Vietnam National University – Ho Chi Minh City
University of Science (HCMUS)
227 Nguyễn Văn Cừ, District 5, Ho Chi Minh City

Mathematical Conference "Summer Meeting 2016"

Saturday July 23 and Sunday July 24, 2016

Plenary Speakers

Xia Chen (University of Tennessee, Knoxivlle, TN, USA)
Thảo Phương T. Hoàng (HCMC University of Pedagogy, Ho Chi Minh City, VN)
Tadele Mengesha (University of Tennessee, Knoxville, TN, USA)
Anh T. Trần (University of Texas at Dallas, Dallas, TX, USA)
Hiền T. Trần (North Carolina State University, Raleigh, NC, USA)

Invited Speakers

Quang L. Đặng (Politecnico di Milano, Milano, Italy)
Đặng Tuấn Hiệp (National Center for Theoretical Sciences, Taiwan)
Định Nguyễn (International University, VNUHCM, Ho Chi Minh City, VN)
Lộc H. Nguyễn (University of North Carolina – Charlotte, NC,USA)
Nhân T. Nguyễn (HCMC University of Pedagogy, Ho Chi Minh City, VN)
Dương T. Phạm (Vietnamese-German University, VN)
Việt T. Phan (Ton Duc Thang University, VN)

Mini tutorial courses: *"Weak convergence methods for nonlinear PDEs"* by prof. Hưng V. Trần, and *"MATLAB for solving inverse problems"* by prof. Hiền T. Trần from July 15 to July 22.

Organizers: **Vũ Q. Huỳnh** (HCMUS), **Khải T. Nguyễn** (Pennsylvania State University, USA), **Tuộc V. Phan** (University of Tennessee, USA), **Hưng V. Trần** (Univeristy of Wisconsin – Madison, USA)

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

The conference is supported in part by the University of Science, the Faculty of Mathematics & Computer Science, and the Summer Meeting Fund.

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

Mathematical Conference: "Summer Meeting 2016"

HCMC University of Science, 23 – 24/7/2016

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

Plenary speakers

Xia Chen *(University of Tennessee, USA)*, Thao Phuong T. Hoang *(HCMC University of Pedagogy, VN)*, Tadele Mengesha *(University of Tennessee, USA)*, Anh T. Tran *(University of Texas at Dallas, USA)*, Hien T. Tran *(North Carolina State University, USA)*

Invited speakers

Quang L. Dang *(Politecnico di Milano, Italy)*, Hiep T. Dang *(National Center for Theoretical Sciences, Taiwan)*, Dinh Nguyen *(International University, VNUHCM)*, Loc H. Nguyen *(University of North Carolina–Charlotte, USA)*, Nhan T. Nguyen *(HCMC University of Pedagogy, VN)*, Duong T. Pham *(Viet Duc University, VN)*, Viet T. Phan *(Ton Duc Thang University, VN)*

Organizers

Vu Q. Huynh *(University of Science, VNUHCM)*, Khai T. Nguyen *(Penn State University, USA)*, Tuoc V. Phan *(University of Tennessee, USA)*, Hung V. Tran *(University of Wisconsin –Madison, USA)*

Local organizers: Ly Kim Ha, Ong Thanh Hai, Bui Le Trong Thanh (University of Science, VNUHCM)

Venue

The University of Science, 227 Nguyen Van Cu, District 5, HCMC

Supported by

University of Science (VNUHCM), Faculty of Mathematics and Computer Science, and Summer Mathematical Meeting Fund

Contacts

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

Program

Saturday, 23/7/2016

Morning

8:00-8:20 Opening

8:20-9:10 Anh T. Tran, *The topology of the Jones polynomial*

9:20-9:50 Hiep D. Tran, *Fano schemes of linear subspaces on complete intersections*

9:50-10:20 Coffee break

10:20-11:10 Tadele Mengesha, *Averaged directional difference quotients*

11:20-11:50 Duong T. Pham, *A posteriori error estimates for solving Laplace-Beltrami equation on the unit sphere with spherical splines.*

Afternoon

14:00-14:50 Xia Chen, *Spatial assymptotics for the parabolic Anderson models with generalized time-space Gaussian noise*

15:00-15:30 Quang L. Dang, *Mathematical model for flash boiling steam/water flow inside nozzle*

15:30-16:00 Coffee break

16:00-16:50 Thao Phuong T. Hoang, *Space-time domain decomposition methods in mixed formulation for flow and transport problems*

17:00-17:30 Nhan T. Nguyen, *A singular-regular decomposition method for numerical simulations of close particles in a Stokes fluid* (cancelled)

Sunday, 24/7/2016

Morning

8:00-8:50 Hien T. Tran, *Modeling Techniques for Complex Biological Systems: Sensitivity, Identifiability, Filtering and Optimal Control*

9:00-9:30 Loc H. Nguyen, *A globally convergent algorithm for a* 3*D inverse scatterring problem*

9:30-10:00 Coffee break

10:00-10:30 Viet T. Phan, *Some results of the Lipschitz constant of* 1*-field on* R^n

10:40-11:10 Dinh Nguyen, *Weak efficient solutions for vector optimization problems via vector Farkas lemmas*

Closed

Abstracts

- XIA CHEN, University of Tennessee, USA

  Spatial asymptotics for the parabolic Anderson models with generalized time-space Gaussian noise

  In this talk, we establish the precise spatial assymptotics for the parabolic Anderson equations with white or fractional Gaussian noise. In the special case of $(1+1)$-white noise, our result applies to Cole-Hopf solution of the KPZ equation.

- HIEP T. DANG, National Center for Theoretical Sciences, Taiwan

  Fano schemes of linear subspaces on complete intersections

  The goal of this talk is to discuss a genus-degree formula for Fano schemes of linear subspaces on complete intersections whenever their expected dimensions are one. We also give a review of the degree formulas for these Fano schemes.

- QUANG L. DANG, Politecnico di Milano, Italy

  Mathematical model for flash boiling steam/water flow inside nozzle

  Flash boiling steam/water flow phenomenon is encountered when a saturation mixture flow of water/vapor or saturation water experiences a depressurization rapidly inside nozzle that leads to thermal non-equilibrium phase change and mechanical non-equilibrium. In this work, the phenomenon is modeled via finite volume method for a mixture model with slip velocity between two phases. To account for thermal non-equilibrium, the author uses evaporation/condensation model with evaporation/condensation frequency (time delay of boiling/condensing) is extracted from experimental data. A k-omega SST model with Standard Wall Functions scheme for near-wall treatment is used to model the turbulent flow. About solution strategy, PISO method for solving the pressure-velocity coupling is applied. This study use Green-Gauss Cell Based solver for gradient discretization, second order upwind for spatial discretization of all other quantities, except volume fraction for which a first order upwind scheme is used for purpose of solution stabilization. This study tested on a $2D$ convergent-divergent nozzle with a range of total pressure-inlet ($134-189$ kPa) and range of inlet liquid mass fraction ($0-0.36$) for case of saturation vapor/liquid flow. Results of simulation in this case are in agreement with experimental data when maximum relative error is 8.2 %. The same geometry and numerical model is also applied for superheated vapor flow in range of total pressue-inlet ($91-141$ kPa) and total inlet temperature ($378-399$ K), maximum relative error between simulation and experimental data in this case is 9.2%..

- THAO PHUONG T. HOANG, HCMC University of Pedagogy, VN

  Space-time domain decomposition methods in mixed formulation for flow and transport problems

  We consider global-in-time, nonoverlapping domain decomposition methods using mixed finite elements to model flow and transport problems in porous media. The first method uses the time-dependent Steklov Poincaré operator and the second uses optimized Schwarz waveform relaxation based on Robin transmission conditions. For each method, a space-time interface problem is derive and different time steps can be used in different subdomains. Two-dimensional numerical results will be presented.

- TADELE MENGESHA, University of Tennessee, USA

  Averaged directional difference quotients

  We study averaged directional difference quotients of vector fields and their continuity property over several function spaces. A third order tensor field will be used to distinguish appropriate directions in which slopes are averaged. The averaged directional derivatives will be shown to approximate classical notions of derivatives. We will use this approximation property to characterize vector fields in the space of Sobolev, bounded variation, and bounded deformation functions in a unified way.

- ANH T. TRAN, University of Texas at Dallas, Dallas, USA

  The topology of the Jones polynomial

  We will discuss old and new conjectures about the topology of the Jones polynomial. These include the AJ conjecture, the slope conjecture, and the strong slope conjecture. The AJ conjecture of Garoufalidis relates the A-polynomial and the colored Jones polynomial of a knot. The A-polynomial was introduced by Cooper et al. in 1994 and has been fundamental in geometric topology. A similar conjecture to the AJ conjecture was also proposed by Gukov from the viewpoint of the Chern-Simons theory. The slope conjecture of Garoufalidis and two new conjectures of Kalfagianni and the speaker are about the relationships between the degree of the colored Jones polynomial of a knot and the topology of the knot. These conjectures assert that certain boundary slopes and Euler characteristics of essential surfaces in a knot complement can be read off from the degree of the colored Jones polynomial.

- DINH NGUYEN, International University, VNUHCM

  Weak efficient solutions for vector optimization problems via vector Farkas lemmas

  We consider the vector optimization problem of the model

  $$\text{(VOP)} \qquad \text{WMin}\{F(x) : x \in C,\ G(x) \in -S\},$$

  where X, Y, Z are locally convex Hausdorff topological spaces, Y and Z are partially ordered by the two closed convex cones K and S (respectively), $F\colon X \to Y \cup \{+\infty_Y\}$, and $G\colon X \to Z \cup \{+\infty_Z\}$ are proper mappings and $\emptyset \neq C \subset X$.

  Several representations of the K-epigraph $\text{epi}_K(F + I_A)^*$ are established (where $A := C \cap G^{-1}(-S)$). These are used as key tools to establish extended versions of Farkas lemmas for systems defined by vector-valued functions, which in their turn, pave new ways for characterizations of weak efficient solutions of the vector optimization problems of the model (VOP).

- LOC H. NGUYEN, International University, VNUHCM

  A globally convergent algorithm for a 3D inverse scatterring problem

  The aim of the talk is to propose an algorithm to reconstruct spatially distributed dielectric constants of scatterers from the boundary measurement of the scattered fields. In contrast with some reconstruction methods by optimal control scheme, this algorithm does not require any knowledge of an initial guest of the true solution. This talk consists of two parts. The first one is to introduce the mathematical results that guarantee the effectiveness of the algorithm. The second part is to discuss some numerical studies. This is a joint work with Michael V. Klibanov and Hui Liu.

- NHAN T. NGUYEN, HCMC University of Pedagogy, VN

  A singular-regular decomposition method for numerical simulations of close particles in a Stokes fluid

  In this talk, we present a new method for computing the hydrodynamic interactions between N solid spherical particles moving with given rotational and translational velocities in Stokes fluid. Our method includes the singular lubrication interactions which may occur when some particles come close to one another. The main new feature is that short-range interactions are propagated to the whole flow, including accurately the many-body lubrication interactions. We compare our method with the Stokesian Dynamics of Durlofsky et. al. and show the higher accuracy of the former.

- VIET T. PHAN, Ton Duc Thang University, VN

  Some results of the Lipschitz constant of 1-field on R^n

  We study the relationship between the Lipschitz constant of 1-field and the Lipschitz constant of the gradient canonically associated with this 1-field. Moreover, we produce two explicit formulas which are two extremal minimal Lipschitz extensions for 1-fields. As a consequence of the previous results, we obtain two explicit formulas for the problem of minimal extension by Lipschitz continuous functions

from R^m to R^n. Finally, we show that Wells's extensions of 1-fields are absolutely minimal Lipschitz extension when the domain of 1-field to expand is finite. We provide a counter-example showing that this result is false in general.

- DUONG T. PHAM, Viet Duc University, VN

  A posteriori error estimates for solving Laplace-Beltrami equation on the unit sphere with spherical splines

  A posteriori error estimates (lower and upper bounds) for Laplace-Beltrami equation on the unit sphere with spherical splines will be proved. Adaptive finite element method techniques are employed to reduce computational complexity of the problem. A significant improvement in terms of degrees of freedom and computational time will be obtained. Numerical experiments illustrate our theoretical results.

- HIEN T. TRAN, North Carolina State University, USA

  Modeling Techniques for Complex Biological Systems: Sensitivity, Identifiability, Filtering and Optimal Control

  Ordinary differential equations (ODE) are a powerful tool for studying complex biological systems. In general, these equations often contain a large number of unknown parameters whose values are difficult to determine even with state-of-the-art laboratory equipments. In this case, it is necessary to determine unknown parameters in ODE models from available experimental data. Typically only a subset of the parameters can be estimated due to restrictions imposed by the model structure and limited experimental data. In this talk, sensitivity and identifiability analyses will be presented as the first step in determining unknown parameters in nonlinear ODE models. An example from modeling HIV infection will be used to illustrate how to apply these sensitivity and identifiability analyses in practice. Finally, receding horizon control (RHC), which is a nonlinear feedback control methodology, will be presented as a promising approach for deriving optimal therapies for viral infections. However, implementation of RHC technique in clinical settings will require the design and construction of nonlinear state estimator or observer. We will examine a nonlinear Kalman filtering based state estimator that used viral load and T-cell count measurements to construct the feedback control law.

Registered Participants			
	Name	Institution:	Occupation
1	Lê Chiêu Hoàng Nguyên	HCMUS	undergraduate student
2	Nguyễn Thị Thu	HCMUS	graduated
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4	Hoang Nguyen		undergraduate student
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6	Đặng Thanh Bình	Univ. Of Industry, HCMC	university faculty member
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97	Bui Thi Dinh	HCMUS	master student
98	Vũ Hoàng Minh Quân	HCMUS	undergraduate student
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