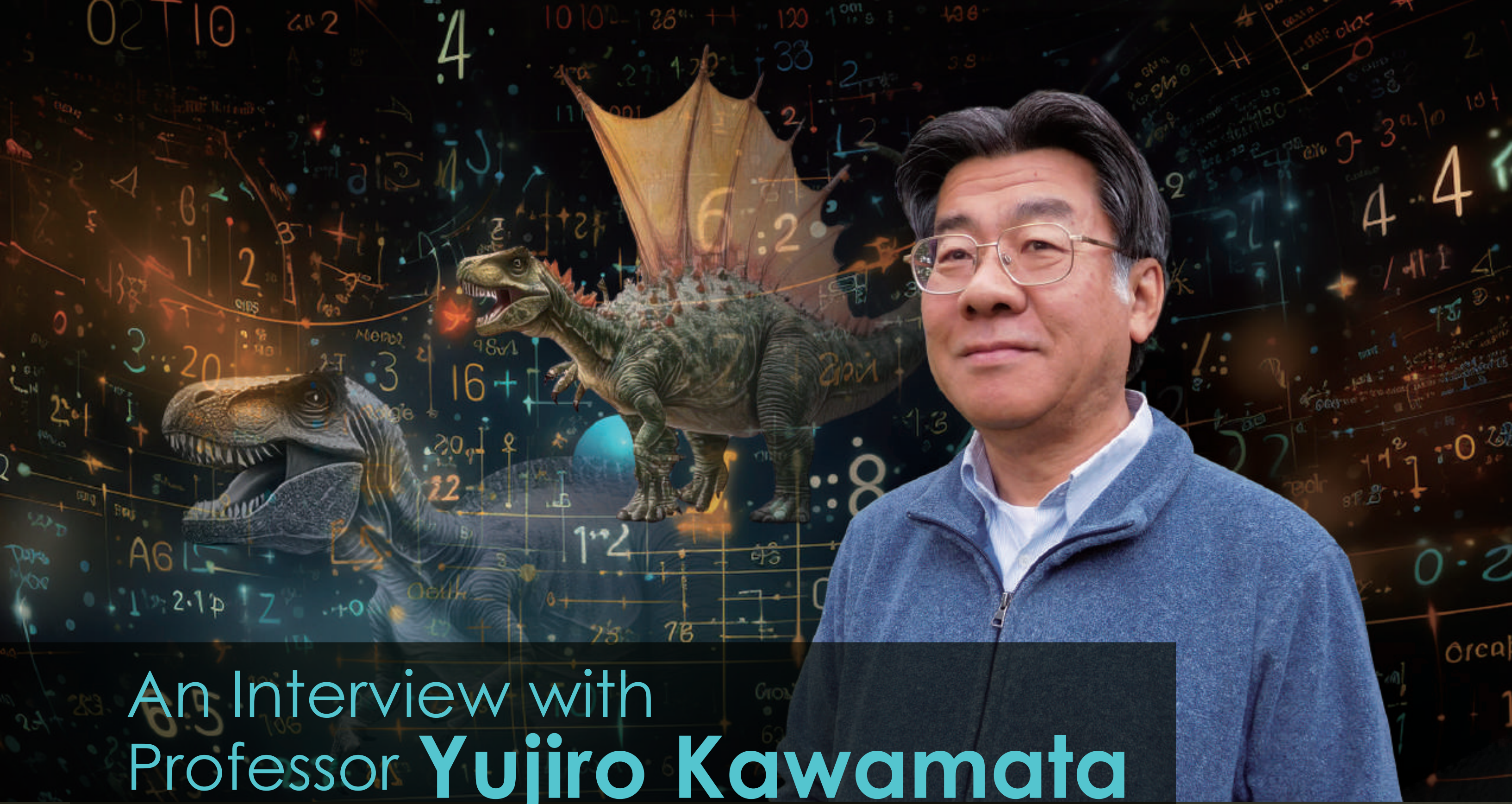
Abelian Varieties and Hecke Symmetry, which explores fine structures of moduli spaces in characteristic p. This series has drawn wide interest from faculty, postdocs, and graduate students alike.

Other summer highlights included Prof. Sze-Bi Hsu and Prof. Jia-Yuan Dai's program Global Dynamics of Competitive Systems under Seasonal Succession, joined by Prof. Lei Niu to discuss frontier topics of competitive dynamical systems, focusing on the global dynamics of three-dimensional Lotka–Volterra models with seasonal succession. The field of mathematical biology also flourished: Prof. Feng-Bin Wang and Prof. Tai-Chia Lin co-hosted Mathematical Modeling and Analysis of Infectious Diseases, which combined tutorials and interdisciplinary discussions for students from mathematical and biomedical backgrounds. Meanwhile, Prof. Te-Sheng Lin invited Prof. Lani Wu and Prof. Steven Altschuler to teach Quantitative Approaches to Modeling and Analyzing Complex Biological Systems, a hands-on course emphasizing how mathematical models illuminate the principles behind self-organization and adaptability in biological networks.

As the fall semester unfolded, Prof. Ulrich Menne offered a foundational course on Geometric Measure Theory, while Prof. Adeel Khan launched Constructible Sheaves and Vanishing Cycles in mid-October, introducing students to the formalism of constructible sheaves and their role in the cohomological study of algebraic varieties.

Looking ahead to 2026, NCTS remains committed to delivering courses that combine depth, breadth, and international collaboration. With a strong tradition of inviting leading scholars and fostering student-centered training, we look forward to another year of dynamic academic exchange and meaningful growth for the mathematical community.

7/14-17	Summer School on Differential Ge-ometry
7/21-25	Mathematical Modeling and Analysis of Infectious Diseases
7/21-24	Global dynamics of competitive systems under seasonal succession
7/21-25	Langlands Duality and Symmetric Varieties
8/7-12	Quantitative approaches to modeling and analyzing complex biological systems
9/5-19	Taiwan Mathematics School: Geometric Measure Theory I
9/8-9/15	NCTS Mini-course on moduli spaces: Wall-crossing for moduli spaces of higher dimensional varieties and applications
9/17-12/19	Moduli of abelian varieties and Hecke symmetry
10/3-2026/1/16	An Introduction to Mathematical Epidemiology
10/14-12/31	Taiwan Mathematics School: Constructible Sheaves and Vanishing Cycles



An Interview with Professor Yujiro Kawamata

On Mathematics, Craftsmanship, and Waiting for Dinosaurs to Go Extinct

Interviewers: Prof. Jungkai Chen (National Taiwan University)
Prof. Hsueh-Yung Lin (National Taiwan University)
Interviewee: Prof. Yujiro Kawamata (The University of Tokyo)
Date and Venue: May 2024, National Center for Theoretical Sciences

Prof. Jungkai Chen:
We are honored to welcome Professor Yujiro Kawamata from the University of Tokyo. You are widely recognized as a leading figure in mathematics, with significant contributions dating back to the late 1980s and early 1990s. To begin, could you share how your journey into mathematics began?

Prof. Yujiro Kawamata:
Even during my university years, I hadn't firmly decided to become a mathematician. I had always enjoyed mathematics-particularly calculations-but I also had a deep interest in literature and read extensively. Fortunately, the University of Tokyo's curriculum did not require students to choose a major immediately, which gave me time to explore. When the time came to choose between the sciences and the humanities, I leaned toward science. By my fourth semester, I had to declare a major and chose mathematics—not with absolute certainty, but because it felt like the most suitable path for me at the time.

Prof. Jungkai Chen:
Did you already have a particular interest in geometry or any other area?

Prof. Yujiro Kawamata:
At that stage, I didn't have much familiarity with specific fields. In my third year, I took

a course on algebraic geometry taught by Professor Shigeru Iitaka. He was energetic and highly original in his teaching. I remember once pointing out an error in his proof during class. He came over, sat on my desk, and thanked me! I was deeply impressed by his openness and his commitment to finding his own proofs. That experience sparked my interest in algebraic geometry. His teaching assistant, Mr. Kazumi Akao, also gave us very challenging exercises. At first, my inability to solve them discouraged me, but I was ultimately inspired by Professor Iitaka's success in building theories from first principles.

Prof. Jungkai Chen:
Was Professor Kunihiko Kodaira also an influence on you?

Prof. Yujiro Kawamata:
That came a bit later. When I was an undergraduate, he was the Dean of the Faculty of Science and very busy, so he didn't teach undergraduate courses. By my fourth year, he was retiring. I attended his final lecture—it was a large colloquium-style talk—and I found it very inspiring. He used an evolutionary analogy: in the age of dinosaurs, mammals were small creatures hiding in caves, but after the dinosaurs went extinct, mammals flourished. He said mathematics was similar—you shouldn't just chase the popular topics, which are like the dinosaurs. Instead, start your own research in a quiet "cave"—and over time, it may grow into something significant. That philosophy left a lasting impression on me.

My first paper was on a generalization in the "log case," which was far from the mainstream at the time. Many people thought the idea was too simplistic and wouldn't last. But it did. I still remember how happy I was when I first discovered the result—I was on a train to Nagano prefecture. For me, physical movement like traveling often triggers new ideas. Just sitting at my desk rarely works. That's why I like to travel—it always gives me something.

Prof. Jungkai Chen:
Professor Iitaka was also one of the pioneers of log theory, wasn't he?

Prof. Yujiro Kawamata:
Yes, the idea originally came from him. He was inspired by the generalization of Hodge theory to open algebraic varieties and thought that a "log" version of algebraic geometry should be developed. He even coined a creative slogan, calling a "log surface" something like "dimension 2.5," suggesting it was an intermediate stage between the well-studied two-dimensional and the much more difficult three-dimensional cases. My own work developed from there.

Prof. Hsueh-Yung Lin:
From your point of view, how has algebraic geometry evolved over the past decades?

Prof. Yujiro Kawamata:
I can't give a complete overview, but I can share some impressions. One major development is the Minimal Model Program (MMP). When I started, the MMP in dimension two was well understood, but many thought extending it to three dimensions was impossible. There was even a paper arguing that the existence of "flips" implied minimal models couldn't exist.

However, by redefining certain concepts and incorporating what were once seen as pathological elements—like singularities—into the theory, mathematicians like Shigefumi Mori made the MMP viable. It's a perfect illustration of Kodaira's philosophy: the field was once a small cave, and now it's flourishing.

Another major development is in Hodge theory. It was once seen as elegant but impractical, yet it turned out to be essential for understanding the positivity of fibrations. And of course, the "log" methods—once seen as a niche generalization—have now become fundamental tools.

Prof. Hsueh-Yung Lin:
What about derived geometry?

Prof. Yujiro Kawamata:
I started exploring derived categories because many talented people were entering the MMP, and I'm not a particularly competitive person. A paper by Bondal and Orlov re-

vealed the potential of this area to me. However, derived geometry eventually became too abstract and conceptual for my taste. I prefer more concrete approaches.

Prof. Jungkai Chen:
Algebraic geometry is often seen as difficult to approach. What advice would you give to young students?

Prof. Yujiro Kawamata:
It's true that scheme theory and commutative algebra can be intimidating. My advice is: don't try to master everything at the outset. Instead, begin with a concrete problem that interests you. As you work through it, you'll encounter situations where you need to understand aspects of scheme theory. That's when you go back and study them-with purpose. This cycle gives meaning to the abstract theory.

The key is motivation. When I was in elementary school, I read One Two Three... Infinity by George Gamow. It explained Cantor's diagonal argument showing that the real numbers are "more numerous" than the natural numbers. I didn't fully understand it, but I was fascinated by the elegance of the proof. It felt like a form of craftsmanship.

I think this appreciation for craftsmanship is part of Japanese tradition and is reflected in how many Japanese mathematicians approach the subject. We often begin with calculations and examples rather than overarching philosophies-a "bottom-up" rather than "top-down" approach. For young students, exposure to engaging science books and mathematical stories is often more effective than formal instruction alone.

Prof. Jungkai Chen:
In today's academic world, we hear a lot about AI, quantum computing, and big data. What are your thoughts on these trends?

Prof. Yujiro Kawamata:
These are promising developments-they're grounded in mathematics and have helped increase support for our field, including funding. Even if these areas don't always use cutting-edge math, they rely on strong foundational knowledge like algebra and manifold theory.

AI is a useful tool, but it must be used with care. If you already have a good foundation, AI can help you refine your work. But if you rely on it without mastering the basics, you won't grow. New technologies often bring benefits, but they also present risks. For example, when I'm on a train, I can't read or write, so I just think. That restriction can be productive. If AI is always at hand, you may be tempted to use it instead of thinking deeply yourself-and that's dangerous.

Prof. Jungkai Chen:
What is your dream in mathematics?

Prof. Yujiro Kawamata:
My dream is simple: I want to discover new, elegant ways to prove things. I enjoy finding small tricks or new perspectives that make difficult theorems easier to understand.

Prof. Hsueh-Yung Lin:
Returning to the MMP, what's your perspective on major open problems like the abundance conjecture?

Prof. Yujiro Kawamata:
I believe the termination part is within reach and should eventually be proved. The abundance conjecture is harder-it seems to touch on deep analytic and algebraic properties. Still, if I had to place a bet, I would say it's true. I know some researchers, like Christopher Hacon, have made great efforts to find counterexamples but haven't succeeded so far.

Prof. Jungkai Chen:
Thank you so much for sharing your thoughts with us. This has been a truly insightful and inspiring conversation.

Prof. Yujiro Kawamata:
Thank you. Your questions were excellent.

2024 Young **Theoretical Scientist** Award

To encourage outstanding early-career research in the mathematical sciences, the National Center for Theoretical Sciences (NCTS) established the Young Theoretical Scientist Award. The award honors promising scientists (typically under 40 and at or below the rank of Associate Professor/Associate Research Fellow) who demonstrate originality and impact. Each recipient receives a two-year research grant of NT$200,000 annually (including an NT$60,000 honorarium and up to NT$140,000 for travel or international collaboration), together with an NCTS medal.

The 2024 awardees are Yen-Huan Li (NTU) and Van Tien Nguyen (NTU).
(Profiles of both awardees will be introduced in the following section.)
To further promote research excellence, the NCTS Mathematics Division also launched the Outstanding Paper Award in 2024. The award recognizes up to six high-quality papers each year authored by researchers in mathematics-related departments in Taiwan who have acknowledged NCTS support. Each winner receives NT$30,000 and a certificate, and will present their research at the NCTS Award Ceremony. Priority is given to early-career scholars.

Dr. Yen-Huan Li

Dr. Yen-Huan Li is an Associate Professor in the Department of Computer Science and Information Engineering at National Taiwan University, a position he has held since 2023. He is also jointly affiliated with the Department of Mathematics. Prior to this, he served as an Assistant Professor at the same university from 2018 to 2023.

His academic journey began at National Taiwan University, where he earned a Bachelor of Science in Engineering (B.S.Eng.) in Electrical Engineering with a minor in Economics (2004–2008) and a Master of Science (M.S.) in Communication Engineering (2008–2010). He then pursued his doctoral studies at École polytechnique fédérale de Lausanne (EPFL), obtaining a PhD in Computer Science in 2018.

Dr. Li's research interests lie in designing and analyzing algorithms for machine learning and optimization, particularly for decision-making under uncertainty without strong assumptions about reality. His main research fields include Machine Learning, Optimization, High-Dimensional Statistics, and Quantum Information.

He has made a substantial impact on learning-based compressive sensing techniques; his paper on learning-based compressive MRI has been cited over 150 times, highlighting its importance in the field. Dr. Li has also made notable contributions to the theory of convex optimization, with specific analyses of algorithms like Frank-Wolfe and mirror descent.

His recent work focuses on online mirror descent algorithms and their applications in areas such as online portfolio selection and quantum state estimation. He has successfully generalized the Follow-the-Regularized-Leader (FTRL) method for non-smooth and non-Lipschitz continuous settings and has investigated stochastic dual averaging methods, improving many regret bounds in a unified way. His research has been published in prominent machine learning conferences like NeurIPS, as well as leading conferences in information theory and quantum informatics, such as ISIT.

Dr. Van Tien Nguyen

Van Tien Nguyen was preparing his PhD during the period 2011-2014 under the guidance of Hatem Zaag at Université Sorbonne Paris Nord, he held a Research Associate position at New York University - Abu Dhabi Campus during the period 2014-2022 and was appointed as Assistant Professor at the National Taiwan University in 2022.

Dr. Nguyen's research area is the qualitative analysis of nonlinear partial differential equations (PDE's), which is fundamental for the mathematical modeling of physical and biological phenomena. More specifically, he has produced an impressive series of results on the description of blow-up singularities for nonlinear parabolic problems. This includes semilinear reaction-diffusion equations, the Keller-Segel system from chemotaxis modeling, the harmonic map heat flow and the Ginzburg-Landau equation. Another direction of his research is about wave maps. On each of them, Dr. Nguyen's work contains contributions of the highest quality at the international level.

With his collaborators, Van Tien marks an initial step toward the classification of singularities in critical regimes. His work is not merely to present the well-known blowup results for the 2D Keller-Segel system, but to develop a robust analysis framework capable of addressing the classification question considered as ambitious within the community. In particular, he introduce a rigorous framework based on a spectral analysis of multiple-scale eigenproblems combined with a rigorous matching asymptotic expansion to investigate blowup phenomena in critical settings.

With his collaborators, Van Tien brings a brand new mechanism of singularity formation involving strong interaction/collision of several solutions with self-similarity and radiation for a nonlinear parabolic system. So far, except in some integrable PDEs where explicit formulas for multiple-soliton solutions are known, the question of the collision of solitons (soliton-soliton interaction) is much less understood. Most previous studies have focused on global-in-time solutions. For the first time, he develop a robust comprehensive framework to rigorously construct such blowup solutions involving simultaneously the non-radial collision and concentration of several solitons.

Research Spotlight

Dr. Yen-Huan Li

This year, we are pleased to introduce our 2024 Young Theoretical Scholar Award recipients: Yen-Huan Li and Van Tien Nguyen, who share insights into their research in the following articles.

Background

I am a machine learning theorist, and I have been developing rigorous and efficient algorithms for handling the logarithmic loss. This loss arises naturally in a variety of applications, including universal data compression in information theory, online portfolio selection in mathematical finance, positron emission tomography in medical imaging, quantum state tomography for quantum computation, and the definitions of several quantum information-theoretical quantities.

Despite the relevance of these applications in their respective fields, neither the logarithmic loss nor its gradients are Lipschitz continuous, violating standard assumptions in the literature. As a result, standard algorithms and their theoretical guarantees do not directly apply. Handling the logarithmic loss—both rigorously and computationally efficiently—remains a challenging problem that calls for novel theoretical developments.

I have been particularly interested in online portfolio selection. This problem originates from a betting interpretation of Shannon entropy, has applications in mathematical finance, and serves as a foundation for game-theoretic statistics, which aims to develop robust, anytime-valid statistical methods. Since it was posed in 1991, designing an optimal online portfolio selection algorithm has remained a classic open problem in machine learning the-

ory. For example, the problem of "fast and optimal online portfolio selection" was raised and discussed during the open problem session at the 33rd Conference on Learning Theory (COLT) in 2020-a leading conference dedicated to machine learning theory-despite the problem's long history.

I also study the quantum generalization of online portfolio selection, known as the online learning of quantum states. This generalization was independently proposed by us at the 24th Annual Conference on Quantum Information Processing (QIP 2021) [1]. The premier venue for theoretical quantum information research-and by Zimmert et al. at COLT 2022. The problem has applications in quantum state tomography and shadow tomography, both of which are essential for building reliable quantum computing devices. The non-commutative nature of the quantum setting introduces additional, highly nontrivial technical challenges.

Both online portfolio selection and the online learning of quantum states are examples of so-called online learning problems, which can be viewed as two-player, multi-round games. In an online learning problem, there are two primary performance measures: computational efficiency and regret rate-the difference between the cumulative loss incurred by an online learning algorithm and the best possible cumulative loss in hindsight. Our objective in these two problems is therefore to achieve a trade-off between efficiency and regret rate that is not dominated by any existing result. The ultimate question-whether one can simultaneously achieve optimal efficiency and regret rate in both problems-remains open.

Our Achievements.

For online portfolio selection, I would like to highlight a class of algorithms we proposed that, for the first time, offer data-dependent regret rate guarantees [2]. In the worst case, these algorithms are guaranteed to achieve a state-of-the-art trade-off between efficiency and regret. Otherwise, they adapt automatically to the data and can simultaneously achieve both optimal regret rate and optimal computational complexity. Previously, data-dependent regret guarantees were established only for loss functions with Lipschitz continuous gradients. Although the gradient of the logarithmic loss is non-Lipschitz, we derived two local-norm-based, Lipschitz-gradient-like characterizations for it. Combined with a novel implicit variant of the optimistic online mirror descent algorithm, these characterizations yield our result.

For the online learning of quantum states, I would like to highlight two results:

- We have generalized the aforementioned local-norm-based, Lipschitz-gradient-like characterization to the quantum case and, based on this generalization, developed a randomized algorithm for maximum-likelihood quantum state tomography [3]. This algorithm is the fastest among existing algorithms, both theoretically and empirically in our numerical experiments.

- We have developed an algorithm that achieves the fastest known regret rate among computationally feasible algorithms [4]. The key to our analysis is a novel notion called VB-convexity. For any given function, we define the log-determinant of its Hessian as its associated volumetric barrier; VB-convexity is a sufficient condition that ensures the convexity of such volumetric barriers.

We have explored several mathematical structures that appear relevant to the logarithmic loss, including self-concordance, relative smoothness, Riemannian geometry, and Hilbert's and Thompson's metrics, and have obtained several results. Nevertheless, I believe we are still far from a principled understanding of the logarithmic loss. Interested readers are welcome to contribute to this line of research.

[1] C.-M. Lin, Y.-M. Hsu, and Y.-H. Li. Maximum-likelihood quantum state tomography by Soft-Bayes. 2020. arXiv:2012.15498.

[2] C.-E. Tsai, Y.-T. Lin, and Y.-H. Li, "Data-dependent bounds for online portfolio selection without Lipschitzness and smoothness," *in Advances in Neural Information Processing Systems 36 (NeurIPS 2023)*, 2023.

[3] C.-E. Tsai, H.-C. Cheng, and Y.-H. Li. Fast minimization of expected logarithmic loss via stochastic dual averaging. In *Proc. 27th Int. Conf. Artificial Intelligence and Statistics*, pages 2908–2916, 2024.

[4] W.-F. Tseng, K.-C. Chen, Z.-H. Xiao, and Y.-H. Li. Online learning of quantum states with logarithmic loss via VB-FTRL. In *Proc. 36th Int. Conf. Algorithmic Learning Theory*, pages 1285-1312, 2025.

Dr. Van Tien Nguyen

My research delves into the mathematical analysis of Nonlinear Partial Differential Equations (PDEs) originating from diverse fields such as physics, chemistry, geometry, and biology. It happens that solutions to some PDEs may develop singularity in finite time from perfectly smooth initial data, leading to the breakdown of the governing equations. The word singularity is often used to describe exceptional events at which something changes dramatically or a new structure emerges. Examples of singularities include shock waves generated by the motion of a supersonic plane, vortices described the flow around the center of a tornado, breakup of a drop of water in an environment of much greater viscosity, chemotaxis process that causes a concen- tration of cell density, touchdown phenomena in micro-electro-mechanical-systems (MEMS), or in a greatly interesting event of forming a black hole after a collapse of a supermassive star or black hole collisions, etc. My primary research objective is to develop mathematical tools for analyzing the formation and structure of these singularities - a central and actively evolving area of modern research.

Knowing that the singularity describes a great variety of phenomena appearing in natu- ral sciences and beyond, detecting or ruling out singularities is one of the most fascinating and difficult topics in modern advanced research in Mathematics. One of the seven Millennium Problems of the Clay Institute concerns the global in time regularity of solutions to the classical Navier-Stokes equations. The key obstacle for regularity is the potential formation of singularities. The same question arises for the Euler equations of fluid mechanics and numerous problems with physical or mathematical background. Singularity formation is a central aspect also in the study of geometric flows. Understanding singularities in the Ricci flow was a key element in Perelman's proof of the Poincaré conjecture. Detecting singularities is a difficult task as it requires a detailed understanding of approximate solutions exhibiting the formation of singularities, for example in the form of asymptotic expansions, and a mathematical framework to prove the existence of full solutions rather than approximate ones, by means of perturbative analysis. Inspired by these profound challenges, my research is dedicated to the existence and stability of singularities in solutions to Nonlinear PDEs, and a comprehensive classification of all possible singularity pattern formations that can emerge from general initial conditions.

My recent research focuses on the formation of singularities in the Keller-Segel equation

$$\partial_t u = \nabla \cdot \big(\nabla u + u \nabla \Delta^{-1} u\big) \quad \text{in } \mathbb{R}^d, \quad d \geq 2,$$

a model with applications in biology (cellular aggregation in chemotaxis leading to high concen- trations) and astrophysics (gravitational collapse). Notably, this equation shares similarities in its singularity scenarios with the nonlinear Schrödinger equation. The nonlocal nonlinear na- ture of the Keller-Segel equation gives rise to intricate interactions that can lead to unexpected and dramatic behavior, making a complete classification of all possible singularity patterns truly challenging. At ICM 2006, Vel´azquez formulated an open question1 on the classifica- tion for the Keller-Segel equation as: "A more ambitious version of this problem would be to

[1] J. J. L. Vel´azquez, Singular solutions of partial differential equations modelling chemotactic aggregation, International Congress of Mathematicians. Vol. III, 2006, pp. 321–338

show that all the solutions that blow up in finite time behave near the singularity as indicated in (13)-(15)". The mentioned formulas (13) - (15) relate to the blowup law of the solution, which was proved in [A.8] with the assumption that the solution behaves like a single-soliton concentration. Furthermore, we obtained a quantization of the blowup law thanks to a spec- tral analysis of multiple-scale eigenproblem studied in the accompanying work [A.7], including infinitely many novel cases. We conjecture that this quantization represents the only possible blowup laws, thereby a complete classification for the single-soliton blowup. There are other blowup solutions having a completely different behaviors reported in [A.1], [A.2], [A.3], [A.4] and [A.6]. Among these recent results, we want to highlight the spectacular *collision singu- larity* constructed in [A.2], as it presents a novel mechanism of singularity formation driven by the strong interaction of several self-similar solutions with radiation, a phenomenon largely unexplored for general nonlinear parabolic PDEs. So far, except in some integrable PDEs where explicit formulas for multiple-soliton solutions are known, the question of the collision of solitons (soliton-soliton interaction) is much less understood. Most previous studies have focused on global-in-time solutions. For the first time, we provided in [A.2] a robust compre-hensive framework to rigorously construct such blowup solutions involving simultaneously the non-radial collision and concentration of several solitons.

The study of singularities in nonlinear PDEs remains a vibrant and challenging frontier in mathematics, with profound contributions to the broader advancement of the theory of nonlinear PDEs. My research will continue exploring the nature of singularities in more complex evolution problems such as the complex Ginzburg-Landau equation whose simpler blowup structures were exhibited in [A.5], and potentially in models from fluid mechanics. While the past three decades have witnessed remarkable progress in constructing solutions exhibiting finite-time singularities, their classification remains a largely open challenge. This classification question will be a central focus of my future work, starting with the Keller-Segel equation, a subject of my research since 2020, before extending to other intricate evolution problems.

References

[A.1] (with N. Nouaili and H. Zaag) *Construction of type I-Log blowup for the Keller- Segel system in dimensions 3 and 4*, Annals of PDE, 2025. [DOI]

[A.2] (with C. Collot, T. Ghoul and N. Masmoudi) *Singularity formed by the collision of two collapsing solitons in interaction for the 2D Keller-Segel system*, [arXiv], 2024.

[A.3] (with Thomas Y. Hou and P. Song) *Axisymmetric type II blowup solutions to the three dimensional Keller-Segel system*, [arXiv], 2025.

[A.4] (with Z. Wang and K. Zhang) *Infinitely many self-similar blow-up profiles for the Keller-Segel system in dimensions 3 to 9*, [arXiv], 2025.

[A.5] (with J. Chen, Thomas Y. Hou and Y. Wang) *On the stability of blowup solutions to the complex Ginzburg-Landau equation in* $\mathbb{R}^d$, [arXiv], 2024.

[A.6] (with C. Collot, T. Ghoul, N. Masmoudi) *Collapsing-ring blowup solutions for the Keller-Segel system in three dimensions and higher*, Journal of Functional Analysis, 2023. [DOI]

[A.7] (with C. Collot, T. Ghoul, N. Masmoudi) *Spectral analysis for singularity forma- tion of the two dimensional Keller-Segel system*, Annals of PDE, 2022. [DOI]

[A.8] (with C. Collot, T. Ghoul, N. Masmoudi) *Refined description and stability for singular solutions of the 2D Keller-Segel system*, Comm. Pure Appl. Math, 2021. [DOI]

Surjeet Choudhary **April 1, 2025 -**

Surjeet Singh Choudhary is a postdoctoral fellow at the National Center for Theoretical Sciences (NCTS). His mentor is Chun-Yen Shen.

He received his Ph.D. from Indian Institute of Science Education and Research, Bhopal, India in July 2024 under the supervision of Professor Saurabh Shrivastava. Later, he was a postdoctoral fellow at Indian Institute of Science Education and Research, Mohali, India.

His research interest is in Harmonic analysis. In particular, he studies boundedness properties of bilinear operators such as bilinear Bochner-Riesz operator and bilinear spherical maximal function.

New Postdocs Fellows

Jhih-Hong Lyu **August 1, 2025 -**

Jhih-Hong Lyu is a postdoctoral fellow at the National Center for Theoretical Sciences (NCTS). His mentor is Professor Tai-Chia Lin and Professor Chiun-Chuan Chen.

He received his Ph.D. from National Taiwan University in 2025 under the supervision of Professor Tai-Chia Lin.

In his dissertation, he derives the Poisson-Boltzmann (PB) equation with steric effect and studies the boundary layer solutions to PB type equations.

His research interests include partial differential equations, differential equations, asymptotic behavior, and mathematical biology. Recently, he studies perturbation problem of PB equations and mean-field equation with blow-up behavior.

Tathagata Ghosh **August 4, 2025 -**

Tathagata (Tat) Ghosh is a postdoctoral fellow at the National Center for Theoretical Sciences (NCTS). His mentor is Dr. Chung-Jun Tsai

In January 2025, he received his PhD from University of Leeds in the UK, supervised by Dr Derek Harland and Dr Gerasim Kokarev.

Broadly, his research area is Geometry and Mathematical Physics. He is interested in Gauge Theory as well as various other geometric structures arising from Quantum Field Theory, Supergravity and String Theory.

He is currently interested in the study of Instantons on manifolds of exceptional holonomy. His recent focus includes Deformation Theory of Instantons on Asymptotically Conical G2 and Spin(7) manifolds, Instantons on asymptotically locally conical (ALC) manifolds, 't Hooft Solutions in Higher dimensions, Heterotic string theory, Hermitian Yang-Mills Connections on Calabi-Yau 4-folds, Deformed Donaldson-Thomas Connections on G2 and Spin(7) manifolds.

Tat's personal homepage is:
https://sites.google.com/view/tat-ghosh-math

Joseph Muller **September 1, 2025 -**

Joseph Muller is a postdoctoral fellow at the National Center for Theoretical Sciences (NCTS). His mentor is Dr. Chia-Fu Yu.

He received his PhD degree from Sorbonne Paris North University in 2023, under the supervision of Prof. Pascal Boyer and Prof. Naoki Imai. Before joining NCTS, he was a JSPS postdoctoral fellow at the University of Tokyo.

His research theme is about number theory and arithmetic geometry. More specifically, he is interested in the cohomology of Shimura varieties, and the arithmetical and geometrical aspects of their supersingular locus. His research aims at understanding some links between Shimura varieties and Deligne-Lusztig theory.

Here is his homepage.
https://sites.google.com/view/josephmuller

Sasha Viktorova **October 1, 2025 -**

Sasha Viktorova is a postdoctoral fellow at the National Center for Theoretical Sciences (NCTS). Her mentor is Professor Hsueh-Yung Lin.

Previously, she was a postdoctoral researcher as part of the Methusalem Project in Pure Mathematics at KU Leuven. She obtained her PhD from Stony Brook University in 2022, under the supervision of Radu Laza.

Dr. Viktorova research is in algebraic and complex geometry. Her interests include cubic hypersurfaces, irreducible symplectic varieties, moduli spaces, and singularity theory.

Here is her personal homepage:https: //sites.google.com/view/viktorova/

Core Members **Honors** in 2025

Professor Chia-Fu Yu, a core member of the center, received the 2024 Academic Award of the Ministry of Education.

Professor Tzu-Yueh Wang, Associate Professor Cheng-Chiang Tsai, and Professor Weichung Wang received the 2024 Outstanding Research Award of the NSTC. Tzu-Yueh Wang is the deputy director-designate of the center from 2026, Cheng-Chiang Tsai is a recipient of the NCTS Young Theoretical Scientist Award and program committee member, and Weichung Wang is a core member of the center

Associate Professor Hao-Chung Cheng, recipient of the NCTS Young Theoretical Scientist Award together with Assistant Professor Shih-Yu Chen, an active participant of the center, received the 2025 Wu Ta-You Memorial Award of the NSTC.

Professor Richard Schoen, an emeritus chair professor from Stanford University and UC Irvine, who has been an NCTS Scholar since 2016 and served on the NCTS International Advisory Committee from 2016 to 2020, has been awarded the World Laureates Association Prize in Computer Science or Mathematics.