

**The International Conference on
Current Progress in Mathematics
(ICCPM 2021)**

2021 数学前沿进展国际会议

Shanghai University

Shanghai, China

November 14 2021



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Shanghai University



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Conference Venue

New Lehu Hotel, Shanghai University, 716 Jinqiu Road, Baoshan district, Shanghai
上海市宝山区锦秋路716号上海大学北大门乐乎新楼

All lectures will be held in the New Lehu Hotel 2nd building (乐乎新楼2号楼)

Accommodation

Campus accommodation:

New Lehu Hotel, Shanghai University, 716 Jingqiu Road, Baoshan district, Shanghai
上海市宝山区锦秋路716号上海大学北大门乐乎新楼

Alternative accommodation:

聚丰园宾馆, 上海大学西门附近
汉庭酒店, 上海大学北门附近

Transportation

From Pudong Airport to Shanghai University (Baoshan Campus)

1. By Metro: Pudong airport by Metro Line 2 to Jing'an Temple, change to Metro Line 7 to Shanghai University. (Total price is 8 RMB.)
2. By Taxi: Directly take taxi to 716 Jingqiu Road, Shanghai University (Baoshan Campus, North Gate). (Total price is about 230 RMB.)

From Hongqiao Airport to Shanghai University (Baoshan Campus)

1. By Metro: Hongqiao airport by Metro Line 2 to Jing'an Temple exchange to Metro Line 7 to Shanghai University. (Total price is 6 RMB.)
2. By Taxi: Directly take taxi to 716 Jingqiu Road, Shanghai University (Baoshan Campus, North Gate). (Total price is about 60 RMB.)

From Shanghai Railway Station to Shanghai University (Baoshan Campus)

1. By Metro Line 1 to Changshu Road exchange to Metro Line 7 to Shanghai University(Baoshan Campus). (Total price is 4 RMB.)
2. By Metro Line 3 to Zhenping Road exchange to Metro Line 7 to Shanghai University(Baoshan Campus). (Total price is 4 RMB.)
3. Directly take taxi to 716 Jingqiu Road, Shanghai University (Baoshan Campus, North Gate). (Total price is about 50 RMB.)
4. By Bus Route 58: Railway Station (Hengfeng Road) -> terminus (near 716 Jingqiu Road, Shanghai University, Baoshan Campus, North Gate). (Total price is 2 RMB.)

Contact

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Program

Saturday, November 13

12:00-19:00 Registration

17:30-19:30 Dinner

Lobby of the Lehu Hotel 乐乎新楼1号楼一楼

Sunday, November 14

Tencent Conference ID: 586 565 812

Password: 6789

Chair: Peicheng Zhu

Daxue Hall(大学厅)-乐乎新楼2号楼二楼

7:50-8:00 Opening Ceremony

Opening remarks by Prof. Peicheng Zhu

Welcome speech by the dean of College of Sciences

Chair: Fayou Zhao

Daxue Hall(大学厅)-乐乎新楼2号楼二楼

8:00-8:35 Speaker: Dashan Fan, University of Wisconsin-Milwaukee Milwaukee (p. 6)

Title: Some multipliers on compact manifolds

Chair: Jianli Liu

Daxue Hall(大学厅)-乐乎新楼2号楼二楼

8:35-9:10 Speaker: Geng Chen, Department of Mathematics, University of Kansas (p. 5)

Title: Uniqueness of BV solution for compressible Euler equations

Tencent Conference ID: 984 746 620

Password: 6789

Chair: Jiancai Sun

Daxue Hall(大学厅)-乐乎新楼2号楼二楼

9:10-9:45 Speaker: Haisheng Li, Rutgers University-Camden (p. 6)

Title: On cocommutative vertex bialgebras

Chair: Jiancai Sun

Daxue Hall(大学厅)-乐乎新楼2号楼二楼

9:45-10:20 Speaker: Kaiming Zhao, Wilfrid Laurier University, Waterloo, Canada (p. 6)

Title: Simple weak twisted modules over the Heisenberg-Virasoro vertex operator algebras

Tencent Conference ID: 814 807 057

Password: 6789

Chair: Peicheng Zhu

Daxue Hall(大学厅)-乐乎新楼2号楼二楼

10:20-10:55 Speaker: Ming Mei, Champlain College and McGill University, Canada (p. 5)

Title: Subsonic / supersonic / transonic steady-states of Euler-Poisson equations

for semiconductors with sonic boundary

Chair: Zi Xu Daxue Hall(大学厅)-乐乎新楼2号楼二楼

10:55-11:30 Speaker: Shiqian Ma, University of California, Davis (p. 7)

Title: Riemannian Optimization for Projection Robust Optimal Transport

Tencent Conference ID: 234 368 172

Password: 6789

Chair: Peicheng Zhu

Daxue Hall(大学厅)-乐乎新楼2号楼二楼

11:30-12:05 Speaker: Zhijun Qiao, University of Texas Rio Grande Valley (p. 8)

Title: Integrable high order CH type models with pseudo-peakons

12:05-14:30 Lunch

Tencent Conference ID: 803 141 587

Password: 6789

Chair: Peicheng Zhu

Daxue Hall(大学厅)-乐乎新楼2号楼二楼

14:30-15:05 Speaker: Wansheng Wang, Shanghai Normal University, China (p. 7)

Title: Variable step size implicit and explicit format for fast option pricing

Chair: Peicheng Zhu

Daxue Hall(大学厅)-乐乎新楼2号楼二楼

15:05-15:40 Speaker: Pierluigi Cesana, Institute of Mathematics for Industry, Kyushu

University, Japan (p. 7)

Title: Atomistic Modeling of Planar Disclinations

Tencent Conference ID: 699 353 929

Password: 6789

Chair: Jianli Liu

Daxue Hall(大学厅)-乐乎新楼2号楼二楼

15:40-16:15 Speaker: Yang Xiang, Hong Kong University of Science and Technology, Hong Kong (p. 8)

Title: Modeling Effects of Randomness on the Strength of High-Entropy Alloys

Chair: Peicheng Zhu

Daxue Hall(大学厅)-乐乎新楼2号楼二楼

16:15-16:50 Speaker: Li Chen, Univ manheim, Germany (p. 8)

Title: Derivation of the Shigesada–Kawasaki–Teramoto cross diffusion model via moderated mean field particle system

Goodbye

Abstracts

Ming Mei

Champlain College and McGill University, Canada

Title: Subsonic / supersonic / transonic steady-states of Euler-Poisson equations for semiconductors with sonic boundary

Abstract: In this talk, I will present a series of studies on the structure of steady-states to Euler-Poisson equations for semiconductors subjected to the sonic boundary, a critical case of boundary setting. Based on the subsonic/supersonic/transonic properties of the doping profile, we give the criteria on the structure of steady-states: in which cases there exist subsonic solutions, supersonic solutions, shock transonic solutions, smooth transonic solutions, and the number of these solutions, and in which cases there are no physical solutions.

Geng Chen

Department of Mathematics, University of Kansas

Title: Uniqueness of BV solution for compressible Euler equations

Abstract: Compressible Euler equations are a typical system of hyperbolic conservation laws, whose solution forms shock waves in general.

It is well known that global BV solutions of system of hyperbolic conservation laws exist, when one considers small BV initial data. In this talk, we will present our recent proof on uniqueness of BV solution.

As a major breakthrough for system of hyperbolic conservation laws in 1990's, solutions have been proved to be unique among BV solutions verifying either the so-called Tame Oscillation Condition, or the Bounded Variation Condition on space-like curves.

In the paper of this talk, we show that these solutions are stable in a larger class of weak (and possibly not even BV) solutions of the system. As a consequence of our result, the Tame Oscillation Condition, and the Bounded Variation Condition on space-like curves are not necessary for the uniqueness of solutions in the BV theory, in the case of systems with two unknowns. Hence, the uniqueness of BV solution is proved.

Haisheng Li

Rutgers University-Camden

Title: On cocommutative vertex bialgebras

Abstract: In this talk, we shall discuss the structure of cocommutative vertex bialgebras. For a general vertex bialgebra V , we show that the set $G(V)$ of group-like elements is naturally an abelian semigroup, whereas the set $P(V)$ of primitive elements is a vertex Lie algebra. For $g \in G(V)$, denote by V_g the connected component containing g . Among the main results, we show that if V is a cocommutative vertex bialgebra, then $V = \bigoplus_{g \in G(V)} V_g$, where V_1 is a vertex subbialgebra which is isomorphic to the vertex bialgebra $\mathcal{V}_{P(V)}$ associated to the vertex Lie algebra $P(V)$, and V_g is a V_1 -module for $g \in G(V)$.

In particular, this shows that every cocommutative connected vertex bialgebra V is isomorphic to $\mathcal{V}_{P(V)}$ and hence establishes the equivalence between the category of cocommutative connected vertex bialgebras and the category of vertex Lie algebras. Furthermore, under the condition that $G(V)$ is a group and lies in the center of V , we prove that $V = \mathcal{V}_{P(V)} \otimes C[G(V)]$ as a coalgebra where the vertex algebra structure is explicitly determined. This talk is based on a joint work with Jianzhi Han and Yukun Xiao.

Dashan Fan

University of Wisconsin-Milwaukee Milwaukee

Title: Some multipliers on compact manifolds

Abstract: We will address some important Fourier multipliers on Riemannian compact manifolds (torus, spheres, compact Lie groups are special cases of compact manifolds). These multipliers include the Bochner-Riesz means, wave operators, fractional Schrodinger operators and fractional heat operators. All these operators have their deep backgrounds rooted in Fourier analysis, partial differential equations and physics. Also, we will present our recent works on some of these operators related to the almost everywhere convergence and approximation theory.

Kaiming Zhao

Wilfrid Laurier University, Waterloo, Canada

Title: Simple weak twisted modules over the Heisenberg-Virasoro vertex operator algebras

Abstract: All simple weak twisted modules over the Heisenberg-Virasoro vertex operator algebras, and all simple restricted modules over the mirror Heisenberg-Virasoro algebra will be given in this talk. This is based on a joint work with Admovic, Tan and Yao.

Shiqian Ma

University of California, Davis

Title: Riemannian Optimization for Projection Robust Optimal Transport

Abstract: The optimal transport problem is known to suffer the curse of dimensionality. A recently proposed approach to mitigate the curse of dimensionality is to project the sampled data from the high dimensional probability distribution onto a lower-dimensional subspace, and then compute the optimal transport between the projected data. However, this approach requires to solve a max-min problem over the Stiefel manifold, which is very challenging in practice. In this talk, we propose a Riemannian block coordinate descent (RBCD) method to solve this problem. We analyze the complexity of arithmetic operations for RBCD to obtain an ϵ -stationary point, and show that it significantly improves the corresponding complexity of existing methods. Numerical results on both synthetic and real datasets demonstrate that our method is more efficient than existing methods, especially when the number of sampled data is very large.

Wansheng Wang

Shanghai Normal University

Title: Variable step size implicit and explicit format for fast option pricing

Abstract: In this report, we discussed the stability and convergence of the implicit and explicit variable step midpoint formula for solving partial integro-differential equation option pricing models. At the same time, we obtained the implicit and explicit variable step size Based on the posterior error estimation of BDF2 method, a time-adaptive algorithm is designed based on these posterior error estimation. The report also presented a large number of numerical results.

Pierluigi Cesana

Associate Professor, Institute of Mathematics for Industry, Kyushu University,
Japan

Title: Atomistic Modeling of Planar Disclinations

Abstract: We describe some recent results on the modeling of planar wedge disclinations. These are rotational mismatches at the level of a crystal lattice which are observed in classes of Shape-Memory Alloys undergoing the austenite-to-martensite transformation and in crystal plasticity. We introduce an energy functional defined over a triangular lattice accounting for nearest-neighbor interactions. We design special rotational-type boundary value problems on the lattice so that the minimizers necessarily exhibit non-homogeneous rotations. We are interested in the asymptotics of the energy minima and minimizers as the lattice spacing vanishes which we compute exactly with Gamma-convergence. We

perform numerical calculations for the discrete model and show that both the shape of the solutions as well as the values of the energies are in agreement with classical results for positive and negative disclinations. This is a collaboration with P. van Meurs (Kanazawa).

Zhijun Qiao

University of Texas Rio Grande Valley

Title: Integrable high order CH type models with pseudo-peakons

Abstract: In this talk, I will introduce some integrable scalar models which possess peaked solitons (peakons), including the well-known Camassa-Holm (CH), the Degasperis-Procesi (DP), and other new peakon equations developed in recent years. I will take the CH case as a typical example to explain the details and show that the Camassa-Holm (CH) spectral problem yields two different integrable hierarchies of nonlinear evolution equations. In particular, the CH peakon equation is able to be extended to the DP, the b-family, the FORQ, the Novikov, the modified CH (MOCH), and other higher order models with peakons or pseudo-peakons. Some open problems will also be addressed for discussion in the end.

Yang Xiang

Hong Kong University of Science and Technology

Title: Modeling Effects of Randomness on the Strength of High-Entropy Alloys

Abstract: High-entropy alloys (HEAs), i.e., single-phase, nearly equiatomic multicomponent, metallic materials, are associated with novel mechanical properties, such as high strength, fracture resistance etc. We propose a stochastic Peierls-Nabarro (PN) model to understand how random site occupancy affects intrinsic strength. We also present an asymptotic derivation of the stochastic continuum model from an atomistic model that incorporates the atomic level randomness. The model predicts the intrinsic strength of HEAs as a function of the standard deviation and the correlation length of the randomness. This approach provides a fundamental explanation to the origin of the high strength of HEAs.

Li Chen

Univ manheim, Germany

Title: Derivation of the Shigesada–Kawasaki–Teramoto cross diffusion model via moderated mean field particle system

Abstract: Population cross-diffusion systems of Shigesada–Kawasaki–Teramoto type are derived

in a mean-field-type limit from stochastic, moderately interacting manyparticle systems for multiple population species in the whole space. The diffusion term in the stochastic model depends nonlinearly on the interactions between the individuals, and the drift term is the gradient of the environmental potential. In the first step, the mean-field limit leads to an intermediate nonlocal model. The local cross-diffusion system is derived in the second step in a moderate scaling regime, when the interaction potentials approach the Dirac delta distribution. The global existence of strong solutions to the intermediate and the local diffusion systems is proved for sufficiently small initial data. This is a joint work with Esther Daus, Alexandra Holzinger, and Ansgar Jüngel.