National Center for Theoretical Sciences

Newsletter Vol. 5 Fall 2018

The 12th AIMS Conference was concluded in Taipei, Taiwan on July 9, 2018 with about 1,600 participants and 130 special sessions.

Inside:

Director's Message

Dear Friends of NCTS,

This summer in NCTS is again another active period full of young prospects. There are 23 undergraduate students selected in our Undergraduate Summer Research Program (USRP) spread into 7 groups. In this project-oriented program, students from all over Taiwan are encouraged to explore various aspects related to math but beyond their regular curriculum. Summer courses for graduate students are another events that attracted more young faces (of course, any well-motivated students are welcome).

In Dec., there are several important mathematical events in Taiwan, which we call Taipei Maths Month as a whole. Highlights include the 2018 ICCM Annual Meeting. It is a great opportunity to meet people in ICCM, which will be held in Dec. 27th – 29th at GIS NTU Convention Center.

The long-awaited new space of NCTS in the new building will be realized very soon. We are now working on detailed interior decoration. As a bounded convergent sequence always converges, we see the convergence of our actual moving date already.

We have announced the call for applications of RA, postdoc fellows, research pairs for the new year 2019 to come. Please check out our webpage or poster for more detailed information. In any event, we welcome researchers and students at all stages from all over the world to pursuit cutting-edge mathematical research and its applications here at NCTS.

NCTS Director
Prof. Jungkai Chen

Former NCTS Scholar Caucher Birkar wins the 2018 Fields Medal

We are pleased to announce that Prof. Caucher Birkar, former NCTS scholar, is one of the four winners of 2018 Fields Medal. The announcement was made at the opening ceremony of the International Congress of Mathematicians (ICM) in Rio de Janeiro, Brazil, August 1st, 2018.

Caucher Birkar was born in July 1978, in Marivan, Iran. He is a UK-based Kurdish-Iranian mathematician and a professor at Cambridge University.
Prof. Birkar has dedicated himself to the multidimensional world of algebraic geometry and forms defined by equations. In 2010 he received the Philip Leverhulme Prize in mathematics and statistics for his contributions to algebraic geometry, and in

2016, the AMS Moore Prize for the article “Existence of minimal models for varieties of log general type” (joint with Paolo Cascini of Imperial College London, Christopher Hacon of University of Utah and James McKernan of University of California, San Diego). And this time he was awarded the Fields Medal for his contribution to the minimum model program in algebraic geometry.

Chairing the packed plenary session at ICM 2018 on August 6th afternoon, NCTS Director Jungkai Alfred Chen said he was fortunate to know him in person for a long time, “he’s always very devoted and willing to share his mathematical ideas. I’m proud that his project was made in Taiwan.” Prof. Birkar visited NCTS once (or twice) a year for one month from 2014 to 2017. He gave series of lectures in NCTS, and part of his important breakthrough on BAB conjecture was initiated and done while visiting NCTS. Prof. Birkar expressed his willing to visit Taiwan continuously for academic exchange in the future.

Interview with Prof. Leon Simon (Part I)

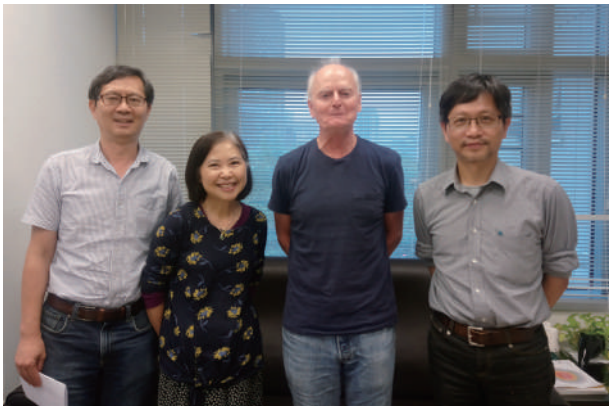
This spring NCTS invited Prof. Leon Simon to give a course of Geometric Measure Theory (GMT). And we were honored to have Prof. Simon to share some experiences from his academic career and his point of view about mathematics education in Taiwan.

Q. What is the earliest memory of being excited by mathematics? Did anyone play a role in inspiring your interest in mathematics?

I was definitely a late starter in getting into mathematics. I had no very special interest in mathematics in high school -- or in any academic subject for that matter. Certainly I was not at all an exceptional student, just doing well enough to ensure a place as a science major at the University of Adelaide. In high school I was more interested in sports and social activities. In my final year of high school I think I was starting to become mildly interested in mathematics -- I do remember thinking a bit about foundations of the subject, but not too much. That changed when I entered the first year science undergraduate program at The University of Adelaide. The first year mathematics course was taught by a man who was not a research mathematician, but nevertheless a skilled expositor who presenting the material in an interesting and thorough, but also very down-to-earth, way. Since I had no idea at that time that I was going to specialize in mathematics, I was probably fortunate to get an initial introduction in this manner, since a more sophisticated and advanced introduction might have been too much for me to handle. In those days there was only one examination -- the final examination at the end of the year, and I had no great expectations that I would do particularly well, since I had formed the opinion that very many people in the class were superior. It came as a pleasant surprise that I ended in the top 5 or 10 percent. Somehow that caused me, beginning in my second undergrad year, to re-evaluate my approach, and to start thinking seriously about the content of the lectures and to believe that I might indeed have some genuine mathematical ability. That was a turning point, and afterwards I became more and more focused and intrigued by the subject. That interest really intensified by the time I reached the third undergraduate year, not least because was I was fortunate enough to be taught in two of those classes by the man who would later become my PhD adviser, Dr. J.H. (Jim) Michael -- of course his first name was not used until later, after I had begun my graduate studies. Jim's lectures were inspirational -- my first real exposure to a person of great mathematical depth and insight. I remember being very focused and enthused about the content of those lectures, and it was my particularly good fortune that I was also part of a tutorial group (about 8 students) run by Jim. Undoubtedly I owe my existence as a mathematician to Jim more than to any other individual.

Q. You completed your BS and PhD degrees in Australia. What are the main differences in mathematical education between Australia and the US?

In the US students who are academically inclined focus in the last 2 or 3 years of high school in building up a record that will maximize their chances of being accepted into a top university like Harvard, Princeton, MIT, Stanford etc. There is really nothing like that in Australia -- most people just go to the best hometown university that they are qualified for. There are also some differences in the organization of the first year program. In the US people are forced to take various general requirements (literature, philosophy, ethics etc.) and are not able to really specialize in their chosen major until the second year or later. Presumably this is to compensate for the very mixed backgrounds of the student body -- which in the US is drawn from all parts of the country and indeed also from other countries. In Australia the student body is much more homogeneous, typically consisting of people who have mostly come from the local area and who have had similar high school experiences; so the kind of general educational requirements that are a feature of the first year undergraduate experience in the US are assumed to have been adequately covered in high school, and the first year can be more specialized. In my case that meant a mixture of science and mathematics classes and nothing else. Similarly there are significant differences in the graduate programs of the two countries. In Australia, especially at the time I was completing my undergraduate work, it was standard that people wanting to enter a PhD program would simply continue on in the same university (usually in their home city), whereas in the US that would be rare; in the US people apply to the graduate programs of the top universities in the country regardless of location. There are also significant differences in the way the graduate programs are run. In Australia one typically would begin working toward a thesis almost immediately, and most reading and expansion of knowledge would be directly related to that very specialized area. Whereas in the US one is required to take a quota of graduate courses in a variety of fields, and only in the second or third year of study would one become specialized and start working on a thesis. I think the US has an advantage there -- I think my graduate education was too specialized, and I had to scramble later to make up for that.



Q. Can you share with us your experience at Stanford University?

I first went to Stanford, to take up an Assistant Professor appointment, very soon after completing my PhD. I remember being rather apprehensive before my arrival -- I was only 27 and I had never traveled outside Australia before --- but I was immediately made very welcome by several of the senior faculty, including in particular David Gilbarg and Robert Osserman. I've always kept those early experiences firmly in mind, feeling that I, as a senior mathematician, should always strive to do for the next generation of young faculty what Gilbarg, Osserman, and their colleagues so kindly did for me. And I believed in this philosophy even more

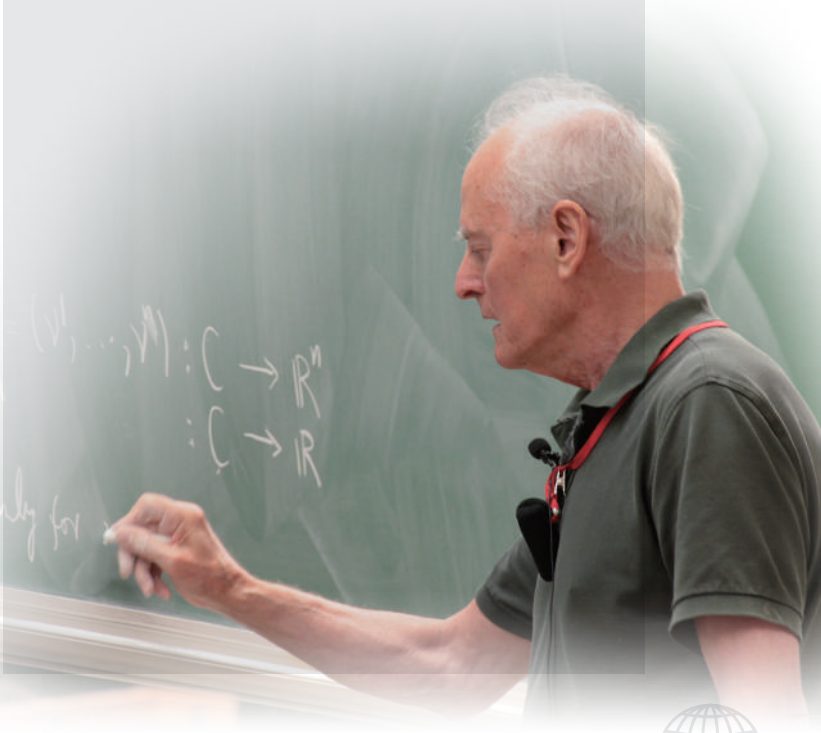
strongly as I got older. So my initial introduction to Stanford was very positive, but not completely without some anxious moments. I remember that the very first course I taught there was an undergraduate differential equations class with about 40 students, mainly undergrads from the engineering faculty. When it came time to assign grades, at the end of the quarter, I looked at the instructions on the reverse side of the grade sheet and saw there that "A should be for excellent performance", "B should be for superior performance," "C for good understanding and facility with the material." What I didn't quite appreciate is that the definitions of what constituted "excellent" or "superior" etc., could vary from country to country, so my initial assignment of grades was really way too hard -- way too many C grades -- quite out of line with accepted custom in the US. Fortunately Bob Osserman (who was Chair of the Stanford Math Department at the time) noticed my grade sheet before it was officially submitted, and I was able to make the appropriate modifications before it was too late, and the final grade sheet was much more in line with accepted standards. Since joining the permanent faculty at Stanford I've always made sure that new incoming junior faculty get adequate mentoring with regard to local customs including recognized grading standards.

Q. What advice would you give to young people on pursuing a career in mathematics?

A career as a research mathematician is for people who really love mathematics, even in the situation (which applies almost 100% of the time!) when things are not going well and you can't seem to find a path to the result you are striving for. That takes a particular kind of personality and a particular kind of intellect --- long hours, days, months of intense focus with no guarantee of reward. And then when you do manage to achieve a good result, there is an all-too-brief period of euphoria before you are engaged in the next challenge! Genius fortunately is in general not required to be a successful researcher, but dedication and unlimited perseverance (plus an occasional bit of luck) almost certainly are.

Q. What are your expectations on today's young mathematical researchers in Taiwan and any advice for them?

Either in Taiwan or the US or anywhere, the advice would be the same --- enjoy your mathematics and try to find a balance between your desire to solve basic and difficult problems and the necessity to keep active and productive. And don't hesitate to seek help and advice from senior colleagues if you have worries. Always try to take advice before making important decisions, including both administrative decisions and decisions about possible choices with regard to your research and teaching efforts.



The 12th AIMS Conference Series on Dynamical Systems, Differential Equations and Applications

On July 5th – 9th 2018, NCTS hosted The 12th AIMS Conference at National Taiwan University, with about 1,600 participants from 60 countries/regions representing all the continents, making it the largest mathematical conference ever in Taiwan. The joint event with AIMS (American Institute of Mathematical Sciences) was an influential gathering for mathematicians and scientists around the world. We welcomed the participants worldwide to explore the ever growing field of analysis and applied analysis, including dynamical systems, differential equations, and real-world applications during the conference.

The conference featured 135 special sessions with a broad and diverse spectrum of topics, organized by research leaders in the fields, poster sessions, and the Best Student Paper Competition. Invited Plenary Lectures were given by 10 world-renown mathematicians, including Prof. Chiun-Chuan Chen, professor of National Taiwan University and former NCTS Executive Committee.

Below are the titles of Invited Plenary Lectures:

Annalisa Buffa (CNR-IMATI: PAVIA, Italy)	Numerical Methods for PDEs: Old and New Challenges
Jean-Michel Coron (Université Pierre et Marie Curie, France)	How the Nonlinearities can be Used to Control a System
Yiming Long (Nankai University)	Closed Geodesics on Compact Finsler Manifolds
Gang Bao (Zhejiang University, Peoples Rep of China)	Recent Developments of Inverse Scattering Problems in Wave Propagation
Natasa Pavlovic (The University of Texas at Austin, USA)	Back and Forth from Quantum Many Particle Systems to Nonlinear PDE, and Applications to Kinetic Equations
Hirokazu Ninomiya (Meiji University, Japan)	Propoagation Phenomena in Reaction-Diffusion Systems
Chiun-Chuan Chen (National Taiwan University)	Travelling Wave Solutions of the 3-species Lotka-Volterra Competition System with Diffusion
Vincent Calvez (Institut Camille Jordan)	Mesoscopic Models for Propogation in Biology
Shige Peng (Shandon University, Peoples Rep of China)	Theoretical Study of Nonlinear Expectations and Applications to Data Sequences with Essential Uncertainty of Probability Distributions
John Ball (University of Oxford, United Kingdom)	Mathematical Models of Liquid Crystals

During the banquet, at the third night of the conference, ten finalists for the 2018 AIMS Student Paper Competition were announced, and up to four awards were given upon recommendation of the selection committee. All winners and finalists were presented with plaques or certificates. Congratulations to the winners!

Special Thanks

Throughout the conference, attendees were treated to sunny weather, friendly satffs and a comfortable NTU campus. The conference ran smoothly thanks to the active support of E-Think PCO Company and the team of enthusiastic volunteers. We'd like to acknowledge the American Institute of Mathematical Sciences and The Mathematical Society of thr Republic of China. We're also grateful for the financial support from Taipei City Government, Ministry of Economic Affairs, and Ministry of Science and Technology.

NCTS Research Spotlight

Prof. Chieh-Yu Chang is now a professor of Mathematics at National Tsing Hua University and NCTS Center Scientist. He won MOST Outstanding Research Award in 2013 and 2018 and ICCM Morningside Silver Medal of Mathematics in 2013. He's currently working on multiple zeta values over function fields in positive characteristic.

Prof. Chieh-Yu Chang's current research topic is around the theory of multiple zeta values (abbreviated as MZV's) over function fields in positive characteristic. The classical MZV's which are referred to MZV's in characteristic zero are generalization of the special values of Riemann zeta function at positive integers at least 2. Euler generalized special Riemann zeta values to double zeta values, which are MZV's of depth two, and MZV's of arbitrary depth were initiated by Zagier and Hoffman in the early 1990's. It has become a hot topic in these two decades because of many connections between different research topics. For example, they have connections with periods of mixed Tate motives in arithmetic geometry, period polynomials for modular forms etc.

The positive characteristic MZV's arise from the polynomial ring $A := \mathbb{F}_q[\theta]$ over the finite field $\mathbb{F}_q$. They were initiated by Thakur in 2004 generalizing the Carlitz zeta values, which are MZV's of depth one. In 2009, Anderson and Thakur interpreted these MZV's as periods of certain mixed Carlitz-Tate t-motives. So understanding the linear relations among these MZV's (also in characteristic zero) is the core problem from the point of view of arithmetic geometry and transcendence theory.

In the classical case, it is known that there are many linear relations among MZV's of the same weight produced by the regularized double shuffle relations established by Ihara-Kaneko-Zagier. In 2004, Furusho initiated the p-adic MZV's generalizing the Kubota-Leopoldt's p-adic zeta values, and in 2007 Furusho and Jafari showed that p-adic MZV's also satisfy the regularized double shuffle relations. Furusho proposed a conjecture asserting that p-adic MZV's satisfy the same linear relations that their corresponding real-valued MZV's satisfy. However, Furusho's conjecture is still an open problem.

In the positive characteristic world, due to the non-archimedean nature of the analytic theory, one has to look for a completely different interpretation of the integral representation for MZV's. Classical double shuffle relations are just not there. However, Prof. Chang's current work with Y. Mishiba is to verify the function field analogue of Furusho's conjecture in arXiv:1710.10849. They do not work in the direction of double shuffle relations but take logarithmic point of view described below.

The importance of classical logarithms and generalized logarithms goes back to Hilbert's seventh problem, which was solved by Gelfond and Sch-

neider in the 1930's. In the 1960's, Baker completely generalized Gelfond-Schneider's result so that he got Fields Medal. Later on Wüstholz established the so-called analytic subgroup theorem, and as a consequence one can derive Baker's theorem. The spirit of Wüstholz's analytic subgroup theorem is that when we have a commutative algebraic group ***G*** defined over a number field, then for any nonzero vector $Z \in \mathrm{Lie}G(\mathbb{C})$ which is mapped to an algebraic point under the exponential map of ***G***, the linear relations among of the coordinates of ***Z*** over the algebraic closure $\overline{\mathbb{Q}}$ of $\mathbb{Q}$ are explained by the defining equations of the Lie algebra of certain algebraic subgroup of ***G*** defined over $\overline{\mathbb{Q}}$. In 1997, Yu established the so-called sub-***t***-module theorem, which plays the function field analogue of Wüstholz's analytic subgroup theorem. In the world of function fields in positive characteristic, ***t***-modules introduced by Anderson play the analogous role of commutative algebraic groups in the classical transcendence theory.

In 1935, Carlitz obtained an important identity that the Carlitz zeta value at 1 is equal to the Carlitz logarithm evaluated at 1, and they note that the classical counterpart of this identity does not exist since the Riemann zeta function is not defined at 1. Carlitz's formula reveals a close relation between positive characteristic zeta values and logarithms. Such a phenomenon was elegantly and completely generalized by Anderson and Thakur in 1990 for all Carlitz zeta values. Precisely, for any positive integer ***s*** they construct a vector $Z_s \in \mathrm{Lie}C^{\otimes s}$ so that up to an explicit integral multiple, the Carlitz zeta value $\zeta_A(s)$ occurs as the last coordinate of Z_s and the vector Z_s is mapped to an integral point of $C^{\otimes s}$, where $C^{\otimes s}$ is the ***s***-th tensor power of the Carlitz module ***C***. This important interpretation together with Yu's transcendence theory enables Yu to prove the transcendence of Carlitz zeta values, whose classical counterpart is only known for special Riemann zeta values at even positive integers.

The starting point of Prof. Chang's recent work with Mishiba is to generalize Anderson-Thakur's work to MZV's of arbitrary depth. Indeed, for any MZV they explicitly construct a ***t***-module ***G*** together with vector $Z \in \mathrm{Lie}G$, which is mapped to an integral point of ***G*** under the exponential map of ***G***, and the MZV in question occurs (up to an integral multiple) as certain coordinate of the vector ***Z***. They also establish such a structural interpretation for ***v***-adic MZV's that are higher depth generalization of Goss' ***v***-adic zeta values and that play the function field analogue of Furusho's p-adic MZV's, where ***v*** is a prime ideal of ***A***. Note that the analogue of this phenomenon for classical MZV's fitting into Wüstholz's analytic subgroup theorem is still unknown yet. By using these interpretations for MZV's as well as Yu's sub-***t***-module theorem, they are able to show that ***v***-adic MZV's satisfy the same linear relations that the corresponding Thakur's MZV's satisfy. This is the precise function field analogue of Furusho's conjecture.

Finally, they remark that there are many parallel theories and deep phenomena to be found in both number fields and global function fields contexts. However, methods, approaches, and proofs of results can be very different. The researches described above and our methods of establishing those results are examples illustrating this point. It is natural to expect that the logarithmic points of view above will keep playing an essential role in future related researches.

Taiwan Mathematics School

This July Taiwan Mathematics School had organized several summer courses with credits, including

(1) Fluid, water wave and phase transition problems.

(2) Mathematical Modeling and Analysis of Infectious Diseases

(3) Introduction to Parallel Computing (II)

Nearly 100 participants attended these courses and came away with both practical and theoretical skills to match their new knowledge on these topics.

With the approaching of the new school year, the course plan of Taiwan Mathematics School is as follows:

- **2018 Fall**
  - Kinetic Equations and Related Topics
  - Introduction to Automorphic Representations on GL(2)
- **2019 Spring**
  - Boltzmann Equations

Kinetic Equations and Related Topics

The main purposes of this course are

(1) to construct the quantitative pointwise estimate of the linearized Boltzmann equation with hard sphere case.

(2) to give an understanding of the relation between the Boltzmann equation and the fluid-dynamic equations including their boundary conditions.

We have two instructors for this course. Prof. Kung-Chien Wu of NCKU will give a brief introduction to kinetic theory, linearized collision operator, quantitative pointwise estimate of the linearized Boltzmann equation in hard sphere, and regularization estimate. Prof. Kazuo Aoki of NCTS & NCKU will teach about boundary conditions for the Boltzmann equation, non-dimensionalization and similarity laws, Chapman-Enskog and Hilbert expansions and fluid-dynamic equations, slip boundary conditions for the compressible Navier-Stokes equations.

Introduction to Automorphic Representations on GL(2)

We invited Prof. Fu-Tsun Wei of NCU to give a course about Automorphic Representations on GL(2). Theory of automorphic representations is a

very important subject in modern number theory. In particular, it is one of the most powerful tools in the research on analytic aspects of L-functions. The purpose of this course is to introduce and study automorphic representations for GL(2).

The course outline is as follows:

(1) Weil representations on SL(2)
(2) Explicit construction of representations on GL(2) as quotients of Weil representations
(3) Whittaker models and Kirillov models
(4) Classification of admissible irreducible representations on GL(2)
(5) Local Jacquet-Langlands correspondence via theta lifting
(6) Theory of local L-functions for GL(2) and GL(2) xGL(2)

Boltzmann Equations

As for the coming semester in 2019, we'll have Prof. I-Kun Chen of NTU and Chun-Hsiung Hsia of NTU to give an advanced course of Boltzmann Equations. This course conducts research ideas and technical machinery for the investigation of Boltzmann equations. We aim to prepare graduate students for the research of the Boltzmann equations.

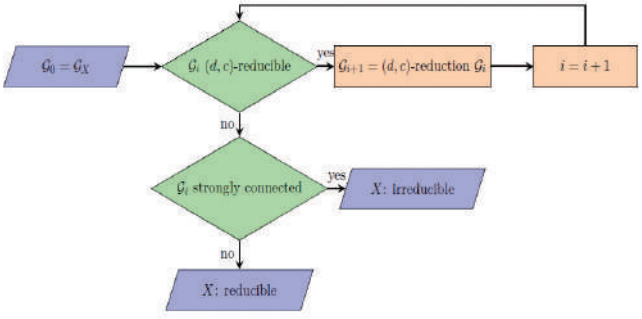
We shall start with the Annals paper of Diperna and Lions to introduce the most important ingredients of the Boltzmann equations. In particular, the basic conservation laws, H theorem and entropy inequalities. There are three useful types solution concepts: distributional solution, mild solution and renormalized solutions. We shall follow Diperna and Lions's idea to show the advantages of these three concepts and see how they go well together to combine with other useful ideas to overcome the subtleties to obtain the L^1 existence theory of cut-off Boltzmann equations. We then connect it to our recent research work on steady state solutions of Boltzmann equations. Unlike the evolution equations on flat domains, we do not have the well-known velocity averaging lemma to help to gain the compactness in the construction of weak solution. Regarding the issue of steady state solution on bounded domain, we need new key features to improve the previous results in literature. We shall explore some new ideas according to our recent work in this course.

We encourage students who are interested in courses mentioned above or want to know more about those theories to join us for further exploration to mathematics world.

NCTS Undergraduate Summer Research Program

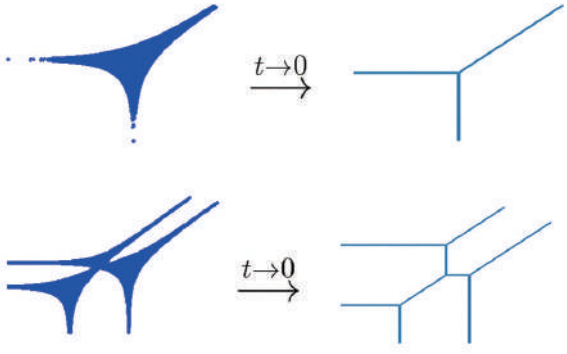
From July 23 – August 24, 2018 NCTS hosted the Undergraduate Summer Research Program. This year, NCTS hosted 23 students from universities around Taiwan to work one of the seven projects and present their findings.

Group 1, which was supervised by Prof. Jung-Chao Ban of NDHU and Prof. Chih-Hung Chang of NUK, looked at the Entropy Theory of Dynamical Systems on Groups. The project discussed the specification of shift space on the free groups.

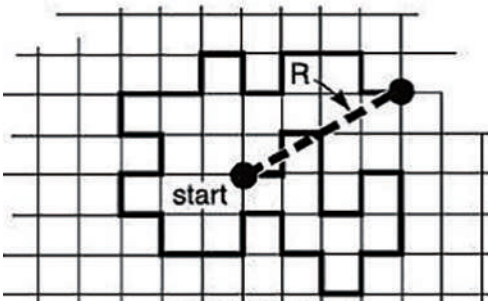


Group 2, which was supervised by Prof. Guan-Yu Chen of NCTU, looked at Markov Chains and Cutoff Phenomena. This project focused on the total variation and the L^2-distance and introduced important techniques to study their mixing times and cutoff times.

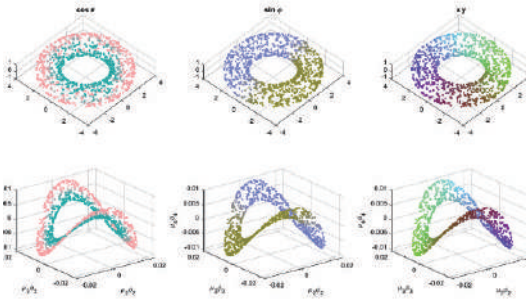
Group 3, which was supervised by Prof. Jungkai Chen of NTU and Prof. Yen-Lung Tsai of NCCU, looked at topics in Computational Tropical and Algebraic Geometry. The project discussed some basic results in classical algebraic geometry, the topic of tropical geometry, which is useful for the problem of counting curves and introduced some tools to classify different type of singular points.



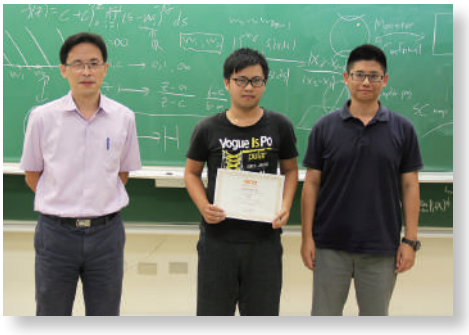
Group 4, which was supervised by Prof. Xiang Fang of NCU, talked about the simple random walk and explore some classical problems, including whether the sweeping robot can go over all the lattice points in the two dimensional space, Gambler's ruin problem and one single boundary problem.



Group 5, which was supervised by Prof. Sheu Yuan-Chung of NCTU and Prof. Gi-Ren Liu of NCKU, looked at Diffusion Map and its Applications in the Automatic Sleep Stage Scoring. This program aimed to let participants understand how to apply their background knowledge of linear algebra, probability to design an automatic sleep scoring algorithm.



Group 6, which was supervised by Prof. Ming-Lun Hsieh of AS, looked at L-functions for Modular Forms: p-adic Aspects. The goal of this project was to understand and work out some basic examples of the construction of p-adic automorphic L-functions by the tools from the theory of automorphic representations.



Group 7, which was supervised by Prof. Chun-Chi Lin of NTNU, Prof. Mei-Heng Yueh of NTNU and Prof. Shizuo Kaji of Kyushu University, looked at Topological Image Analysis. In this project, participants were asked to first familiarize themselves with software to compute persistent homology. Then, they looked at how different filtration, distance, and transformation affect persistent homology.

At the final stage of the research program, the undergraduates gave presentations to discuss their findings. All in all, the participants were benefited greatly from high-quality mentorship and enriching mathematical research experience provided by NCTS Undergraduate Summer Research Program.

Highlights of Events

5/4 – 5/6	Health Hackathon 2018 - Focus on Artificial Intelligence and Mathematics
5/8 – 5/10	NCTS Workshop on Geometric Measure Theory and Minimal Submanifolds
5/27 – 5/29	NCTS Symplectic Expedition: Floer Theory and beyond
5/28 – 6/1	NCTS Workshop on Mathematical Biology
6/4 – 6/8	Spring Probability Workshop
6/16 – 6/18	2018 Taiwan-Japan Workshop on Scattering, Dispersion, Traveling Waves, and Inverse Problems
6/19 – 6/22	NCTS Workshop on Isometric Embedding and Quasilocal Mass
7/2 – 7/4	International Workshop on Critical Phenomena
7/23 – 8/24	NCTS Undergraduate Summer Research Program
8/2 – 8/5	Taiwan-Japan Joint Workshop on MZV's

Upcoming Events

2018 Taipei Maths Month

12/3 – 12/5	Chen-Jung Hsu Lectures
12/7	NCTS Interdisciplinary Lectures - Applying Physics to Mathematics
12/7	ICCM Sze Lim Lectures - Two Magic Tricks
12/8 – 12/9	Annual Meeting of The Mathematical Society of the Republic of China
12/27 – 12/29	Annual Meeting of International Consortium of Chinese Mathematicians

2019

1/2 – 1/3	NCTS Workshop on Global Differential Geometry
2/15	2019 NCTS Young Dynamics Day

New Postdoc Fellows

We have several new postdoc fellows joining us this semester.

Dr. Ser-Wei Fu graduated with a PhD degree in 2014 from the University of Illinois at Urbana-Champaign. His research direction lies in the field of geometric topology. He was a research assistant professor at Temple University till 2017.

This is my first year as a postdoc of the National Center for Theoretical Sciences. Everything is still fresh and new to me. I look forward to learning about the culture of NCTS via interacting with my colleagues and participating in various events. On the other hand, I am interested in a broad spectrum of topics. I hope to engage in fruitful mathematical discussions with all the mathematicians at NCTS.

Dr. Jia-Yuan Dai completed his PhD at Free University of Berlin in 2017 and was a postdoctoral researcher at Collaborative Research Center till June 2018. His research interests include nonlinear dynamical systems, reaction-diffusion equations, and spiral/scroll waves.

During my Ph.D. studies at the Free University of Berlin I worked extensively on differential equations with scientific applications. In my thesis I constructed a new functional approach to analyze the bifurcation structure of complex Ginzburg-Landau spiral waves. After my Ph.D. I have embarked on three novel research projects: completion of the bifurcation diagram of Ginzburg-Landau spiral waves, delay feedback stabilization of relative equilibria, and the existence of the Gowdy spacetime on three-

dimensional tori.
I feel very honored to start my academic career with the NCTS postdoctoral fellowship. Here I am 11 experiencing a culture of multi-disciplinary cooperation in a competitive working environment with sufficient financial supports. I believe that I can integrate my background and enthusiasm into the NCTS, and accomplish my research projects during the stay.

Dr. Yi-Sheng Wang got his Ph.D. at the University of Freiburg. He was a postdoc at the University of Freiburg and Mathematical Research Institute of Oberwolfach. His interests lie in the areas of algebraic and differential topology.

I am a new postdoc at NCTS. I finished my PhD at the University of Freiburg in 2017, under the supervision of Prof. Sebastian Goette. In my thesis, I study homotopy aspects of Atiyah-Patodi-Singer index theory. My research focuses primarily on the areas of geometric topology and homotopy theory; I am especially interested in homotopy-theoretic methods in differential topology and applications of index theory in low-dimensional topology. During my research stay at MFO early this year, I also started working on knotted surfaces in the 3-space and their classification problems. I am grateful for having the opportunity to continue my research at NCTS.

Highlights of Courses

Summer Courses

5/28 – 7/4	Theoretical Foundation of Data Science, with Application
6/26 – 7/4	NCTS-Taiwan Math School: Fluid, Water Wave and Phase Transition Problems
7/9 – 7/20	Introduction to 3-manifold Topology with some Applications to Knot Theory
7/16 – 7/19	NCTS-Taiwan Math School: Introduction to Parallel Computing (II)
7/16 – 7/27	Mathematical Problems Arising in Materials Science
7/16 – 7/27	NCTS-Taiwan Math School: Mathematical Modeling and Analysis of Infectious Diseases
7/23 – 8/2	RandomWalks and Related Topics
7/30 – 8/17	Image and Shape Manipulation
7/31 – 8/21	Diffusion Learning Theory and Medical Applications – the first step
8/27 – 9/4	Mathematical Biology

Courses

9/9/2018 - 1/4/2019	NCTS-Taiwan Mathematics School: Kinetic Equations and Related Topics
9/9/2018 - 1/4/2019	NCTS-Taiwan Math School: Introduction to Automorphic Representations on GL(2)

ICCM2018

The International Consortium of Chinese Mathematicians (ICCM) will hold the second ICCM annual meeting at National Taiwan University from Dec. 27th to Dec. 29th, 2018. This session of ICCM is jointly hosted by the Yau Mathematical Sciences Center (YMSC) at Tsinghua University, National Center for Theoretical Sciences (NCTS), the Institute of Mathematics of Academia Sinica and Shing-Tung Yau Center at National Chiao Tung University. It is expected that about 300 participants will attend the annual meeting of ICCM 2018. The activities of ICCM annual meetings include academic talks, prize presentations, reports and discussions of ICCM matters.

Winners of the second ICCM 2018 Best Paper Award, thirty medals with equalty are expected to be awarded on the first day of annual meeting of ICCM 2018. In the next 3 days, there will be about 25 plenary lectures and 75 invited lectures to be arranged at NCTS. It will bring Chinese and overseas mathematicians together to discuss the latest research developments

Join Us!

NCTS is calling for 2019 postdoctoral fellows!

Application is open from Oct. 1, 2018 to Feb. 28, 2019. The appointment starts from August 1, 2019, for 1 or 2 years, extendable up to 3 years. Every talent pursuing academic excellence is welcome. Priority will be given to the following areas: *Algebraic Geometry, Differential Geometry and Geometric Analysis, Differential Equations and Stochastic Analysis, Scientific Computation, Data Science.*

NCTS is calling for Research Pairs!

A Research Pair consists of 2-4 researchers, without the same affiliations. Each member in one pair is expected to spend 2-4 weeks at NCTS for research collaborations, and will be supported as a visiting scholar for NCTS. Application is always open!

Please visit http://ncts.tw/ for position details.

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