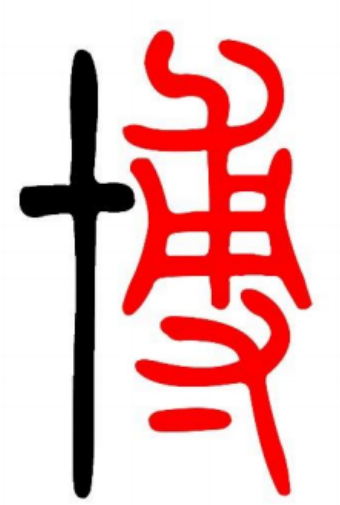
清华大学第 631 期
博士生学术论坛



活动手册

2021 年 4 月 17 日 北京 清华大学

主办：清华大学研究生院

协办：清华大学研究生会

承办：清华大学数学科学系

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清华大学第 631 期博士生学术论坛

4 月 17 日

委员会名单

► 指导委员会:

邹文明老师　　李　思老师

黄忠亿老师　　陈志杰老师

► 学术委员会:

陈炳仪　　陈　敬　　桂政平　　武丽娜

► 组织委员会:

邓邦明　　陈志杰　　吴承原　　程泽涛　　张港回

论坛期间如果发生任何问题请联系:

吴承原 15651779535　　程泽涛 18810833216

清华大学第 631 期博士生学术论坛

4 月 17 日

会议日程安排

4 月 17 日

08 : 20∼08 : 40　注册
08 : 40∼08 : 50　开幕式，系主任邹文明致辞（分会场一）
08 : 50∼09 : 00　赵访熊奖学金颁奖（分会场一）
09 : 00∼09 : 45　特邀报告: 刘正伟教授（分会场一）
09 : 45 ∼10 : 00　茶歇
10 : 00∼12 : 05　学术报告（分会场一，分会场二，分会场三）
12 : 05∼13 : 30　午餐及中午休息
13 : 30 ∼15 : 10　学术报告（分会场一，分会场二，分会场三）
15 : 10 ∼15 : 30　茶歇
15 : 30 ∼18 : 00　学术报告（分会场一，分会场二，分会场三）

清华大学第 631 期博士生学术论坛

4 月 17 日

特邀报告

17 日上午（分会场一（郑裕彤讲堂））

报告题目 TITLE	**量子傅立叶分析**		
报告人	刘正伟教授	**单位**	清华大学
报告摘要	量子傅里叶分析是研究量子对称性的理论，重点研究量子傅里叶对偶的分析、代数和拓扑性质。这个报告中，我们将介绍量子傅里叶分析这个方向的背景、代表性成果、应用和最新进展。		

清华大学第 631 期博士生学术论坛

4 月 17 日

学生报告时间表

17 日上午（分会场一（郑裕彤讲堂），基础数学与应用数学方向）

时间	姓名	题目
10:00∼10:25	涂绪山	Regularity for Monge-Ampére Equations with oblique data
10:25∼10:50	陈炳仪	Explicit bound of the discrepancy of divisors computing minimal log discrepancies on surfaces
10:50∼11:15	钟一鸣	A Special Type of Sextics, the Related K3 Surfaces and Deligne-Mostow's Theory
11:15∼11:40	关志达	Four dimensional biharmonic hypersurfaces in nonzero space forms have constant mean curvature
11:40∼12:05	李培根	Exponential sums and rigid cohomology

清华大学第 631 期博士生学术论坛

4 月 17 日

学生报告时间表

17 日上午（分会场二（A304），概率统计、计算数学与运筹学方向）

时间	姓名	题目
10:00∼10:25	陈昌	Efficient Computations for Phase Field Crystal Models
10:25∼10:50	苗淳瑞	A novel spectral method for the semi-classical Schrödinger equation based on the Gaussian wave-packet transform
10:50∼11:15	谢鹏程	Derivative-free optimization methods for special constrained grey box optimization problems
11:15∼11:40	盖阔	深度神经网络与 Wasserstein 空间的测地线
11:40∼12:05	王玖鳞	Closing the gap between necessary and sufficient conditions for local non-global minimizer of trust region subproblem

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4 月 17 日

学生报告时间表

17 日上午（分会场三（A404），应用数学方向）

10:00∼10:25	郭淑媛	On the Optimal Locations of Nodes of Sturm-Liouville Problems
10:25∼10:50	焦小沛	New classes of finite dimensional filters with non-maximal rank estimation algebra on state dimension n and linear rank n-2
10:50∼11:15	曾泓博	Existence and uniqueness for variational problem from progressive lens design
11:15∼11:40	胡奕啸	带随机采样的冻结高斯波束方法的地震成像研究
11:40∼12:05	刘爽	Spreading and Competition in Periodic and Advective Habitats

清华大学第 631 期博士生学术论坛

4 月 17 日

学生报告时间表

17 日下午（分会场一（郑裕彤讲堂），基础数学与应用数学方向）

时间	姓名	题目
13:30∼13:55	韩丽娜	Hall polynomials for tame quivers with automorphism
13:55∼14:20	自云鹏	Geometry of the Winger Pencil
14:20∼14:45	蔡书哲	玻色子的玻尔兹曼方程：凝聚与不凝聚
14:45∼15:10	杨佐	Normalized solutions of nonlinear Schrödinger equations
15:30∼15:55	张禾	Irreducible Tensor Modules over Quantum Coordinate Algebra of type A
15:55∼16:20	殷鑫	Positive least energy solutions for k-coupled critical systems involving fractional Laplacian
16:20∼16:45	宣一	Exterior John Domains and Quasisymmetric mappings
16:45∼17:10	王军	On generalized configuration space and its homotopy groups
17:10∼17:35	柳翔	Embeddings of templates in 3-spaces

清华大学第 631 期博士生学术论坛

4 月 17 日

学生报告时间表

17 日下午（分会场二（A304），概率统计、计算数学与运筹学方向）

时间	姓名	题目
13:30∼13:55	肖敬松	Consistent community detection approach in the non-parametric weighted stochastic blockmodel with unknown number of communities
13:55∼14:20	宋逸伦	The Pre-commitment KMM Problem in a continuous-time framework
14:20∼14:45	胡家琦	Robust equilibrium strategies in a defined benefit pension plan game
14:45∼15:10	马伟东	Model-Free Feature Screening for Ultrahigh Dimensional Discriminant Analysis and FDR Control With Knockoff Features

清华大学第 631 期博士生学术论坛

4 月 17 日

学生报告时间表

17 日下午（分会场二（A304），概率统计、计算数学与运筹学方向）

时间	姓名	题目
15:30∼15:55	陈键	Stochastic Control of a Class of Dynamical Systems via Path Limits
15:55∼16:20	袁冯毅	Retirement decision and optimal consumption-investment under addictive habit persistence
16:20∼16:45	王夏恺	Multi-phase segmentation using modified complex Cahn-Hilliard equations
16:45∼17:10	黄艾彤	Reconstruction of Sparse Polynomials via Quasi-Orthogonal Matching Pursuit Method
17:10∼17:35	郑三棚	A modified moving least-squares suitable for scattered data fitting with outliers
17:35∼18:00	桂升	Molecular Sparse Representation by a 3D Ellipsoid Radial Basis Function Neural Network via L1 Regularization

清华大学第 631 期博士生学术论坛

4 月 17 日

学生报告时间表

17 日下午（分会场三（A404)，应用数学方向）

时间	姓名	题目
13:30∼13:55	孙祎泽	The distillability of entanglement of bipartite reduced density matrices of a tripartite state
13:55∼14:20	徐子翔	On color isomorphic patterns in proper colorings
14:20∼14:45	张瑾珂	Theory and Design of PID Controller for Nonlinear Uncertain Systems
14:45∼15:10	寿凌云	Global weak solutions for fluid-particle models
15:30∼15:55	赵爽	Outflow/Inflow Problem for Two-Phase Flow
15:55∼16:20	苗慧敏	Feedback particle filter with correlated noises

附件一　学生报告摘要

基础数学与应用数学方向

报告题目 TITLE	**Hall polynomials for tame quivers with automorphism**				
作者姓名	韩丽娜	学号	2015311024	导师姓名	邓邦明
关键词	Ringel–Hall algebra; Green's formula; Hall polynomial; Quiver with automorphism.				
学术报告摘要	Let Q be a finite quiver together with an automorphism σ, denoted by (Q,σ). It is known that the pair (Q,σ) defines a family of algebras $\mathfrak{A}(Q,\sigma;q)$ over finite fields $\mathbb{F}_q$ of q elements. In this paper we study Hall polynomials for the algebras $\mathfrak{A}(Q,\sigma;q)$ under the assumption that Q is a tame quiver. We can define the notion of decomposition sequences for (Q,σ) which parameterize isoclasses (=isomorphism classes) of finite dimensional modules over $\mathfrak{A}(Q,\sigma;q)$. The main purpose of this paper is to prove that Hall polynomial exists for each triple of decomposition sequences for (Q,σ). If σ is an identity automorphism, we recover the main results in both Hubery [Represent. Theory **14** (2010), 355–378] and Deng–Ruan [J. Algebra **475** (2017), 171–206].				

报告题目 TITLE	**Geometry of the Winger Pencil**				
作者姓名	自云鹏	学号	2016311026	导师姓名	Eduard Looijenga
关键词	Winger Pencil & Moduli Space & Icosahedral Symmetry				
学术报告摘要	We investigate the moduli of genus 10 curves that are endowed with a faithful action of the icosahedral group $\mathcal{A}_5$. We show among other things that this has the structure of a Deligne-Mumford stack whose underlying coarse moduli space essentially consists of two copies of the pencil of plane sextics that was introduced by Winger in 1924, but with the unique unstable member (a triple conic) replaced by a smooth non-planar curve. The orbifold defined by any member has genus zero and comes with 4 orbifold points. We show that by numbering the points, we get a fine moduli space whose base is naturally a finite cover of $\mathcal{M}_{0,4}$.				

报告题目 TITLE	**On the Optimal Locations of Nodes of Sturm-Liouville Problems**				
作者姓名	郭淑媛	**学号**	2017311247	**导师姓名**	章梅荣
关键词	Eigenfunction; location of node; eigenvalue; Sturm-Liouville operator; complete continuity; continuous differentiability; optimization problem				
学术报告摘要	By a node of the Sturm-Liouville problem, it means an interior zero of an eigenfunction. It is well-known that the set of nodes can be used to recover the potentials and the boundary data in the Sturm-Liouville problems. In this talk, we will first consider nodes as nonlinear functionals of potentials from the Lebesgue spaces and introduce its continuous Fréchet differentiability in potentials in the usual norms sence and also its complete continuity when the weak topologies are considered. As an application, we will develop a direct variational approach to solve some optimization problems on the unique node of the second Dirichlet eigenfunction when the norms of integrable potentials are known.				

报告题目 TITLE	**玻色子的玻尔兹曼方程：凝聚与不凝聚**				
作者姓名	蔡书哲	**学号**	2019311322	**导师姓名**	卢旭光
关键词	玻色子; 硬位势; 有限实践凝聚; 均衡位势; 有限时间不凝聚。				
学术报告摘要	在此报告中，我们讨论空间均匀，速度各向同性前提下的玻色子的玻尔兹曼方程。我们论证在此前提下，如果低温且硬位势下，由此方程能导出粒子有有限时间凝聚；而如果处于均衡位势，那么无论温度高低，都没有有限时间凝聚。				

报告题目 TITLE	**New classes of finite dimensional filters with non-maximal rank estimation algebra on state dimension n and linear rank n-2**				
作者姓名	焦小沛	**学号**	2017311703	**导师姓名**	丘成栋
关键词	finite dimensional filters; estimation algebra; Wong's Ω-matrix; non-maximal rank				
学术报告摘要	Ever since the technique of Kalman filter was popularized, there has been lots of research interests in finding new classes of finite dimensional recursive filters. In this paper, by applying Wong's theorem, we construct a new class of finite dimensional filters with arbitrary state space dimension n and linear rank $n-2$. Importantly, we show that in the new class of nonlinear filtering systems, the entries of Wong's Ω-matrix are not necessary to be constants or polynomials and can be C^∞ functions.				

报告题目 TITLE	**Regularity for Monge-Ampére Equations with oblique data**				
作者姓名	涂绪山	学号	2017311231	导师姓名	简怀玉
关键词	Monge-Ampére equations; Neumann problem; Schauder estimate; Liouville theorem.				
学术报告摘要	In this report, we study the viscosity convex solutions of the oblique problem of Monge- Ampére equations. We prove the existence theorem. Under suitable assumption on the known data, we obtain the Liouville theorem for viscosity convex solutions in semi-space, as well as the $W^{2,1}$, $W^{2,p}$ and $C^{2,\alpha}$ estimate. For the two-dimensional case, these results can be viewed as the extension of the classical schauder estimate and Liouville theorem for the Neumann problem of Possion equation. When the space dimension is n 3, we give an example to show that our results are optimal.				

报告题目 TITLE	**Explicit bound of the discrepancy of divisors computing minimal log discrepancies on surfaces**				
作者姓名	陈炳仪	学号	2016311023	导师姓名	丘成栋
关键词	birational geometry; minimal log discrepany				
学术报告摘要	Mustata and Nakamura posed a conjecture on the boundness of the discrepancy of divisors computing minimal log discrepancies. They proved their conjecture for surfaces without giving an explicit bound. In this talk, I will give an explicit bound for their conjecture in the surface case. Some examples will be given to indicate that the bound is optimal.				

报告题目 TITLE	**A Special Type of Sextics, the Related K3 Surfaces and Deligne-Mostow's Theory**				
作者姓名	钟一鸣	学号	2016311024	导师姓名	Eduard Looijenga
关键词	singular plane sextic curves, K3 surfaces, Deligne-Mostow theory, complex ball uniformizations				
学术报告摘要	We study moduli spaces of certain sextic curves with singularity of degree 3 from both perspectives of Deligne-Mostow theory and periods of K3 surfaces. In both ways we can describe the moduli space via arithmetic quotients of complex hyperbolic balls. We show that the two ball-quotient constructions can be unified by a geometric construction.				

报告题目 TITLE	**Four dimensional biharmonic hypersurfaces in nonzero space forms have constant mean curvature**				
作者姓名	关志达	**学号**	2015310999	**导师姓名**	李海中
关键词	Biharmonic maps; Biharmonic hypersurfaces; Constant mean curvature.				
学术报告摘要	In this report, through making careful analysis of Gauss and Codazzi equations, we prove that four dimensional biharmonic hypersurfaces in nonzero space forms have constant mean curvature. Our result gives the positive answer to the conjecture proposed by Balmus-Montaldo-Oniciuc in 2008 for four dimensional hypersurfaces.				

报告题目 TITLE	**Exponential sums and rigid cohomology**				
作者姓名	李培根	**学号**	2016311025	**导师姓名**	扶磊
关键词	exponential sums; rigid cohomology; Dwork cohomology.				
学术报告摘要	In the present talk, we will give a comparison theorem between the rigid cohomology defined by Berthelot and the Dwork cohomology introduced by Adolphson and Sperber to study the exponential sums. Furthermore, we can use the results of Dwork cohomology to calculate the rigid cohomology of the Dwork isocrystal on the torus.				

报告题目 TITLE	**Normalized solutions of nonlinear Schrödinger equations**				
作者姓名	杨佐	**学号**	2016311011	**导师姓名**	邹文明
关键词	Schrödinger equation; Normalized solution; Multiplicity; Orbital stability.				
学术报告摘要	Due to its important applications in many physical problems, the normalized solution of nonlinear Schrödinger equations has gradually attracted the attention of a large number of researchers in recent years: $$\begin{cases} -\Delta u + \lambda u = g(u),\ x \in \mathbb{R}^N, \\ u \in H^1(\mathbb{R}^N),\ \int_{\mathbb{R}^N} u^2 dx = c, \end{cases}$$ where the normalization condition $c \in \mathbb{R}^+$ is given, but the Lagrange multiplier λ is unknown. We first introduce the existence, multiplicity, and other properties of the normalized solution of a single Schrödinger equation under different conditions. Then we introduce some new results related to the normalized solution to other types nonlinear Schrödinger equations.				

报告题目 TITLE	**Existence and uniqueness for variational problem from progressive lens design**				
作者姓名	曾泓博	**学号**	2018311297	**导师姓名**	简怀玉
关键词	Variational problem; Willmore surfaces of revolution; fourth-order elliptic partial differential equation£»existence and uniquenes.				
学术报告摘要	We study a functional modelling the progressive lens design,which is a combination of Willmore functional and total Gauss curvature. First,we prove the existence for the minimizers of revolution surfaces with dirichlet boundary data. Then,choosing such a minimiser as background surfaces to approximate the functional by a quadratic functional,we prove the existence and uniqueness of the solution to the Euler-Lagrange equation for the quadratic functionals.				

报告题目 TITLE	**Irreducible Tensor Modules over Quantum Coordinate Algebra of type A**				
作者姓名	张禾	**学号**	2017311227	**导师姓名**	张贺春
关键词	quantum coordinate algebra; irreducible module; tensor module; box-diagram.				
学术报告摘要	In this report we give a generalization of Soibelman and Tanisaki's construction of irreducible tensor modules over quantum coordinate algebra when the group is of type A. Some combinatorial properties of the box-diagram are studied to get the result.				

报告题目 TITLE	**带随机采样的冻结高斯波束方法的地震成像研究**				
作者姓名	胡奕啸	**学号**	2016311006	**导师姓名**	黄忠亿
关键词	高频地震波；到时地震成像；随机采样；冻结高斯波束方法				
学术报告摘要	在本报告中，我们回顾了之前利用冻结高斯波束方法进行高频地震成像的数值方法，并针对其计算量的特点提出了带随机采样的冻结高斯波束方法，在保持一定的精度下大大减小计算量的新方法。并在最后给出了数值计算结果进行方法的验证。				

报告题目 TITLE	**Positive least energy solutions for k-coupled critical systems involving fractional Laplacian**				
作者姓名	殷鑫	**学号**	2016311010	**导师姓名**	邹文明
关键词	k-coupled critical system; fractional laplacian; positive least energy solution; existence; asymptotic behaviour.				
学术报告摘要	In this report, we study the following k-coupled critical system: $$\begin{cases} (-\Delta)^s u_i + \lambda_i u_i = \mu_i u_i^{2^*-1} + \sum\limits_{j=1, j\neq i}^{k} \beta_{ij} u_i^{\frac{2^*}{2}-1} u_j^{\frac{2^*}{2}} & \text{in } \Omega, \\ u_i = 0 \quad \text{in} \quad \mathbb{R}^N \backslash \Omega, \quad i = 1, 2, \cdots, k. \end{cases}$$ Here $(-\Delta)^s$ is the fractional Laplacian operator, $0 < s < 1$, $2^* = \frac{2N}{N-2s}$ is a fractional Sobolev critical exponent, $N > 2s$, $-\lambda_s(\Omega) < \lambda_i < 0, \mu_i > 0$, $\beta_{ij} = \beta_{ji} \neq 0$ and $\Omega \subset \mathbb{R}^N$ is a smooth bounded domain, where $\lambda_s(\Omega)$ is the first eigenvalue of $(-\Delta)^s$ with the homogeneous Dirichlet boundary datum. We characterize the positive least energy solution of the k-coupled fractional critical system for the purely cooperative case $\beta_{ij} > 0$ with $N > 4s$. It's interesting to see that the least energy of the k-coupled system decreases as k grows. Moreover, we establish the existence of positive least energy solution of the limit system in $\mathbb{R}^N$, as well as classification results. Besides, we investigated in the asymptotic behaviour of the positive least energy solutions of the critical system.				

报告题目 TITLE	**Exterior John Domains and Quasisymmetric mappings**				
作者姓名	宣一	**学校**	中国科学院数学与系统科学研究院	**导师姓名**	刘劲松
关键词	John Domains, Quasisymmetric Maps				
学术报告摘要	An exterior John domain is a John domain which is the exterior of a compact set. We prove that a quasiconformal mapping from the exterior of the closed unit ball to the exterior of a compact set is quasisymmetric with respect to the length inner distance if and only if its image is an exterior John domain.				

报告题目 TITLE	**Spreading and Competition in Periodic and Advective Habitats**				
作者姓名	刘爽	**学校**	中国人民大学	**导师姓名**	楼元
关键词	Periodic, Advective, Principal eigenvalue				
学术报告摘要	In this talk, we shall discuss the dynamics of reaction-diffusion-advection models for single and two competing species in one-dimensional periodic habitat. We establish the monotone dependence of the principal eigenvalue on diffusion and drift rates. As applications, we first estiblish the critical threshold for the persistence and the monotone dependence of the minimal wave speed on the drift rate. We also consider two competing species model and study the local and global stability of semi-trivial steady states. This is a joint work with Prof. Yuan Lou (The Ohio State University).				

报告题目 TITLE	**On generalized configuration space and its homotopy groups**				
作者姓名	王军	**学校**	首都师范大学	**导师姓名**	赵学志
关键词	Generalized configuration space; Stiefel Manifolds; Homotopy groups				
学术报告摘要	”Let M be a subset of vector space or projective space. Generalizing the classical configuration space, the author considers the *generalized configuration space* of M which is formed by ordered n-tuples of elements of M where any k elements of each n-tuple are linearly independent. Denote *generalized configuration space* of M by $W_{k,n}(M)$. In addition to be a generalization of classical configuration space, the *generalized configuration space* is also a generalization of Stiefel manifold. In this paper, the author studies topological property of the generalized configuration spaces, and calculates homotopy, homology, and cohomology groups for some special cases. This article gives the fundamental groups of generalized configuration spaces of $\mathbb{R}Pm$ for some special cases and the generators of fundamental group, the connections between the homotopy groups of generalized configuration spaces of Sm and the homotopy groups of Stiefel manifolds. It is also proved that the higher homotopy groups of generalized configuration spaces $W_{k,n}(Sm)$ and $W_{k,n}(\mathbb{R}Pm)$ are isomorphic. ”				

报告题目 TITLE	**On color isomorphic patterns in proper colorings**				
作者姓名	徐子翔	**学校**	首都师范大学	**导师姓名**	葛根年
关键词	Proper edge coloring, Color isomorphic, Even cycle, Subdivisions				
学术报告摘要	"Given a graph H and an integer $k \geqslant 2$, let $f_k(n, H)$ be the smallest number of colors C such that there exists a proper edge coloring of the complete graph K_n with C colors containing no k vertex disjoint color isomorphic copies of H. Conlon and Tyomkyn initiated the study of this function using a variety of combinatorial, probabilistic and algebraic techniques. In this talk, we first review some known results and methods of Conlon and Tyomkyn. Then we will introduce some new results on the even cycle C_4 and the 1-subdivision of complete graph K_t. Finally, several open problems and conjectures will be discussed."				

报告题目 TITLE	**Embeddings of templates in 3-spaces**				
作者姓名	柳翔	**学校**	首都师范大学	**导师姓名**	赵学志
关键词	3-manifold, embedding, fibration, isotopy, link, Smale flow, spatial graph, template				
学术报告摘要	The template is a compact branched surface with a semi-flow, which is used to model knots and links as periodic orbits arising from a 3-dimensional flow. For embedded templates in $S3$, we introduce isotopic invariants that can classify Smale flows up to isotopy. For 3-dimensional Euclidean space, following the Hirsch-Smale theory we develop fibrations of spaces of immersions, as well as embeddings, of a template and its boundary. It is joint work with XueZhi ZHAO.				

报告题目 TITLE	**Global weak solutions for fluid-particle models**				
作者姓名	寿凌云	**学校**	首都师范大学	**导师姓名**	李海梁
关键词	Two-phase flow, Compressible Navier-Stokes, Vlasov, Vlasov-Fokker-Planck, Global existence, Large time behavior				
学术报告摘要	In this talk, we will present our recent results about fluid-particle two phase flow, which consists of compressible Navier-Stokes equations with density-dependent viscosity coefficient and Vlasov equation (or Vlasov-Fokker-Planck equation) coupled each other though a nonlinear drag force. The existence, uniqueness, and regularity of the global weak solution to one-dimensional initial value problem for general initial data are established, and the large time behaviors of global solution are analyzed. This is joint with Prof. Hai-Liang Li.				

报告题目 TITLE	**Outflow/Inflow Problem for Two-Phase Flow**				
作者姓名	赵爽	**学校**	首都师范大学	**导师姓名**	李海梁
关键词	Stationary solution, Nonlinear stability, Two-phase flow, Inflow problem, Outflow problem.				
学术报告摘要	In this talk, we present recent investigation on inflow/outflow problem for full two-phase flow, which consists of two compressible Navier-Stokes equations coupled each other through the drag force relaxation mechanisms and is derived by the Chapman-Enskog expansion from the Vlasov-Navier-Stokes for mixed fluid-particle motion. The existence of the unique stationary solution is shown respectively corresponding to supersonic, sonic, and subsonic flow at far field. The nonlinear stability and long time convergence rates are also established. This is joint with Professor Hai-Liang Li.				

报告题目 TITLE	**Feedback particle filter with correlated noises**				
作者姓名	苗慧敏	**学校**	北京航空航天大学	**导师姓名**	罗雪
关键词	Feedback particle nonlinear filtering (NLF)				
学术报告摘要	Motivated by the mean-field game theory, the feedback particle filter (FPF) for the signal-observation nonlinear filtering (NLF) model with independent white noises, has been developed in [23] for the first time. In this paper, we shall extend this algorithm to the case where the scalar signal process is correlated with the scalar observation process. The equation that the control inputs (K, u) satisfied has been derived by minimizing the Kullback-Leibler (K-L) divergence of the conditional density and the conditional posterior empirical distribution of the controlled particles. Then we show rigorously that the control inputs obtained is consistent, in the sense that if the initial conditional density and the empirical distribution are the same, so are the posterior ones. The explicit expression for the control input u is given if K is obtained. The numerical simulation of a scalar NLF problem with transition phenomenon has been solved by our algorithm with satisfactory performance not only in accuracy but also in efficiency.				

概率统计、计算数学与运筹学方向

报告题目 TITLE	**Multi-phase segmentation using modified complex Cahn-Hilliard equations**				
作者姓名	王夏恺	**学号**	2016311007	**导师姓名**	黄忠亿
关键词	Cahn-Hilliard equations; Multi-phase segmentation; mean curvature term;.				
学术报告摘要	In this report, we propose a novel PDE-based model for the multi-phase segmentation problem by using a complex version of Cahn-Hilliard equations. Specifically, we modify the original complex system of Cahn-Hilliard equations by adding the mean curvature term and the fitting term to the evolution of its real part, which helps to render a piecewisely constant function at the stead state. By applying the K-means method to this function, one could achieve the desired multiphase segmentation. To solve the proposed system of equations, a semi-implicit finite difference scheme is employed. Numerical experiments are presented to demonstrate the feasibility of the proposed model and compare our model with other related ones.				

报告题目 TITLE	**Efficient Computations for Phase Field Crystal Models**				
作者姓名	陈昌	**学号**	2020311335	**导师姓名**	包承龙
关键词	phase field crystal models, stationary states, adaptive accelerated Bregman proximal gradient methods				
学术报告摘要	In this talk, we introduce an adaptive Bregman proximal gradient (AB-BPG) algorithm for computing the stationary states of the phase field crystal model. Based on modern optimization techniques, a practical linear search approach is used to obtain adaptive step sizes and ensures a energy dissipating property. The convergence property of the proposed method is established without the requirement of global Lipschitz continuity. Numerical experiments in computing Landau-Brazovskii (LB) model and Lifshitz-Petrich (LP) model will be reported.				

报告题目 TITLE	**Stochastic Control of a Class of Dynamical Systems via Path Limits**				
作者姓名	陈键	**学号**	2015311030	**导师姓名**	陈金文
关键词	stochastic control; dynamical system, large deviation, path limit.				
学术报告摘要	In this report, Some limit theorems are derived for a class of controlled Markov systems with small noises. The aim is to understand the effects of strategies of actions on the limiting behaviors of the systems, so that optimization for associated utilities can be considered. In deriving the limits, we apply a large deviation approach with a somewhat new technique of proof. An almost sure convergence theorem is then derived. To meet more realistic situations, the noises need not to be smooth or Lipschitz continuous, even are allowed to be discontinuous in the states. Dependence of the limits on the strategies can be found, which involves a certain differential equation. Some illustrative examples are provided.				

报告题目 TITLE	**Retirement decision and optimal consumption-investment under addictive habit persistence**				
作者姓名	袁冯毅	**学号**	2019311332	**导师姓名**	梁宗霞
关键词	Retirement decision; Stopping-control problem; Habit persistence; Wealth-habit- wage triplet; Retirement boundary; Dual transformation.				
学术报告摘要	This paper studies the retirement decision, optimal investment and consumption strategies under habit persistence for an agent with the opportunity to design the retirement time. The optimization problem is formulated as an interconnected optimal stopping and stochastic control problem (Stopping-Control Problem) in a finite time horizon. The problem contains three state variables: wealth x, habit level h and wage rate w. We aim to derive the retirement boundary of this "wealth-habit-wage" triplet (x,h,w). The complicated dual relation is proposed and proved to convert the original problem to the dual one. We obtain the retirement boundary of the dual variables based on an obstacle-type free boundary problem. Using dual relation we find the retirement boundary of primal variables and feed-back forms of optimal strategies. We show that if the so-called "de facto wealth" exceeds a critical proportion of wage, it will be optimal for the agent to choose to retire immediately. In numerical applications, we show how "de facto wealth" determines the retirement decisions and optimal strategies. Moreover, we observe discontinuity at retirement boundary: investment proportion always jumps down upon retirement, while consumption may jump up or jump down, depending on the change of marginal utility. We also find that the agent with higher standard of life tends to work longer.				

报告题目 TITLE	**Model-Free Feature Screening for Ultrahigh Dimensional Discriminant Analysis and FDR Control With Knockoff Features**				
作者姓名	马伟东	**学号**	2016311034	**导师姓名**	杨瑛
关键词	Feature screening, ranking consistency property, sure screening property, ultrahigh dimensional discriminant analysis				
学术报告摘要	This article proposes a model-free marginal feature screening procedure for ultrahigh dimensional discriminant analysis based on a new metric named integral Pearson's chi-squared (IPC) index. We allow the number of response classes to diverge with the sample size at a certain order and establish the sure screening and ranking consistency properties of the proposed procedure in the ultrahigh dimensional setting. We furthur propose two two-step approaches with the help of knockoff features to control FDR and mFDR.				

报告题目 TITLE	**Consistent community detection approach in the nonparametric weighted stochastic blockmodel with unknown number of communities**				
作者姓名	肖敬松	**学号**	2017311265	**导师姓名**	杨瑛
关键词	Weighted stochastic blockmodel; Nonparametric; Clustering; Consistency.				
学术报告摘要	In this report, we introduce new concepts of consistency in the stochastic blockmodel (SBM) and propose a nonparametric approach to deal with the weighted SBM.				

报告题目 TITLE	**The Pre-commitment KMM Problem in a continuous-time framework**				
作者姓名	宋逸伦	**学号**	2018311331	**导师姓名**	梁宗霞
关键词	Pre-commitment KMM problem; Distorted Legendre transformation; Generalized dual method; Smooth ambiguity; Portfolio selection; Efficient frontier.				
学术报告摘要	In this report, we introduce a new distorted Legendre transformation and extends the dual method developed in Kramkov and Schachermayer [22]. Using the transformation and generalized dual method, we investigate the pre-commitment KMM problem proposed by Klibanoff et al. [20] in a continuous-time framework. The KMM problem is a portfolio selection under smooth ambiguity. It characterizes risk attitude and ambiguity attitude separately and is an open problem, where the investor is ambiguous about the financial model and searches the optimal investment strategy to maximize the two-fold utility of terminal wealth. By convex analysis, the original KMM problem is first transformed to an equivalent one maximizing the sum of weighted utilities under different priors. Then, a generalized duality theorem is established on this problem to show the uniqueness and existence of the KMM problem. Besides, the efficient frontier is constructed, and the optimal terminal wealth and the optimal strategy are derived. Explicit forms of optimal strategies are presented for CRRA, CARA and HARA utilities, which find that investor with higher ambiguity aversion tends to be more concerned about bad market conditions. In the end of this work, numerical results are revealed for different utility functions and ambiguity attitudes.				

报告题目 TITLE	**Robust equilibrium strategies in a defined benefit pension plan game**				
作者姓名	胡家琦	**学号**	2020311316	**导师姓名**	梁宗霞
关键词	Overfunded DB pension plan; Robust control; Stochastic differential game; Nash equilibrium; Stochastic dynamic programming				
学术报告摘要	This paper investigates the robust non-zero-sum games in an aggregated overfunded defined benefit (abbr. DB) pension plan. The sponsoring firm is concerned with the investment performance of the fund surplus while the participants act as a union to claim a share of the fund surplus. The financial market consists of one risk-free asset and n risky assets. The firm and the union both are ambiguous about the financial market and care about the robust strategies under the worst case scenario. The union's objective is to maximize the expected discounted utility of the additional benefits, the firm's two different objectives are to maximizing the expected discounted utility of the fund surplus and the probability of the fund surplus reaching an upper level before hitting a lower level in the worst case scenario. We formulate the related two robust non-zero-sum games for the firm and the union. Explicit forms and optimality of the solutions are shown by stochastic dynamic programming method. In the end of this paper, numerical results are illustrated to depict the economic behaviours of the robust equilibrium strategies in these two different games.				

报告题目 TITLE	**A novel spectral method for the semi-classical Schrödinger equation based on the Gaussian wave-packet transform**				
作者姓名	苗淳瑞	**学号**	2020311323	**导师姓名**	朱毅
关键词	semi-classical Schrödiner equation; Gaussian wave-packet transform; Hagedrn's wave-packets; spectral method.				
学术报告摘要	In this talk, I will briefly introduce a new spectral method to solve the semi-classical Schrödinger equation based on the Gaussian wave-packet transform (GWPT) and Hagedorn's semi-classical wave-packets (HWP). I will also introduce its related numerical analysis. The GWPT equivalently recasts the highly oscillatory wave equation as a much less oscillatory one (the w equation) coupled with a set of ordinary differential equations governing the dynamics of the so-called GWPT parameters. The Hamiltonian of the w equation consists of a quadratic part and a small non-quadratic perturbation, which is of order $\mathcal{O}(\sqrt{\varepsilon})$, where $\varepsilon \ll 1$ is the rescaled Planck's constant. By expanding the solution of the w equation as a superposition of Hagedorn's wave-packets, we construct a spectral method while the $\mathcal{O}(\sqrt{\varepsilon})$ perturbation part is treated by the Galerkin approximation. This numerical implementation of the GWPT avoids artificial boundary conditions and facilitates rigorous numerical analysis. In this work, we establish how the error of solving the semi-classical Schrödinger equation with the GWPT is determined by the errors of solving the w equation and the GWPT parameters. We prove that this scheme has the spectral convergence with respect to the number of Hagedorn's wave-packets in one dimension. Extensive numerical tests are provided to demonstrate the properties of the proposed method.				

报告题目 TITLE	**Derivative-free optimization methods for special constrained grey box optimization problems**				
作者姓名	谢鹏程	**学校**	中国科学院数学与系统科学研究院	**导师姓名**	袁亚湘
关键词	Derivative-free optimization; interpolation; trust region; grey box				
学术报告摘要	The report mainly focuses on solving grey box problems with special structure by derivative-free optimization algorithms, including an introduction to derivative-free optimization algorithms, the update of the model for solving grey box optimization problems, and derivative-free optimization algorithms with penalty functions and the projection technique. The report also presents the application of the derivative-free algorithms based on the interpolation model for solving constrained problems and problems with special structure.				

报告题目 TITLE	**深度神经网络与 Wasserstein 空间的测地线**				
作者姓名	盖阔	**学校**	中国科学院数学与系统科学研究院	**导师姓名**	张世华
关键词	深度神经网络、残差网络、连续性方程、最优传输				
学术报告摘要	深度学习在各个领域都取得了极大成功，但其内在原理仍然没有完全被人理解。最近的一些重要工作指出了深度学习与动力系统的关系。在本报告中我们建立了深度神经网路与连续性方程的联系以刻画其保测度性。在测度空间中有无数条曲线连接神经网络的输入分布和输出分布。我们发现深度神经网络倾向于拟合 Wasserstein 距离诱导的测地线，并且从理论上阐明了逼近测地线有利于神经网络的优化和泛化。相比于无跨连的网络（plain network），残差网络可以更好的拟合测地线，这解释了为什么残差网络相比于无跨连的网络可以优化、泛化得更好。我们设计了线形指标（line-shape score）和最优传输指标（optimal transport score）去刻划真实网络对测地线的逼近程度，并在标准数据集（CIFAR-10、CIFAR-100）上验证了我们的理论。				

报告题目 TITLE	**Closing the gap between necessary and sufficient conditions for local non-global minimizer of trust region subproblem**				
作者姓名	王玖鳞	**学校**	北京航空航天大学	**导师姓名**	夏勇
关键词	Trust region subproblem, Local minimizer, Optimality condition				
学术报告摘要	The trust region subproblem has at most one local nonglobal minimizer. In characterizing this local solution, there is a clear gap between necessary and sufficient conditions. In this work, we surprisingly show that the sufficient second-order optimality condition remains necessary.				

报告题目 TITLE	**Reconstruction of Sparse Polynomials via Quasi-Orthogonal Matching Pursuit Method**				
作者姓名	黄艾彤	**学校**	北京航空航天大学	**导师姓名**	冯仁忠
关键词	Reconstruction of sparse polynomial, Compressive sensing, Mutual coherence, Quasi-orthogonal matching pursuit algorithm				
学术报告摘要	”In this talk, we propose a Quasi-Orthogonal Matching Pursuit (QOMP) algorithm for constructing a sparse approximation of functions in terms of expansion by orthonormal polynomials. For the two kinds of sampled data, data with noises and without noises, we apply the mutual coherence of measurement matrix to establish the convergence of the QOMP algorithm which can reconstruct s-sparse Legendre polynomials, Chebyshev polynomials and trigonometric polynomials in s step iterations. The results are also extended to general bounded orthogonal system including tensor product of these three univariate orthogonal polynomials. Finally, numerical experiments will be presented to verify the effectiveness of the QOMP method.”				

报告题目 TITLE	**A modified moving least-squares suitable for scattered data fitting with outliers**				
作者姓名	郑三棚	**学校**	北京航空航天大学	**导师姓名**	冯仁忠
关键词	Scattered data, Data fitting, Outlier, Moving least squares, Weight function, Modified moving least squares				
学术报告摘要	”In the fitting of scattered data, there may be a few sample values that contain high noise, which are called outliers. In dealing with such scattered data, the approximation effect of the classical moving least squares (abbr. MLS) is greatly reduced due to the existence of outliers. In this paper, a modified moving least squares (abbr. MMLS) is proposed, which can recognize outliers automatically from scattered data and weaken the influence of the outliers in fitting by an added weight function in MLS. It is theoretically proven that if the only noise existing in scattered data is outliers, the solution of MMLS is close to that of MLS in the absence of outliers. Because the computational process of the proposed MMLS is consistent with the classical MLS, the computational efficiency of MMLS is higher than that of Levin’s moving least-hardy method (abbr. MLH) which is proposed to also deal with the fitting of scattered data with outliers by iterative solution. The numerical experiments not only confirm the property of MMLS but also show that the approximation effect of MMLS is almost identical with that of MLH.”				

报告题目 TITLE	**The distillability of entanglement of bipartite reduced density matrices of a tripartite state**				
作者姓名	孙祎泽	**学校**	北京航空航天大学	**导师姓名**	陈霖
关键词	Distillability of entanglement, Reduced density operator, Schmidt rank				
学术报告摘要	”The relation between the distillability of entanglement of three bipartite reduced density matrices from a tripartite pure state has been studied in Hayashi and Chen (2011 Phys. Rev. A 84 012325). We extend this result to the tripartite mixed state of rank at most three. In particular we show that if the state has two bipartite reduced density operators with rank two, then the third bipartite reduced density operator additionally having non positive partial transpose (non-PPT) is distillable. In contrast, we show that the tripartite PPT state with two reduced density operators of rank two is a three-qubit fully separable state. We obtain these facts by proving a conjectured matrix inequality for the bipartite matrix M with Schmidt rank at most three. This is one of the main results of this paper.We also prove it for some M with arbitrary Schmidt rank.”				

报告题目 TITLE	**Theory and Design of PID Controller for Nonlinear Uncertain Systems**				
作者姓名	张瑾珂	**学校**	中国科学院数学与系统科学研究院	**导师姓名**	郭雷
关键词	PID control, nonlinear uncertain system, output regulation，agents-based systems				
学术报告摘要	It is well-known that the classical proportional-integral-derivative (PID) controller plays a fundamental role in various engineering systems. However, up to now a theory that can explain the rationale why the linear PID can effectively deal with nonlinear uncertain dynamical systems and a method that can provide explicit design formula for the PID parameters are still lacking. This motivates our recent study on the theoretical foundation of the PID control. The main purpose of this paper is to extend the 1-D results to higher dimensional nonlinear uncertain systems and to improve the results significantly by a refined method. We will also consider a class of multi-agent uncertain nonlinear systems where each agent is controlled by a PID controller using its own regulation error. We will show that a parameter manifold can be constructed explicitly so that when the PID parameters are chosen from this manifold, the multi-agent systems will be globally stable and the tracking error of each agent will coverage to zero exponentially fast.				

报告题目 TITLE	**Molecular Sparse Representation by a 3D Ellipsoid Radial Basis Function Neural Network via L1 Regularization**				
作者姓名	桂升	**学校**	中国科学院数学与系统科学研究院	**导师姓名**	卢本卓
关键词	Molecular shape; Gaussian density map; Radial basis function neural network; Sparse representation.				
学术报告摘要	The three-dimensional structures and shapes of biomolecules provide essential information about their interactions and functions. Unfortunately, the computational cost of biomolecular shape representation is an active challenge which increases rapidly as the number of atoms increase. Recent developments in sparse representation and deep learning have shown significant improvements in terms of time and space. A sparse representation of molecular shape is also useful in various other applications, such as molecular structure alignment, docking, and coarse-grained molecular modeling. We have developed an ellipsoid radial basis function neural network (ERBFNN) and an algorithm for sparsely representing molecular shape. To evaluate a sparse representation model of molecular shape, the Gaussian density map of the molecule is approximated using ERBFNN with a relatively small number of neurons. The deep learning models were trained by optimizing a nonlinear loss function with L1 regularization. Experimental results reveal that our algorithm can represent the original molecular shape with a relatively higher accuracy and fewer scale of ERBFNN. Our network in principle is applicable to the multiresolution sparse representation of molecular shape and coarse-grained molecular modeling.				

附件二　与会学生名单

序号	姓名	手机
1	吴承原	15651779535
2	许先粮	13752131032
3	冯立	18410147271
4	王夏恺	17611677051
5	韩丽娜	18811327119
6	杨博寒	13708345090
7	朱芮萱	13521882090
8	徐瑾涛	18810050829
9	杨璐	15910936956
10	张跃进	18810960897
11	陈啸	13857115978
12	蔡立德	17710145752
13	刘志文	19801169712
14	李海波	18810623085
15	魏逸伦	18911653309
16	孙泽钜	18801002156
17	马衍龙	15098796513
18	陈昌	18373259368
19	钟宇宸	17343060496

20	林天润	18210435184
21	自云鹏	18510465740
22	黄谭昊	18810618323
23	朱雨薇	18811718100
24	陈蕴灵	15311518044
25	李冀维	18513280877
26	江孝炜	17610769503
27	王跃然	18810610189
28	马晨阳	18602484053
29	陈键	18610330946
30	李梦妮	18811310667
31	胡潇宇	18810996878
32	田松涛	15672830402
33	杜婷	13142036658
34	郭淑媛	13146026955
35	殷思瑶	18810690556
36	陆李威	15706703006
37	林国昌	18101213016
38	徐黎闽	17888825947
39	裴少君	18813171062
40	袁冯毅	13051230311
41	孙楠	15124997208

42	吴雨檬	17549668387
43	刘思汉	13051863277
44	蔡书哲	15157771688
45	马伟东	18801307916
46	焦小沛	18801321174
47	王良熔	15158505192
48	涂绪山	18500325351
49	陈炳仪	18811366025
50	张思韫	18810518763
51	钟一鸣	18811472293
52	关志达	13021940229
53	郑璐予	18090308916
54	陈奕宏	18811125377
55	赵馨	17750662376
56	程泽涛	18810833216
57	胥夫鹏	17738419872
58	邱言哲	18701676268
59	朱晓鹏	15201519542
60	胡颀轩	18800130771
61	曹颖	18355117533
62	叶泽宇	18559296732
63	刘志文	19801169712

64	李培根	18810056854
65	李博	18892067211
66	曹霞霞	18810823538
67	林汛	15089640580
68	杨佐	15949172708
69	刘天昊	18810057226
70	肖敬松	13120195525
71	曾泓博	18801132175
72	张禾	18813052416
73	王昊昕	18801110809
74	李芮暄	13120393639
75	杨志强	18800128592
76	刘剑锋	17328305397
77	宋逸伦	13466392195
78	胡家琦	18800131057
79	胡奕啸	13051325272
80	王鹤锦	18800106657
81	要文慧	18810609326
82	冯昱	18726198230
83	苗淳瑞	15117907745
84	殷鑫	18801013236
85	刘杨	18800107539

86	曾思佳	17320265331
87	温瑨	18035200558
88	陈振	15562659667
89	谢鹏程	13203866776
90	宣一	18513603767
91	盖阔	18321789207
92	王玖鳞	18810592447
93	刘爽	18810907102
94	黄艾彤	18813007148
95	郑三棚	18910661227
96	孙祎泽	18810931286
97	王军	17611220760
98	徐子翔	13031172626
99	柳翔	13426353534
100	张瑾珂	15611660512
101	寿凌云	18801319117
102	赵爽	15910967506
103	苗慧敏	18513352003
104	桂升	15611536086
105	裴骞	18810515010
106	王欣薇	18810666575

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