



VNU-HCM University of Science (HCMUS)

Faculty of Mathematics and Computer Science

227 Nguyễn Văn Cừ, District 5, Ho Chi Minh City, Viet Nam

Mathematical Conference “Summer Meeting 2017”

Saturday July 22 and Sunday July 23, 2017

Plenary Speakers

- **William Cherry** (Univ. of North Texas): *Non-Archimedean Function Theory*
- **Nguyễn Quốc Hùng** (Scuola Normale Superiore di Pisa): *Gradient estimates for singular quasilinear elliptic equations with measure data*
- **Lê Hải Khôi** (Nanyang Technological Univ.): *Complex symmetric weighted composition operators on the Fock space*
- **Nguyễn Tiến Khải** (North Carolina State Univ.): *Conservation laws and some applications to traffic flows*
- **Nguyễn Công Phúc** (Louisiana State Univ.): *Quasilinear equations with gradient natural growth and distributional data*

Invited Speakers

- **Djordje Baralic** (Mathematical Institute SASA, Belgrade): *Colorful KKM and the Lebesgue theorems*
- **Mai Hoàng Biên** (HCMUS): *Subnormal subgroups in division rings with generalized power central group identities*
- **Nguyễn Thanh Bình** (HCMUS): *Orthogonal Regularization for Training Recurrent Neural Networks*
- **Lý Kim Hà** (HCMUS): *Global Lipschitz continuity of Bergman projections in a class of convex domains in C^2*
- **Đặng Tuấn Hiệp** (National Center for Theoretical Sciences, Taiwan): *Schubert calculus on the Lagrangian Grassmannian*
- **Nguyễn Minh Quân** (VNU-HCM International Univ.): *Soliton-like behavior in pulse collisions in perturbed linear systems of coupled-PDEs*
- **Phan Thanh Toàn** (Tôn Đức Thắng Univ.): *Dedekind-Mertens lemma and content formulas for polynomials and power series*

Organizers: Nguyễn Tiến Khải (North Carolina State Univ.), Trần Vinh Hùng (Univ. of Wisconsin), Huỳnh Quang Vũ (HCMUS)

Local Organizers: Lý Kim Hà, Ông Thanh Hải, Bùi Lê Trọng Thanh (HCMUS)

Summer courses:

- *Mathematical Modeling Techniques for Biological System*, Hiền Trần (North Carolina State Univ.)
- *An introduction to optimal control problems and Hamilton-Jacobi Bellman equations*, Nguyễn Tiến Khải (North Carolina State Univ.)
- *An introduction to the Monge-Ampere equation and its applications*, Lê Quang Năm (Indiana Univ.)
- *Some new methods in viscosity solutions*, Trần Vinh Hùng (Univ. of Wisconsin)

Further information: http://www.math.hcmus.edu.vn/summer_meeting

Mathematical Conference "Summer Meeting 2017"

VNU-HCM University of Science (HCMUS), Ho Chi Minh City, 22–23/7/2017

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

Plenary speakers

- William Cherry (University of North Texas)
- Nguyễn Quốc Hưng (Scuola Normale Superiore di Pisa)
- Lê Hải Khôi (Nanyang Technological University)
- Nguyễn Tiến Khải (North Carolina State University)
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- Lý Kim Hà (HCMUS)
- Đặng Tuấn Hiệp (National Center for Theoretical Sciences, Taiwan)
- Nguyễn Minh Quân (VNU-HCM International University)
- Phan Thanh Toàn (Tôn Đức Thắng University)

Organizers

Nguyễn Tiến Khải (North Carolina State University), Trần Vĩnh Hưng (University of Wisconsin), Huỳnh Quang Vũ (HCMUS)

Local organizers: Lý Kim Hà, Ông Thanh Hải, Bùi Lê Trọng Thanh (HCMUS)

Venue

Lecture Hall Building I, The University of Science, 227 Nguyen Van Cu, District 5, HCMC

Supported by

VNU-HCM University of Science, Faculty of Mathematics and Computer Science, Summer Mathematical Meeting Fund

Contacts

Web: http://www.math.hcmus.edu.vn/summer_meeting

Program

Saturday, 22/7/2017

Morning

Chair: Nguyễn Tiến Khải

7:50–8:15 Registration

8:15–8:25 Opening

8:30–9:15 Nguyễn Công Phúc, *Quasilinear equations with gradient natural growth and distributional data*

9:25–10:10 Nguyễn Quốc Hưng, *Gradient estimates for singular quasilinear elliptic equations with measure data*

10:10–10:40 Break

10:40–11:25 Lê Hải Khôi, *Complex symmetric weighted composition operators on the Fock space*

11:35–12:00 Lý Kim Hà, *Global Lipschitz continuity of Bergman projections in a class of convex domains in \mathbb{C}^2*

Afternoon

Chair: Huỳnh Quang Vũ

14:00–14:45 William Cherry, *Non-Archimedean Function Theory*

14:55–15:20 Phan Thanh Toàn, *Dedekind-Mertens lemma and content formulas for polynomials and power series*

15:20–15:50 Break

15:55–16:20 Djordje Baralic, *Colorful KKM and the Lebesgue theorems*

16:30–16:55 Đặng Tuấn Hiệp, *Schubert calculus on the Lagrangian Grassmannian*

Sunday, 23/7/2017

Morning

Chair: Trần Vĩnh Hưng

8:00–8:30 coffee time, informal discussion

8:30–9:15 Nguyễn Tiến Khải, *Conservation laws and some applications to traffic flows*

9:25–9:50 Nguyễn Thanh Bình, *Orthogonal Regularization for Training Recurrent Neural Networks*

9:50–10:20 Break

10:20–10:45 Mai Hoàng Biên, *Subnormal subgroups in division rings with generalized power central group identities*

11:55–11:20 Nguyễn Minh Quân, *Soliton-like behavior in pulse collisions in perturbed linear systems of coupled-PDEs*

Closing

Abstracts

Djordje Baralic, Colorful KKM and the Lebesgue theorems

We extend the Lebesgue theorem (on covers of cubes) and the Knaster–Kuratowski–Mazurkiewicz theorem (on covers of simplices) to different classes of convex polytopes. We also show that the n -dimensional Hex theorem admits a generalization where the n -dimensional cube is replaced by a n -colorable simple polytope. Our methods assume the use of specially designed quasitoric manifolds from toric topology, with easily computable cohomology rings and the cohomological cup-length and they offers a great flexibility and versatility in applications.

Mai Hoàng Biên, Subnormal subgroups in division rings with generalized power central group identities

Let D be a division ring with center C and $c \in D^* = D \setminus \{0\}$. In 1978, Herstein conjectured that if for every $a \in D^*$, there exists a positive integer n_a such that $(cac^{-1}a^{-1})^{n_a} \in C$, then $c \in C$. In this talk, we provide some positive supports for the conjecture. References: M. H. Bien, Subnormal subgroups in division rings with generalized power central group identities, Arch. Math. 106 (2016), 315--321.

Nguyễn Thanh Bình, Orthogonal Regularization for Training Recurrent Neural Networks

Recurrent Neural Networks (RNNs) are difficult to train due to the well-known problem of exploding and vanishing gradient. Recent approaches have attempted to enforce the orthogonal or unitary transition matrix in order to stabilise the gradient. These methods often restrict the recurrent matrix to be unitary or orthogonal at each training iteration, which can be achieved either by doing a parametrization or a direct optimisation to enforce the constraint. Unlike the existing approaches, in this work, we propose an orthogonal regularisation scheme which relaxes the strict orthogonal constraint during RNN training. In particular, instead of restricting the recurrent matrix to be exactly orthogonal at every training iteration, the orthogonal regularization is able to keep the recurrent matrix being close to orthogonal to prevent the exploding and vanishing gradient without doing computationally intensive parametrization or extra optimization effort at every iteration. We show that the weak orthogonal regularisation is sufficient to address the exploding and vanishing gradient problem. We also investigate the generalization error when using the weak orthogonal condition on training general deep networks, and show that the generalisation error of a network is bounded based on the distance to the orthogonality of its parameters. Finally, we conduct an extensive set of experiments, in which our promising empirical results validate that the orthogonal regularizer can effectively address the vanishing and exploding gradient during RNN training, which not only benefits training better simple RNN, but also improves a range of RNN variants.

William Cherry, Non-Archimedean Function Theory

I will survey non-Archimedean analogs of classical complex function theory, including Nevanlinna's theory of value distribution and Benedetto's analogs of the Ahlfors Island Theorems.

Lý Kim Hà, Global Lipschitz continuity of Bergman projections in a class of convex domains in \mathbb{C}^2

The global Lipschitz continuity of Bergman projections in a class of smoothly bounded, convex domains in \mathbb{C}^2 is the main purpose of this talk.

Đặng Tuấn Hiệp, Schubert calculus on the Lagrangian Grassmannian

Let LG be a complex Lagrangian Grassmannian parametrizing Lagrangian (i.e. maximal isotropic) subspaces in a complex symplectic vector space of dimension $2n$. This talk is mainly devoted to the geometry of LG . More concretely, I will recall the definition of Schubert classes on LG and some basic results which are similar to the classical Pieri and Giambelli rules. A presentation of the cohomology ring of LG will be discussed. Finally, I will discuss recent results related to quantum cohomology of LG .

Nguyễn Quốc Hưng, Gradient estimates for singular quasilinear elliptic equations with measure data

In this talk, we discuss gradient estimates for singular quasilinear elliptic equations with measure data $-\operatorname{div}(A(x, \nabla u)) = \mu$, in a bounded domain $\Omega \subset \mathbb{R}^N$, where $A(x, \nabla u) \nabla u \asymp |\nabla u|^p$, $p \in \left(1, 2 - \frac{1}{n}\right]$ and μ is a Radon measure in Ω .

Nguyễn Tiên Khải, Conservation laws and some applications to traffic flows

In this talk, I will introduce a new class of models of traffic flow on a network of roads. In these models, the percentage of drivers who travel along an incoming road and wish to turn into an outgoing road is not a constant. Moreover, the drivers who enter a congested road are placed in a buffer of limited capacity, waiting their turn in line. The main goal is to describe traffic flow at intersections and study optimization problems on a network of roads.

I will present the well-posedness result for a new intersection model of traffic flows, and the existence of globally optimal solutions, Nash equilibrium solutions for a decision problem involving a continuum of drivers on the network.

Lê Hải Khôi, Complex symmetric weighted composition operators on the Fock space

The general study of the complex symmetry was commenced by Garcia and Putinar (2006-2007). Thereafter, a number of the papers is devoted to the topic. The results show that the bounded complex symmetric operators are quite diverse. It includes the Volterra integration operators, normal operators, compressed Toeplitz operators, etc. A question about whether there exist the complex symmetric weighted composition operators was analyzed recently by Garcia-Hammond and Jung-Kim-Ko-Lee (2014), for Hardy spaces in the unit disk. Independently, they discovered the complex symmetric structure when the conjugation is of the form $Cf(z) = \overline{f(\bar{z})}$. In this talk, we study general weighted composition conjugations of the form $(C_{\xi, \eta} f)(z) = \xi(z) \overline{f(\eta(z))}$ on the Fock space $\mathcal{F}^2(\mathbb{C})$ and study the conditions under which weighted composition operators are complex symmetric. The results are based on joint works with P.V. Hai.

Nguyễn Công Phúc, Quasilinear equations with gradient natural growth and distributional data

We obtain necessary and sufficient conditions, sometimes with sharp constants, on the distributional data σ for the existence of a globally finite energy solution to the quasilinear equation with a gradient source term of natural growth of the form $-\Delta_p u = |\nabla u|^p + \sigma$ in a bounded open set $\Omega \subset \mathbb{R}^n$. Here Δ_p , $p > 1$, is the standard p -Laplacian operator defined by $\Delta_p u = \operatorname{div}(|\nabla u|^{p-2} \nabla u)$. The study of $-\Delta_p u := |\nabla u|^p + \sigma$ is then applied to show the existence of globally finite energy solutions to the quasilinear equation of Schrödinger type $-\Delta_p v = \sigma v^{p-1}$, $v \geq 0$ in Ω , and $v = 1$ on $\partial\Omega$, via the exponential transformation $u \mapsto v = e^{\frac{u}{p-1}}$. This talk is based on joint work with Karthik Adimurthi.

Nguyễn Minh Quân, Soliton-like behavior in pulse collisions in perturbed linear systems of coupled-PDEs

In this talk, we present the soliton-like behavior in fast two-pulse collisions of pulses of weakly perturbed linear systems of coupled-PDEs. The behavior is demonstrated for linear systems of coupled-PDEs with weak cubic loss and for systems described by linear diffusion-advection models with weak quadratic loss. We show that in both systems, the expressions for the collision-induced amplitude shifts due to the nonlinear loss have the same form as the expression for the amplitude shift in a fast collision between two optical solitons in the presence of weak cubic loss. Our work shows that conclusions drawn from analysis of fast two-soliton collisions in the presence of dissipation can be applied for understanding the dynamics of fast two-pulse collisions in a large class of weakly perturbed linear physical systems. This is a joint work with Avner Peleg and Toan Huynh.

Phan Thanh Toàn, Dedekind-Mertens lemma and content formulas for polynomials and power series

Let $R[X]$ and $R[[X]]$ be the polynomial ring and the power series ring respectively over a commutative ring R with identity. For $f \in R[[X]]$, denote by A_f the content ideal of f , i.e., the ideal of R generated by the coefficients of f . The central question is “what is the relationship between the content ideal of the product fg and those of f and g ?” Dedekind-Mertens lemma tells us that if $f, g \in R[X]$, then

$$(1) \quad A_f^{k+1}A_g = A_f^kA_{fg}$$

for some positive integer k (depending only on g). Recently Epstein and Shapiro have successfully extended Dedekind-Mertens formula (1) to power series over Noetherian rings. They showed that if R is a Noetherian ring and if $f, g \in R[[X]]$, then

$$A_f^{k+1}A_g = A_f^kA_{fg}$$

for some positive integer k (depending only on g). In this talk we introduce our recent results in the case R is non-Noetherian. We further present some other content formulas relating A_f , A_g , and A_{fg} for $f, g \in R[[X]]$.

This is a joint work with Byung Gyun Kang and Mi Hee Park.

List of participants

HCMUP: Ho Chi Minh City University of Pedagogy

S: undergraduate student

F: university faculty

P: PhD student

M: master student

1	Tran Khai An	HCMUS	S
2	Nguyen Thi Van Anh	HCMUS	S
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4	Trần Hoàng Ân		P
5	Trương Nguyễn Thiên Ân	HCMUS	
6	Trần Hoài Ân	HCMUP	
7	Võ Quốc Bảo		M
8	Djordje Baralic	Mathematical Institute SASA, Belgrade, Serbia	Research Assistant Professor
9	Mai Hoàng Biên	HCMUS	F
10	Phan Tấn Bình		M
11	Nguyễn Thanh Bình	HCMUS	F
12	Lê Công Bình	Duong Van Duong High School, HCMC	Giáo viên Toán THPT
13	Nguyen Van Boul	HCMUS	M
14	William Cherry	University of North Texas	F
15	Nguyễn Chí Công		
16	Vũ Đỗ Huy Cường	HCMUS	F
17	Dang Truong	DFM-Engineering	R&D engineer
18	Pham The Doanh	HCMUS	S
19	Trương Hữu Dũng	Trường Đại học Đồng Nai	P
20	Dương Hoàng Dũng	Kyushu University, Japan	F
21	Phan Trí Dũng	HCMUS	
22	Nguyễn Đình Dương	HCMUS	P
23	Nguyễn Tiến Đạt	HCMUS	M
24	Trần Bình Đường		M
25	Ly Kim Ha	HCMUS	F
26	Ông Thanh Hải	HCMUS	F
27	Đoàn Lê Trung Hậu	HCMUS	S
28	Nguyen Trong Hieu	Aachen University	P
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30	Phan Đình Hiếu	HCMUS	
31	Nguyễn Thanh Hiếu	HCMUS	S
32	Lê Ngọc Hiếu		M
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39	Vũ Hùng	HCMUS	S
40	Nguyen Thi Huong	HCMUS	M
41	Bui Thi Thu Huong	HCMUS	M
42	Nguyễn Huỳnh Huy	Bách Khoa University	S
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45	Võ Hoàng Hưng	HCMUS	
46	Nguyen Tien Khai	North Carolina State University	F
47	Trần Thiện Khải	Trường Đại học Trà Vinh	F
48	Tra Quoc Khanh	HCMUS	P

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50	Võ Thị Bích Khuê	ĐH Tài chính-Marketing	
51	Cao Văn Kiên		M
52	Võ Ngọc Lâm		R&D
53	Nguyễn Đình Liêm		
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59	Luu Giang Nam	HCMUS	S
60	Truong Hoang Ngan	HCMUS	M
61	Lê Bá Ngân	HCMUS	S
62	Phạm Quang Nghĩa	HCMUS	S
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73	Phạm Trương Hoàng Nhân	HCMUS	S
74	Lương Anh Nhật	HCMUS	S
75	Nguyen Thi Nhung	HCMUS	F
76	Nguyễn Công Phúc	Lousiana State University	F
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