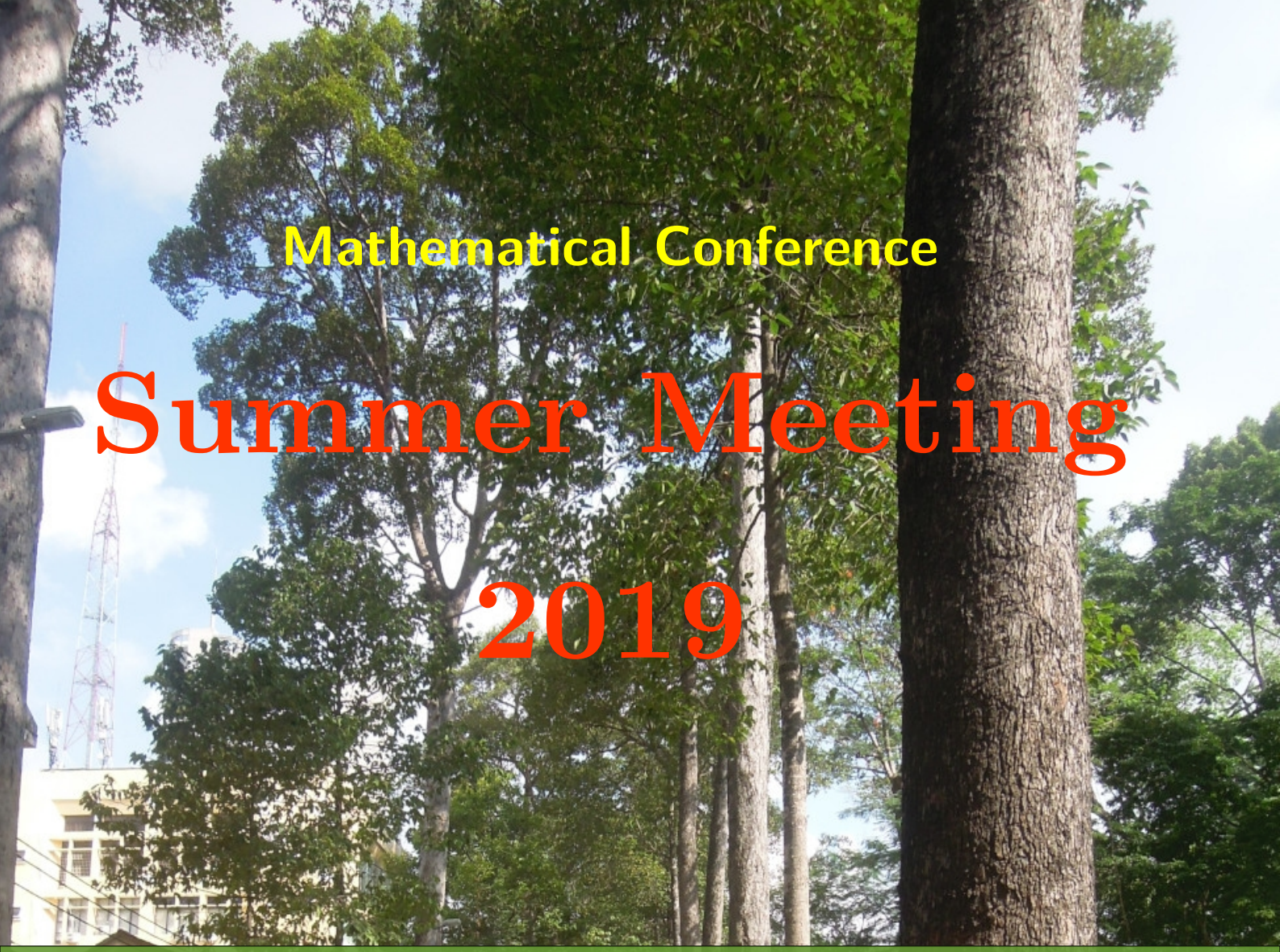

Mathematical Conference

Summer Meeting

2019

Saturday and Sunday July 27-28, 2019

Vietnam National University Ho Chi Minh City-University of Science

227 Nguyen Van Cu District 5 Ho Chi Minh City

TRUONG DAI HOC KHOA HOC TU NHIEN

KHTN

TP. HO CHI MINH

Khoa Toán - Tin học

Fac. of Math. & Computer Science

Mathematical Conference
Summer Meeting 2019

VNU-HCM University of Science, July 27–28, 2019

"Summer Meeting" is an annual mathematical meeting since 2008 organized primarily by alumni of the Faculty of Mathematics and Computer Science of the Vietnam National University Ho Chi Minh City-University of Science who are doing mathematics abroad, held during the summer breaks.

List of speakers

- Chang Heon Kim, Sungkyunkwan University, Korea
- Soonhak Kwon, Sungkyunkwan University, Korea
- Linh Viet Nguyen (Nguyen Viet Linh), University of Idaho, USA
- Loc Hoang Nguyen (Nguyen Hoang Loc), University of North Carolina Charlotte, USA
- Cong Phuc Nguyen (Nguyen Cong Phuc), Louisiana State University, USA
- Van Tien Nguyen (Nguyen Van Tien), New York University Abu Dhabi, UAE
- Tan-Trung Nguyen (Nguyen Tan Trung), VNUHCM-University of Science, Ho Chi Minh City, Vietnam
- Hoang Anh Tran (Tran Anh Hoang), Oak Ridge National Laboratory, USA
- Son Nguyen Thai Tu (Tu Nguyen Thai Son), University of Wisconsin–Madison, USA
- Son Phung Truong Van (Van Phung Truong Son), Carnegie Mellon University, USA

Organizers

Program committee: Phu Nhan Chung (Chung Nhan Phu) *(Sungkyunkwan University, Korea)*, Vu Quang Huynh (Huynh Quang Vu) *(VNUHCM-US, Vietnam)*, Khai Tien Nguyen (Nguyen Tien Khai) *(North Carolina State University, USA)*, Hung Vinh Tran (Tran Vinh Hung) *(Univeristy of Wisconsin–Madison, USA)*

Local organizing committee: Nguyen Le Hoang Anh, Vo Duc Cam Hai *(VNUHCM-US, Vietnam)*

Supported by

VNUHCM-US; Faculty of Math & CS; and the Summer Mathematical Meeting Fund

Venue and Contacts

VNUHCM-US, 227 Nguyen Van Cu, District 5, Ho Chi Minh City, Vietnam
Website: http://www.math.hcmus.edu.vn/summer_meeting

Program

Saturday, 27/7/2019

Room: Lecture Hall of Building I

Morning

7:30-8:00 Registration.

8:00-8:20 Opening remarks

8:20-9:10 Hoang Anh Tran, *Regularization Methods for Reconstructing Sparse Data with Structures*

9:20-10:10 Tan-Trung Nguyen, *Playing with Deep Learning and Burgers Equation*

10:10-10:40 Coffee break

10:40-11:30 Son Phung Truong Van, *Optimal heat transfer in a box*

Afternoon

14:00-14:50 Linh Viet Nguyen, *Thermoacoustic tomography in fluid and elastic media*

15:00-15:50 Loc Hoang Nguyen, *A convergent numerical method for a multi-frequency inverse source problem in inhomogeneous media*

15:50-16:20 Coffee break

16:20-17:10 Son Nguyen Thai Tu, *State-Constraint static Hamilton-Jacobi equations in nested domains*

————————————————————

Sunday, 28/7/2019

Room: B11A

Morning

8:20-9:10 Van Tien Nguyen, *Singularity formation in Nonlinear Evolution Equations*

9:20-10:10 Soonhak Kwon, *APN functions and their differential properties* , changed to: *Survey on vectorial Boolean functions and their properties over finite fields*

10:10-10:40 Coffee break

10:40-11:30 Chang Heon Kim, *Recursion formulas for modular traces of weak Maass forms of weight zero*

11:40 -12:30 Cong Phuc Nguyen, *Weighted and pointwise bounds in measure datum problems with applications*

Abstracts

- Chang Heon Kim, Sungkyunkwan University, Korea

  Recursion formulas for modular traces of weak Maass forms of weight zero

  The values of the classical j-invariant at CM points are called singular moduli. Zagier proved that the traces of singular moduli are Fourier coefficients of a weakly holomorphic modular form of weight 3/2. Later Bruinier and Funke generalized Zagier's result to the sums of the values at Heegner points of modular functions on modular curves of arbitrary genus. In this talk, we find recursion formulas satisfied by modular traces of weakly holomorphic modular functions and more generally modular traces of certain weak Maass forms of weight zero. (This is a joint work with Soyoung Choi).

- Soonhak Kwon, Sungkyunkwan University, Korea

  APN functions and their differential properties

  APN(almost perfect nonlinear) functions over binary finite fields play an important role in many areas of cryptography such as AES. A differential of quadratic APN function is 2:1 function and becomes a linearized polynomial when the APN function is quadratic. We discuss the relations between quadratic APN functions and their corresponding linearized polynomials.

- Linh Viet Nguyen, University of Idaho, USA

  Thermoacoustic tomography in fluid and elastic media

  Thermoacoustic tomography (TAT) is a hybrid method of imaging. It combines the good contrast of microwave imaging and high resolution of ultrasound imaging. One of the main techniques for image reconstruction in TAT is the time-reversal method. In this talk, we will discuss how the method works in two scenario of TAT: fluid and elastic media.

- Loc Hoang Nguyen, University of North Carolina Charlotte, USA

  A convergent numerical method for a multi-frequency inverse source problem in inhomogeneous media

  We propose a new numerical method to solve an inverse source problem for the Helmholtz equation in inhomogeneous media. This method reduces the original inverse problem to a boundary value problem for a coupled system of elliptic PDEs, in which the unknown source function is not involved. The Dirichlet boundary condition is given on the entire boundary of the domain of interest and the Neumann boundary condition is given on a part of this boundary. To solve this problem, the quasi-reversibility method is applied. Uniqueness and existence of the minimizer are proven. A new Carleman estimate is established. Next, the convergence of those minimizers to the exact solution is proven using that Carleman estimate. Results of numerical tests are presented.

- Tan-Trung Nguyen, VNUHCM-University of Science, Ho Chi Minh City, Vietnam

  Playing with Deep Learning and Burgers Equation

  Deep learning (DL) methods have been developed dramatically recent years with applications in many fields. A DL method in general aims to build a space containing an optimal objective which can be obtained through some numerical methods. From solving hyperbolic systems of conservation laws point of views, we consider how to apply DL methods to obtain the entropy weak solutions in case of shocks. Many DL methods have been proposed in communities to solve for partial differential equations but non of them really consider entropy shock solutions. The 1D Burgers' equation is used as a toy model to mimick the resulting behaviour of numerical schemes when replacing a conservation law by a form which is equivalent for smooth solutions, such as the total energy by the internal energy balance in the Euler equations. We propose in this work two methods to solve for entropy weak solutions of 1D Burgers' equation. The first one is to add a numerical viscosity then learn the optimal parameter. On the other hand, the second one considers an adaptation of activation functions to the Rankine-Huginot condition.

- Cong Phuc Nguyen, Louisiana State University, USA

Weighted and pointwise bounds in measure datum problems with applications

Muckenhoupt-Wheeden type bounds and pointwise bounds by Wolff's potentials are obtained for gradients of solutions to a class of quasilinear elliptic equations with measure data. Such results are obtained globally over sufficiently flat domains in $\mathbb{R}^n$ in the sense of Reifenberg. The principal operator here is modeled after the p-Laplacian, where for the first time singular case $\frac{3n-2}{2n-1} < p \leq 2 - \frac{1}{n}$ is considered. As an application, sharp existence and removable singularity results are obtained for a class of quasilinear Riccati type equations having a gradient source term with linear or superlinear power growth. This talk is based on joint work with Quoc-Hung Nguyen.

- Van Tien Nguyen, New York University Abu Dhabi, UAE

Singularity formation in Nonlinear Evolution Equations

Many central problems in geometry, mathematical physics and biology reduce to questions regarding the behavior of solutions of nonlinear evolution equations. The dynamical behavior of bounded solutions for large times is of significant interest. However, in many real situations, solutions develop singularities in finite time. The singularities have to be analyzed in detail before attempting to extend solutions beyond their singularities or to understand their geometry in conjunction with globally bounded solutions. In this context we have been particularly interested in qualitative descriptions of blowup. Particular examples in the talk include semilinear reaction-diffusion systems, wave maps and the classical Keller-Segel system of modeling chemotaxis. I will present different techniques based on spectral analysis or/and energy methods to study the question of existence and stability of blowup solutions to these equations.

- Hoang Anh Tran, Oak Ridge National Laboratory, USA

Regularization Methods for Reconstructing Sparse Data with Structures

We discuss recent advances in convex and nonconvex optimization approaches for the reconstruction of high- dimensional data, which exploit not only the sparsity of the data, but also the inherent structures in that sparsity. Examples include lower structure in polynomial expansions, tree structure in wavelet representation of images, and joint sparsity in multiple measurement vector problems. We will verify the advantage and efficiency of our methods via examples in uncertainty quantification, imaging and experimental data processing.

- Son Nguyen Thai Tu, University of Wisconsin, Madison, USA

State-Constraint static Hamilton-Jacobi equations in nested domains

We study state-constraint static Hamilton-Jacobi equations in a sequence of domains $\{\Omega_k\}_{k\in\mathbb{N}}$ in $\mathbb{R}^n$ such that $\Omega_k \subset \Omega_{k+1}$ for all $k \in \mathbb{N}$. We obtain rates of convergence of u_k, a solution to the state-constraint problem in Ω_k, to u, a solution to the corresponding problem in $\Omega = \bigcup_{k\in\mathbb{N}} \Omega_k$. In many cases, the rates obtained are proven to be optimal. (it's a joint work with Yeoneung Kim and Hung V. Tran)

- Son Phung Truong Van, Carnegie Mellon University, USA

Optimal heat transfer in a box

The problem of optimization of heat transfer is of both daily-life and industrial importance. Yet, not until recently, people started to tackle this problem with full mathematical rigor. In this talk, we will consider how to design a fluid flow in order to optimize heat transfer in a 2D square. The main idea is to re-scale the problem appropriately and analyze it using both probabilistic and PDE tools. Through this problem, we hope to demonstrate the power of probabilistic intuitions and the simplicity of PDE proofs.

List of registered participants

Number	Name	Institution
1	Nguyễn Lê Hoàng Anh	VNUHCM-US
2	Võ Trần Duy	VNUHCM-US
3	Nguyễn Đức Vũ Duy	VNUHCM-US
4	Nguyễn Ngọc Duy	VNUHCM Highschool for the gifted
5	Phạm Trương Hoàng Đức	Trường Trung cấp Kinh tế - Kỹ thuật Nguyễn Hữu Cảnh
6	Võ Đức Cẩm Hải	VNUHCM-US
7	Hoàng Trung Hậu	
8	Quách Thị Mộng Hiền	VPLS Hiếu Trung
9	Nguyễn Vũ Trung Hiếu	VNUHCM-John von Neumann Institute
10	Trần Minh Hòa	
11	Nguyễn Đăng Khải Hoàn	VNUHCM-US
12	Nguyễn Dương Minh Hoàng	ETEQ JSC
13	Nguyễn Huy Hoàng	Minerva schools at KGI
14	Trương Thị Bích Hồng	HCMC University of Law
15	Nguyễn Quang Huy	HCMC University of Technical Education
16	Trần Vĩnh Hưng	University of Wisconsin – Madison, USA
17	Nguyễn Tiến Khải	North Carolina State University, USA
18	Chang Heon Kim	Sungkyunkwan University, Korea
19	Soonhak Kwon	Sungkyunkwan University, Korea
20	Phan Mỹ Linh	Thiện Lý law firm
21	Tiêu Khởi Mai	VNUHCM-US
22	Bùi Ngọc Minh Mẫn	VNUHCM-John von Neumann Institute
24	Nguyễn Trung Nghĩa	VNUHCM-US
25	Linh Viet Nguyen	University of Idaho, USA
26	Loc Hoang Nguyen	University of North Carolina Charlotte, USA
27	Phuc Cong Nguyen	Louisiana State University Baton Rouge, USA
28	Van Tien Nguyen	New York University Abu Dhabi, UAE
29	Trung Tan Nguyen	VNUHCM-US
30	Thang Nguyen	University of Michigan
31	Phạm Duy Nguyên	An Dương Vương Highschool
32	Phạm Trương Hoàng Nhân	University of Toulouse III - Paul Sabatier
33	Nguyễn Thành Nhân	HCMC University of Pedagogy
34	Trương Minh Phong	Foreign Trade University
35	Chung Nhân Phú	Sungkyunkwan University, Korea
36	Lê Văn Phúc	
37	Ngô Thị Mỹ Phượng	Tiền Giang University
38	Nguyễn Minh Quân	VNUHCM-International University
39	Nguyễn Võ Lan Thảo	VNUHCM-US
40	Lưu Xuân Thắng	Khánh Hòa University
41	Bùi Quang Thịnh	Tiền Giang University
42	Huỳnh Thanh Toàn	HCMC University of Medicine
43	Hoang Anh Tran	Oak Ridge National Laboratory, USA
44	Nguyễn Thu Trang	VNUHCM-John von Neumann Institute
45	Nguyễn Minh Trí	Đại học Đồng Nai
46	Huỳnh Phước Trường	Masaryk University
47	Son Nguyen Thai Tu	University of Wisconsin Madison, USA
48	Nguyễn Xuân Tuấn	SMC

49	Son Phung Truong Van	Carnegie Mellon University, USA
50	Huỳnh Quang Vũ	VNUHCM-US
51	Pham Xuat	
52	Văn Hải Vân	
53	Đỗ Văn Nhân	VNUHCM-US
54	Nguyễn Thị Hồng Thái	VNUHCM-US
55	Vũ Ái Nhi	VNUHCM-US
56	Nguyễn Vy Thông	VNUHCM-US
57	Lê Phú Nhật Huỳnh	VNUHCM-US
58	Ngô Thị Thanh	VNUHCM-US
59	Hồ Nguyễn Huyền Thư	VNUHCM-US
60	Đỗ Hoàng Việt	VNUHCM-US
61	Phạm Thị Nhung	VNUHCM-US
62	Nguyễn Thị Hải Hà	VNUHCM-US
63	Nguyễn Khắc Định	Dai-i-chi Life
64	Nguyễn Nhựt Hưng	VNUHCM-US
65	Nguyễn Phạm Ngọc Ẩn	VNUHCM-US
66	Hồ Thị Yến Nhi	VNUHCM-US
67	Đặng Thanh Vương	VNUHCM-US
68	Chu Thị Thu Hiền	HCMC University of Pedagogy
69	Nguyễn Phúc Sơn	VNUHCM-University of Law
70	Đặng Thảo Vy	VNUHCM-US
71	Phan Quang Khánh	VNUHCM-US
72	Lê Minh Trí	VNUHCM-US
73	Huỳnh Văn Y	VNUHCM-US
74	Lê Minh Tuấn	Saigon University
75	Nguyễn Duy Khánh	CoderSchool
76	Bùi Lê Trọng Thanh	VNUHCM-US
77	Nguyễn Minh Tùng	VNUHCM-US
78	Lê Trần Ngọc Trân	VNUHCM-US
79	Trần Minh Huấn	VNUHCM-US
80	Dương Đặng Xuân Thành	Canada
81	Huỳnh Tấn Liêm	Saigon Technological University
82	Vũ Ngọc Ánh	Saigon University
83	Đặng Đức Trọng	VNUHCM-US
84	Trần Minh Phương	Ton Duc Thang University
85	Phạm Ngô Thành Đạt	VNUHCM-US
86	Vũ Ngọc Ánh	Freelance
87	Bồ Quang Đông	VNUHCM-US
88	Lê Văn Luyện	VNUHCM-US
89	Trần Thế Hùng	