Program

The *42nd* Conference on

Stochastic Processes and their Applications

27 June -- 01 July 2022

School of Mathematics and Statistics, Wuhan University

Chinese Society of Probability and Statistics

Plenary Speakers

Anne van Delft - Itô Prize lecture, Columbia, New York

Hugo Duminil-Copin - Medallion lecture, UNIGE, Geneva & IHES, Paris

Nina Holden, ETH, Zurich

Hubert Lacoin, IMPA, Rio de Janeiro

Nike Sun - Doeblin Prize lecture, MIT, Cambridge

Bálint Tóth - Medallion lecture, UOB, Bristol & Alfréd Rényi Institute, Budapest

Vitali Wachtel, Uni Augsburg, Augsburg

Jian Wang, FNU, Fuzhou

Hao Wu - Doob lecture, Tsinghua, Beijing

Lorenzo Zambotti - Lévy lecture, Sorbonne, Paris

Tusheng Zhang, USTC, Hefei

Scientific Committee

Jean-François Le Gall-**Chair** Paris-Saclay, Paris
Jean Bertoin ETH, Zurich
Hugo Duminil-Copin UNIGE, Geneva & IHES, Paris
Alison Etheridge Oxford
Ryoki Fukushima KyotoU, Kyoto
Massimiliano Gubinelli UB, Bonn
Alice Guionnet ENSL, Lyon
Claudio Landim IPAM, Rio de Janeiro
Eyal Lubetzky NYU, New York
Gabor Lugosi PFU, Barcelona
Zhi-Ming Ma CAS, Beijing
Leonid Mytnik Technion, Haifa
Jeremy Quastel UofT, Toronto
Kavita Ramanan Brown, Providence
Cristina Toninelli Paris Dauphine, Paris
Vladimir Vatutin RAS, Moscow
Xicheng Zhang WHU, Wuhan

Organizing Committee

Xicheng Zhang-**Chair** WHU, Wuhan
Qiong Deng WHU, Wuhan
Fuqing Gao WHU, Wuhan
Fuzhou Gong CAS, Beijing
Zenghu Li BNU, Beijing
Wei Liu WHU, Wuhan
Zhi-Ming Ma CAS, Beijing
Ran Wang WHU, Wuhan
Jinan Yang WHU, Wuhan
Huijiang Zhao WHU, Wuhan

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Contents

Schedule

June 27 (Monday)

- Opening ceremony and all **plenary talks** are scheduled both online and onsite.
  Online: Zoom ID 9426764296, password 123456.
  Onsite: 丁香厅、茉莉厅 (转播)、潜江厅 (转播).
- All evening talks are scheduled online only.
- All online speakers are asked to enter the Zoom meeting **5** minutes **early**.

08:30-09:00	**Opening Ceremony 黄鹤厅**		
09:00-09:45	**Doeblin Prize Lecture: Nike Sun (PT5), Chair: Zhen-Qing Chen, 黄鹤厅**		
10:00-11:45 *Chair*	IS4 黄鹤厅 Wei-Kuo Chen	IS5 茉莉厅 Shaolin Ji	IS17 潜江厅 Yanxia Ren
10:00-10:35	Antonio Auffinger	Qiman Shao	Zenghu Li
10:35-11:10	Si Tang	Zhonggen Su	Zhan Shi
11:10-11:45	Qiang Zeng	Zengjing Chen	Renming Song
Conference break			
报告厅	丁香厅	茉莉厅	潜江厅
14:30-15:15	**Plenary Speaker: Hubert Lacoin (PT4), Chair: Songxi Chen, 丁香厅**		
15:30-16:15	**Medallion Lecture: Hugo Duminil-Copin (PT2), Chair: Quanhua Xu**		
16:30-18:15 *Chair*	IS8 Nicolas Curien	IS9 Denis Denisov	IS15 Hao Ni
16:30-17:05	Jian Ding	Denis Denisov	Weijun Xu
17:05-17:40	Linxiao Chen	Kilian Raschel	Horatio Boedihardjo
17:40-18:15	Chang-Long Yao	Vladislav Vysotsky	Harald Oberhauser
Conference break			
20:30-22:15 *Chair*	IS2 Charles Bordenave	IS3 Sandra Cerrai	IS7 Dong Wang
20:30-21:05	Marwa Banna	Michael Salins	Dong Wang
21:05-21:40	Afonso Bandera	Leonid Koralov	Xuan Wu
21:40-22:15	Zhigang Bao	Mauro Mariani	Eunghyun Lee
Zoom ID	**9426764296**	**93775719317**	**3820529526**
Password	**123456**		

June 28 (Tuesday)

- All **plenary talks** are scheduled both online and onsite.
  Online: Zoom ID 9426764296, password 123456.
  Onsite: 丁香厅、茉莉厅 (转播)、潜江厅 (转播).
- All evening talks are scheduled online only.
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报告厅	丁香厅	茉莉厅	潜江厅
08:30-09:15	**Itô Prize Lecture: Anne van Delft (PT1), Chair: Zhiming Ma**		
09:30-10:45 *Chair*	CS1 Lijun Bo	CS2 Jian Ding	CS3 Scott Smith
09:30-09:55	Yuecai Han	Dong Yao	Scott Smith
09:55-10:20	Tianyang Nie	Chenlin Gu	Dejun Luo
10:20-10:45	Jingrui Sun	Yuan Zhang	Haitian Yue
11:00-12:15 *Chair*	CS16 Yanqi Qiu	CS10 Juan Li	CS20 Zhonggen Su
11:00-11:25	Zhaofeng Lin	Yongsheng Song	Xiequan Fan
11:25-11:50	Yong Han	Kai Du	Hanchao Wang
11:50-12:15	Chao Liu	Falei Wang	Youzhou Zhou
Conference break			
14:30-16:15 *Chair*	IS1 Marek Biskup	IS6 Zhen-Qing Chen	IS11 Christina Goldschmidt
14:30-15:05	Ellen Powell	Xin Chen	Serte Donderwinkel
15:05-15:40	Antoine Jego	Moritz Kassmann	Sara Hernandez Torres
15:40-16:15	Chiranjib Mukherjee	Panki Kim	Thomas Duquesne
16:30-17:15	**Lévy Lecture: Lorenzo Zambotti (PT10), Chair: Zenghu Li**		
Conference break			
20:30-22:15 *Chair*	IS23 Lorenzo Zambotti	IS12 Milton Jara	Springer-Book Richard Kruel
20:30-21:05	Sandra Cerrai	Alisa Knizel	Olav Kallenberg
21:05-21:40	Francesco Caravenna	Dominik Schmid	Christiane Cocozza-Thivent
21:40-22:15	Oleg Butkovskiy	Rodrigo Marinho	Qi Lv & Xu Zhang
Zoom ID	**9426764296**	**93775719317**	**3820529526**
Password	**123456**		

June 29 (Wednesday)

- All **plenary talks** are scheduled both online and onsite.
  Online: Zoom ID 9426764296, password 123456.
  Onsite: 丁香厅、茉莉厅 (转播)、潜江厅 (转播).
- All evening talks are scheduled online only.
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报告厅	丁香厅	茉莉厅	潜江厅
08:30-09:15	**Plenary Speaker: Tusheng Zhang (PT11), Chair: Jie Xiong, 丁香厅**		
09:30-10:45 *Chair*	CS5 Xianping Guo	CS7 Yong Jiao	CS8 Zhao Dong
09:30-09:55	Yi Zhang	Ping Zhong	Zhao Dong
09:55-10:20	Yonghui Huang	Simeng Wang	Zhenxin Liu
10:20-10:45	Xin Guo	Lian Wu	Jifa Jiang
Conference break			
14:30-16:15 *Chair*	IS14 Stephen Muirhead	IS16 Lea Popovic	IS19 Zhan Shi
14:30-15:05	Vivek Dewan	Xiangying (Zoe) Huang	Xinxin Chen
15:05-15:40	Pierre-François Rodriguez	Amandine Veber	Thomas Duquesne
15:40-16:15	Franco Severo	Sarah Penington	Bastien Mallein
16:30-17:15	**Medallion Lecture: Bálint Tóth (PT6), Chair: Zhan Shi**		
Conference break			
20:30-21:45 *Chair*	CS17 Hao Shen	CS23 Liming Wu	CS24 Aihua Xia
20:30-20:55	Giuseppe Cannizzaro	Arnaud Guillin	Joseph E. Yukich
20:55-21:20	Tommaso Rosati	Nengyi Wang	Matthias Schulte
21:20-21:45	Rongfeng Sun	Zhumengmeng Jin	Guangqu Zheng
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June 30 (Thursday)

- All **plenary talks** are scheduled both online and onsite.
  Online: Zoom ID 9426764296, password 123456.
  Onsite: 丁香厅、茉莉厅 (转播)、潜江厅 (转播).
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报告厅	丁香厅	茉莉厅	潜江厅
08:30-09:15	**Doob Lecture: Hao Wu (PT9), Chair: Lixin Zhang, 丁香厅**		
09:30-10:45 *Chair*	CS18 Jian Song	CS13 Zhipeng Liu	CS14 Qi Lv
09:30-09:55	Jianping Jiang	Xuan Wu	Hanxiao Wang
09:55-10:20	Jian Song	Promit Ghosal	Yan Wang
10:20-10:45	Wei Wu	Yizao Wang	Yanqing Wang
Conference break			
14:30-15:45 *Chair*	CS4 Arnaud Guillin	CS9 Seiichiro Kusuoka	CS11 Xiangdong Li
14:30-14:55	Max Fathi	Nikolay Barashkov	Kazuhiro Kuwae
14:55-15:20	Ivan Gentil	Mamoru Okamoto	Anton Thalmaier
15:20-15:45	Chaoen Zhang	Rongchan Zhu	Wei Liu
16:00-17:15 *Chair*	CS12 Quansheng Liu	CS15 Stephane Menozzi	CS27 Huaizhong Zhao
16:00-16:25	Christophe Cuny	Alexander Veretennikov	Chunrong Feng
16:25-16:50	Cagri Sert	Chengcheng Ling	Zeng Lian
16:50-17:15	Hui Xiao	Antonello Pesce	Huaizhong Zhao
Conference break			
20:30-22:15 *Chair*	IS21 Perla Sousi	IS10 Sebastian Engelke	IS13 Andreas Kyprianou
20:30-21:05	Dominik Schmid	Jacopo Borga	Leif Doering
21:05-21:40	Guillaume Conchon--Kerjan	Jere Koskela	Juan Carlos Pardo
21:40-22:15	Jonathan Hermon	Konstantin Matetski	Andreas Kyprianou
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July 1 (Friday)

- All **plenary talks** are scheduled both online and onsite.
  Online: Zoom ID 9426764296, password 123456.
  Onsite: 丁香厅、茉莉厅 (转播)、潜江厅 (转播).
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报告厅	丁香厅	茉莉厅	潜江厅
08:30-09:15	**Plenary Speaker: Jian Wang (PT8), Chair: Huaizhong Zhao, 丁香厅**		
09:30-10:45 *Chair*	CS21 Rongfeng Sun	CS25 Wensheng Wang	CS26 Jie Xiong
09:30-09:55	Xinxing Chen	Wensheng Wang	Siyu Lv
09:55-10:20	Ran Wei	Wangjun Yuan	Jiaqiang Wen
10:20-10:45	Makoto Nakashima	Ran Wang	Shuaiqi Zhang
Conference break			
14:30-16:15 *Chair*	IS18 Michael Röckner	IS20 Tomoyuki Shirai	IS22 Feng-Yu Wang
14:30-15:05	Martin Grothaus	Alexander Bufetov	Xiaoyue Li
15:05-15:40	Xiangchan Zhu	Subhroshekhar Ghosh	Xing Huang
15:40-16:15	Michael Röckner	Hirofumi Osada	Yulin Song
16:30-17:15	**Plenary Speaker: Vitali Wachtel (PT7), Chair: Jian Ding, 丁香厅**		
17:30-18:15	**Plenary Speaker: Nina Holden (PT3), Chair: Jian Ding**		
Conference break			
20:30-21:45 *Chair*	CS6 Yaozhong Hu	CS19 Renming Song	CS22 Hao Wu
20:30-20:55	Jingyu Huang	Longjie Xie	Tianyi Bai
20:55-21:20	Qun Shi	Zhenyao Sun	Xiangyu Huang
21:20-21:45	Jiayu Zheng	Rui Zhang	Yijun Wan
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Program Overview

Plenary Talks

PT1 **Uncertainty quantification for deviations from structural assumpations on the second order dynamics of nonstationary random surfaces** (Abstract–page 19)
Anne van Delft, *Columbia University, USA*
Time: 08:30-09:15, 28 June; Zoom ID: 9426764296, Password: 1234546

PT2 **Emergent symmetries in 2D percolation** (Abstract–page 19)
Hugo Duminil-Copin, *UNIGE, Switzerland & IHES, France*
Time: 15:30-16:15, 27 June; Zoom ID: 9426764296, Password: 1234546

PT3 **Conformal welding in Liouville quantum gravity: recent results and applications** (Abstract–page 19)
Nina Holden, *ETH, Switzerland*
Time: 17:30-18:15, 1 July; Zoom ID: 9426764296, Password: 1234546

PT4 **Existence of solution and localization for the stochastic heat equation with multiplicative Lévy white noise** (Abstract–page 20)
Hubert Lacoin, *IMPA, Brasil*
Time: 14:30-15:15, 27 June; Zoom ID: 9426764296, Password: 1234546

PT5 **On the Ising perceptron** (Abstract–page 20)
Nike Sun, *MIT, USA*
Time: 09:00-09:45, 27 June; Zoom ID: 9426764296, Password: 1234546

PT6 **Invariance principles for Lorentz Gas beyond kinetic limits** (Abstract–page 20)
Bálint Tóth, *UOB, UK & Alfréd Rényi Institute, Hungary*
Time: 16:30-17:15, 29 June; Zoom ID: 9426764296, Password: 1234546

PT7 **Supermartingale approach to random walks in cones** (Abstract–page 21)
Vitali Wachtel, *Uni Augsburg, Germany*
Time: 16:30-17:15, 1 July; Zoom ID: 9426764296, Password: 1234546

PT8 **Potential theory on symmetric non-local operators and applications to long range jumps in random media** (Abstract–page 22)
Jian Wang, *FNU, China*
Time: 08:30-09:15, 1 July; Zoom ID: 9426764296, Password: 1234546

PT9 **Connection probabilities for random-cluster model and uniform spanning tree** (Abstract–page 22)
Hao Wu, *Tsinghua, China*
Time: 08:30-09:15, 30 June; Zoom ID: 9426764296, Password: 1234546

PT10 **Renormalisation from quantum field Theory to stochastic partial differential equations** (Abstract–page 23)
Lorenzo Zambotti, *Sorbonne, France*
Time: 16:30-17:15, 28 June; Zoom ID: 9426764296, Password: 1234546

PT11 **Stochastic partial differential equations with local monotone coefficients** (Abstract–page 23)
Tusheng Zhang, *USTC, China*
Time: 08:30-09:15, 29 June; Zoom ID: 9426764296, Password: 1234546

Invited Sessions

IS1 Log-correlated Processes, Organizer: Marek Biskup (Los Angeles)
Time: 14:30-16:15, 28 June; Zoom ID: 9426764296, Password: 123456

- **Characterising the Gaussian free field** (Abstract–page 24)
  Ellen Powell, *Durham University, UK*
- **Multiplicative chaos of the Brownian loop soup** (Abstract–page 24)
  Antoine Jego, *EPFL, Switzerland*
- **SPDEs, directed polymers and multiplicative chaos** (Abstract–page 24)
  Chiranjib Mukherjee, *University of Münster, Germany*

IS2 Large Random Matrices, Organizer: Charles Bordenave (Marseille)
Time: 20:30-22:15, 27 June; Zoom ID: 9426764296, Password: 123456

- **Quantitative estimates on random matrices via free probability** (Abstract–page 24)
  Marwa Banna, *NYU Abu Dhabi, United Arab Emirates*
- **Matrix concentration and free probability** (Abstract–page 25)
  Afonso Bandera, *ETH Zürich, Switzerland*
- **Phase transition of eigenvector for spiked random matrices** (Abstract–page 25)
  Zhigang Bao, *Hong Kong University of Science and Technology, China*

IS3 Large Deviations, Organizer: Sandra Cerrai (Maryland)
Time: 20:30-22:15, 27 June; Zoom ID: 93775719317, Password: 123456

- **Systems of stochastic reaction-diffusion equations satisfy a large deviations principle that is uniform over all initial data** (Abstract–page 25)
  Michael Salins, *Boston University, USA*
- **Perturbations of parabolic equations and diffusion processes with degeneration: boundary problems and metastability** (Abstract–page 26)
  Leonid Koralov, *University of Maryland, USA*
- **A Variational approach to stability and limits of McKean-Vlasov dynamics** (Abstract–page 26)
  Mauro Mariani, *National Research University Higher School of Economics, Russia*

IS4 Spin Glasses and Random Matrices, Organizer: Wei-kuo Chen (Minneapolis)
Time: 10:00-11:45, 27 June; Zoom ID: 9426764296, Password: 123456

- **The spherical $s + q$ model** (Abstract–page 26)
  Antonio Auffinger, *Northwestern University, USA*
- **On convergence of the cavity and Bolthausen's TAP iterations to the local magnetization** (Abstract–page 27)
  Si Tang, *Lehigh University, USA*
- **Complexity of high dimensional Gaussian random fields with isotropic increments** (Abstract–page 27)
  Qiang Zeng, *University of Macau, China*

IS5 Centennial of the Lindeberg Central Limit Theorem, Organizer: Zengjing Chen (Shandong)
Time: 10:00-11:45, 27 June; Zoom ID: 93775719317, Password: 123456

- **Recent developments on normal and nonnormal approximation by Stein's method** (Abstract–page 28)
  Qiman Shao, *Southern University of Science and Technology, China*
- **On second order fluctuations for random integer partitions** (Abstract–page 28)
  Zhonggen Su, *Zhejiang University, China*
- **Central limit theorems, Loss aversion and multi-armed bandits** (Abstract–page 29)
  Zengjing Chen, *Shandong University, China*

IS6 Stochastic Analysis, Organizer: Zhen-Qing Chen (Seattle)
Time: 14:30-16:15, 28 June; Zoom ID: 93775719317, Password: 123456

- **Quenched invariance principle for a class of non-symmetric non-local operator in ergodic environment** (Abstract–page 29)
  Xin Chen, *Shanghai Jiaotong University, China*
- **Pointwise estimates for solutions to non-local parabolic equations** (Abstract–page 29)
  Moritz Kassmann, *Bielefeld University, Germany*
- **Potential theory of Markov processes with jump kernels degenerating at the boundary** (Abstract–page 30)
  Panki Kim, *Seoul National University, Korea*

IS7 Integrable Probability, Organizer: Ivan Corwin (New York)
Time: 20:30-22:15, 27 June; Zoom ID: 3820529526, Password: 123456

- **Vector Riemann-Hilbert problem related to a biorthogonal ensemble from quantum transport** (Abstract–page 30)
  Dong Wang, *NUS, Singapore*
- **Scaling limits of the Laguerre unitary ensemble** (Abstract–page 30)
  Xuan Wu, *University of Chicago, USA*
- **Simplified forms of the transition probabilities of the two-species ASEP** (Abstract–page 30)
  Eunghyun Lee, *Nazarbayev University, Kazakhstan*

IS8 Models of Two-dimensional Random Geometry, Organizer: Nicolas Curien (Orsay)
Time: 16:30-18:15, 27 June; Zoom ID: 9426764296, Password: 123456

- **Random distances of Liouville quantum gravity: a review** (Abstract–page 31)
  Jian Ding, *Peking University, China*
- **Phase transition in the Ising model on a random 2D lattice** (Abstract–page 31)
  Linxiao Chen, *ETH Zürich, Switzerland*
- **Convergence of limit shapes for 2D near-critical first-passage percolation** (Abstract–page 31)
  Chang-Long Yao, *Academy of Mathematics and Systems Science, CAS, China*

IS9 Random Walks, Organizer: Denis Denisov (Manchester)
Time: 16:30-18:15, 27 June; Zoom ID: 93775719317, Password: 123456

- **Ordered random walks** (Abstract–page 32)
  Denis Denisov, *University of Manchester, UK*
- **Escape probability for drifted random walks in wedges** (Abstract–page 32)
  Kilian Raschel, *Université de Tours, France*

- **Contraction principle for trajectories of random walks** (Abstract–page 32)
  Vladislav Vysotsky, *University of Sussex, UK*

IS10 Bernoulli Society New Researcher Award, Organizer: Sebastian Engelke (Geneva)
Time: 20:30-22:15, 30 June; Zoom ID: 93775719317, Password: 123456

- **Universal limits of random constrained permutations and Liouville quantum gravity** (Abstract–page 33)
  Jacopo Borga, *Stanford University, USA*
- **Convergence to the coalescent of ancestries from non-neutral Cannings models** (Abstract–page 33)
  Jere Koskela, *University of Warwick, UK*
- **Determinantal processes in the KPZ universality class** (Abstract–page 34)
  Konstantin Matetski, *Columbia University, UK*

IS11 Random Trees and Graphs, Organizer: Christina Goldschmidt (Oxford)
Time: 14:30-16:15, 28 June; Zoom ID: 3820529526, Password: 123456

- **Random trees have height** $O(\sqrt{n})$ (Abstract–page 34)
  Serte Donderwinkel, *University of Oxford, UK*
- **Scaling limits of uniform spanning trees and forests** (Abstract–page 34)
  Saraí Hernández-Torres, *Technion - Israel Institute of Technology, Israel*
- **Limits of multiplicative inhomogeneous random graphs and Lévy trees** (Abstract–page 35)
  Thomas Duquesne, *Sorbonne Université, France*

IS12 Interacting Particle Systems, Organizer: Milton Jara (Rio de Janeiro)
Time: 20:30-22:15, 28 June; Zoom ID: 93775719317, Password: 123456

- **Stationary measure for the open KPZ equation** (Abstract–page 36)
  Alisa Knizel, *University of Chicago, USA*
- **Mixing times for the TASEP on the circle** (Abstract–page 36)
  Dominik Schmid, *Universität Bonn and Princeton University*
- **Central limit theorem for non-equilibrium stationary states** (Abstract–page 36)
  Rodrigo Marinho, *Universidade Federal do Rio Grande do Sul, Brazil*

IS13 Stable Processes, Organizer: Andreas Kyprianou (Bath)
Time: 20:30-22:15, 30 June; Zoom ID: 3820529526, Password: 123456

- **General path integrals and stable SDEs** (Abstract–page 36)
  Leif Doering, *University of Mannheim, Germany*
- **Growth-fragmentation embedded in Brownian excursions from hyperplanes** (Abstract–page 37)
  Juan Carlos Pardo, *CIMAT Guanajuato, México*
- **Attraction to and repulsion from patches on the hypersphere and hyperplane for isotropic d-dimensional stable Lévy processes** (Abstract–page 37)
  Andreas Kyprianou, *University of Bath, UK*

IS14 Level Lines of Gaussian Processes and Percolation, Organizer: Stephen Muirhead (Melbourne)
Time: 14:30-16:15, 29 June; Zoom ID: 9426764296, Password: 123456

- **Gaussian first passage percolation** (Abstract–page 37)
  Vivek Dewan, *Université Grenoble Alpes, France*
- **On Gaussian free fields, percolation and universality** (Abstract–page 38)
  Pierre-François Rodriguez, *Imperial College London,UK*
- **On the off-critical level sets of smooth Gaussian fields** (Abstract–page 38)
  Franco Severo, *ETH Zürich, Switzerland*

IS15 Rough Paths, Organizer: Hao Ni (London)
Time: 16:30-18:15, 27 June; Zoom ID: 3820529526, Password: 123456

- **Weak universality of some singular stochastic PDEs** (Abstract–page 39)
  Weijun Xu, *Peking University, China*
- **Tail probabilities for integrals along fractional Brownian motion** (Abstract–page 39)
  Horatio Boedihardjo, *Warwick University, UK*
- **Scoring rules for path forecasts** (Abstract–page 39)
  Harald Oberhauser, *Oxford University, UK*

IS16 Stochastic Models in Biology, Organizer: Lea Popovic (Montreal)
Time: 14:30-16:15, 29 June; Zoom ID: 93775719317, Password: 123456

- **Motion by mean curvature in interacting particle systems** (Abstract–page 39)
  Xiangying (Zoe) Huang, *University of British Columbia, Canada*
- **Growth properties of the infinite-parent spatial Lambda-Fleming-Viot process** (Abstract–page 40)
  Amandine Veber, *University Paris Cité & CNRS, France*
- **Genealogies in bistable waves** (Abstract–page 40)
  Sarah Penington, *University of Bath, UK*

IS17 Branching Processes, Organizer: Yanxia Ren (Beijing)
Time: 10:00-11:45, 27 June; Zoom ID: 3820529526, Password: 123456

- **Exponential ergodicity of branching processes with immigration and competition** (Abstract–page 41)
  Zenghu Li, *Beijing Normal University, China*
- **The Derrida-Retaux continuum system as an exactly solvable growth-fragmentation process** (Abstract–page 41)
  Zhan Shi, *Academy of Mathematics and Systems Science, China*
- **The Seneta-Heyde scaling for supercritical super-Brownian motion** (Abstract–page 41)
  Renming Song, *University of Illinois at Urbana-Champaign, USA*

IS18 Dirichlet Forms and SPDE, Organizer: Michael Röckner (Bielefeld)
Time: 14:30-16:15, 1 July; Zoom ID: 9426764296, Password: 123456

- **Hypocoercivity for non-linear infinite-dimensional degenerate stochastic differential equations** (Abstract–page 42)
  Martin Grothaus, *University of Kaiserslautern, Germany*
- **Global existence and non-uniqueness for 3D Navier-Stokes equations with space-time white noise** (Abstract–page 42)
  Xiangchan Zhu, *Academy of Mathematics and Systems Science, China*
- **On a longstanding open problem in the theory of Markov processes** (Abstract–page 42)
  Michael Röckner, *Bielefeld University, Germany*

IS19 Random Processes in Random Environment, Organizer: Zhan Shi (Beijing)
Time: 14:30-16:15, 29 June; Zoom ID: 3820529526; Password: 123456

- **Critical branching random walk conditioned to survive at a given set in $\mathbb{Z}^2$** (Abstract–page 43)
  Xinxin Chen, *Beijing Normal University, China*
- **Scaling limits of tree-valued branching random walks** (Abstract–page 44)
  Thomas Duquesne, *Sorbonne Université, France*
- **Atypical invasion of the reducible multi-type branching Brownian motion** (Abstract–page 44)
  Bastien Mallein, *Université Sorbonne Paris Nord, France*

IS20 Point Processes and Stochastic Geometry, Organizer: Tomoyuki Shirai (Fukuoka)
Time: 14:30-16:15, 1 July; Zoom ID: 93775719317, Password: 123456

- **Normal approximation, the Gaussian multiplicative chaos, and excess one for the sine-process** (Abstract–page 45)
  Alexander Bufetov, *CNRS, Steklov, IITP RAS*
- **Stochastic geometry beyond independence and its applications** (Abstract–page 45)
  Subhroshekhar Ghosh, *National University of Singapore, Singapore*
- **Rigidity of translation invariant random point fields implies subdiffusivity** (Abstract–page 46)
  Hirofumi Osada, *Kyushu University, Japan*

IS21 Mixing Times of Markov Chains, Organizer: Perla Sousi (Cambridge)
Time: 20:30-22:15, 30 June; Zoom ID: 9426764296, Password: 123456

- **Cutoff for the simple exclusion process with open boundaries** (Abstract–page 46
  Dominik Schmid, *Princeton University, USA*
- **Entropic cutoff for the random walk on random lifts of Markov chains** (Abstract–page 46)
  Guillaume Conchon-Kerjan, *University of Bath, UK*
- **Cutoff at an entropic time for random walks on graphs with an added random perfect matching** (Abstract–page 47)
  Jonathan Hermon, *University of British Columbia, UK*

IS22 Path-distribution Dependent SDEs, Organizer: Feng-Yu Wang (Tianjin)
Time: 14:30-16:15, 1 July; Zoom ID: 3820529526, Password: 123456

- **Approximation of the invariant measure for nonlinear stochastic delay differential equations** (Abstract–page 47)
  Xiaoyue Li, *Northeast Normal University, China*
- **Well-posedness and regularity for distribution dependent SPDEs with singular drifts** (Abstract–page 47)
  Xing Huang, *Tianjin University, China*
- **Large deviation principles for path-distribution dependent SDEs** (Abstract–page 48)
  Yulin Song, *Nanjin University, China*

IS23 Stochastic Partial Differential Equations, Organizer: Lorenzo Zambotti (Paris)
Time: 20:30-22:15, 28 June; Zoom ID: 9426764296, Password: 123456

- **Large deviations for the invariant measures of the $2D$ stochastic Navier-Stokes equation with vanishing noise correlation** (Abstract–page 48)
  Sandra Cerrai, *University of Maryland, College Park, USA*

- **The critical 2d Stochastic Heat Flow** (Abstract–page 48)
  Francesco Caravenna, *University of Milano-Bicocca, Italy*
- **Weak and mild solutions of SPDEs with distributional drift** (Abstract–page 48)
  Oleg Butkovskiy, *Weierstrass Institute for Applied Analysis and Stochastics, Germany*

Contributed Sessions

CS1 Stochastic Control with Financial Applications, Organizer: Lijun Bo (Xi'An)
Time: 09:30-10:45, 28 June; Zoom ID: 9426764296, Password: 123456

- **Deep learning algorithm for optimal stopping problems** (Abstract–page 49)
  Yuecai Han, *Jilin University, China*
- **Maximum principle for discrete-time stochastic control problem of mean-field type** (Abstract–page 50)
  Tianyang Nie, *Shandong University, China*
- **Turnpike Properties for Stochastic Linear-Quadratic Optimal Control Problems** (Abstract–page 50)
  Jingrui Sun, *Southern University of Science and Technology, China*

CS2 Epidemic Model, Organizer: Jian Ding (Beijing)
Time: 09:30-10:45, 28 June; Zoom ID: 93775719317, Password: 123456

- **Epidemics on evolving graphs** (Abstract–page 50)
  Dong Yao, *Jiangsu Normal University, China*
- **Random recursive trees and contact tracing** (Abstract–page 51)
  Chenlin Gu, *NYU Shanghai, China*
- **Assessing covertness and household transmissions of the COVID-19 with stochastic dynamic models** (Abstract–page 51)
  Yuan Zhang, *Peking University, China*

CS3 Stochastic Partial Differential Equations, Organizer: Benjiamin Gess (Bielefeld)
Time: 09:30-10:45, 28 June; Zoom ID: 3820529526, Password: 123456

- **A new derivation of the master loop equations for lattice Yang-Mills** (Abstract–page 51)
  Scott Smith, *Academy of Mathematics and Systems Science, China*
- **Scaling limit and CLT for stochastic 2D Euler equations with transport noise** (Abstract–page 52)
  Dejun Luo, *Academy of Mathematics and Systems Science, China*
- **Invariant Gibbs measures for NLS and Hartree equations** (Abstract–page 52)
  Haitian Yue, *ShanghaiTech University, China*

CS4 Functional Inequalities, Organizer: Arnaud Guillin (Auvergne)
Time: 14:30-15:45, 30 June; Zoom ID: 9426764296, Password: 123456

- **Lipschitz transport maps between probability measures** (Abstract–page 52)
  Max Fathi, *Université de Paris, France*
- **On the Sobolev inequalities and spherical Caffarelli-Kohn-Nirenberg model** (Abstract–page 53)
  Ivan Gentil, *Université Claude Bernard Lyon 1, France*

- **On entropy-entropy production inequalities for the McKean-Vlasov equation** (Abstract–page 53)
  Chaoen Zhang, *Harbin Institute of Technology, China*

CS5 Optimization and Game Problems for Controlled Markov Processes, Organizer: Xianping Guo (Guangzhou)
Time: 09:30-10:45, 29 June; Zoom ID: 9426764296, Password: 123456

- **On continuous-time Markov decision processes with gradual and impulsive control** (Abstract–page 53)
  Yi Zhang, *University of Birmingham, UK*
- **Zero-sum infinite-horizon discounted piecewise deterministic Markov games** (Abstract–page 54)
  Yonghui Huang, *Sun Yat-Sen University, China*
- **Risk sensitive zero-sum games with unbounded reward rates and varying discount factors** (Abstract–page 54)
  Xin Guo, *Tsinghua University, China*

CS6 Topics in Nonlinear Stochastic Heat Equations, Organizer: Yaozhong Hu (Alberta)
Time: 20:30-21:45, 1 July; Zoom ID: 9426764296, Password: 123456

- **Stochastic heat equation with super-linear drift and multiplicative noise on $\mathbb{R}^d$** (Abstract–page 55)
  Jingyu Huang, *University of Birmingham, UK*
- **Well-posedness of stochastic differential equations with discontinuous and unbounded drift** (Abstract–page 55)
  Qun Shi, *Jiangxi Normal University, China*
- **On mean-field super-Brownian motions** (Abstract–page 55)
  Jiayu Zheng, *Shenzhen MSU-BIT University, China*

CS7 Non-Commutative Probability, Organizer: Yong Jiao (Changsha)
Time: 09:30-10:45, 29 June; Zoom ID: 93775719317, Password: 123456

- **The Brown measure of the sum of a free random variable and Voiculescu's circular element or its elliptic deformation** (Abstract–page 56)
  Ping Zhong, *University of Wyoming, Canada*
- **How to quantum shuffle cards -mixing time and cutoff profiles** (Abstract–page 56)
  Simeng Wang, *Harbin Institute of Technology, China*
- **Distributional inequalities for noncommutative martingales** (Abstract–page 57)
  Lian Wu, *Central South University, China*

CS8 Stochastic Dynamical Systems, Organizer: Jifa Jiang (Shanghai)
Time: 09:30-10:45, 29 June; Zoom ID: 3820529526, Password: 123456

- **The concentration of limiting invariant measure for stochastic dynamic system with local Lipschitz coefficients in $\mathbb{R}^d$** (Abstract–page 57)
  Zhao Dong, *Academy of Mathematics and Systems Science, China*
- **Averaging principle for monotone SPDEs** (Abstract–page 58)
  Zhenxin Liu, *Dalian University of Technology, China*
- **On the Stochastic Stability of Limiting Measures in SODEs** (Abstract–page 58)
  Jifa Jiang, *Shanghai Normal University, China*

CS9 Singular SPDE and Quantum Field Theory, Organizer: Seiichiro Kusuoka (Kyoto)
Time: 14:30-15:45, 30 June; Zoom ID: 93775719317, Password: 123456

- **Scale to scale coupling and centered maximum of the $P(\phi)_2$-field theories** (Abstract–page 59)
  Nikolay Barashkov, *University of Helsinki, Finland*
- **On the Φ^3_3 measure** (Abstract–page 59)
  Mamoru Okamoto, *Osaka University, Japan*
- **A stochastic analysis approach to lattice Yang–Mills at strong coupling** (Abstract–page 59)
  Rongchan Zhu, *Beijing Institute of Technology, China*

CS10 Stochastic Analysis and Related Topics, Organizer: Juan Li (Jinan)
Time: 11:00-12:15, 28 June; Zoom ID: 93775719317, Password: 123456

- **The law of large numbers under sublinear expectations** (Abstract–page 60)
  Yongsheng Song, *Academy of Mathematics and Systems Science, China*
- **Empirical approximation to invariant measures for McKean-Vlasov processes** (Abstract–page 60)
  Kai Du, *Fudan University, China*
- **Quadratic mean-field reflected BSDEs** (Abstract–page 60)
  Falei Wang, *Shangdong University, China*

CS11 Entropy and its Applications, Organizer: Xiangdong Li (Beijing)
Time: 14:30-15:45, 30 June; Zoom ID: 3820529526, Password: 123456

- **New Laplacian comparison theorem and its applications to diffusion processes on Riemannian manifolds** (Abstract–page 60)
  Kazuhiro Kuwae, *Fukuoka University, Japan*
- **Higher order derivative formulae for heat semigroups on Riemannian manifolds and geometric applications** (Abstract–page 61)
  Anton Thalmaier, *Luxembourg*
- **Uniform Poincare inequalities and logarithmic Sobolev inequalities for mean field particle systems** (Abstract–page 61)
  Wei Liu, *Wuhan University, China*

CS12 Limit Theorems on Products of Random Matrices, Organizer: Quansheng Liu (Bretagne)
Time: 16:00-17:15, 30 June; Zoom ID: 9426764296, Password: 123456

- **On the Berry-Esseen theorem for products of iid random matrices of $GL_d(\mathbb{R})$** (Abstract–page 62)
  Christophe Cuny, *Université de Brest, France*
- **Counting and boundary limit theorems for representations of Gromov-hyperbolic groups** (Abstract–page 62)
  Cagri Sert, *Universität Zürich, Switzerland*
- **Law of large numbers and edgeworth expansion for the coefficients of products of random matrices** (Abstract–page 62)
  Hui Xiao, *Universität Hildesheim, Germany*

CS13 KPZ Universality: Properties and Limit Theorems, Organizer: Zhipeng Liu (Kansas)
Time: 09:30-10:45, 30 June; Zoom ID: 93775719317, Password: 123456

- **Tightness and Brownian regularity for KPZ line ensemble** (Abstract–page 63)
  Xuan Wu, *University of Chicago, USA*
- **The ASEP speed process** (Abstract–page 63)
  Promit Ghosal, *MIT, USA*
- **A conditional scaling limit of the KPZ fixed point with height tending to infinity at one location** (Abstract–page 64)
  Yizao Wang, *University of Cincinnati, USA*

CS14 Some Recent Progresses on Stochastic Linear Quadratic Control Problems, Organizer: Qi Lv (Chengdu)
Time: 09:30-10:45, 30 June; Zoom ID: 3820529526, Password: 123456

- **Linear-quadratic optimal controls for stochastic Volterra integral equations: causal state feedback and path-dependent Riccati equations** (Abstract–page 64)
  Hanxiao Wang, *Shenzhen University, China*
- **Stochastic linear quadratic optimal control problems for stochastic evolution equations with unbounded control operator** (Abstract–page 64)
  Yan Wang, *Sichuan University, China*
- **A closed-loop based algorithm of LQ problems for stochastic heat equations** (Abstract–page 65)
  Yanqing Wang, *Southwest University, China*

CS15 Singular Stochastic Differential Equations, Organizer: Stephane Menozzi (Evry)
Time: 16:00-17:15, 30 June; Zoom ID: 93775719317, Password: 123456

- **On weak solutions of degenerate McKean-Vlasov equations** (Abstract–page 65)
  Alexander Veretennikov, *Moscow, Russia*
- **Taming singular SDEs: A numerical method** (Abstract–page 65)
  Chengcheng Ling, *Berlin, Germany*
- **Density and gradient estimates for kinetic SDEs with low regularity coefficients** (Abstract–page 66)
  Antonello Pesce, *Bologna, Italy*

CS16 Probability Theory and Functional Analysis, Organizer: Yanqi Qiu (Wuhan)
Time: 11:00-12:15, 28 June; Zoom ID: 9426764296, Password: 123456

- **Local convergence for point processes** (Abstract–page 66)
  Zhaofeng Lin, *Fudan University, China*
- **Boundedness of Gaussian random sums on trees** (Abstract–page 66)
  Yong Han, *Shenzhen University, China*
- **Littlewood-type theorems for random Dirichlet multipliers** (Abstract–page 67)
  Chao Liu, *Dalian University of Technology, China*

CS17 KPZ Equations and Related Topics, Organizer: Hao Shen (Wisconsin-Madison)
Time: 20:30-21:45, 29 June; Zoom ID: 9426764296, Password: 123456

- **Edwards-Wilkinson fluctuations for the anisotropic KPZ in the weak coupling regime** (Abstract–page 67)
  Giuseppe Cannizzaro, *University of Warwick, UK*
- **Ergodicity for projective processes of linear hyperviscous SPDEs** (Abstract–page 67)
  Tommaso Rosati, *Imperial College London, UK*

- **The critical 2d stochastic heat flow is not a GMC** (Abstract–page 68)
  Rongfeng Sun, *National University of Singapore, Singapore*

CS18 Lattice Spin Models, Organizer: Jian Song (Jinan)
Time: 09:30-10:45, 30 June; Zoom ID: 9426764296, Password: 123456

- **High-dimensional Ising model with various boundary conditions** (Abstract–page 68)
  Jianping Jiang, *Tsinghua University, China*
- **A new correlation inequality for Ising models with external fields** (Abstract–page 68)
  Jian Song, *Shandong University, China*
- **The critical phase of the antiferromagnetic Potts model on regular trees** (Abstract–page 69)
  Wei Wu, *NYU Shanghai, China*

CS19 Stochastic Analysis and Branching Processes, Organizer: Renming Song (Urbana-Champaign)
Time: 20:30-21:45, 1 July; Zoom ID: 93775719317, Password: 123456

- **Multiscale stochastic systems with irregular coefficients** (Abstract–page 69)
  Longjie Xie, *Jiangsu Normal University, China*
- **On the coming down from infinity of local time coalescing Brownian motions** (Abstract–page 69)
  Zhenyao Sun, *Technion - Israel Institute of Technology, Israel*
- **Weak convergence of the extremes of the branching Lévy processes with regularly varying tails** (Abstract–page 70)
  Rui Zhang, *Capital Normal University, China*

CS20 Concentration Phenomenon of Measure with Applications, Organizer: Zhonggen Su (Hangzhou)
Time: 11:00-12:15, 28 June; Zoom ID: 3820529526, Password: 123456

- **Deviation inequalities for stochastic approximation by averaging** (Abstract–page 70)
  Xiequan Fan, *Tianjin University, China*
- **Uniform concentration inequalities for marked point processes** (Abstract–page 70)
  Hanchao Wang, *Shandong University, China*
- **Transition Density of an Infinite-dimensional diffusion with the Jack Parameter** (Abstract–page 71)
  Youzhou Zhou, *Xi' an Jiaotong-Liverpool University, China*

CS21 Random Polymer and Related Models, Organizer: Rongfeng Sun (Singapore)
Time: 09:30-10:45, 1 July; Zoom ID: 9426764296, Password: 123456

- **The Derrida–Retaux conjecture for recursive models** (Abstract–page 71)
  Xinxing Chen, *Shanghai Jiaotong University, China*
- **Non-directed polymers in random environments on $\mathbb{Z}^d$** (Abstract–page 71)
  Ran Wei, *Nanjing University, China*
- **Gaussian fluctuations of stochastic heat equation and KPZ equation in higher dimension in L^2 regime** (Abstract–page 72)
  Makoto Nakashima, *Nagoya University, Japan*

CS22 Random Walk and Statistical Physics Models, Organizer: Hao Wu (Beijing)
Time: 20:30-21:45, 1 July; Zoom ID: 3820529526, Password: 123456

- **Capacity of the range of critical branching random walks** (Abstract–page 72)
  Tianyi Bai, *NYU Shanghai, China*
- **A variational formula for the once-reinforced random walk and its applications** (Abstract–page 72)
  Xiangyu Huang, *Peking University, China*
- **On massive perturbations of LERW, Ising model and dimer model** (Abstract–page 73)
  Yijun Wan, *Université Paris-Sud, France*

CS23 Stochastic Algorithm, Organizer: Liming Wu (Auvergne)
Time: 20:30-21:45, 29 June; Zoom ID: 93775719317, Password: 123456

- **Piecewise deterministic Markov processes and sampling** (Abstract–page 73)
  Arnaud Guillin, *Université Clermont Auvergne, France*
- **Various scan Gibbs samplers: convergence rates and concentration inequalities** (Abstract–page 74)
  Nengyi Wang, *Huazhong University of Science and Technology, China*
- **Dimension free convergence rates for Gibbs samplers for Bayesian linear mixed models** (Abstract–page 74)
  Zhumengmeng Jin, *University of Florida, U.S.*

CS24 Asymptotic Theory in Geometric Probability, Organizer: Aihua Xia (Melborne)
Time: 20:30-21:45, 29 June; Zoom ID: 3820529526, Password: 123456

- **Maximal fluctuations of convex hull interfaces** (Abstract–page 74)
  Joseph E. Yukich, *Lehigh University, USA*
- **Multivariate normal approximation of stabilising functionals of Poisson processes** (Abstract–page 75)
  Matthias Schulte, *Technische Universität Hamburg, Germany*
- **A simplified second-order Gaussian Poincaré inequality in discrete setting with applications** (Abstract–page 75)
  Guangqu Zheng, *The University of Edinburgh, UK*

CS25 Gaussian Processes and Related Topics, Organizer: Yiming Xiao (Michigan)
Time: 09:30-10:45, 1 July; Zoom ID: 93775719317, Password: 123456

- **The Csorgo-Revesz modulus of non-differentiability of fractional Brownian motion** (Abstract–page 76)
  Wensheng Wang, *Hangzhou Dianzi University, China*
- **Hittting probabilities of Gaussian random fileds and collision and eigenvalues of random matrices** (Abstract–page 76)
  Wangjun Yuan, *University of Ottawa, China*
- **Sample path properties of a generalized fractional Brownian motion** (Abstract–page 76)
  Ran Wang, *Wuhan University, Canada*

CS26 Stochastic Optimal Controls and Games, Organizer: Jie Xiong (Shenzhen)
Time: 09:30-10:45, 1 July; Zoom ID: 3820529526, Password: 123456

- **Hybrid optimal impulse control** (Abstract–page 76)
  Siyu Lv, *Southeast University, China*
- **General Indefinite Backward Stochastic Linear-Quadratic Optimal Control Problems** (Abstract–page 77)
  Jiaqiang Wen, *Southern University of Science and Technology, China*

- **Stochastic control for sub-diffusions and its applications** (Abstract–page 77)
  Shuaiqi Zhang, *China University of Mining and Technology, China*

CS27 Random Periodic Processes, Organizer: Huaizhong Zhao (Durham)
Time: 16:00-17:15, 30 June; Zoom ID: 3820529526, Password: 123456

- **Random quasi-periodic paths and quasi-periodic measures of SDEs** (Abstract–page 78)
  Chunrong Feng, *Durham University, UK*
- **Random Horseshoe of Anosov systems driven by a quasi-periodic forcing** (Abstract–page 78)
  Zeng Lian, *Sichuan University, China*
- **Ergodicity of random periodic processes** (Abstract–page 79)
  Huaizhong Zhao, *Durham University, UK*

Abstracts

Abstracts of Plenary Talks

P1

Title: Uncertainty quantification for deviations from structural assumpations on the second order dynamics of nonstationary random surfaces
Author: Anne van Delft

Abstract: TBA

P2

Title: Emergent symmetries in 2D percolation
Author: Hugo Duminil-Copin

Abstract: A great achievement of physics in the second half of the twentieth century has been the prediction of conformal symmetry of the scaling limit of critical statistical physics systems. Around the turn of the millennium, the mathematical understanding of this fact progressed tremendously in two dimensions with the introduction of the Schramm-Loewner Evolution and the proofs of conformal invariance of the Ising model and dimers. Nevertheless, the understanding is still restricted to very specific models.

In this talk, we will gently introduce the notion of conformal invariance of lattice systems by taking the example of percolation models. Percolation models are models of random subgraphs of a given lattice. They have a rich history and lie at the crossroad of several families of lattice models, in particular in two dimensions. In recent years, the understanding of their critical behaviour progressed greatly in the planar case.

We will explain some recent proof of rotational invariance for a large class of such percolation models, called the random-cluster models or Fortuin-Kasteleyn percolation. This represents an important progress in the direction of proving full conformal invariance. We will also explain what are the missing ingredients to prove the full conformal invariance.

This is based on joint work with Karol Kozlowski, Dmitry Krachun, Ioan Manolescu, and Mendes Oulamara.

P3

Title: Conformal welding in Liouville quantum gravity, recent results and applications
Author: Holden Nina

Abstract: Liouville quantum gravity (LQG) is a natural model for a random fractal surface with origin in the physics literature. A powerful tool in the study of LQG is conformal welding, where multiple LQG surfaces are combined into a single LQG surface. The interfaces between the original LQG surfaces are typically described by variants of the random fractal curves known as Schramm-Loewner evolutions (SLE). We will present a few recent conformal welding results for LQG surfaces and their applications, which range from SLE and LQG to planar maps and random permutations. Based on joint works with Ang and Sun, with Lehmkuehler, and with Borga, Sun and Yu.

P4

Title: Existence of solution and localization for the stochastic heat equation with multiplicative Lévy white noise
Author: Hubert Lacoin

Abstract: We consider the following stochastic partial differential equation in $\mathbb{R}^d$

$$\partial_t u = \Delta u + \xi \cdot u$$

where the unknown u is a function of space and time. The operator Δ denotes the usual Laplacian in $\mathbb{R}^d$ and ξ is a space-time Lévy white noise. This equation has been extensively studied in the case where ξ is a Gaussian White noise. In that case, it is known that the equation is well posed only when the space dimension d is equal to one.

In our talk, we consider the case where ξ is a Lévy white noise with no diffusive part and only positive jumps. We identify necessary and sufficient conditions on the Lévy jump measure for the existence of solutions to the equation. We further discuss the connection between the SHE and continuum directed polymer models.

(joint work with Quentin Berger (Sorbonne Université, Paris) and Carsten Chong (Columbia University, New York))

P5

Title: On the Ising perceptron
Author: Nike Sun

Abstract: The perceptron is a toy model of a single-layer neural network that ”stores” a collection of given patterns. The model with N nodes and M=N*alpha random patterns is related to a natural problem in high-dimensional probability, concerning the intersection of M random half-spaces with the discrete cube or sphere in N dimensions. We also consider a more general version of the problem, defined by bounded activation functions, which was introduced and studied by Talagrand. We will present some new techniques and recent results on these models. Based on joint works with Jian Ding, Erwin Bolthausen, Shuta Nakajima, and Changji Xu.

P6

Title: Invariance principles for Lorentz Gas beyond kinetic limits
Author: Bálint Tóth (University of Bristol and Rényi Institute Budapest)

Abstract: Understanding the diffusive behaviour of particles suspended in a gas or fluid in thermal equilibrium is a major challenge of mathematically rigorous statistical physics, dating back to the ground-breaking works of Einstein, Smoluchowski, Langevin and other classics. In 1905 Hendrik Lorentz proposed a very simple looking model for study which turned out to be rather difficult to rigorously understand and still keeps us busy. Since the early times the model has been known under the name of Lorentz gas. The randomised version is the following: place spherical balls of small, fixed radius and infinite mass centred on the points of a Poisson point process of some fixed intensity in d-dimensional Euclidean space, where d=2 or d=3. Assume that the density of scatterers is sufficiently small so that with positive probability there is free passage out to infinity. Now, consider the trajectory of a point particle starting with randomly oriented unit velocity, performing free flight in the complement of the scatterers, and scattering elastically on them. This trajectory will be a stochastic process with randomness coming from the random placement of the fixed scatterers and the random initial velocity. Once these are fixed, otherwise, the motion is Newtonian, deterministic. A major problem in mathematical statistical physics is to understand the diffusive scaling limit of this particle trajectory. Indeed, the Holy Grail of this field of research would be to prove the invariance principle (i.e., weak convergence to a Wiener process with nondegenerate variance) for the sequence of trajectories under diffusive scaling. This is too hard. An intermediate scaling regime is the so-called Boltzmann-Grad limit, when the scatterer density increases to infinity and scatterer radius decreases to zero so that the typical free flight between two successive scattering events stays of order 1. Classical results of Gallavotti (1970) and Spohn (1980) prove that in this limit the trajectory converges to a Markovian flight process (essentially a random walk), which, due to Donsker's theorem, under a second diffusive limit indeed converges to Wiener process. In a recent work (joint with C. Lutsko) we obtained new results interpolating between Gallavotti-Spohn and the Holy Grail which is still beyond reach. The method relies on a subtle probabilistic coupling between the physical Lorentz process and its Markovian approximation. I will present annealed and semi-quenched versions of this type of theorem, also extended to other similar models. Later in the lecture I will switch to another related problem: the weak coupling limit of Lorentz gas with smooth (rather than hard core) potential. Here, in the limit the interaction potential is scaled down while the relative density of scatterers is kept constant. The kinetic limit (somewhat analogous to Gallavotti-Spohn in the previous case) was obtained by Kesten and Papanicolaou in 1981. Our coupling method is expected to deliver a substantial improvement in this direction, too. This is still work in progress.

P7

Title: Supermartingale approach to random walks in cones
Author: Vitali Wachtel

Abstract: I shall discuss various constructions of positive harmonic functions for random walks killed at leaving a cone. In particular, I shall present a recently developed supermartingale approah, which allows one to construct a positive harmonic function in Lipschitz cones under minimal moment conditions and to obtain more accurate information about the behaviour of the harmonic function not far from the boundary of the cone.

P8

Title: Potential theory on symmetric non-local operators and applications to long range jumps in random media
Author: Jian Wang

Abstract: In this talk we first summarize developments of the De Giorgi-Nash-Moser theory for symmetric Markov processes with jumps. We then discuss various applications, which include quenched invariance principle for random conductance models with long-range jumps, and homogenization of discontinuous Markov processes with Levy type generators in random or periodic media. The talk is based on joint works with Xin Chen, Zhen-Qing Chen and Takashi Kumagai.

P9

Title: Connection probabilities for random-cluster model and uniform spanning tree
Author: Hao Wu

Abstract: Conformal invariance of critical lattice models in two-dimensional has been vigorously studied for decades. The first example where the conformal invariance was rigorously verified was the planar uniform spanning tree (together with loop-erased random walk), proved by Lawler, Schramm and Werner around 2000. Later, the conformal invariance was also verified for Bernoulli percolation (Smirnov 2001), level lines of Gaussian free field (Schramm-Sheffield 2009), and Ising model and FK-Ising model (Chelkak-Smirnov et al 2012). In this talk, we focus on connection probabilities of these critical lattice models in polygons with alternating boundary conditions. This talk has two parts.

1. In the first part, we consider critical random-cluster model with cluster weight $q \in (0, 4)$ and give conjectural formulas for connection probabilities of multiple interfaces. The conjectural formulas are proved for q=2, i.e. the FK-Ising model.

2. In the second part, we consider uniform spanning tree (UST) and give formulas for connection probabilities of multiple Peano curves. UST can be viewed as the limit of random-cluster model as q goes to 0. Its connection probabilities turn out to be related to logarithmic CFT.

This talk is based on joint works with Yu Feng, Mingchang Liu, and Eveliina Peltola.

P10

Title: Renormalisation from quantum field theory to stochastic partial differential equations
Author: Lorenzo Zambotti

Abstract: In the last decade there has been a lot of work on singular Stochastic Partial Differential Equations (SPDEs) requiring a renormalisation, namely a procedure based on a regularization of the noise and a deformation of the equation by subtracting suitable counterterms. These counterterms have a precise structure and are very well described algebraically; they contain the famous diverging constants (infinities) which make renormalization a mysterious and fascinating topic. Renormalization and infinities appear famously in Quantum Field Theory (QFT), where they are related to ultra-violet divergences. Theoretical physicists introduced SPDEs in QFT in the 80s in order to give a new constructive approach to Euclidean quantum fields. In this talk I will try to compare these two theories, showing that there are similarities but also important differences, such that it is still broadly impossible to fully translate the results of one theory in the context of the other.

P11

Title: Stochastic partial differential equations with local monotone coefficients
Author: Tusheng Zhang

Abstract: Considered in a Gelfand triple, the well posedness of stochastic partial differential equations with monotone or particular type of local monotone coefficients is now well understood.

In this talk, we will report recent progresses on the well-posedness of stochastic partial differential equations which have fully local monotone coefficients. The results apply to many interesting models/examples. This is a joint work with Michael Rockner and Shijie Shang.

Abstracts of Invited Sessions (IS1 - IS23)

IS1 **Log-correlated Processes,** Organizer: Marek Biskup

IS1-1

Title: Characterising the Gaussian free field
Author: Ellen Powell

Abstract: I will discuss recent approaches to characterising the Gaussian free field in the plane, and in higher dimensions. The talk will be based on joint work with Juhan Aru, Nathanael Berestycki and Gourab Ray.

IS1-2

Title: Multiplicative chaos of the Brownian loop soup
Author: Antoine Jego

Abstract: The Brownian loop soup is a random collection of infinitely many Brownian-type loops in a given domain of the plane which is related to many random conformal objects. In this talk, we will be interested in thick points, that is points that have been visited usually often by the loop soup. We will first explain how one can sample a typical thick point. We will then describe the structure of the loop soup viewed from such a point. We will in particular answer the following question: is a thick point thick because of finitely many very thick loops visiting the point, or because of infinitely many loops with typical local time? Based on a joint work with E. Aïdékon, N. Berestycki and T. Lupu.

IS1-3

Title: SPDEs, directed polymers and multiplicative chaos
Author: Chiranjib Mukherjee

Abstract: We will report on some recent results linking three models of disordered media which permeate in several forms in multiplicative noise stochastic PDEs, directed polymers and Gaussian multiplicative chaos.

IS2 **Large Random Matrices,** Organizer: Charles Bordenave

IS2-1

Title: Quantitative estimates on random matrices via free probability
Author: Marwa Banna

Abstract: In this talk, I highlight the connection between free probability and random matrix theory and show how free probability tools can be used to obtain different results on random matrices such as: regularity properties of limiting spectral distributions and obtaining quantitative bounds for such limit theorems.

IS2-2

Title: Matrix concentration and free probability
Author: Afonso Bandera

Abstract: Matrix Concentration inequalities such as Matrix Bernstein inequality have played an important role in many areas of pure and applied mathematics. These inequalities are intimately related to the celebrated noncommutative Khintchine inequality of Lust-Piquard and Pisier. In the middle of the 2010's, Tropp improved the dimensional dependence of this inequality in certain settings by leveraging cancellations due to non-commutativity of the underlying random matrices, giving rise to the question of whether such dependency could be removed. In this talk we leverage ideas from Free Probability to fully remove the dimensional dependence in a range of instances, yielding optimal bounds in many settings of interest. As a byproduct we develop matrix concentration inequalities that capture non-commutativity (or, to be more precise, "freeness"), improving over Matrix Bernstein in a range of instances. No background knowledge of Free Probability will be assumed in the talk. Joint work with March Boedihardjo and Ramon van Handel, more information at arXiv:2108.06312 [math.PR].

IS2-3

Title: Phase transition of eigenvector for spiked random matrices
Author: Zhigang Bao

Abstract: In this talk, we will first review some recent results on the eigenvectors of random matrices under fixed-rank deformation, and then we will focus on the limit distribution of the leading eigenvectors of the Gaussian Unitary Ensemble (GUE) with fixed-rank (aka spiked) external source, in the critical regime of the Baik-Ben Arous-Peche (BBP) phase transition. The distribution is given in terms of a determinantal point process with extended Airy kernel. Our result can be regarded as an eigenvector counterpart of the BBP eigenvalue phase transition. The derivation of the distribution makes use of the recently rediscovered eigenvector-eigenvalue identity, together with the determinantal point process representation of the GUE minor process with external source. This is a joint work with Dong Wang (UCAS).

IS3 **Large Deviations,** Organizer: Sandra Cerrai

IS3-1

Title: Systems of stochastic reaction-diffusion equations satisfy a large deviations principle that is uniform over all initial data
Author: Michael Salins

Abstract: 2.I identify two common situations where the large deviations principle for systems of small-noise stochastic reaction-diffusion equations is uniform over unbounded sets of initial data. This result can be used to prove Freidlin-Wentzell exit time asymptotics from unbounded sets.

IS3-2

Title: Perturbations of parabolic equations and diffusion processes with degeneration: boundary problems and metastability
Author: Leonid Koralov

Abstract: We study diffusion processes in a bounded domain with absorbing or reflecting boundary. The generator of the process is assumed to contain two terms: the main term that degenerates on the boundary in a direction orthogonal to the boundary and a small non-degenerate perturbation. Understanding the behavior of such processes allows us to study the stabilization of solutions to the corresponding parabolic equations with a small parameter. Metastability effects arise in this case: the asymptotics of solutions, as the size of the perturbation tends to zero, depends on the time scale. Initial-boundary value problems with both the Dirichet and the Neumann boundary conditions will be considered. The talk is based on joint work with M. Freidlin.

IS3-3

Title: A variational approach to stability and limits of McKean-Vlasov dynamics
Author: Mauro Mariani

Abstract: Interacting particles systems suggest a variational formulation (as opposed to a differential one) of the McKean-Vlasov and other dynamics. This can equivalently be regarded as a non-linear, non-reversible version of the well-known gradient-flow formulation of the heat equation. We use this formulation to prove some stability results in the low temperature regimes for some classes of McKean-Vlasov dynamics under minimal assumptions. Even in the case of linear equations (diffusion processes) we get some new results concerning convergence of models with critical exponents.

IS4 **Spin Glasses and Random Matrices,** Organizer: Wei-kuo Chen

IS4-1

Title: The spherical $s + q$ model
Author: Antonio Auffinger

Abstract: In this talk we will survey a classical model of spin glass, a linear combination of a s-body and a q-body interaction, the spherical s+q model. We will discuss the phase diagram for the free energy at low temperature, the existence and transitions between Replica Symmetric, 1-Replica Symmetry Breaking (RSB), 2 -RSB and 1-FullRSB phases. Based on a joint work with Yuxin Zhou.

IS4-2

Title: On convergence of the cavity and Bolthausen's TAP iterations to the local magnetization
Author: Si Tang

Abstract: The cavity and TAP equations are high-dimensional systems of nonlinear equations of the local magnetization in the Sherrington-Kirkpatrick model. In the seminal work, Bolthausen introduced an iterative scheme that produces an asymptotic solution to the TAP equations if the model lies inside the Almeida-Thouless transition line. However, it was unclear if this asymptotic solution coincides with the local magnetization. In this work, motivated by the cavity equations, we introduce a new iterative scheme and establish a weak law of large numbers. We show that our new scheme is asymptotically the same as the so-called Approximate Message Passing algorithm, a generalization of Bolthausen's iteration, that has been popularly adapted in compressed sensing, Bayesian inferences, etc. Based on this, we confirm that our cavity iteration and Bolthausen's scheme both converge to the local magnetization as long as the overlap is locally uniformly concentrated. This is a joint work with Wei-Kuo Chen (University of Minnesota).

IS4-3

Title: Complexity of high dimensional Gaussian random fields with isotropic increments
Author: Qiang Zeng

Abstract: Random fields with isotropic increments were introduced by Kolmogorov in the 1940s. Gaussian random fields on N-dimensional Euclidean spaces with isotropic increments were classified as isotropic case and non-isotropic case by Yaglom in the 1950s. Such models were used widely in statistical physics. In particular, they were introduced to model a single particle in a random potential by Engel, Mezard and Parisi in 1990s. A basic question is to count the number of critical points (or local minima, saddles) of the fields, which is commonly known as complexity. In 2004, Fyodorov computed the large N limit (on the exponential scale) of expected number of critical points for isotropic Gaussian random fields. However, many natural models are not isotropic and only have isotropic increments, which creates new difficulty in understanding the complexity. In this talk, I will present some results on the large N behavior of complexity of non-isotropic Gaussian random fields with isotropic increments. Connection to random matrices and large deviations will be explained. This talk is based on joint work with Antonio Auffinger (Northwestern University).

IS5 Centennial of the Lindeberg Central Limit Theorem, Organizer: Zengjing Chen

IS5-1

Title: Recent developments on normal and nonnormal approximation by Stein's method
Author: Qiman Shao)

Abstract: Stein's method is a powerful tool for normal and nonnormal distribution approximation. This talk will give a brief survey on recent developments on normal and nonnormal approximation, including Berry-Esseen type bounds and Cramér type moderate deviations.

IS5-2

Title: On second order fluctuations for random integer partitions
Author: Zhonggen Su

Abstract: The study of asymptotic properties of random integer partitions has attracted a lot of research activities since the seminal work by Verhsik and his school in the 1970s. In this talk, we report some new work on both integer partitions endowed with the multiplicative measures with equiweighted parts and minimal difference partitions, whose limit shapes were characterized exactly by Bogachev and his coauther recently. In particular, we establish the second order fluctuations around the limit shapes, namely the central limit theorems. A crucial component in the argument is to use the characteristic function trick for sums of independent non-identically distributed random variables, which was initially invented by Feller, Lévy, Lindeberg, Lyapunov, and others as early as 100 years ago.

IS5-3

Title: Central limit theorems, Loss aversion and multi-armed bandits
Author: Zengjing Chen

Abstract: This paper establishes two central limit theorems under the assumption that conditional variances can vary in a largely unstructured history-dependent way across experiments subject only to the restriction that they lie in a fixed interval. Limits take a novel and tractable form, and are expressed in terms of oscillating Brownian motion and skew Brownian motion, respectively. A second contribution is to demonstrate that these results may be applied to a class of multi-armed bandit problems where the decision-maker is loss averse.

IS6 **Stochastic Analysis,** Organizer: Zhen-Qing Chen

IS6-1

Title: Quenched invariance principle for a class of non-symmetric non-local operator in ergodic environment
Author: Xin Chen

Abstract: We study quenched invariance principle for the process $\{X_t^\omega\}_{t\geqslant 0}$ associated with the (non-symmetric) operator

$$L^\omega f(x) := \text{p.v.} \int_{\mathbb{R}^d} (f(x+z) - f(x))\nu(\mathrm{d}x) + b(x,\omega)\cdot f(x),$$

where $\nu(\mathrm{d}x)$ is a symmetric Lévy measure such that $\int_{\mathbb{R}^d/\{0\}} |z|^2\nu(\mathrm{d}z) < \infty$ and $b(x,\omega)$ is a divergence freee vector field in ergodic enviroment. In particular, we have characterized the limit process and constructed the corrector equation corresponding for L^ω. The talk is based on a joint on-going work with Kun Yin.

IS6-2

Title: Pointwise estimates for solutions to non-local parabolic equations
Author: Moritz Kassmann

Abstract: On the one hand, we present a recent approach to heat kernel bounds for non-local parabolic operators. Moreover, we prove Hölder regularity estimates and Harnack inequalities in the case where the operator is determined by a non-symmetric non-local bilinear form. On the other hand, we study inequalities for non-negative solutions to the fractional heat equation. In particular, we establish a differential Li-Yau inequality that implies the well-known parabolic Harnack inequality. The talk is based on joint works with Marvin Weidner and Tuhin Ghosh.

IS6-3

Title: Potential theory of Markov processes with jump kernels degenerating at the boundary
Author: Panki Kim

Abstract: In this talk we discuss the potential theory of Markov processes, whose jump kernels degenerate at the boundary. To be more precise, we consider processes in $\mathbb{R}^d_+$ with jump kernels of the form $\mathcal{B}(x,y)|x-y|^{-d-\alpha}$ and killing potentials $\kappa(x) = cx_d^{-\alpha}$, $0 < \alpha < 2$. The boundary part $\mathcal{B}(x,y)$ is allowed to degenerate at the boundary. We discuss the boundary Harnack principle and sharp two-sided estimates on the Green functions of these processes.

IS7 **Integrable Probability,** Organizer: Ivan Corwin

IS7-1

Title: Vector Riemann-Hilbert problem related to a biorthogonal ensemble from quantum transport
Author: Dong Wang

Abstract: The quantum transport problem for 1 dimensional disordered wires can be modeled by the Dorokhov-Mello-Pereyra-Kumar (DMPK) equation, and this equation has a free fermion solution, which is mathematically a biorthogonal ensemble. The asymptotic analysis for this biorthogonal ensemble is still challenging. In this talk we discuss an approach to the asymptotics of the biorthogonal ensemble by vector Riemann-Hilbert problem.

IS7-2

Title: Scaling limits of the Laguerre unitary ensemble
Author: Xuan Wu

Abstract: In this talk, we will discuss the LUE, focusing on the scaling limits. On the hard-edge side, we construct the α-Bessel line ensemble for all $\alpha \in \mathbb{N}_0$. This novel Gibbsian line ensemble enjoys the α-squared Bessel Gibbs property. Moreover, all α-Bessel line ensembles can be naturally coupled together in a Bessel field, which enjoys rich integrable structures. We will also talk about work in progress on the soft-edge side, where we expect to have the Airy field as the scaling limit. This talk is based on joint works with Lucas Benigni, Pei-Ken Hung, and Greg Lawler.

IS7-3

Title: Simplified forms of the transition probabilities of the two-species ASEP
Author: Eunghyun Lee

Abstract: It is known that the transition probability of the ASEP with N particles is written as a sum of $N!$ contour integrals where each integral is corresponding to a permutation in the symmetric group S_N. However, the transition probability of the multi-species ASEP may be written as a sum of a larger number of integrals than $N!$ for some initial orders of particles and final orders of particles. We show that the transition probabilities of the two-species ASEP are written as a sum of at most $N!$ contour integrals if the initial order is given by 2...21, 12...2, 12....2 or 1...12, and we find some probability distributions using these results.

IS8 **Models of Two-dimensional Random Geometry,** Organizer: Nicolas Curien

IS8-1

Title: Random distances of Liouville quantum gravity: a review
Author: Jian Ding

Abstract: In this talk I will review progress on random metric associated with Liouville quantum gravity with focus on the construction and the phase transition. The talk is based on works with Julien Dubédat, Alexander Dunlap, Hugo Falconet, Subhajit Goswami, Ewain Gwynne, Avelio Sepúlveda, Ofer Zeitouni and Fuxi Zhang in various combinations, and especially on a few recent joint works with Ewain Gwynne.

IS8-2

Title: Phase transition in the Ising model on a random 2D lattice
Author: Linxiao Chen

Abstract: The Ising model is one of the first statistical mechanics models known to have a non-trivial phase transition in two dimensions. On regular lattices, this phase transition has been extensively studied. In this talk I will present an annealed Ising model on a random 2D lattice, introduced first in the Physics literature as a model of quantum gravity in 2D. This model has a phase transition at a unique temperature by examining its free energy, its critical exponents, and the scaling limit of some interface lengths. In particular, these results confirm the physical intuition that a random lattice coupled to a non-critical Ising model has a geometry similar to a uniform random lattice with an instance of Bernoulli percolation on it. Based on arxiv:1806.06668, arXiv:2003.09343 and a joint work in progress with Joonas Turunen.

IS8-3

Title: Convergence of limit shapes for 2D near-critical first-passage percolation
Author: Chang-Long Yao

Abstract: Consider Bernoulli first-passage percolation on the triangular lattice in which sites have 0 and 1 passage times with probability p and $1-p$, respectively. We will focus on the subcritical regime: $p < p_c$. Let $B(p)$ be the limit shape in the classical "shape theorem", and let L(p) be the correlation length. We will show that the re-scaled limit shape $B(p)/L(p)$ converges to a Euclidean disk, as p tends to p_c from below. The proof relies on the scaling limit of near-critical percolation established by Garban, Pete and Schramm (2018) and the construction of the collection of continuum clusters introduced by Camia, Conijn and Kiss (2019).

IS9 **Random Walks,** Organizer: Denis Denisov

IS9-1

Title: Ordered random walks
Author: Denis Denisov

Abstract: We will consider d one-dimensional random walks. We will discuss time tail asymptotics of the when the random walks intersect each other. Then we discuss construction of random walks conditioned so that the components stay ordered (in the sense of Doob' s h-transform) and corresponding limit theorems. The talk is based on a paper with V. Wachtel and a paper with W. Fitzgerald.

IS9-2

Title: Escape probability for drifted random walks in wedges
Author: Kilian Raschel

Abstract: In this ongoing work with Viet Hung Hoang (Münster) and Pierre Tarrago (Sorbonne), we consider random walks in two-dimensional cones, killed when hitting the boundary. When the drift belongs to the cone, there is a positive probability that the walk never reaches the boundary axes. For certain models of singular transition probabilities, we compute surprisingly simple formulas for these escape probabilities. These formulas typically involve famous recurrent sequences, such as the Fibonacci numbers. We also present some conjectures concerning the Martin boundary of these processes.

IS9-3

Title: Contraction principle for trajectories of random walks
Author: Vladislav Vysotsky

Abstract: In 1976 Mogulskii proved a large deviations principle (LPD) for trajectories of random walks with finite Laplace transform of their increments. For the increments whose Laplace transform is finite only in a neighbourhood of zero, there were no tractable results until 2013, when Borovkov and Mogulskii proved a weaker-than-standard result using a new concept of "metric" LDPs. We establish a contraction principle for general "metric" LDPs, showing that they are preserved under uniformly continuous mappings. This allows us to transform the result of Borovkov and Mogulskii on random walks trajectories into standard LDPs. As an application, we extend the classical Cramer theorem by (re)proving an LPD for kernel-weighted sums of i.i.d. random vectors in R^d.

IS10 **Bernoulli Society New Researcher Award,** Organizer: Sebastian Engelke

IS10-1

Title: Universal limits of random constrained permutations and Liouville quantum gravity
Author: Jacopo Borga

Abstract: We present a new family of universal limiting random measures of the unit square, called skew Brownian permuton, and discuss how they naturally arise as scaling limits of various models of random constrained permutations. The construction of these new limiting random measures will lead us to investigate an intriguing connection with some flows of SDE related to skew Brownian motions. We finally explain how it is possible to construct these new limiting permutons directly from Liouville quantum gravity coupled with two SLE curves.

IS10-2

Title: Convergence to the coalescent of ancestries from non-neutral Cannings models
Author: Jere Koskela

Abstract: Cannings models are iterative, labelled particle systems in which new generations of particles inherit their labels from randomly chosen parents in a previous generation. They lie at the core of mathematical population genetics, and also describe broad classes of genetic algorithms. It is well known that when the sampling of parents is neutral, i.e. when the family size distribution of a particle does not depend on its label and family sizes in distinct generations are independent, the random ancestral tree embedded into such a particle system converges to the coalescent process in the infinite population size limit, essentially provided that the variances of family sizes remain bounded. I will show that an analogous condition suffices for a similar convergence result for non-neutral particle systems as well, at the cost of a less tractable rescaling of time than is required in the neutral case. This is joint work with Suzie Brown, Paul Jenkins, Adam Johansen, and Dario Spanò.

IS10-3

Title: Determinantal processes in the KPZ universality class
Author: Konstantin Matetski

Abstract: The KPZ universality class is a broad collection of random growing one-dimensional interfaces, which are conjectured to converge after a suitable rescaling to the same limit, called the KPZ fixed point. The latter is a Markov process on a space of continuous functions. For particular initial states, the marginal distributions of the KPZ fixed point coincide with the Tracy-Widom distributions from the random matrix theory. The abbreviation KPZ stands for the names of the three physicists, Kardar, Parisi, and Zhang, who conjectured the existence of such a universal limit in the 1980s. The KPZ universality class contains a very special subclass of models described by margins of determinantal point processes. This subclass includes, in particular, such well-known models as the geometric and exponential Last Passage Percolations, the Totally Asymmetric Simple Exclusion Process (TASEP), and the Polynuclear Growth (PNG). The distribution function of such models can be computed exactly, which allows for studying their scaling limits. The talk is based on joint work with J. Quastel and D. Remenik.

IS11 Random Trees and Graphs, Organizer: Christina Goldschmidt

IS11-1

Title: Random trees have height $O(\sqrt{n})$
Author: Serte Donderwinkel

Abstract: I will discuss a recent work with Louigi Addario-Berry, in which we resolve several conjectures on the height of uniformly random trees with a given degree sequence, simply generated trees and Bienaymé trees. The proof is based on a bijection between trees and sequences that we introduced in a joint work with Mickaël Maazoun and James Martin.

IS11-2

Title: Scaling limits of uniform spanning trees and forests
Author: Saraí Hernández-Torres

Abstract: In two and three dimensions, the scaling limit of the uniform spanning tree of $\mathbb{Z}^d$ is a measured, rooted spatial tree, and its embedding in $\mathbb{R}^d$ fills the space. For these integer lattices and high-dimensional finite graphs, the proofs of the existence of the corresponding limit trees rely on Wilson's algorithm. The situation is different in $\mathbb{Z}^d$ for $d \geqslant 5$. In this case, the infinite-volume limit of uniform spanning trees of finite subgraphs is the uniform spanning forest (USF) with, almost surely, infinitely many trees. Sampling with Wilson's algorithm, one builds different trees simultaneously. Hence, studying the scaling limit of one tree in the USF requires a different approach. This talk will present recent advances in this direction for the USF of $\mathbb{Z}^d$, $d \geqslant 5$, based on joint work with Tom Hutchcroft.

IS11-3

Title: Limits of multiplicative inhomogeneous random graphs and Lévy trees

Author: Thomas Duquesne

Abstract: The convergence of the height process for (sub)critical offspring distribution is done in Theorem 2.3.2 in Le Gall & D. [21], Chapter 2, p. 60. However, the proof works verbatim in the supercritical cases.

We consider a model of inhomogeneous random graphs that extend Erdős–Rényi graphs and that shares a close connection with the multiplicative coalescence, as pointed out by Aldous [*Ann. Probab.*, vol. 25, pp. 812–854, 1997]. These models have been studied first by Aldous and Limic [*Electron. J. Probab.*, vol. 3, pp. 1–59, 1998] and their connected components evolve as a multiplicative coalescent: namely, let N be the number of vertices and let $w_1, \ldots, w_N$ be a set of positive weights; we independently put an edge between vertices i and j with probability $p_{i,j} = 1 - e^{-w_i w_j / s}$ (in our case, we consider, $s = w_1 + \ldots + w_N$).

Our results are the following: we first generate such graphs by an exploration that reduces to a LIFO queue. This point of view allows to code an appropriate spanning tree of the graph thanks to a contour process (and a modified Lukasiewicz path) and to get a simple control on the surplus edges. The spanning tree encompasses most of the metric structure. This construction also allows to embed such graphs into Galton-Watson trees.

This embedding transfers asymptotically into an embedding of the limit objects into a forest of Lévy trees, which allows us to prove a limit theorem and an explicit construction of the limit objects from the excursions of a Lévy-type process. As a consequence of our construction, we give a transparent and explicit condition for the compactness of the limit objects and determine their fractal dimensions. These results extend and complement several previous results that had obtained via model- or regime-specific proofs, for instance: the case of Erdős–Rényi random graphs obtained by Addario-Berry, Goldschmidt and B. [*Probab. Theory Rel. Fields*, vol. 153, pp. 367–406, 2012], the *asymptotic homogeneous* cases as studied by Bhamidi, Sen and Wang [*Probab Theory Rel. Fields*, vol. 169, pp. 565–641, 2017], or the *power-law* cases as considered by Bhamidi, Sen and van der Hofstad [*Probab. Theory Rel. Fields*, vol. 170, pp. 387–474, 2018].

This is a joint work with Nicolas Broutin (Sorbonne university) and Minmin Wang (University of Sussex).

IS12 **Interacting Particle Systems,** Organizer: Milton Jara

IS12-1

Title: Stationary measure for the open KPZ equation
Author: Alisa Knizel

Abstract: The Kardar-Parisi-Zhang (KPZ) equation is the stochastic partial differential equation that models interface growth. In the talk I will present the construction of a stationary measure for the KPZ equation on a bounded interval with general inhomogeneous Neumann boundary conditions. Along the way, we will encounter classical orthogonal polynomials, the asymmetric simple exclusion process, and precise asymptotics of q-Gamma functions. This construction is a joint work with Ivan Corwin.

IS12-2

Title: Mixing times for the TASEP on the circle
Author: Dominik Schmid

Abstract: The exclusion process is one of the best-studied examples of an interacting particle system. In this talk, we consider simple exclusion processes on finite graphs. We give an overview over some recent results on the mixing time of the totally asymmetric simple exclusion process (TASEP). In particular, we provide bounds on the mixing time of the TASEP on the circle, using a connection to periodic last passage percolation. This talk is based on joint work with Allan Sly.

IS12-3

Title: Central limit theorem for non-equilibrium stationary states
Author: Rodrigo Marinho

Abstract: We consider a non-equilibrium, d-dimensional reaction-diffusion model with a unique stable density. We derive a quantitative version of the hydrostatic limit for its stationary state and we show that, up to dimension 3, the CLT of the density of particles with respect to the stationary state is given by a mean-zero Gaussian random variable with explicit variance. The proof uses a sharp upper bound on the relative entropy between its stationary measure, which is unknown, and the Bernoulli product measure associated with the stable density.

IS13 **Stable Processes,** Organizer: Andreas Kyprianou

IS13-1

Title: General path integrals and stable SDEs
Author: Leif Doering

Abstract: In recent years there have been several approaches towards the understanding of path integrals for Markov processes. We will discuss a general theorem characterisation finiteness of such integrals. As an applications we give Engelbert-Schmidt type theorems for stable SDEs with.

IS13-2

Title: Growth-fragmentation embedded in Brownian excursions from hyperplanes
Author: Juan Carlos Pardo

Abstract: In this talk, we present a self-similar growth-fragmentation process linked to a Brownian excursions from hyperplanes, obtained by cutting the excursion at heights along horizontal hyperplanes. More precisely by slicing these excursions, we obtain a collection of excursions which exhibit a branching structure. We define the size of such an excursion as the difference between the endpoint and the starting point (this is a vector in $\mathbb{R}^{d-1}$). We show that considering the collection of these sizes at varying heights constructs a special growth-fragmentation in $\mathbb{R}^{d-1}$. This is a joint work with William Da Silva.

IS13-3

Title: Attraction to and repulsion from patches on the hypersphere and hyperplane for isotropic d-dimensional stable Lévy processes
Author: Andreas Kyprianou

Abstract: Consider a d-dimensional stable Lévy processes with index in (0,1). Suppose that D is a region of the unit sphere $S^{d-1} = x : |x| = 1$. We construct the aforesaid stable Lévy process conditioned to approach D continuously, either from inside S^{d-1}, from outside S^{d-1} or in an oscillatory way; all of which have zero probability. Our approach also extends to the setting of hitting bounded domains of (d-1)-dimensional hyperplanes. We appeal to a mixture of methods, appealing to the modern theory of self-similar Markov process as well as the classical potential analytic view. Joint work with Tsogzolmaa Saizmaa (National University of Mongolia), Sandra Palau (UNAM, Mexico) and Mateusz Kwasniki (Technical University of Wroclaw).

IS14 Level Lines of Gaussian Processes and Percolation, Organizer: Stephen Muirhead

IS14-1

Title: Gaussian first passage percolation

Author: Vivek Dewan

Abstract: The model of percolation given by sub-level sets of continuous Gaussian fields on R^d with fast decorrelation features many analogous properties with Bernoulli percolation on Z^d, including a sharp phase transition. The extent of these analogies is the subject of many recent investigations. One natural direction is to try and extend the comparison to the random pseudometric model of first passage percolation (FPP). In the lattice model, it consists in assigning independently a non-negative random variable of same law to each edge, and defining the distance $T(x, y)$ between two vertices x and y as the least sum of these random variables among all edge paths between x and y.

We will explain how a natural counterpart of such a model can be defined in the setting of continuous Gaussian fields. We will then show how, just like in the lattice case, the important factor in the behaviour of the model is whether or not the zero-distance clusters percolate.

IS14-2

Title: On Gaussian free fields, percolation and universality
Author: Pierre-François Rodriguez

Abstract: We will survey recent results regarding percolation models with long-range dependence, which arise in relation with Gaussian free fields in transient setups. These models benefit from a rich mathematical structure and offer an ideal framework to develop a rigorous (near-)critical scaling theory in dimensions larger than 2.

IS14-3

Title: On the off-critical level sets of smooth Gaussian fields
Author: Franco Severo

Abstract: We consider the level sets of smooth Gaussian fields on $\mathbb{R}^d$ below a parameter $\ell \in \mathbb{R}$. As ℓ varies this defines a percolation model, whose critical point is denoted by ℓ_c. In this talk we will discuss the behaviour of these level sets on the off-critical regime, i.e. for $\ell \neq \ell_c$. Our main result states that, for fields with positive and sufficiently fast decaying correlations, the connection probabilities decay exponentially for $\ell < \ell_c$ and percolation occurs in sufficiently thick 2D slabs for $\ell > \ell_c$.This result, often referred to as (subcritical and supercritical, respectively) sharpness of phase transition, are typically the starting point for the study of finer properties of the off-critical phases. The result follows from a global comparison with a truncated and discretised version of the model, which may be of independent interest. The proof of this comparison relies on an interpolation scheme that integrates out the long-range and infinitesimal correlations of the model while compensating them with a small change in the parameter ℓ.

IS15 **Rough Paths,** Organizer: Hao Ni

IS15-1

Title: Weak universality of some singular stochastic PDEs
Author: Weijun Xu

Abstract: We will discuss some progress on weak universalities of some singular stochastic PDEs, including KPZ and Φ^4_3.

IS15-2

Title: Tail probabilities for integrals along fractional Brownian motion
Author: Horatio Boedihardjo

Abstract: Given a stochastic process X, what can we say about the probability distribution for the integral along X? One way to study this question is to see if the integral has a density function and if so what properties do the density function have. These questions are well-studied classically when X is a Brownian motion, when the differential equation are defined in the sense of Ito. Rough path theory has enabled us to make sense of integral along more general Gaussian processes (and beyond), with much recent progress in understanding the distribution of the solution in this extended setting. We will explore one of these questions, particularly on the tail probabilities for integrals along fractional Brownian motion. Joint work with Xi Geng.

IS15-3

Title: Scoring rules for path forecasts
Author: Harald Oberhauser

Abstract: Often one is interested in not only predicting a scalar- or vector-valued quantity but the whole dynamics over a period time, that is one predicts trajectories. In which sense, is one forecaster better than others? We revisit the classical scoring rule framework to address this question. This leads to notions of entropy, divergence, and mutual information that respect the Non-Euclidean structure of (measures) on path-space.

IS16 **Stochastic Models in Biology,** Organizer: Lea Popovic

IS16-1

Title: Motion by mean curvature in interacting particle systems
Author: Xiangying (Zoe) Huang

Abstract: There are a number of situations in which rescaled interacting particle systems have been shown to converge to a reaction diffusion equation (RDE) with a bistable reaction term. These RDEs have traveling wave solutions. When the speed of the wave is nonzero, block constructions have been used to prove the existence or nonexistence of nontrivial stationary distributions. Here, we follow the approach in a paper by Etheridge, Freeman, and Pennington to show that in a wide variety of examples when the RDE limit has a bistable reaction term and traveling waves have speed 0, one can run time faster and further rescale space to obtain convergence to motion by mean curvature. This opens up the possibility of proving that the sexual reproduction model with fast stirring has a discontinuous phase transition, and that in Region 2 of the phase diagram for the nonlinear voter model studied by Molofsky et al there were two nontrivial stationary distributions.

IS16-2

Title: Growth properties of the infinite-parent spatial Lambda-Fleming-Viot process
Author: Amandine Veber

Abstract: The infinite-parent spatial Lambda-Fleming-Viot process is a model for spatially expanding populations in a two dimensional continuum, in which empty areas are filled with ghost individuals. This model can be seen as a continuous-space version of the Eden growth model, and it comes with a dual process that allows us to trace back the origins of a sample of individuals taken from the current population. In this talk, we shall focus on the growth properties of the area covered by real individuals. With the help of a simple toy model, we shall also investigate how the fluctuations at the front edge lead to a much larger speed of growth of the occupied region than that predicted by simple first-moment estimates.

Joint work with Apolline Louvet (Ecole Polytechnique and University of Paris Cité)

IS16-3

Title: Genealogies in bistable waves
Author: Sarah Penington

Abstract: Consider a diploid population (one in which each individual carries two copies of each gene) living in one spatial dimension. Suppose a particular gene appears in two forms (alleles) A and a, and that individuals carrying AA have a higher fitness than aa individuals, while Aa individuals have a lower fitness than both AA and aa individuals. The proportion of advantageous A alleles expands through the population approximately according to a travelling wave. We can prove that on a suitable timescale, the genealogy of a sample of A alleles taken from near the wavefront converges to a Kingman coalescent as the population density goes to infinity. This contrasts with the case of directional selection in which the corresponding limit is thought to be the Bolthausen-Sznitman coalescent. Joint work with Alison Etheridge.

IS17 **Branching Processes,** Organizer: Yanxia Ren

IS17-1

Title: Exponential ergodicity of branching processes with immigration and competition
Author: Zenghu Li

Abstract: We study the ergodic property of a continuous-state branching process with immigration and competition, which is an extension of the models introduced by Pardoux (2016, Springer) and Berestycki et al. (Probably. Theory Relat. Fields, 2018) with an additional immigration structure. The exponential ergodicity in a weighted total variation distance is proved for general branching mechanism including all stable cases. The proof is based on a Markov coupling process and a non-symmetric control function for the distance. These are designed to identify and to make advantage of the dominating factor among the branching, immigration and competition mechanisms in different parts of the state space of the coupling process. The main results are applied to two typical choices of the weighted total variation distance. This is based on a joint work with Pei-Sen Li, Jian Wang and Xiaowen Zhou.

IS17-2

Title: The Derrida-Retaux continuum system as an exactly solvable growth-fragmentation process
Author: Zhan Shi

Abstract: The Derrida-Retaux continuum system originates from a family of hierarchical renormalization models in statistical physics, and can be viewed as an exactly solvable growth-fragmentation process in the sense of Bertoin. I am going to make some elementary discussions on asymptotic properties of the system. Based on joint work with B. Derrida (Collège de France) and T. Duquesne (Sorbonne Université).

IS17-3

Title: The Seneta-Heyde scaling for supercritical super-Brownian motion
Author: Renming Song

Abstract: We study the additive martingale $W_t(\lambda)$ and the derivative martingale $\partial W_t(\lambda)$ for one-dimensional supercritical super-Brownian motions with general branching mechanism. In the critical case $\lambda = \lambda_0$, we prove that $\sqrt{t}W_t(\lambda_0)$ converges in probability to a positive limit, which is a constant multiple of the almost sure limit $\partial W_\infty(\lambda_0)$ of the derivative martingale $\partial W_t(\lambda_0)$. We also prove that, on the survival event, $\limsup_{t\to\infty} \sqrt{t}W_t(\lambda_0) = \infty$ almost surely. This talk is based on a joint paper with Haojie Hou and Yanxia Ren.

IS18 **Dirichlet Forms and SPDE,** Organizer: Michael Röckner

IS18-1

Title: Hypocoercivity for non-linear infinite-dimensional degenerate stochastic differential equations
Author: Martin Grothaus

Abstract: Motivated by problems from Industrial Mathematics we further developed the concepts of hypocoercivity. The original concepts needed Poincaré inequalities and were applied to equations in linear finite dimensional spaces. Meanwhile we can treat equations in manifolds or even infinite dimensional spaces. The condition giving micro- and macroscopic coercivity we could relax from Poincaré to weak Poincaré inequalities. In this talk an overview and many examples are given.

IS18-2

Title: Global existence and non-uniqueness for 3D Navier-Stokes equations with space-time white noise
Author: Xiangchan Zhu

Abstract: We establish global-in-time existence and non-uniqueness of probabilistically strong solutions to the three dimensional Navier–Stokes system driven by space-time white noise. In this setting, solutions are expected to have space regularity at most $-1/2-\kappa$ for any $\kappa > 0$. Consequently, the convective term is ill-defined analytically and probabilistic renormalization is required. Up to now, only local well-posedness has been known. With the help of paracontrolled calculus we decompose the system in a way which makes it amenable to convex integration. By a careful analysis of the regularity of each term, we develop an iterative procedure which yields global non-unique probabilistically strong paracontrolled solutions. Our result applies to any divergence free initial condition in $L^2 \cup B^{-1+\kappa}_{\infty,\infty}$, $\kappa > 0$, and implies also non-uniqueness in law.

IS18-3

Title: On a longstanding open problem in the theory of Markov processes
Author: Michael Röckner

Abstract: We define a class of not necessarily linear C_0-semigroups $(P_t)_{t\geqslant 0}$ on $C_b(E)$ (more generally, on $C_\kappa(E) := \frac{1}{\kappa}C_b(E)$, for some growth bounding continuous function κ) equipped with the mixed topology $\tau_1^{\mathscr{M}}$ for a large class of topological state spaces E. In the linear case we prove that such $(P_t)_{t\geqslant 0}$ can be characterized as integral operators given by measure kernels satisfying certain properties. We prove that the strong and weak infinitesimal generators of such C_0-semigroups coincide. As a main result we prove that transition semigroups of Markov processes are C_0-semigroups on $(C_b(E), \tau_1^{\mathscr{M}})$, if they leave $C_b(E)$ invariant and they are jointly weakly continuous in space and time. In particular, they are infinitesimally generated by their generator $(L, D(L))$ and thus reconstructable through an Euler formula from their strong derivative at zero in $(C_b(E), \tau_1^{\mathscr{M}})$. This solves a long standing open problem on Markov processes. Our results apply to a large number of Markov processes given as the laws of solutions to SDEs and SPDEs, including the stochastic 2D Navier-Stokes equations and the stochastic fast and slow diffusion porous media equations. Furthermore, we introduce the notion of a Markov core operator $(L_0, D(L_0))$ for the above generators $(L, D(L))$ and prove that uniqueness of the Fokker-Planck-Kolmogorov equations corresponding to $(L_0, D(L_0))$ for all Dirac initial conditions implies that $(L_0, D(L_0))$ is a Markov core operator for $(L, D(L))$. As a consequence we can identify the Kolmogorov operator of a large number of SDEs on finite and infinite dimensional state spaces as Markov core operators for the infinitesimal generators of the C_0-semigroups on $(C_\kappa(E), \tau_\kappa^{\mathscr{M}})$ given by their transition semigroups. If each P_t is merely convex, we prove that $(P_t)_{t\geqslant 0}$ gives rise to viscosity solutions to the Cauchy problem of its associated (non linear) infinitesimal generators. Furthermore, we prove that each P_t has a stochastic representation as a convex expectation in terms of a nonlinear Markov process.

Joint work with:
Ben Goldys, University of Sydney
Max Nendel, Bielefeld University

Bibliography

[1] Ben Goldys, Max Nendel and Michael Röckner. Operator semigroups in the mixed topology and the infinitesimal description of Markov processes, 2022; arXiv:2204.07484.

IS19 **Random Processes in Random Environment,** Organizer: Zhan Shi

IS19-1

Title: Critical branching random walk conditioned to survive at a given set in $\mathbb{Z}^2$

Author: Xinxin Chen

Abstract: We consider a discrete-time branching simple random walk in $\mathbb{Z}^2$ where each particle independently makes simple random walk and produces a random number of children so that the offspring law is of mean 1 and of finite variance. We study the asymptotic behaviours of the critical branching random walk (CBRW) conditioned to hit a given site at large time n and obtain a Yaglom theorem. We also discuss the joint survival probabilities that the CBRW hits two sites which are of distances $\Theta(n^a)$ at large time n.

IS19-2

Title: Scaling limits of tree-valued branching random walks
Author: Thomas Duquesne

Abstract: We consider a branching random walk taking its values in the b-ary rooted tree $\mathbb{W}_b$ (i.e. the set of finite words written in the alphabet $1, ..., b$, with $b \geqslant 2$). The branching random walk is indexed by an uniform ordered rooted tree with n vertices. The jumps of the branching random walk are those of a nearest-neighbour null-recurrent random walk on Wb (reflection at the root of Wb and otherwise : probability $1/2$ to move closer to the root of $\mathbb{W}_b$ and probability $1/(2b)$ to move away from it to one of the b sites above). We denote by $\mathcal{R}_b(n)$ the range that is the set of all sites in Wb visited by the branching random walk. We first prove a law of large numbers for $\#\mathcal{R}_b(n)$ and we also prove that if we equip $\mathcal{R}_b(n)$ (which is a random subtree of $\mathbb{W}_b$) with its graph-istance d_{gr}, then the metric space $(\mathcal{R}_b(n), n^{1/4} d_{gr})$, equipped with its normalised empirical measure converges to the reflected Brownian cactus, a variant of the Brownian cactus introduced by N. Curien, J-F. Le Gall and G. Miermont (Ann. IHP 2013).

A part of these results extend in random environment:

- we prove that the range of critical biased RWs on N-type supercritical GW-trees converges to the tree coded by a reflected Brownian motion which extend a result due to A. Dembo and N. Sun (EJP 2012);

- under specific assumptions, the range of the critical biased branching random walk in a Galton-Watson tree converges to a Brownian cactus when it is suitably rescaled.

This is a joint work with Robin Khanfir (Sorbonne university), Shen Lin (Sorbonne university) and Niccolo Torri (Nanterre University).

IS19-3

Title: Atypical invasion of the reducible multi-type branching Brownian motion
Author: Bastien Mallein

Abstract: A branching Brownian motion can be described as a particle system on the real line. In this process, each particle moves independently according to a Brownian motion for an independent exponential time, after which the particle splits into 2. After splitting, the two daughter particles immediately start from their position independent copies of the process.

We take interest in a multi-type version of the system in which the diffusion constant and the branching rate depend on the type of particles. When the process is irreducible (i.e. when particles of type 1 can give birth to particles of type 2, but not reciprocally), an anomalous spreading phenomenon may occur, in which the speed of the multi-type process exeeds the speed of each "pure" process. We take interest in the asymptotic behavior of extremal particles in this setting, showing the convergence in law of the extremal process centered around the median of the maximal displacement.

IS20 Point Processes and Stochastic Geometry, Organizer: Tomoyuki Shirai

IS20-1

Title: Normal approximation, the Gaussian multiplicative chaos, and excess one for the sine-process
Author: Alexander Bufetov

Abstract: The Soshnikov Central Limit Theorem states that scaled additive statistics of the sine-process converge to the normal law. The first main result of this talk gives a detailed comparison between the law of an additive, sufficiently Sobolev regular, statistic under the sine-process and the normal law. The comparison for low frequencies is obtained by taking the scaling limit in the Borodin-Okounkov-Geronimo-Case formula. The exponential decay for the high frequencies is obtained, under an additional assumption of holomorphicity in a horizontal strip, with the use of an analogue of the Johansson change of variable formula; quasi-invariance of the sine-process under compactly supported diffeomorphisms plays a key rôle in the proof. The corollaries of the normal approximation theorem include the convergence of the random entire function, the infinite product with zeros at the particles, to Gaussian multiplicative chaos. A complementary estimate to the Ghosh completeness theorem follows in turn: indeed, Ghosh proved that reproducing sine-kernels along almost every configuration of the sine-process form a complete set; it is proved in the talk that if one particle is removed, then the set is still complete; whereas if two particles are removed from the configuration, then the resulting set is the zero set for the Paley-Wiener space. The talk extends the results of the preprint https://arxiv.org/abs/1912.13454

IS20-2

Title: Stochastic geometry beyond independence and its applications
Author: Subhroshekhar Ghosh

Abstract: The classical paradigm of randomness is the model of independent and identically distributed (i.i.d.) random variables, and venturing beyond i.i.d. is often considered a challenge to be overcome. In this talk, we will explore a different perspective, wherein stochastic systems with constraints in fact aid in understanding fundamental problems. Our constrained systems are well-motivated from statistical physics, including models like the random critical points and determinantal probability measures. These will be used to shed important light on natural questions of relevance in understanding data, including problems of likelihood maximization and dimensionality reduction. En route, we will explore connections to spiked random matrix models and novel asymptotics for the fluctuations of spectrally constrained random systems. Based on the joint works below.

IS20-3

Title: Rigidity of translation invariant random point fields implies subdiffusivity
Author: Hirofumi Osada

Abstract: The celebrated Nash theory for symmetric diffusions clarifies the relation of the time decay of the transition probability density of diffusion with translation invariant measure and Nash inequality. If Nash inequality holds, then the diffusion is diffusive. However, there exists no analogy for infinite-dimensional space.

In this talk, we present an analogy of Nash theory concerning the criteria for diffusivity of tagged particles of the stochastic dynamics associated with the translation-invariant random point fields that are number rigid. This result implies the tagged particles of the Ginibre interacting Brownian motion and the diffusions related to the planner Gaussian analytic function are subdiffusive.

IS21 Mixing Times of Markov Chains, Organizer: Perla Sousi

IS21-1

Title: Cutoff for the simple exclusion process with open boundaries
Author: Dominik Schmid

Abstract: The goal of this talk is to provide an overview on recent mixing time results for symmetric and asymmetric simple exclusion processes with open boundaries. We focus on cases where the cutoff phenomenon, an abrupt convergence to the stationary measure, can be verified. This talk is based on joint work with Dor Elboim, Nina Gantert and Evita Nestoridi.

IS21-2

Title: Entropic cutoff for the random walk on random lifts of Markov chains

Author: Guillaume Conchon-Kerjan

Abstract: A random n-lift of a finite base graph G is obtained by taking n copies of each vertex, and for each edge $e = (u, v)$ of G, drawing an edge between the i-th copy of u and the $\sigma_e(i)$-th copy of v, where the σ_e's are independent uniform permutations of $\{1, \dots, n\}$. We show that the random walk on this graph has a cutoff (i.e. its empirical distribution rushes to the invariant measure) at time $h^{-1} \log n$ for large n. The constant h is the entropy of the universal cover of G, which is a periodic tree. The result holds when adding weights on the edges of G making the random walk irreversible.

IS21-3

Title: Cutoff at an entropic time for random walks on graphs with an added random perfect matching
Author: Jonathan Hermon

Abstract: We establish universality of cutoff for simple random walk on a class of random graphs defined as follows. Given a finite graph $G = (V, E)$ with $|V|$ even we define a random graph $G' = (V, E \cup E)$obtained by picking E to be the (unordered) pairs of a random perfect matching of V. We show that for a sequence of such graphs of diverging sizes and of uniformly bounded degree, if the minimal size of a connected component of (the original graphs) is at least 3, then the obtained graphs are w.h.p. expanders and the random walk on them exhibits cutoff at a time with an entropic interpretation. This provides a simple generic operation of adding some randomness to a given graph, which results in cutoff.

IS22 **Path-distribution Dependent SDEs,** Organizer: Feng-Yu Wang

IS22-1

Title: Approximation of the invariant measure for nonlinear stochastic delay differential equations
Author: Xiaoyue Li

Abstract: Our main aim of this paper is to study the explicit numerical method for approximating nonlinear stochastic delay differential equations (SDDEs). Precisely, we construct a $C([-\tau, 0]; \mathbb{R}^d)$-valued explicit truncated Euler-Maruyama linear interpolation segment process (TEMLISP), and prove that it is asymptotically stable in distribution and admits a unique numerical invariant measure. Furthermore, we show that the numerical invariant measure converges to the exact one in the Fortet-Mourier distance d_{Ξ} as the step size tends to zero.

IS22-2

Title: Well-posedness and regularity for distribution dependent SPDEs with singular drifts
Author: Xing Huang

Abstract: In this paper, the distribution dependent stochastic differential equation in a separable Hilbert space with a Dini continuous drift is investigated. The existence and uniqueness of weak and strong solutions are obtained. Moreover, some regularity results as well as gradient estimates and Wang ' s log-Harnack inequality are derived for the associated semigroup. In addition, Wang ' s Harnack inequality with power and shift Harnack inequality are also proved when the noise is additive. All of the results extend the ones in the distribution independent situation.

IS22-3

Title: Large deviation principles for path-distribution dependent SDEs
Author: Yulin Song

Abstract: In this talk, by the weak convergence method large deviation principles for path-distribution dependent SDEs are established. This is joint work with Xinyi Gu.

IS23 Stochastic Partial Differential Equations, Organizer: Lorenzo Zambotti

IS23-1

Title: Large deviations for the invariant measures of the $2D$ stochastic Navier-Stokes equation with vanishing noise correlation
Author: Sandra Cerrai

Abstract: We study the two-dimensional incompressible Navier-Stokes equation on the torus, driven by Gaussian noise that is white in time and colored in space. We consider the case where the magnitude of the random forcing and its correlation scale are both small. We prove a large deviations principle for the solutions, as well as for the family of invariant measures, as the intensity of the noise and the correlation radius are simultaneously sent to zero, under a suitable scaling.

IS23-2

Title: The critical 2d stochastic heat flow
Author: Francesco Caravenna

Abstract: We consider the $2d$ heat equation with multiplicative space-time white noise, known as the Stochastic Heat Equation (SHE). This is a critical stochastic PDE which falls outside the scope of robust solution theories, such as Regularity Structures or Paracontrolled Calculus. When space-time is suitably discretised, the solution of the SHE can be interpreted as the partition function of a statistical mechanics model, the so-called directed polymer in random environment. We prove that as the discretisation is removed, and the noise strength is rescaled in a critical way, the solution of the discretised SHE converges to a unique limit: a universal process of random measures on R^2, which we call the critical $2d$ Stochastic Heat Flow. We investigate some of its features, getting explicit bounds on its moments, and we outline future directions of research. (joint work with R. Sun and N. Zygouras)

IS23-3

Title: Weak and mild solutions of SPDEs with distributional drift
Author: Oleg Butkovskiy

Abstract: Based on an ongoing project with Siva Athreya, Khoa Le, and Leonid Mytnik. We study the stochastic heat equation

$$du = \Delta u + b(u) + \xi,$$

where b is a distribution (for example, the Dirac delta function) and ξ is the space-time white noise. Note that since b is not a function, the composition $b(u)$ is a priori not well-defined and it is not even clear how to define a meaningful concept solution to this equation. We introduce a natural definition of a weak and mild solution to this equation in the spirit of the work of Bass-Chen (2001) and show that this equation is strongly well-posed for a certain class of drifts including the delta function. Quite surprisingly, our approach allowed to prove new results even for the case where b is a function: we have shown existence and uniqueness of both weak and mild solutions for $b \in L_1((R))$, thus improving the classical results of Gyongy and Pardoux (1993).

Abstracts of Contributed Sessions (CS1 - CS27)

CS1 Stochastic Control with Financial Applications, Organizer: Lijun Bo

CS1-1

Title: Deep learning algorithm for optimal stopping problems
Author: Yuecai Han

Abstract: We introduce a deep learning algorithm for complex and high-dimensional optimal stopping and multiple optimal stopping problems. Results concerning the consistency and convergence rate of are presented, which show that this method is able to circumvent the curse of dimensionality. The numerical results show that the algorithm is accurate and effective in pricing high-dimensional American options.

CS1-2

Title: Maximum principle for discrete-trime stochastic control problem of mean-field type
Author: Tianyang Nie

Abstract: In this talk, a discrete-time mean-field type stochastic optimal control problem is studied. The goal is to derive the stochastic maximum principle with convex control domains. L-derivative is applied to handle the mean-field term and a technique of adjoint operator is used to overcome the difficulties of obtaining adjoint equations and duality relation. Then, the stochastic maximum principle for discrete-time mean-field type stochastic optimal control problem is established. Finally, as an illustration of our stochastic maximum principle, a discrete-time mean-variance portfolio selection problem is solved with the decoupling technique which is different from the continuous-time case. This talk is based on the joint work with Bozhang Dong and Prof. Zhen Wu.

CS1-3

Title: Turnpike Properties for Stochastic Linear-Quadratic Optimal Control Problems
Author: Jingrui Sun

Abstract: The turnpike property refers to the phenomenon that in many optimal control problems over finite but long time horizon, optimal trajectories approach to a steady state of the system and stay close to it for the major part of the time horizon. In the past several decades, much progress has been made in the turnpike theory for deterministic optimal control problems of finite and infinite dimensions, while little attention has been paid to the case of stochastic optimal control, which is commonly encountered in practice. The presence of the diffusion term brings essential difficulty for studying the turnpike property of stochastic optimal control. Intuitively mimicking the idea of deterministic situations will most likely lead us to a wrong direction, in particular, an incorrect formulation of the corresponding static optimization problem. In this talk we will report some recently obtained results on the turnpike properties of stochastic linear-quadratic optimal control problems.

CS2 **Epidemic Model,** Organizer: Jian Ding

CS2-1

Title: Epidemics on evolving graphs
Author: Dong Yao

Abstract: In the standard SI model on a graph, infected individuals infect their susceptible neighbors at rate λ .The evoSI model is a modification of the standard SI model where infected-susceptible pairs are broken at rate ρ and the susceptible individual rewires to a uniformly randomly chosen individual. EvoSIR model is similarly defined with infected individuals recovering at rate 1. We consider evoSI and evoSIR models on graphs given by the configuration model and Erdös-Rényi random graph. We show that there is a quantity whose sign governs the continuity of the phase transition of final epidemic size. We also consider the survival probability of critical evoSI model. Based on joint work with Wenze Chen, Rick Durrett, and Yuewen Hou.

CS2-2

Title: Random recursive trees and contact tracing
Author: Chenlin Gu

Abstract: We consider a random process on recursive trees, with three types of events. Vertices give birth at a constant rate (growth), each edge may be removed independently (fragmentation of the tree) and clusters are frozen with a rate proportional to their size (isolation of connected component). Our model is motivated by the control of epidemics and contact-tracing where clusters correspond to subtrees of infected individuals that can be identified and isolated. This talk is based on a joint work with Vincent Bansaye (Ecole Polytechnique) and Linglong Yuan (The University of Liverpool).

CS2-3

Title: Assessing covertness and household transmissions of the COVID-19 with stochastic dynamic models
Author: Yuan Zhang

Abstract: The current outbreak of coronavirus disease 2019 (COVID-19) has been going on for over two years and is deemed as a once-in-a-century health crisis. A major driving force in the persistence of COVID-19 is believed to be the transmission caused by those who are unaware of their infection and thus can easily pass on the pathogen to their family members. We employ stochastic dynamic models to study the covertness and household transmissions of the COVID-19 base on epidemiological data in Hubei, China. Our models estimates that 79.8

CS3 **Stochastic Partial Differential Equations,** Organizer: Benjiamin Gess

CS3-1

Title: A new derivation of the master loop equations for lattice Yang-Mills
Author: Scott Smit

Abstract: The master loop equations describe a recursive formula satisfied by Wilson loops in discrete Yang-Mills theory. They have a long history in the physics literature on large N problems and were recently derived in a generalized form by Chatterjee. We will discuss a new derivation relying on stochastic quantization and Ito' s formula. This is based on joint work with Hao Shen and Rongchan Zhu.

CS3-2

Title: Scaling limit and CLT for stochastic 2D Euler equations with transport noise
Author: Dejun Luo

Abstract: We consider the vorticity form of stochastic 2D Euler equations with multiplicative transport noise and L^2-initial data. Under a suitable scaling of the noise to high Fourier modes, the solutions converge weakly to the unique solution of the deterministic 2D Navier-Stokes equation. We shall present some quantitative convergence rates and a CLT result underlying such scaling limit. This talk is based on joint works with Franco Flandoli and Lucio Galeati.

CS3-3

Title: Invariant Gibbs measures for NLS and Hartree equations
Author: Haitian Yue

Abstract: In this talk, I'll present our results about invariant Gibbs measures for the periodic nonlinear Schr?dinger equation (NLS) in 2D, for any (defocusing and renormalized) odd power nonlinearity and for the periodic Hartree equation in 3D. The results are achieved by introducing a new method (we call the random averaging operators method) which precisely captures the intrinsic randomness structure of the problematic high-low frequency interactions at the heart of this problem. This is work with Yu Deng (USC) and Andrea Nahmod (UMass Amherst).

CS4 Functional Inequalities, Organizer: Arnaud Guillin

CS4-1

Title: Lipschitz transport maps between probability measures
Author: Max Fathi

Abstract: Lipschitz transport maps allow to transfer functional inequalities from a simple reference measure to more general targets. For example, Caffarelli's contraction theorem from optimal transport allows to get such maps from gaussian sources to uniformly log-concave targets. In this talk, I will present a construction for a family of non-uniformly log-concave targets. Joint work with D. Mikulincer, J. Neeman and Y. Shenfeld.

CS4-2

Title: On the Sobolev inequalities and spherical Caffarelli-Kohn-Nirenberg model
Author: Ivan Gentil

Abstract: We first review the classical result of Bidautt-Veron-Veron in 1991, that is the Sobolev inequality holds whenever the curvature-dimension condition CD(rho,n) is satisfied. This result is optimal in the sense that, for the spherical model we obtain the optimal constants. We explain how, under a weaker assumption than the usual curvature-dimension condition CD(rho,n), for the Spherical Caffarelli-Kohn-Nirenberg model, we obtain also the optimal constants of the Sobolev inequality associated. This is a joint work with L. Dupaigne and S. Zugmeyer.

CS4-3

Title: On entropy-entropy production inequalities for the McKean-Vlasov equation
Author: Chaoen Zhang

Abstract: The production of entropy is an essential feature of diffusive or collisional kinetic models. In many cases of interest linear inequalities between the entropy and entropy production functional have been proved or expected, and they are usually referred to as entropy-entropy production inequalities(EEP inequalities in short). As is well known, such inequalities can imply quantitative rate of convergence. I will talk about EEP inequalities for the McKean-Vlasov equation. Under certain convexity assumptions, Carrillo, McCann and Villani proved EEP inequalities by either Bakry-Emery's method or the HWI method. To obtain EEP inequalities in non-convex settings, we derive uniform log Sobolev inequalities for the associated interacting particle systems. The proof relies on Zegarlinski' s theorem for Gibbs measures and an estimate due to Wu. This talk is based on a joint work with Arnaud Guillin, Wei Liu and Liming Wu.

CS5 Optimization and Game Problems for Controlled Markov Processes, Organizer: Xianping Guo

CS5-1

Title: On continuous-time Markov decision processes with gradual and impulsive control
Author: Yi Zhang

Abstract: Consider a Markov pure jump process, whose transition rate can be controlled with the gradual control. In addition, its state can be instantaneously changed by the impulsive control. Refer to such a model as a continuous-time Markov decision process with gradual-impulsive control, for which we consider the optimal control problem with total cost criteria and constraints, and present its optimality results. This is based on the observation that the problem can be reduced to an equivalent one for models with gradual control only.

CS5-2

Title: Zero-sum infinite-horizon discounted piecewise deterministic Markov games
Author: Yonghui Huang

Abstract: This talk is on zero-sum piecewise deterministic Markov games, where the expected infinite-horizon discounted payoff criterion is considered. The policies of two players are history-dependent, and the controls continuously act on the transition rate and the payoff rate. Under suitable conditions, the non-explosion of the process and the Dynkin's formula are developed in our setup, via which the value function of the zero-sum game is shown to be the unique solution to Shapley equation that is in the form of a differential equation. By Shapley equation, we establish the existence of Nash equilibrium in a very simple form, which only depends on the current state and can be applied at any time. A potential algorithm for computing Nash equilibrium is proposed.

CS5-3

Title: Risk sensitive zero-sum games with unbounded reward rates and varying discount factors
Author: Xin Guo

Abstract: We study the zero sum games considering the players' risk preference. The game problem aims at the discounted criterion with varying discount factors and the unbounded reward functions. Compared with the existing researches on the discounted criterion, the solution of the Shapley equation (SE) in our case does not have any boundaries converging uniformly to one as the risk-sensitive parameters go to zero. In our research, under the similar conditions in the bounded case, we come up with a new boundary, which is used to extend both the bounded payoff functions and the constant discount factors in the existing works. Moreover, we establish the existence of a solution to the SE as well as prove the existence of Nash equilibria. In addition, an iteration algorithm is provided for computing the values and Nash equilibria of the games.

CS6 Topics in Nonlinear Stochastic Heat Equations, Organizer: Yaozhong Hu

CS6-1

Title: Stochastic heat equation with super-linear drift and multiplicative noise on $\mathbb{R}^d$
Author: Jingyu Huang

Abstract: Consider the stochastic heat equation on $\mathbb{R}^d$,

$$\frac{\partial u}{\partial t} = \frac{1}{2}\Delta u + b(u) + \sigma(u)\dot{W},$$

where $\dot{W}$ is a centered Gaussian noise which is white in time and colored in space, the initial condition is assumed to be a positive measure. The functions $b(z)$ and $\sigma(z)$ are locally Lipschitz and as $|z| \to \infty$, $|b(z)| = O(|z| \log |z|)$ and $|\sigma(z)| = o(|z|(\log |z|)^{\alpha})$ for some $0 < \alpha \leqslant 1/2$. We show that under improved Dalang's condition, there is a unique global solution. This is based on joint work with Le Chen.

CS6-2

Title: Well-posedness of stochastic differential equations with discontinuous and unbounded drift
Author: Qun Shi

Abstract: In this paper we study the existence and uniqueness of the strong solution of following d-dimensional stochastic differential equation driven by Brownian motion:

$$dX_t = b(t; X_t)dt + (t; X_t)dB_t; X_0 = x;$$

where the diffusion coeffcient is a bounded Holder continuous and uniformly non-degenerate d*d matrix-valued function and B is a d-dimensional standard Brownian motion; the drift coefficient b may be discontinuous and unbounded, not necessarily in L_p^q, extending the existed work to discontinuous and unbounded drift coefficient situation. The idea is to combine the Zvonkin' s transformation with the Lyapunov function. To this end, we need to localize the connection between the solutions of the SDE up to an exit time of a bounded domain D and the associated partial differential equation on this domain. As an interesting by-product, we establish a local version of the Krylov estimates (Theorem 4.1) and a local version of the stability result of the stochastic differential equations of discontinuous coefficients (Theorem 4.4).

CS6-3

Title: On mean-field super-Brownian motions
Author: Jiayu Zheng

Abstract: The mean-field stochastic partial differential equation (SPDE) corresponding to a mean-field super-Brownian motion (sBm) is obtained and studied. In this mean-field sBm, the branching-particle lifetime is allowed to depend upon the probability distribution of the sBm itself, producing an SPDE whose space-time white noise coefficient has, in addition to the typical sBm square root, an extra factor that is a function of the probability law of the density of the mean-field sBm. This novel mean-field SPDE is thus motivated by population models where things like overcrowding and isolation can affect growth. By employing the moment formula, the large time moment asymptotic for super-Brownian motions is also studied.

CS7 **Non-communicative Martingales,** Organizer: Yong Jiao

CS7-1

Title: The Brown measure of the sum of a free random variable and Voiculescu's circular element or its elliptic deformation
Author: Ping Zhong

Abstract: The circular element is the most important example of non-normal random variable used in free probability, and its Brown measure is the uniform measure in the unit disk. The circular element has connection to asymptotics of non-normal random matrices with i.i.d. entries. We obtain a formula for the Brown measure of the addition $x_0 + c$ of an arbitrary free random variable x_0 and circular element c, which is known to be the limit empirical spectral distribution of deformed i.i.d. random matrices. Generalizing the case of circular and semi-circular elements, we also consider g, a family of elliptic deformations of c, that is $*$-free from x_0. Possible degeneracy then prevents a direct calculation of the Brown measure of $x_0 + g$. We instead show that the whole family of Brown measures of operators $x_0 + g$ are the push-forward measures of the Brown measure of $x_0 + c$ under a family of self-maps of the complex plane, which could possibly be singular. We calculate density formulas for various interesting examples. This work generalizes previous results of Bordenave-Caputo-Chafai, Hall-Ho, and a joint work with Ho. The main results offer potential applications to various deformed random matrix models. Our method is based on a Hermitian reduction and subordination functions in free probability.

CS7-2

Title: How to quantum shuffle cards -mixing time and cutoff profiles
Author: Simen Wang

Abstract: The celebrated cutoff phenomenon was first discovered by Diaconis and Shahshahani in 1981 for random transpositions, or intuitively for random "card shuffles" : imagine a deck of N cards spread on a table, randomly select one of them uniformly, and then another one uniformly; if one card is chosen twice, then do nothing; otherwise swap the two cards. For a number of steps, the distribution of permutations of cards stays far apart from stationarity and then it suddenly drops exponentially close to it. In this talk, I will present the similar random walk theory on compact quantum groups, and in particular present a recent analogous result in the setting of quantum random transpositions. I will also discuss the associated asymptotic description of the convergence to equilibrium, called the "cutoff profile", whose type is different from the classical examples and involves free Poisson distributions emerged from the free probability theory. This is joint work with Amaury Freslon and Lucas Teyssier (PTRF 2022).

CS7-3

Title: Distributional inequalities for noncommutative martingales
Author: Lian Wu

Abstract: Motivated by considerable progress achieved on martingale inequalities in the context noncommutative L_p-spaces, a lot of attention has been paid to exploring possible extensions of martingale inequalities in more general function spaces (such as noncommutative Lorentz spaces, noncommutative Orlicz spaces, symmetric Banach operator spaces, etc). A common feature of studying martingale inequalities in the spaces mentioned above is that one may often avoid having to deal with the distribution functions of measurable operators in question. We, therefore, directely establish distributional estimates for noncommutative martingales. Our results include distributional versions of the noncommutative Stein, dual Doob, martingale transform and Burkholder-Gundy inequalities.A variety of known and new martingale inequalities can be inferred from our paper. Our proof mainly relies upon new extrapolation theorems, which are of interest in their own right.

CS8 Stochastic Dynamical Systems, Organizer: Jifa Jiang

CS8-1

Title: The concentration of limiting invariant measure for stochastic dynamic system with local Lipschitz coefficients in $\mathbb{R}^d$
Author: Zhao Dong

Abstract: In this talk, I consider the zero-noise limit of the invariant measure μ_ϵ of the SDE defined on $\mathbb{R}^d$ with local Lipschitz coefficients and more than one ergodic state. Our result illustrates that, under some certain conditions, the μ_ϵ weakly converges to a linear combination of Dirac measure, which supports on some stable sets of the corresponding ODE. To make our result more intuitive, I will first give some numerical simulations of examples. Secondly, I will present the main results of our work with brief proofs, which are generalizations of the classic Freidlin-Wentzell theory. Finally, I will analyze the examples above theoretically. This talk is based on the joint work with Fan Gu and Liang Li.

CS8-2

Title: Averaging principle for monotone SPDEs
Author: Zhenxin Liu

Abstract: The first Bogolyubov theorem on averaging for SDEs has been investigated extensively. In this talk, we will discuss the second Bogolyubov theorem and global averaging principle for monotone SPDEs. This talk is based on our joint work with Mengyu Cheng.

CS8-3

Title: On the stochastic stability of limiting measures in SODEs
Author: Jifa Jiang

Abstract: We exploit limiting measures of stationary measures of stochastic ordinary differential equations. Such measures are more stable than other invariant measures of unperturbed systems or the most stable if they uniquely exist to stochastic perturbations. Using the Freidlin-Wentzell large deviations principle, we prove that limiting measures are concentrated away from repellers which are topologically transitive, or equivalent classes, or admit Lebesgue measure zero. We also preclude concentrations of limiting measures on acyclic saddle or trap chains and prove that limiting measures are concentrated on minimal elements of the partial order induced by the Freidlin-Wentzell's equivalent relation, which are Liapunov stable if there are a finite number of equivalent classes. Applications are made to the Morse-Smale systems, the Axiom A systems including structural stability systems and separated start systems, the gradient or gradient-like systems, those systems possessing the Poincaré-Bendixson property with a finite number of limit sets to obtain that limiting measures live on Liapunov stable critical elements, Liapunov stable basic sets, Liapunov stable equilibria, Liapunov stable limit sets including saddle or trap cycles, respectively. A number of nontrivial examples admitting a unique limiting measure are provided, which include monostable and multistable systems. This is a joint work with Xu Tianyuan and Chen Lifeng.

CS9 Singular SPDE and Quantum Field Theory, Organizer: Seiichiro Kusuoka

CS9-1

Title: Scale to scale coupling and centered maximum of the $P(\phi)_2$-field theories
Author: Nikolay Barashkov

Abstract: I will present some results on a ''scale to scale" Coupling of the $P(\phi)_2$ field theories to the Gaussian Free Field. As an application we will derive some results on the centerd maximum of $P(\phi)_2$ field theories, similarly to the Free/Sine-Gordon case.

CS9-2

Title: On the Φ^3_3 measure
Author: Mamoru Okamoto

Abstract: We consider the construction of the Φ^3_3 measure. This problem turns out to be critical, exhibiting the phase transition. In the weakly nonlinear regime, we prove normalizability of the Φ^3_3-measure and show that it is singular with respect to the massive Gaussian free field. In the strongly nonlinear regime, we establish non-normalizability of the Φ^3_3 measure. This is a joint work with Tadahiro Oh (Univ. of Edinburgh) and Leonardo Tolomeo (Univ. Bonn).

CS9-3

Title: A stochastic analysis approach to lattice Yang–Mills at strong coupling
Author: Rongchan Zhu

Abstract: We develop a new stochastic analysis approach to the lattice Yang–Mills model at strong coupling in any dimension $d > 1$, with t' Hooft scaling βN for the inverse coupling strength. We study their Langevin dynamics, ergodicity, functional inequalities, large N limits, and mass gap.

Assuming $|\beta| < \frac{N-2}{32(d-1)N}$ for the structure group $SO(N)$, or $|\beta| < \frac{1}{16(d-1)}$ for $SU(N)$, we prove the following results. The invariant measure for the corresponding Langevin dynamic is unique on the entire lattice, and the dynamic is exponentially ergodic under a Wasserstein distance. The finite volume Yang–Mills measures converge to this unique invariant measure in the infinite volume limit, for which Log-Sobolev and Poincaré inequalities hold. These functional inequalities imply that the suitably rescaled Wilson loops for the infinite volume measure has factorized correlations and converges in probability to deterministic limits in the large N limit, and correlations of a large class of observables decay exponentially, namely the infinite volume measure has a strictly positive mass gap. Our method improves earlier results or simplifies the proofs, and provides some new perspectives to the study of lattice Yang–Mills model. This talk is based on a joint work with Hao Shen and Xiangchan Zhu.

CS10 Stochastic Analysis and Related Topics, Organizer: Juan Li

CS10-1

Title: The law of large numbers under sublinear expectations
Author: Yongsheng Song

Abstract: We first give an error estimate for the (weak) law of large numbers under sublinear expectations (LLN*). Then we give a version of strong LLN* as the sublinear expectaion $\hat{E}$ is regular. Finally, we characterize the triviality of the tail σ-algebra of a sequence of independent random variables under a sublinear expectation.

CS10-2

Title: Empirical approximation to invariant measures for McKean-Vlasov processes
Author: Kai Du

Abstract: This work obtains that, under a monotonicity condition, the invariant probability measure of a McKean-Vlasov process can be approximated by weighted empirical measures of some processes including itself. These processes are described by distribution dependent or empirical measure dependent stochastic differential equations constructed from the equation for the McKean-Vlasov process. Convergence of empirical measures is characterized by upper bound estimates for their Wasserstein distance to the invariant measure. The theoretical results are demonstrated via a mean-field Ornstein-Uhlenbeck process.

CS10-3

Title: Quadratic mean-field reflected BSDEs
Author: Falei Wang

Abstract: In this talk, we analyze mean-field reflected backward stochastic differential equations when the driver has quadratic growth in the second unknown z. Using linearization technique and BMO martingale theory, we first apply fixed point argument to establish uniqueness and existence result for the case with bounded terminal condition and obstacle. Then, with the help of a θ-method, we develop a successive approximation procedure to remove the boundedness condition on the terminal condition and obstacle when the generator is concave (or convex) with respect to the 2nd unknown z.

CS11 Entropy and its Applications, Organizer: Xiangdong Li

CS11-1

Title: New Laplacian comparison theorem and its applications to diffusion processes on Riemannian manifolds
Author: Kazuhiro Kuwae

Abstract: This is a joint work with Xiang-Dong Li (CAS, AMSS). Let $L = \Delta - \langle \nabla\phi, \nabla\cdot\rangle$ be a symmetric diffusion operator with an invariant measure $\mu(\mathrm{d}x) = e^{-\phi(x)}m(\mathrm{d}x)$ on a complete non-compact smooth Riemannian manifold (M, g) with its volume element $m = \mathrm{vol}_g$, and $\phi \in C^2(M)$ a potential function. In this paper, we prove a Laplacian comparison theorem on weighted complete Riemannian manifolds with $\mathrm{CD}(K, m)$-condition for $m \leqslant 1$ and a continuous function K. As consequences, we give the optimal conditions on m-Bakry-Émery Ricci tensor for $m \leqslant 1$ such that the (weighted) Myers' theorem, Bishop-Gromov volume comparison theorem, stochastic completeness and Feller property of L-diffusion processes hold on weighted complete Riemannian manifolds. Some of these results were well-studied for m-Bakry-Émery Ricci curvature for $m \geqslant n$ by Li (2005), Lott (2003), Qian (1987), and Wei-Wylie (2009), or $m = 1$ by Wylie and Wylie-Yeroshkin (2016). When $m < 1$, our results are new in the literature.

CS11-2

Title: Higher order derivative formulae for heat semigroups on Riemannian manifolds and geometric applications
Author: Anton Thalmaier

Abstract: We explain new formulae for the Hessian of heat semigroups generated by the Laplace-Beltrami operator on a Riemannian manifold, including formulae on manifolds with boundary. We give various geometric applications of these formulae, including explicit Hessian estimates for Dirichlet and Neumann eigenfunctions, as well as applications related to Riesz transforms, Calderón-Zygmund type inequalities and log-Sobolev inequalities. Our approach relies on probabilistic methods from Stochastic Analysis.

CS11-3

Title: Uniform Poincare inequalities and logarithmic Sobolev inequalities for mean field particle systems
Author: Wei Liu

Abstract: In this talk we show some explicit and sharp estimates of the spectral gap and the log-Sobolev constant for mean field particles system, uniform in the number of particles, when the confinement potential have many local minimums. Our uniform log-Sobolev inequality, based on Zegarlinski's theorem for Gibbs measures, allows us to obtain the exponential convergence in entropy of the McKean-Vlasov equation with an explicit rate constant, generalizing the result of Carrillo-McCann-Villani(2003) by means of the displacement convexity approach, or Malrieu(2001,2003) by Bakry-Emery technique or the recent work of Bolley-Gentil-Guillin by dissipation of the Wasserstein distance.This talk is based on a joint work with Arnaud Guillin, Liming Wu and Chaoen Zhang.

CS12 Limit Theorems on Products of Random Matrices, Organizer: Quansheng Liu

CS12-1

Title: On the Berry-Esseen theorem for products of iid random matrices of $GL_d(\mathbb{R})$
Author: Christophe Cuny

Abstract: Let $A_n = \epsilon_n \cdots \epsilon_1$, where $(\epsilon_n)_{n\geqslant 1}$ is a sequence of independent random matrices taking values in $GL_d(\mathbb{R}), d \geqslant 2$ with common distribution μ. Under standard assumptions on μ (strong irreducibility and proximality), we prove Berry-Esseen type theorems for $\log(\|A_n\|)$ when μ has a polynomial moment. More precisely, we get the rate $((\log n)/n)^{q/2-1}$ when μ has a moment of order $q \in (2, 3]$ and the rate $1/\sqrt{n}$ when μ has a moment of order 4, which significantly improves earlier results in this setting. Joint work with J. Dedecker, F. Merlevéde and M. Peligrad.

CS12-2

Title: Counting and boundary limit theorems for representations of Gromov-hyperbolic groups
Author: Cagri Sert

Abstract: Let Γ be a hyperbolic group and S a finite symmetric generating set. The choice of S determines a metric on Γ (namely the graph metric on the associated Cayley graph). Given a representation $\rho : \Gamma \to GL_d(\mathbb{R})$, we are interested in obtaining results analogous to random matrix products theory (RMPT) but for the deterministic sequence of spherical averages (with respect to S-metric). We will discuss a general law of large numbers and more refined limit theorems such as central limit theorem and large deviations. If time allows, we will also see boundary limit theorems and convergence of interpolated matrix norms along geodesic rays to the standard Brownian motion. The proofs make crucial use of RMPT in Markovian dependence. Joint work with S. Cantrell.

CS12-3

Title: Law of large numbers and edgeworth expansion for the coefficients of products of random matrices
Author: Hui Xiao

Abstract: Let $(g_n)_{n\geqslant 1}$ be a sequence of independent and identically distributed random elements with law μ on the general linear group $\mathrm{GL}(V)$, where $V = \mathbb{R}^d$. Consider the random walk $G_n := g_n \dots g_1$, $n \geqslant 1$. For the coefficients $\langle f, G_n v\rangle$ with $v \in V$ and $f \in V^*$, under the first moment assumption on μ, we prove a weak law of large numbers, and under the second moment assumption on μ, we prove a strong law of large numbers. Under the exponential moment condition on μ, we establish the first-order Edgeworth expansion. Our approach is based on various versions of the regularity of the invariant measure of the Markov chain $G_n \cdot x = \mathbb{R}G_n v$ on the projective space of V with the starting point $x = \mathbb{R}v$. Joint work with Ion Grama and Quansheng Liu.

CS13 KPZ Universality: Properties and Limit Theorems, Organizer: Zhipeng Liu

CS13-1

Title: Tightness and Brownian regularity for KPZ line ensemble
Author: Xuan Wu

Abstract: Many important models in integrable probability (e.g. the KPZ equation, solvable directed polymers, ASEP, stochastic six vertex model) can be embedded into Gibbsian line ensembles. The Gibbs property provides a powerful resampling invariance against Brownian bridges over an arbitrary interval. In this talk, I will explain how to study the tightness and path regularity of the KPZ line ensemble using this hidden probabilistic structure.

CS13-2

Title: The ASEP speed process
Author: Promit Ghosal

Abstract: We consider the asymmetric simple exclusion process (ASEP) on Z started with particles at negative integer sites, holes at positive integer sites and a single second class particle at the origin. We prove that the speed of the second class particle converges to uniform distribution on a symmetric interval almost surely. This enables us to construct the ASEP speed process. Our work positively resolves a conjecture of Amir, Angel and Valko and extends the TASEP result of Mountford and Guiol. Our techniques rely on a combination of probabilistic couplings and effective hydrodynamic results. This is joint work with Amol Aggarwal and Ivan Corwin.

CS13-3

Title: A conditional scaling limit of the KPZ fixed point with height tending to infinity at one location
Author: Yizao Wang

Abstract: We consider the conditional law of the KPZ fixed point given that the height at a fixed space-time location is large, and establish a conditional limit theorem when the height tends to infinity, for both step and flat initial conditions. The limiting random field can be represented as a transformation of two independent Brownian bridges, and in addition the limiting random field depends also the initial law of the KPZ fixed point.

CS14 Some Recent Progresses on Stochastic Linear Quadratic Control Problems, Organizer: Qi Lv

CS14-1

Title: Linear-quadratic optimal controls for stochastic Volterra integral equations: causal state feedback and path-dependent Riccati equations
Author: Hanxiao Wang

Abstract: A linear-quadratic optimal control problem for stochastic Volterra integral equations (SVIEs, for short) is considered. By a variational method, the optimality system is derived, which is a coupled system of forward SVIEs and type-II backward SVIEs. To decouple the optimality system, a link between the type-II and type-III backward SVIEs is rigorously established and a path-dependent Riccati equation is introduced, whose solution is an operator-valued function. Under certain conditions, it is proved that the path-dependent Riccati equation admits a unique solution. Then the decoupling field for the optimality system is found and a causal state feedback representation is obtained for the optimal control. An additional interesting finding is that when the drift term of the state system dose not contain controls, the causal feedback reduces to a Markovian feedback. Joint work with Jiongmin Yong (UCF) and Chao Zhou (NUS).

CS14-2

Title: Stochastic linear quadratic optimal control problems for stochastic evolution equations with unbounded control operator
Author: Yan Wang

Abstract: We study the existence of optimal feedback control of a stochastic linear quadratic optimal control problem for systems governed by stochastic evolution equations. We assume that the dynamics of the problem are generated by a strongly continuous semigroup, while the control operator is unbounded. The existence is established by means of the strongly regular solution to the corresponding Riccati equation, which is implied by the uniform convexity of the quadratic cost functional.

CS14-3

Title: A closed-loop based algorithm of LQ problems for stochastic heat equations
Author: Yanqing Wang

Abstract: In this talk, firstly we review some results on numerical methods to solve LQ problems governed by stochastic heat equations. Then we present a closed-loop based scheme to solve these problems, and give the convergence rate. Compared with the existing schemes relying on optimal controls ' open-loop strategy, our method can avoid computing conditional expectations.

CS15 Singular Stochastic Differential Equations, Organizer: Stephane Menozzi

CS15-1

Title: On weak solutions of degenerate McKean-Vlasov equations
Author: Alexander Veretennikov

Abstract: Existence of weak solutions of degenerate McKean - Vlasov equations is established under the assumptions of just a partial diffusion non-degeneracy, and of a partial continuity, and of boundedness of all the coefficients. The proof is based on Skorokhod's and Krylov's approaches.

CS15-2

Title: Taming singular SDEs: A numerical method
Author: Chengcheng Ling

Abstract: We consider a generic and explicit tamed Euler–Maruyama scheme for multidimensional time-inhomogeneous stochastic differential equations with multiplicative Brownian noise. The diffusive coefficient is uniformly elliptic, Hölder continuous and weakly differentiable in the spatial variables while the drift satisfies the Ladyzhenskaya–Prodi–Serrin condition, as considered by Krylov and Röckner (2005). In the discrete scheme, the drift is tamed by replacing it by an approximation. A strong rate of convergence of the scheme is provided in terms of the approximation error of the drift in a suitable and possibly very weak topology. A few examples of approximating drifts are discussed in detail. The parameters of the approximating drifts can vary and—under suitable conditions—be fine-tuned to achieve the standard $1/2$-strong convergence rate with a logarithmic factor.

CS15-3

Title: Density and gradient estimates for kinetic SDEs with low regularity coefficients
Author: Antonello Pesce

Abstract: We discuss some recent results on Kinetic degenerate Kolmogorov SDEs: we show two sided bounds and pointwise controls of its derivatives, under somehow minimal assumptions that guarantee that the equation is weakly well posed. These estimates reflect the transport of the initial condition by the unbounded drift through an auxiliary, possibly regularized flow.

CS16 Probability Theory and Functional Analysis, Organizer: Yanqi Qiu

CS16-1

Title: Local convergence for point processes
Author: Zhaofeng Lin

Abstract: In this talk, we will discuss some recent progress of the point processes. We obtain the local convergence for point processes under certain conditions related to the correlation functions. In particular, in the determinantal case, these conditions are fairly general. This talk is based on a joint work with Prof. Yanqi Qiu and Prof. Kai Wang.

CS16-2

Title: Boundedness of Gaussian random sums on trees
Author: Yong Han

Abstract: We study a very natural Gaussian process on trees and obtain a necessary and sufficient condition for the almost sure boundedness of this Gaussian process. The condition we obtained also turns out to be necessary and sufficient for the almost sure uniform convergence of the Gaussian process along all rooted geodesic rays. This is based on joint work with Yanqi Qiu and Zipeng Wang.

CS16-3

Title: Littlewood-type theorems for random Dirichlet multipliers
Author: Chao Liu

Abstract: In this talk, we present a systematic study of random Dirichlet functions. In 1993, Cochran-Shapiro-Ullrich proved the following elegant result on random Dirichlet multipliers: For any $\sum_{n=0}^{\infty} a_n z^n \in \mathcal{D}$, the Dirichlet space over the unit disk, almost all of its randomizations $\sum_{n=0}^{\infty} \pm a_n z^n$ are multipliers of $\mathcal{D}$. We exploit Cochran-Shapiro-Ullrich's result and extend it in several directions.

CS17 KPZ Equations and Related Topics, Organizer: Hao Shen

CS17-1

Title: Edwards-Wilkinson fluctuations for the anisotropic KPZ in the weak coupling regime
Author: Giuseppe Cannizzaro

Abstract: In this talk, we present recent results on an anisotropic variant of the Kardar-Parisi-Zhang equation, the Anisotropic KPZ equation (AKPZ), in the critical spatial dimension d=2. This is a singular SPDE which is conjectured to describe the fluctuations of a large family of random surface growth phenomena but whose analysis falls outside of the scope not only of classical stochastic calculus but also of the theory of Regularity Structures and paracontrolled calculus. We first consider a regularised version of the AKPZ equation which preserves the invariant measure and prove that the correlation length grows like t1/2 (log t)1/4 up to lower order correction. Second, we show that in the so-called weak coupling regime, i.e. the equation regularised at scale N and the coefficient of the nonlinearity tuned down by a factor (log N)-1/2, the AKPZ equation converges to a linear stochastic heat equation with renormalised coefficients. This is joint work with D. Erhard and F. Toninelli.

CS17-2

Title: Ergodicity for projective processes of linear hyperviscous SPDEs
Author: Tommaso Rosati

Abstract: In this joint work with Martin Hairer we study Lyapunov exponents of linear hyperviscous SPDEs with multiplicative noise on a torus. We derive tightness and (under stronger conditions on the noise) geometric ergodicity of the associated projective dynamics, which via Furstenberg-Khasminskii type formulas implies uniqueness of the Lyapunov exponent, its finiteness and continuity with respect to parameters of the equation. This extends previous results, for instance by Sinai regarding Burgers' or the KPZ equation, which were restricted to positive solutions of SPDEs satisfying maximum principles.

CS17-3

Title: The critical 2d stochastic heat flow is not a GMC
Author: Rongfeng Sun

Abstract: We show that the recently constructed critical 2d Stochastic Heat Flow (SHF) falls outside the class of Gaussian Multiplicative Chaoses (GMC) in the sense that it cannot be realised as the exponential of a (generalized) Gaussian field. We achieve this by comparing the moments of the SHF with those of a GMC, providing strict lower bounds on the moments of the SHF, which are of independent interest. Based on joint work with F. Caravenna and N. Zygouras.

CS18 Lattice Spin Models, Organizer: Jian Song

CS18-1

Title: High-dimensional Ising model with various boundary conditions
Author: Jianping Jiang

Abstract: We discuss the effect of free and periodic boundary conditions for the high-dimensional Ising model in finite domains. This is based on joint work with F. Camia and C.M. Newman.

CS18-2

Title: A new correlation inequality for Ising models with external fields
Author: Jian Song

Abstract: We study ferromagnetic Ising models on finite graphs with an inhomogeneous external field, where a subset of vertices is designated as the boundary. We show that the influence of boundary conditions on any given spin is maximised when the external field is identically 0. One corollary is that spin-spin correlations are maximised when the external field vanishes and the boundary condition is free, which proves a conjecture of Shlosman. In particular, the random field Ising model on $\mathbb{Z}^d$, $d \geqslant 3$, exhibits exponential decay of correlations in the entire high temperature regime of the pure Ising model. Another corollary is that the pure Ising model in $d \geqslant 3$ satisfies the conjectured strong spatial mixing property in the entire high temperature regime. This is a joint work with Jian Ding and Rongfeng Sun.

CS18-3

Title: The critical phase of the antiferromagnetic Potts model on regular trees
Author: Wei Wu

Abstract: I will discuss a joint work with Chenlin Gu and Kuan Yang, where we showed the critical antiferromagnetic Potts model on regular trees (with $q = 3, 4$) has a power law decay with exponent $1/2$.

CS19 Stochastic Analysis and Branching Processes, Organizer: Renming Song

CS19-1

Title: Multiscale stochastic systems with irregular coefficients
Author: Longjie Xie

Abstract: In this talk, we will discuss some recent progress on the averaging principle of multiscale stochastic systems, including stochastic differential equations, stochastic partial differential equations and stochastic McKean-Vlasov equations. We will mainly focus on systems with irregular coefficients, which reflect the regularization effect of noises on the convergence in the averaging principle.

CS19-2

Title: On the coming down from infinity of local time coalescing Brownian motions
Author: Zhenyao Sun

Abstract: For a system of local time coalescing Brownian motions on the real line with infinitely many initial particles, we give a necessary and sufficient condition for the number of particles coming down from infinity. When they do come down from infinity, we also identify the speed. This is based on my ongoing work with Clayton Barnes and Leonid Mytnik.

CS19-3

Title: Weak convergence of the extremes of the branching Lévy processes with regularly varying tails
Author: Rui Zhang

Abstract: In this paper, we study the weak convergence of the extremes of supercritical branching Lévy processes $\{\mathbb{X}_t, t \geq 0\}$ with regularly varying tails. The result is drastically different from the case of branching Brownian motions. We prove that the random measure $\mathbb{X}_t$, when properly renormalized, converges weakly. As a consequence, we obtain a limit theorem for the order statistics of $\mathbb{X}_t$.

CS20 Concentration Phenomenon of Measure with Applications, Organizer: Zhonggen Su

CS20-1

Title: Deviation inequalities for stochastic approximation by averaging
Author: Xiequan Fan

Abstract: We introduce a class of Markov chains that includes models of stochastic approximation by averaging and non-averaging. Using a martingale approximation method, we establish various deviation inequalities for separately Lipschitz functions of such a chain, with different moment conditions on some dominating random variables of martingale differences. Finally, we apply these inequalities to stochastic approximation by averaging. This talk is based on join work of Pierre Alquier, Jerome Dedecker and Paul Doukhan.

CS20-2

Title: Uniform concentration inequalities for marked point processes
Author: Hanchao Wang

Abstract: Over the last three decades, there has been a renewed interest in exponential concentration inequalities for stochastic processes in probability and statistics. The uniform concentration inequalities can usually be obtained by the chaining method. This talk will present my recent works on uniform concentration inequalities for the stochastic integral of marked point processes. The results are given in terms of an entropy condition for partitioning the index set of the integrands.

CS20-3

Title: Transition density of an infinite-dimensional diffusion with the Jack parameter
Author: Youzhou Zhou

Abstract: From the Poisson-Dirichlet diffusions to the $\mathbb{Z}$-measure diffusions, they all have explicit transition densities. In this paper, we will show that the transition densities of the $\mathbb{Z}$-measure diffusions can also be expressed as a mixture of a sequence of probability measures on the Thoma simplex. The coefficients are still the transition probabilities of the Kingman coalescent stopped at state 1. This fact will be uncovered by a dual process method in a special case where the $\mathbb{Z}$-measure diffusions is established through up-down chain in the Young graph.

CS21 **Random Polymer and Related Models,** Organizer: Rongfeng Sun

CS21-1

Title: The Derrida–Retaux conjecture for recursive models
Author: Xinxing Chen

Abstract: We are interested in the nearly supercritical regime in a family of max-type recursive models studied by Derrida and Retaux (2014), and prove that under a suitable integrability assumption on the initial distribution, the free energy decays sub-exponentially with exponent $\frac{1}{2}$. This gives a weaker answer to a conjecture of Derrida and Retaux (2014).

CS21-2

Title: Non-directed polymers in random environments on $\mathbb{Z}^d$
Author: Ran Wei

Abstract: In this talk, we introduce a random polymer model on Zd, called the non-directed polymer model. The model consists of a simple symmetric random walk S on $\mathbb{Z}^d$ (representing the polymer chains) and a family of i.i.d. random variables $\omega := (\omega_x)_{x\in\mathbb{Z}^d}$ (representing the random environments). The interaction between the random walk and the random environments is defined by a Gibbs transform, that is, the law of the random walk up to time N is tilted by $\exp(\sum_{x\in\mathcal{R}_N}(\beta\omega_x - h))$, where $\mathcal{R}_N$ is the range of the random walk, β is the inverse temperature, and h is a non-random external field. It can be viewed as a perturbed version of *the random walk penalized (rewarded) by its range or a variant of the classic directed polymer model*. We assume that the tail probability of the environment ω decays polynomially with exponent α, and $\beta = \beta_N$ and $h = h_N$ grow or decay polynomially over time with exponents γ and ζ respectively. Under the above conditions, we investigate the phase diagram for α, γ, ζ, and we also study the scaling limits for the logarithmic partition functions and the transversal fluuctuations of the random walk under the polymer measures in different phases.

CS21-3

Title: Gaussian fluctuations of stochastic heat equation and KPZ equation in higher dimension in L^2 regime
Author: Makoto Nakashima

Abstract: The solution h of KPZ equation in $d = 1$ is described by the solution u of the multiplicative stochastic heat equation (SHE) via the Cole-Hopf transformation $h = \log u$. However, for higher dimensions, this argument does not work since SHE does not have a function-valued solution. In some recent works, the Gaussian fluctuations of the solutions of stochastic heat equation and KPZ equation with space-regularized noise in higher dimensions have been studied. In this talk, we will discuss the joint fluctuations of the solutions. The talk is based on joint work with Clément Cosco and Shuta Nakajima.

CS22 Random Walk and Statistical Physics Models, Organizer: Hao Wu

CS22-1

Title: Capacity of the range of critical branching random walks
Author: Tianyi Bai

Abstract: The capacity of a finite set is a fundamental concept characterizing intersection probabilities. In this talk, we consider the capacity of a critical branching random walk (BRW) in $\mathbb{Z}^d$, $d \geq 3$. By extracting translational invariant / independent segments in the branching structure, we show that in dimensions $d \geq 6$, the capacity of BRW has a scaling limit, and in $d = 3, 4, 5$ it converges in distribution to that of the continuum random tree. This talk is based on the joint work with Yijun Wan and Yueyun Hu.

CS22-2

Title: A variational formula for the once-reinforced random walk and its applications
Author: Xiangyu Huang

Abstract: The once-reinforced random walk (ORRW) is a kind of non-Markov process with the transition probability only depending on the current weights of all edges. The weights are set to be 1 initially. At the first time an edge is traversed, its weight is changed to a positive parameter δ at once, and it will remain in δ. In this talk, I will show a variational formula for the ORRW on finite graphs. As an application, the large deviation principle for the empirical measure of the ORRW is given. Its rate function is decreasing in δ, and is not differentiable at $\delta = 1$. Moreover, the critical exponent of the exponential integrability of a class of stopping times can be obtained by this variational formula. Beyond that, the critical exponent is continuous, decreasing in δ. Furthermore, its limit (as $\delta \to 0$) has a relationship with the structure of the graph. This is a joint work with Professor Yong Liu and Professor Kainan Xiang.

CS22-3

Title: On massive perturbations of LERW, Ising model and dimer model
Author: Yijun Wan

Abstract: Over the past decade, there has been a lot of progress in the understanding of statistical physics models at criticality, such as the loop-erased random walk, the Ising model, and the dimer model, notably their scaling limits, in large parts due to the development of discrete complex analysis techniques and the introduction of the Schramm-Loewner evolution. Recently such convergence has also been obtained in the off-critical case by moving away from the critical temperature carefully. In this talk, I will talk about some massive perturbations of those models and some convergence results in the near-critical regime. The talk is based on joint works with Dmitry Chelkak and Sung-Chul Park.

Generally, there shouldn't be any problem with the timing, and I will give the talk directly, which you can record during the conference. Nevertheless, I don't know the exact date yet.

CS23 **Stochastic Algorithm,** Organizer: Liming Wu

CS23-1

Title: Piecewise deterministic Markov processes and sampling
Author: Arnaud Guillin

Abstract: We will present here some PDMP processes, tailored for sampling, such as the zig-zag sampler, the bouncy particle sampler or event-chain. We will illustrate their efficiency numerically and provide a few results and their theoretical properties, such as existence of invariant measures or geometric ergodicity. If time permits, we will discuss shortly the case of hard spheres in 2D and event chain Monte Carlo method. (Joint with A. Durmus and P. Monmarché or A. Monemvassitis and M. Michel)

CS23-2

Title: Various scan Gibbs samplers: convergence rates and concentration inequalities
Author: Nengyi Wang

Abstract: To sample from a high-dimensional probability distribution, various scan Gibbs samplers are often used. In this report, we mainly consider the systematic scan and random scan Gibbs samplers. We discuss their theoretical properties from two perspectives: one is about convergence rates of the transition probability of the induced Markov chain to the given high-dimensional probability distribution in the Wasserstein metric, and the other is about concentration inequalities for the convergence of the empirical mean to the high-dimensional integral.

CS23-3

Title: Dimension free convergence rates for Gibbs samplers for Bayesian linear mixed models
Author: Zhumengmeng Jin

Abstract: The emergence of big data has led to a growing interest in so-called convergence complexity analysis, which is the study of how the convergence rate of a Monte Carlo Markov chain (for an intractable Bayesian posterior distribution) scales as the underlying data set grows in size. Convergence complexity analysis of practical Monte Carlo Markov chains on continuous state spaces is quite challenging, and there have been very few successful analyses of such chains. In this talk, I will demonstrate how a Wasserstein-based technique introduced by Qin and Hobert (2022) can be applied to study Gibbs samplers for Bayesian linear mixed models. Then, it will be shown that under regularity conditions, the geometric convergence rate of this Gibbs sampler converges to zero as the data set grows in size.

CS24 **Asymptotic Theory in Geometric Probability,** Organizer: Aihua Xia

CS24-1

Title: Maximal fluctuations of convex hull interfaces

Author: Joseph E. Yukich

Abstract: We consider the random polytope obtained as the convex hull of a random set of points which are independently and uniformly distributed in a smooth convex body K of d-dimensional Euclidean space. We study the maximal fluctuations of the boundary of the random polytope when the size of the random input tends to infinity. The maximal radial fluctuations, as measured by the rescaled Hausdorff distance between the random polytope and the body K, asymptotically follow a Gumbel extreme value distribution and have an explicit extremal index. Likewise, the maximal longitudinal fluctuations of the random polytope, as measured by the rescaled maximal facet areas, also converge to a Gumbel distribution. Surprisingly, the maximal fluctuations resemble those of interfaces in general dynamic and equilibrium systems, including those arising in subcritical random cluster and bond percolation models. This is based on joint work with Pierre Calka.

CS24-2

Title: Multivariate normal approximation of stabilising functionals of Poisson processes

Author: Matthias Schulte

Abstract: In this talk functionals of Poisson processes are studied which are sums of scores of the underlying points. It is assumed that the scores stabilise in the sense that the score of a point is determined by the points in a random neighbourhood given by a so-called radius of stabilisation. We consider a vector of sums of stabilising scores. For the situation that the radii of stabilisation decay exponentially fast and some moment assumptions are satisfied, quantitative bounds for the multivariate normal approximation are established. The results deal with several distances including a multivariate generalisation of the Kolmogorov distance and lead to optimal rates of convergence. Examples concerning spatial random graphs will be discussed. The proofs of the main results rely on the Malliavin-Stein method for multivariate normal approximation and a careful analysis of the covariance structure.

This talk is based on joint work with J.E. Yukich (Lehigh University).

CS24-3

Title: A simplified second-order Gaussian Poincaré inequality in discrete setting with applications

Author: Guangqu Zheng

Abstract: In this talk, we will present a simplified second-order Gaussian Poincaré inequality for normal approximation of functionals over infinitely many Rademacher random variables. It is derived by means of the discrete Malliavin-Stein method. We will present its applications to the subgraph counting statistic in the Erdös-Rényi random graph, percolation on the Hamming hypercube, and Linial-Meshulam-Wallach random κ-complex. This talk is based on the joint work with P. Eichelsbacher, B. Rednoss, and C. Thäle.

CS25 Gaussian Processes and Related Topics, Organizer: Yiming Xiao

CS25-1

Title: The Csorgo-Revesz modulus of non-differentiability of fractional Brownian motion
Author: Wensheng Wang

Abstract: We establish the exact modulus of non-differentiability of fractional Brownian motion. As an application of the result, we prove that the uniform Holder condition for the maximum local times of fractional Brownian motion obtained in Xiao (1997) is optimal.

CS25-2

Title: Hittting probabilities of Gaussian random fileds and collision and eigenvalues of random matrices
Author: Wangjun Yuan

Abstract: Let $X = \{X(t), t \in \mathbb{R}^N\}$ be a centered Gaussian random field with values in $\mathbb{R}^d$ satisfying certain conditions and let $F \subseteq \mathbb{R}^d$ be a Borel set. We provide a sufficient condition for F to be polar for X, i.e. $P(X(t) \in F \text{ for some } t \in \mathbb{R}^N) = 0$, which significantly improves previous results, where the case of F being a singleton was considered. We provide a variety of examples of Gaussian random fields for which our result is applicable. Moreover, by using our result, we solve a problem on the existence of collisions of the eigenvalues of random matrices with Gaussian random field entries. This is a joint work with Cheuk Yin Lee, Jian Song and Yimin Xiao.

CS25-3

Title: Sample path properties of a generalized fractional Brownian motion
Author: Ran Wang

Abstract: We study the sample path properties of a generalized fractional Brownian motion (GFBM) introduced by Guodong Pang and Murad S. Taqqu (2019). More precisely, we establish the exact uniform modulus of continuity, small ball probabilities, Chung's LIL and Strassen's local LIL for GFMBM. This talk is based on joint works with Prof. Yimin Xiao.

CS26 Stochastic Optimal Controls and Games, Organizer: Jie Xiong

CS26-1

Title: Hybrid optimal impulse control
Author: Siyu Lv

Abstract: This talk is concerned with an optimal impulse control problem under a hybrid diffusion (or, regime switching) model, where the state of the system consists of a number of diffusions coupled by a continuous-time finite-state Markov chain. The objective is to minimize the expected discounted cost from exerting the impulse control in the infinite horizon. Based on the dynamic programming principle (DPP), the value function of the hybrid optimal impulse control problem is shown to be the unique viscosity solution to the associated Hamilton-Jacobi-Bellman (HJB) equation, which is in the form of a coupled system of variational inequalities. Moreover, a verification theorem as the sufficient condition for optimality of a solution is also established. The optimal impulse control, indicates when and how it is optimal to intervene, is described by the obstacle part of the HJB equation. Finally, the general theoretical results are applied to an optimal cash management problem. The value function in closed-form and an explicit optimal policy are obtained, which exhibit clearly the effect of regime switching on the agent's decision. This talk is based on the joint work with Prof Jie Xiong.

CS26-2

Title: General indefinite backward stochastic linear-quadratic optimal control problems
Author: Jiaqiang Wen

Abstract: In this work, we study a general backward stochastic linear-quadratic optimal control problem, in which both the state equation and the cost functional contain the nonhomogeneous terms. The main feature of the problem is that the weighting matrices in the cost functional are allowed to be indefinite, and the cross-product terms in the control and the state processes are present. Necessary and sufficient conditions for the solvability of the problem are obtained, and a characterization of the optimal control in terms of forward-backward stochastic differential equations is derived. By a Riccati equation approach, a general procedure for constructing optimal controls is developed and the value function is obtained explicitly. (Joint work with Jingrui Sun and Jie Xiong)

CS26-3

Title: Stochastic control for sub-diffusions and its applications
Author: Shuaiqi Zhang

Abstract: This paper deals with optimal stochastic control problem for stochastic differential equation driven by non-Markov sub-diffusion B_{L_t}, where B_t is the standard Brownian motion on $\mathbb{R}$, and $L_t := \inf\{r > 0 : S_r > t\}, \quad t \geqslant 0$, is the inverse of a subordinator S_t with drift $\kappa > 0$ that is independent of B_t. It is worth mentioning that since the structure of the sub-diffusion process, the control problem is very distinct from the Brownian motion case. The control for sub-diffusion is not purely stochastic. Roughly speaking, it is deterministic and stochastic alternatively. Thus, both the stochastic maximum and the Hamilton-Jacobi-Bellman (HJB) equation are systems of equations. We develop stochastic maximum principles using both spike and convex variational methods. The existence and uniqueness to the solutions of the adjoint equation, which is a backward stochastic differential equation driven by B_{L_t}, is established. Two sufficient conditions, with and without the concavity assumption on the Hamiltonian, are given, which correspond to the spiking and convex variation respectively. Moreover, a dynamic programing principle (DPP) is studied. We emphasize that the state equation driven by B_{L_t} is not Markov. In order to put it into DPP setting, overshot process is added to make it Markov. The HJB equation, or more precisely, system of HJB equations, involves fractional derivative due to the sub-diffusive nature of our model. Furthermore, the regularity of value function is proved in order to study both the HJB equations and its viscosity solutions. We show that the value function is the unique viscosity solution of the HJB equations. Two examples are provided to illustrate the utility of our results, one is a linear quadratic model and the other is a mean-variance portfolio selection model. Both are solved explicitly. We further compare the control of diffusion and that of non-Markov sub-diffusion both analytically and numerically.

CS27 **Random Periodic Processes,** Organizer: Huaizhong Zhao

CS27-1

Title: Random quasi-periodic paths and quasi-periodic measures of SDEs
Author: Chunrong Feng

Abstract: In my talk, firstly I will introduce the concepts random quasi-periodic paths for random dynamical systems and quasi-periodic measures for Markovian semigroups. We give a sufficient condition for the existence and uniqueness of random quasi-periodic paths and quasi-periodic measures for stochastic differential equations and a sufficient condition for the density of the quasi-periodic measure to exist and to satisfy the Fokker-Planck equation. We then lift the Markovian semigroup to a cylinder on a torus and obtain the unique invariant measure and its ergodicity. This is a joint work with Huaizhong Zhao.

CS27-2

Title: Random Horseshoe of Anosov systems driven by a quasi-periodic forcing
Author: Zeng Lian

Abstract: Consider C2 Anosov systems on a compact manifold driven by a quasiperiodic forcing. We study their dynamical complexity on various levels from both perspectives of path-wise dynamics and stochastic processes. In this talk, I will report the results on the existence of random horseshoe from two different viewpoints： topology and probability. This is joint with Wen Huang and Kening Lu.

CS27-3

Title: Ergodicity of random periodic processes
Author: Huaizhong Zhao

Abstract: In this talk, I will discuss the random periodic paths, periodic measures of stochastic systems and their ergodic theory. I will discuss their link with Fokker-Planck operators, spectrum theory, and their applications in statistics, and some real world problems. This is based on a series of joint work with Chunrong Feng, Yu Liu, Yujia Liu, Qaoyou Qu and Johnny Zhong.