5th International Conference on Stochastic Analysis and its Applications

Bonn

September 5-9, 2011

hausdorff center for mathematics

universitätbonn

Contents

1

Welcome

Welcome to Bonn!

We are pleased to welcome you to the 5th International Conference on Stochastic Analysis and its Applications at Bonn University from September 5th to 9th 2011.

This meeting is the 5th in a series of international conferences. The previous ones were held at *Seattle (2006)*, *Seoul (2008)*, *Beijing (2009)* and *Osaka (2010).* The next meeting will be held in *Bedlewo, Poland* from 10 to 14 September 2012.

This conference is supported by *Hausdorff Center for Mathematics* and it is co-sponsored by *Global Center of Excellence* at Kyoto University as well as by the *Collaborative Research Center SFB 611* at Bonn University.

The main topics of the conference are

A. Dirichlet forms and stochastic analysis

B. Jump processes

C. Stochastic partial differential equations

D. Stochastic analysis and geometry

E. Optimal transport and allocation problems

F. Functional analysis

G. Random media, percolation clusters and fractals

H. Stochastic models in physics and biology

These areas are strongly related to each other and have been very active in recent years. They occupy a central place in modern probability theory and analysis. The primary goal of the conference is to bring researchers in areas listed above, from all over the world, to survey the fields, exchange ideas and to foster future collaborations. Another important goal is to expose young researchers and Ph.D students to the most recent developments in active areas of probability theory.

We hope you will enjoy this meeting and your time in Bonn!

2

General Information

2.1 Scientific Board

Anton Bovier (Bonn)
Zhen-Qing Chen (Seattle)
David Elworthy (Warwick)
Takashi Kumagai (Kyoto)
Michel Ledoux (Toulouse)
Michael Röckner (Bielefeld)
Rene Schilling (Dresden)
Karl-Theodor Sturm (Bonn, Chairman)

2.2 Venue

All lectures will take place in the former building of the mathematics department at Wegelerstrasse 10 (We10). Also the conference office and computer facilities will be at Wegelerstrasse 10. The reception on Monday evening will be in the new building of the mathematics department at Endenicher Allee 60 (LWK).
Plenary and main lecture will take place in Großer Hörsaal (GHS). Invited talks will be held in Kleiner Hörsaal (KHS) and contributed talks in Hörsaal Theoretische Physik (TP).

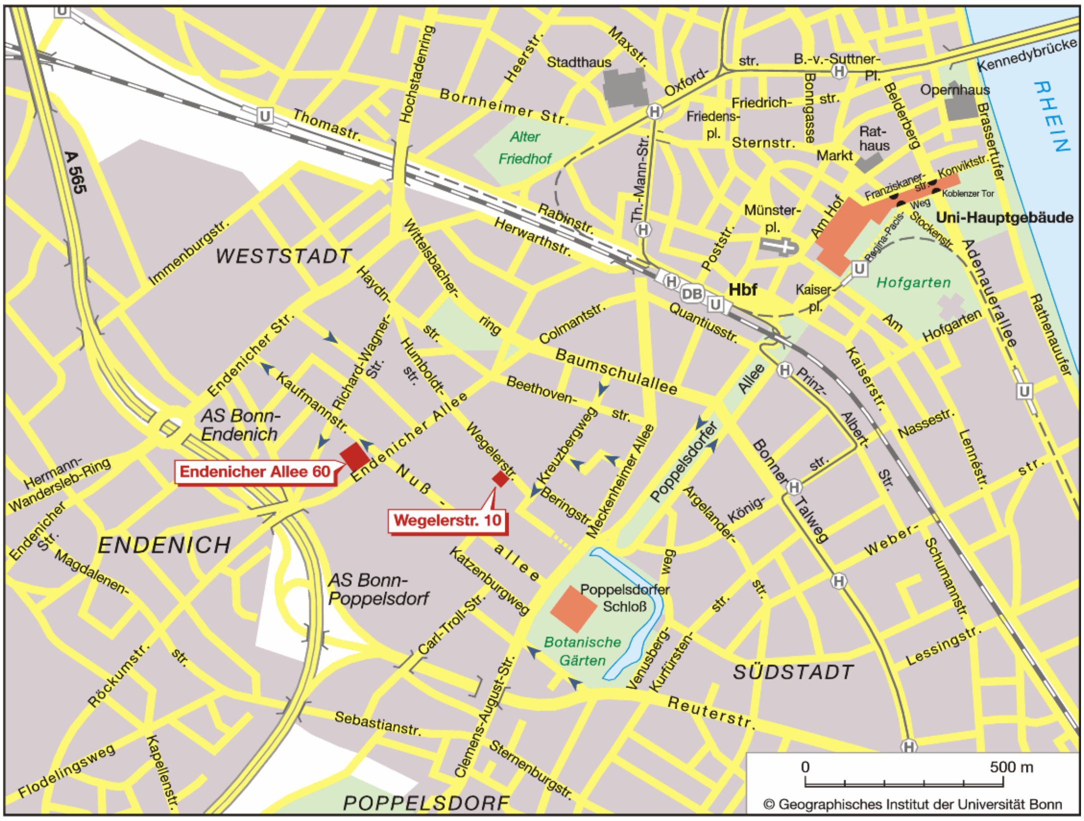
2.3 Internet Access

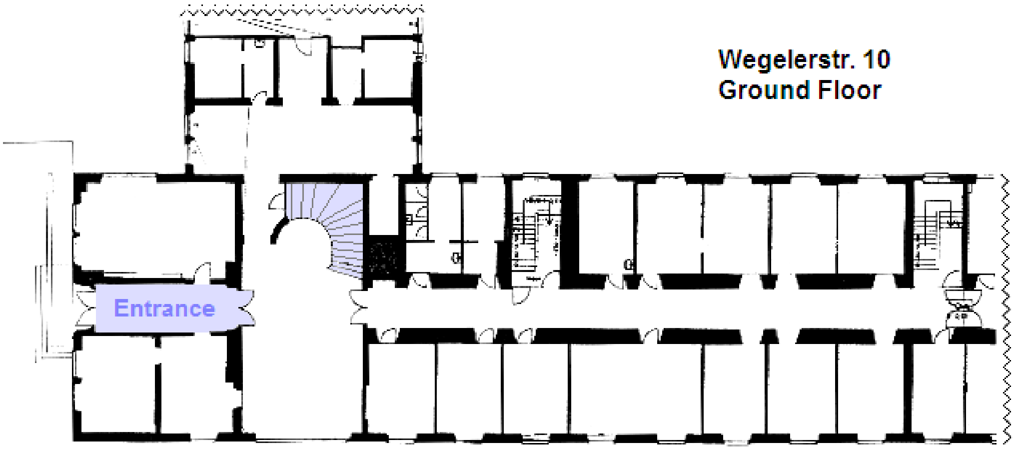
Throughout the building of the conference venue at Wegelerstraße 10 you have wireless internet access. A personal username and password is provided in the pouch you received at the registration.
In the conference office you have the possibility to print documents if neccessary.

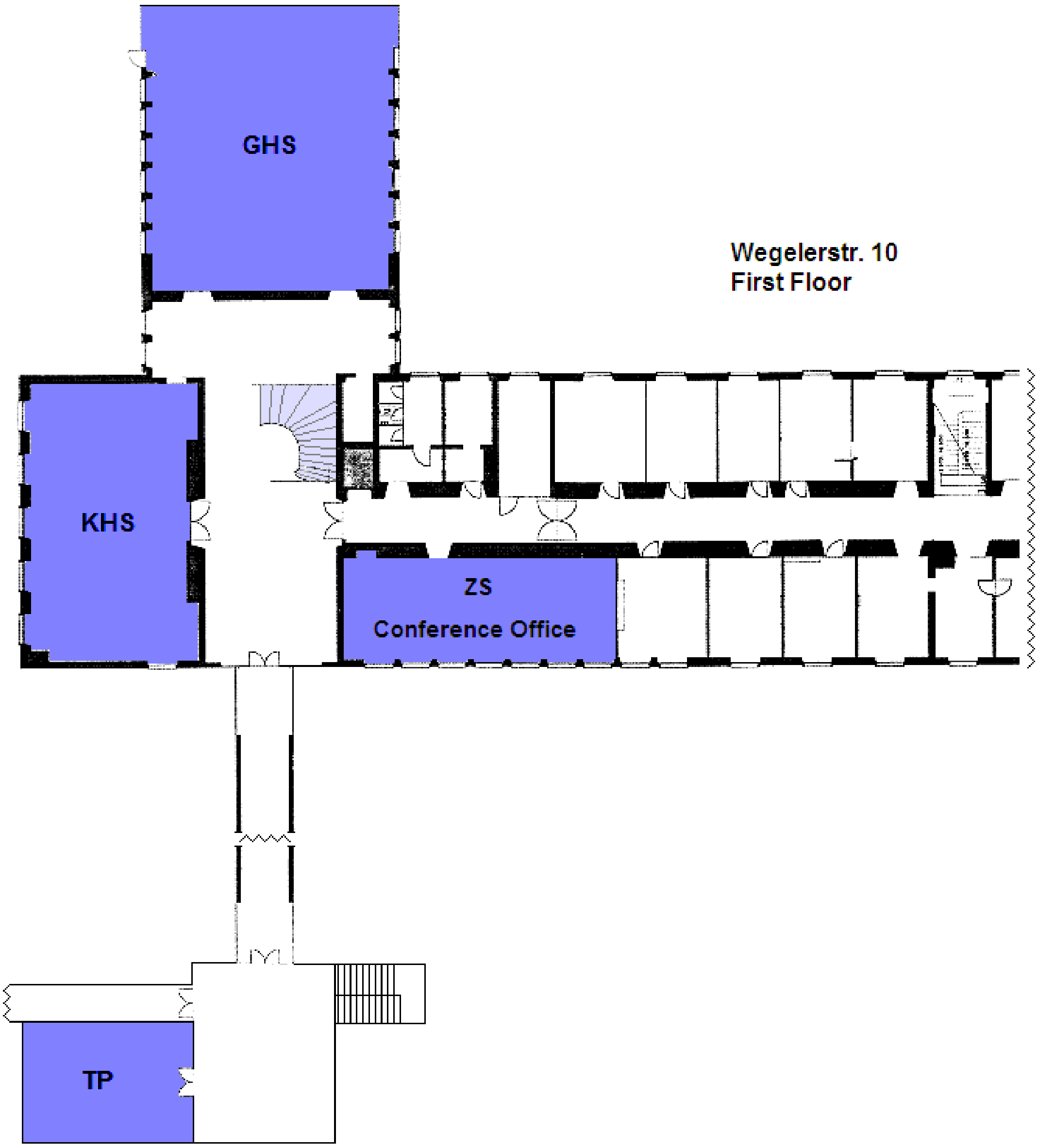
2.4 Conference Office

The conference office is located on the 1st floor of Wegelerstraße 10 in Zeichensaal (ZS).

2.5 Maps


WESTSTADT
ENDENICH
SÜDSTADT
POPPELSDORF
RHEIN
Kennedybrücke
Stadthaus
Opernhaus
Alter Friedhof
Markt
Rat-
haus
Münster-
pl.
Hbf
Uni-Hauptgebäude
Hofgarten
Koblenzer Tor
Poppelsdorfer
Schloß
Botanische
Gärten
AS Bonn-
Endenich
AS Bonn-
Poppelsdorf
Endenicher Allee 60
Wegelerstr. 10
A 565
Thomastr.
Bornheimer Str.
Hochstadenring
Heerstr.
Maxstr.
Oxford-
str.
B.-v.-Suttner-
Pl.
Friedrich-
str.
Friedens-
pl.
Sternstr.
Bonngasse
Belderberg
Brassertufer
Franziskaner-
str.
Konviktstr.
Regina-Pacis-
Weg
Stockenstr.
Adenauerallee
Rathenauufer
Am Hof
Poststr.
Th.-Mann-Str.
Rabinstr.
Herwarthstr.
Quantiusstr.
Kaiser-
pl.
Am
Hofgarten
Immenburgstr.
Wittelsbacher-
ring
Haydn-
str.
Richard-Wagner-
Str.
Humboldt-
str.
Colmantstr.
Baumschulallee
Beethoven-
str.
Endenicher Str.
Kaufmannstr.
Endenicher Allee
Wegelerstr.
Kreuzbergweg
Beringstr.
Meckenheimer Allee
Poppelsdorfer
Allee
Prinz-
Albert-
str.
Kaiserstr.
Nassestr.
Lennéstr.
str.
Bonner
Talweg
Argelander-
str.
König-
str.
Weber-
str.
Schumannstr.
Lessingstr.
Hermann-
Wandersleb-Ring
Endenicher
Str.
Magdalenen-
str.
Nuß-
allee
Katzenburgweg
Carl-Troll-Str.
Röckumstr.
Flodelingsweg
Kapellenstr.
Sebastianstr.
Clemens-August-Str.
Sternenburgstr.
Venusberg-
weg
Kurfürsten-
str.
Reuterstr.
0
500 m
© Geographisches Institut der Universität Bonn


Wegelerstr. 10
Ground Floor
Entrance


GHS
Wegelerstr. 10
First Floor
KHS
ZS
Conference Office
TP

3

Special Events

3.1 Reception

On **monday night** (september 5th) all participants are invited to a reception party starting at **7pm** in the entrance hall of the Mathematics building located at **Endenicher Allee 60**.
We will serve cold drinks, wine and draft beer as well as canapés.

3.2 Conference Dinner

The conference banquet will take place on **thursday night** (september 8th) at **7 pm**. It will be held in the medieval castle *Godesburg* in Bonn-Bad Godesberg. The charge of 45 Euros (to be paid at registration) includes a complete menu and drinks.
There will be a bus transfer operating between Godesburg and the conference venue Wegelerstraße 10 as well as the hotels President and Residence. Shuttles leave from the venue and the hotels at around **6.30 pm** and return from Godesburg at **11 pm**.

3.3 Excursion

On **wednesday afternoon** (september 7th) we offer three different half-day tours in the area around Bonn.

A: Hiking in the Ahr valley with wine tasting and dinner

After a short tour through the medieval city center of Ahrweiler we will have a short walk to the former bunker of the German government. It was build as a rescue place during the cold war. Afterwards we will hike through the wineyards to Walporzheim where we visit a wine manufactory. There will be a tour through the cellars and finally accompanying a traditional regional dinner we will taste different local wine. *75 Euro (transport + guided tour + small dinner + wine tasting)*

B: Cologne, Cathedral, Brewery

We will visit the famous cathedral in Cologne and have a guided tour through the historic city centre. In the evening we will meet in a local brewery. *25 Euro (train ticket + entrance fee + guided tour)*

C: Koblenz, Bundesgartenschau

The city of Koblenz is this year's host of the "Bundesgartenschau". On this occasion the whole city transforms into a big park with seasonal flowers, music and cultural program. Also the old fortress, situated on a hill directly at the river Rhine and giving a wonderful view of the city and the sorroundings, is part of this exhibition. There is the possibility to reserve a table at a restaurant in Koblenz where one could meet for a dinner la carte. *47 Euro (train ticket + entrance fee + guided tour)*

4

Scientific Programme

4.1 Main Lectures

	Monday		Tuesday		Wednesday		Thursday		Friday	
09.00-09.55	P1	Saloff-Coste	P2	Barlow	P3	Bertoin	P4	Peng	M23	Lyons
09.55-10.40	M1	Ambrosio	M8	Sznitman	M15	Kim	M17	Bismut	M24	Shigekawa
10.40-11.10					Coffee Break					
11.10-11.55	M2	Grigor'yan	M9	Holroyd	M16	Jacob	M18	Cruzeiro	M25	Stannat
12.05-12.50	M3	Kumagai	M10	Deuschel			M19	Zähle	M26	T. Zhang
12.50-14.40	Lunch Break						Lunch Break			
14.40-15.25	M4	F.-Y. Wang	M11	Méléard	Exkursion		M21	Driver	M27	Bogdan
15.35-16.20	M5	Guillin	M12	Greven			M21	Aida	P5	Hairer
16.20-14.50	Coffee Break						Coffee Break			
16.50-17.35	M6	Malrieu	M13	Z. Li			M22	Thalmaier		
17.45-18.30	M7	Takeda	M14	Gayrard						

All main lectures take place in Großer Hörsaal (GHS).

M21	**Shigeki Aida** (*Tohoku University*) Tunneling for spatially cut-off $P(\phi)_2$-Hamiltonians	Thu 15.35	24
M1	**Luigi Ambrosio** (*Scuola Normale Superiore Pisa*) Metric measure spaces with Riemannian Ricci curvature bounded from below	Mon 09.55	24
P2	**Martin Barlow** (*University of British Columbia*) Loop erased walk and uniform spanning trees	Tue 9.00	24
P3	**Jean Bertoin** (*Université Pierre et Marie Curie, Paris 6*) Burning cars in a parking lot	Wed 9.00	25
M17	**Jean-Michel Bismut** (*Université Paris-Sud*) The hypoelliptic Laplacian and probability	Thu 9.55	25
M27	**Krzysztof Bogdan** (*Wrocław University of Technology*) On Bergman spaces	Fri 14.40	25
M18	**Ana-Bela Cruzeiro** (*Universidade de Lisboa*) Generalized stochastic Navier-Stokes flows	Thu 11.10	25
M10	**Jean-Dominique Deuschel** (*Technische Universität Berlin*) A quenched invariance principle for non-elliptic random walk in balanced random environment	Tue 12.05	25
M20	**Bruce Driver** (*University of California*) Feynman path integrals in curved spaces	Thu 14.40	26
M14	**Veronique Gayrard** (*Université de Provence, Marseille*) Aging in mean field spin glasses	Tue 17.45	26

M12	**Andreas Greven** (*Universität Erlangen-Nürnberg*) Multiscale analysis of emerging rare mutants	Tue 15.35	26
M2	**Alexander Grigoryan** (*Universität Bielefeld*) On escape rate of Brownian motion on Riemannian manifolds	Mon 11.10	27
M5	**Arnaud Guillin** (*Université Blaise Pascal, Clermont-Ferrand II*) Uniform convergence in Wasserstein distance	Mon 15.35	27
P5	**Martin Hairer** (*University of Warwick*) Rough stochastic PDEs	Fri 15.35	27
M9	**Alexander Holroyd** (*Microsoft Research, Rochester*) Invariant matching	Tue 11.10	27
M17	**Niels Jacob** (*Swansea University*) Geometry and transition densities of jump-type processes	Wed 11.10	27
M15	**Panki Kim** (*Seoul National University*) Behavior of heat kernel for jump process	Wed 9.55	28
P1	**Laurent Saloff-Coste** (*Cornell University*) The heat kernel in inner uniform domains	Mon 9.00	29
M3	**Takashi Kumagai** (*Kyoto University*) Markov chain approximations to non-symmetric diffusions with bounded coefficients	Mon 12.05	28
M13	**Zenghu Li** (*Beijing Normal University*) Forward and backward stochastic partial differential equations of super-Lévy processes	Tue 16.50	28
M23	**Terry J. Lyons** (*University of Oxford*) The expected signature of a stochastic process. Some new PDEs.	Fri 9.00	28
M6	**Florent Malrieu** (*Université de Rennes*) McKean-Vlasov equations and functional inequalities	Fri 14.40	28
M11	**Sylvie Méléard** (*CMAP Palaiseau*)	Tue 14.40	29
M24	**Ichiro Shigekawa** (*Kyoto University*) The spectrum of non-symmetric operators and Markov processes	Fri 9.55	29
M25	**Wilhelm Stannat** (*TU Darmstadt*) Stochastic Navier-Stokes equations with Coriolis force	Fri 11.10	30
M8	**Alain-Sol Sznitman** (*ETH Zürich*) Random interlacements and the Gaussian free field	Tue 9.55	30
M7	**Masayoshi Takeda** (*Tohoku University*) A tightness property of a symmetric Markov process and the uniform large deviation principle	Mon 17.45	30
M22	**Anton Thalmaier** (*University of Luxembourg*) Stochastic calculus with respect to moving metrics and connections	Thu 16.50	30
M4	**Feng-Yu Wang** (*Beijing Normal University*) Equivalent semigroup properties for the curvature-dimension condition	Mon 14.40	30
M19	**Martina Zähle** (*University of Jena*) A pathwise approach to parabolic SPDE in metric measure spaces	Thu 12.05	31

M26	**Tusheng Zhang** (*University of Manchester*) A probabilistic approach to mixed boundary value problems for elliptic operators with singular coefficients	Fri 12.05	31

4.2 Invited Lectures

	Monday		Tuesday		Wednesday		Thursday		Friday	
09.00-09.20									E	Huesmann
09.25-09.50									E6	Timar
09.55-10.15	C1	Grothaus	D1	Debbasch	E1	von Renesse	H1	Roelly	F1	Popescu
10.20-10.40	C2	Weber	D2	X.-M. Li	E2	Maas	H2	Jansen	F2	Menz
10.40-11.10	Coffee Break									
11.10-11.30	C3	Yoshida	D3	Lévy	E3	Gigli	H3	Winter	F3	Pratelli
11.35-11.55	C4	Kawabi	D4	Baudoin	E4	Lee	H4	Keller-Ressel	F4	Juillet
12.05-12.25	C5	Gess	D5	X.-D. Li			H5	Kliem	F5	Kaleta
12.30-12.50	C6	R.Zhu	D6	Bailleul			H6	Klimovsky	F6	van Neerven
12.50-14.40	Lunch Break						Lunch Break			
14.40-15.00	B1	S.Geiss	A1	Kulczycki			G1	Andres		
15.05-15.25	B2	Hausenblas	A2	Vondracek	Exkursion		G2	Černý		
15.35-15.55	B3	Kwaśnicki	A3	Kassmann			G3	Telcs		
16.00-16.20	B4	Mimica	A4	Kusuoka			G4	Sanz-Solé		
16.20-16.50	Coffee Break						Coffee Break			
16.50-17.10	B5	J.Wang	A5	Eberle			G5	Kajino		
17.15-17.35	B6	K.Yano	A6	Ryznar			G6	Y.Yano		

All invited lectures take place in Kleiner Hörsaal (KHS).

A. Dirichlet forms and stochastic analysis

Chairmen: Zhen-Qing Chen (Seattle)

A1 **Tadeusz Kulczycki** (*Polish Academy of Sciences and Wrocław University of Technology*) — Tue 14.40 — 32
Stationary distributions for jump processes with inert drift

A2 **Zoran Vondracek** (*University of Zagreb*) — Tue 15.05 — 32
Minimal thinness for subordinate Brownian motion

A3 **Moritz Kassmann** (*Universität Bielefeld*) — Tue 15.35 — 32
Nondegenerate nonlocal Dirichlet forms

A4 **Seiichiro Kusuoka** (*Kyoto University*) — Tue 16.00 — 32
Diffusion processes in thin tubes and their limits on graphs

A5 **Andreas Eberle** (*Universität Bonn*) — Tue 16.50 — 32
Reflection coupling and Wasserstein contractivity without convexity

A6 **Michal Ryznar** (*Wrocław University of Technology*) — Tue 17.15 — 33
Potential theory of one-dimensional geometric stable processes

B. Jump processes

Chairmen: René Schilling (Dresden)

B1 **Stefan Geiss** (*University of Innsbruck*) — Mon 14.40 — 33
A fractional derivative on the Wiener space and applications to approximation theory

B2 **Erika Hausenblas** (*Montanuniversität Leoben*) — Mon 15.05 — 33
The stochastic reaction diffusion equation driven by Lévy noise

B3	**Matheusz Kwaśnicki** (*Polish Academy of Sciences, Warsaw*) Spectral Theory for symmetric one-dimensional Lévy Processes in domains	Mon 15.35	33
B4	**Ante Mimica** (*Universität Bielefeld*) Continuity properties of harmonic functions for jump processes	Mon 16.00	34
B5	**Jian Wang** (*Fujian Normal University and TU Dresden*) The Coupling of Lévy processes	Mon 16.50	34
B6	**Kouji Yano** (*Kobe University*) On universal sigma-finite measures for penalisations by multiplicative weights	Fri 14.40	34

C. Stochastic partial differential equations

Chairmen: Michael Röckner (Bielefeld)

C1	**Martin Grothaus** (*University of Kaiserslautern*) Stochastic partial differential equations via non-time-homogeneous evolution systems	Mon 9.55	35
C2	**Hendrik Weber** (*Warwick University*) Rough Burgers-like equations and their approximations	Mon 10.20	35
C3	**Minoru W. Yoshida** (*Tokyo City University*) On diffusion processes taking values in direct product spaces of Bohr compactification of $\mathbb{R}$	Mon 11.10	35
C4	**Hiroshi Kawabi** (*Okayama University*) Strong uniqueness of diffusions to Gibbs measures on a path space with exponential interactions	Mon 11.35	36
C5	**Benjamin Gess** (*University of Bielefeld*) Random attractors for stochastic porous media equations perturbed by space-time linear multiplicative noise	Mon 12.05	36
C6	**Rongchan Zhu** (*Beijing University / University of Bielefeld*) BSDE and generalized Dirichlet forms	Mon 12.30	36

D. Stochastic analysis and geometry

Chairmen: David Elworthy (Warwick)

D1	**Fabrice Debbasch** (*UPMC*) Stochastic processes on Lorentzian manifolds: construction and applications	Tue 9.55	36
D2	**Xue-Mei Li** (*University of Warwick*) SDE with non-smooth coefficients	Tue 10.20	37
D3	**Thierry Lévy** (*Université de Genève*) The master field on the plane	Fri 10.55	37
D4	**Fabrice Baudoin** (*Purdue University*) Curvature dimension inequalities for subelliptic diffusion operators	Tue 11.35	37
D5	**Xiangdong Li** (*Chinese Academy of Sciences*) Perelman's W-entropy for the Witten Laplacian and the Fokker-Planck equation on Riemannian manifolds	Tue 12.05	38
D6	**Ismael Bailleul** (*Cambridge University*)	Tue 12.30	38

Relativistic processes: where we are and what is ahaid of us

E. Optimal transport and allocation problems

Chairmen: Karl-Theodor Sturm (Bonn)

E1	**Max von Renesse** (*TU Berlin*) Ergodic properties of stochastic curve shortening flows in the plane	Wed 9.55	38
E2	**Jan Maas** (*University of Bonn*) Gradient flows of the entropy for finite Markov chains	Wed 10.20	39
E3	**Nicola Gigli** (*Université de Nice*) Optimal transport maps on spaces with Ricci curvature bounded below	Fri 10.55	39
E4	**Paul Lee** (*University of California, Berkeley*) Comparison theorems in 3D contact subriemannian manifolds	Wed 11.35	39
E5	**Martin Huesmann** (*University of Bonn*) Optimal transport between random measures	Fri 9.00	39
E6	**Adam Timar** (*University of Vienna*) A Poisson allocation of optimal tail	Fri 9.25	39

F. Functional analysis

Chairmen: Michel Ledoux (Toulouse)

F1	**Ionel Popescu** (*IMAR and Gatech*) Free functional inequalities on the circle	Fri 9.55	40
F2	**Georg Menz** (*MPI Leipzig*) Log-Sobolev inequality for Kawasaki dynamics with superquadratic single-site potential	Fri 10.20	40
F3	**Aldo Pratelli** (*Universita di Pavia*) The rectified cost function in mass transportation	Fri 11.10	40
F4	**Nicolas Juillet** (*Université de Strasbourg*) Convexity in the Wasserstein space over R^d	Fri 11.35	40
F5	**Kamil Kaleta** (*Wrocław University of Technology*) Spectral gap estimate for fractional Schrödinger operator in the interval	Fri 12.05	41
F6	**Jan van Neerven** (*TU Delft*) Maximal L^p-regularity for stochastic evolution equations	Fri 12.30	41

G. Random media, percolation clusters and fractals

Chairmen: Takashi Kumagai (Kyoto)

G1	**Sebastian Andres** (*University of British Columbia*) Invariance principle for the random conductance model	Thu 14.40	41
G2	**Jiří Černý** (*ETH Zürich*) Critical behaviour of the vacant set of random walk on random graphs	Thu 15.05	41
G3	**András Telcs** (*Budapest University of Technology and Economics*)	Thu 15.35	42

	Diffusive limits on the Penrose tiling		
G4	**Marta Sanz-Solé** (*University of Barcelona*) University of Barcelona	Thu 16.00	42
G5	**Naotaka Kajino** (*Universität Bielefeld*) On-diagonal oscillation of the heat kernels on p.c.f. self-similar fractals	Thu 16.50	42
G6	**Yuko Yano** (*Kyoto University*) On the law of the occupation time for Brownian motion on the Sierpinski gasket	Thu 17.15	42

H. Stochastic models in physics and biology

Chairmen: Anton Bovier (Bonn)

H1	**Sylvie Roelly** (*Universität Potsdam*) Infinite system of Brownian balls with Brownian radii	Thu 9.55	43
H2	**Sabine Jansen** (*WIAS*) Random partitions in statistical mechanics	Thu 10.20	43
H3	**Anita Winter** (*University Duisburg-Essen*) Aldouss move on cladograms in the diffusion limit	Thu 11.10	43
H4	**Martin Keller-Ressel** (*TU Berlin*) On the limit distributions of continuous-state branching processes with immigration	Thu 11.35	44
H5	**Sandra Kliem** (*University Duisburg-Essen*) Hierarchically interacting Λ-Cannings processes	Thu 12.05	44
H6	**Anton Klimovsky** (*Eindhoven University of Technology*) Renormalisation of hierarchically interacting Λ-Cannings processes in the mean-field limit	Thu 12.30	44

4.3 Contributed Lectures

	Monday		Tuesday		Wednesday		Thursday		Friday	
09.00-09.15									k1	Dippon
09.15-09.30									k2	Huq
09.30-09.45									k3	Evans
09.55-10.10	a1	Kuwae	d1	J.Zhang	g1	Herrmann	h1	Hajri	k4	Khaliq
10.10-10.25	a2	Jin	d2	Cox	g2	Najafi	h2	W.Yang	k5	Urombo
10.25-10.40	a3	Dyda	d3	El-Borau	g3	Neves	h3	Bernal	k6	Kamrani
10.40-11.10	Coffee Break									
11.10-11-25	a4	Sandrić	d4	Dadakhodjaev	g4	Thäle	h4	Eldredge	l1	Tugaut
11.25-11.40	a5	Sztonyk	d5	Riedle	g5	Neklyudov	h5	Wei	l2	Döering
11.40-11.55	a6	Małecki	d6	Dirksen	g1	Torbin	h6	Takemura	l3	Nakashima
12.05-12.20	a7	Huang	d7	Sabbagh			h7	Riedel	l4	Tanaka
12.20-12.35	a8	Łochowski	d8	Rakhimov			i1	Yam	l5	Iizuka
12.35-12.50	a9	Takeuchi	d9	R.Bhardwaj			i2	Kalimulina	l6	Moreno
12.50-14.40	Lunch Break						Lunch Break			
14.40-14.55	b1	X.Zhu	e1	Kuwada			i3	Leshchenko	d10/l7	C.Geiss /Luks
14.55-15.10	b2	Dunst	e2	Funano			i4	Luecht-Eisenbach	d11/l8	Kunze /Popov
15.10.15.25	b3	Ebglezos	e3	Stummer			i5	Yvinec	l9	C.Deng
15.35-15.50	b4	Erbar	e4	Takatsu	Exkursion		i6	Behzadi		
15.50-16.05	b5	Gawarecki	e5	Mainini			c2	P. Bhardwaj		
16.05-16.20	b6	Karczewska	e6	Cavalletti			c3	Mudakkar		
16.20-16.50	Coffee Break						Coffee Break			
16.50-17.05	b7	Maurelli	e7	Angst						
17.05-17.20	b8	Shamarova	e8	Tardif						
17.20-17.35	b9	Töelle	e9	Ingolfsson						
17.45-18.00	b10	Trevisan	f1	Olu						
18.00-18.15	b11	L.Xu	f2	Papapantoleon						
18.15-18.30	c1	Adil Khan								

All contributed lectures take place in Hörsaal Theoretische Physik (TP).

a.

a1 **Kazuhiro Kuwae** (*Kumamoto University*) Mon 9.55 46
On gaugeability for generalized Feynman-Kac functionals and its applications

a2 **Peng Jin** (*Wuppertal University*) Mon 10.10 46
On drift-type perturbation for stable processes

a3 **Bartlomiej Dyda** (*Universität Bielefeld*) Mon 10.25 46
Fractional Laplacian on power functions

a4 **Nikola Sandrić** (*University of Zagreb*) Mon 11.10 46
Recurrence and transience property for a class of Markov chains

a5 **Pawel Sztonyk** (*Wrocław University of Technology*) Mon 11.25 47
Estimates of transition densities and their derivatives for jump Lévy processes

a6 **Jacek Małecki** (*Wrocław University of Technology*) Mon 11.40 47
Suprema of Lévy processes

a7 **Xueping Huang** (*Universität Bielefeld*) Mon 12.05 47
On stochastic completeness of symmetric jump processes

a8 **Łochowski** (*Warsaw School of Economics*) Mon 12.20 47
Vaccine development for malaria based on mathematical models of stochastic analysis

a9 **Atsushi Takeuchi** (*Osaka City University*) Mon 12.35 48
Osaka City University

b.

b1 **Xiangchan Zhu** (*University of Bielefeld*) Mon 14.40 48

	The stochastic reflection problem on an infinite dimensional convex set and BV functions in a Gelfand triple		
b2	**Thomas Dunst** (*Universität Tübingen*) Approximation of SPDEs driven by Lévy noise	Mon 14.55	48
b3	**Nikolaos Englezos** (*University of Piraeus*) Stochastic Burgers PDEs with random coefficients and a generalization of the Cole-Hopf transformation	Mon 15.10	49
b4	**Matthias Erbar** (*Universität Bonn*) Displacement convexity and Ricci curvature for finite Markov chains	Mon 15.35	49
b5	**Leszek Gawarecki** (*Kettering University*) Weak variational solutions with applications to stochastic partial differential equations	Mon 15.50	49
b6	**Anna Karczewska** (*University of Zielona Gora*) Stochastic Volterra equations in Hilbert space	Mon 16.05	49
b7	**Mario Maurelli** (*Scuola Normale Superiore, Pisa*) Uniqueness for stochastic continuity equation, Wiener chaos and superposition solutions	Mon 16.50	50
b8	**Evelina Shamarova** (*University of Porto*) Solution to the Navier-Stokes equations with random initial data	Mon 17.05	50
b9	**Jonas M. Tölle** (*TU Berlin*) Ergodicity and random attractors for singular stochastic evolution inclusions	Mon 17.20	51
b10	**Dario Trevisan** (*Scuola Normale Superiore, Pisa*) BV functions in the classical Wiener space and an extension of the Clark-Ocone-Karatzas formula	Mon 17.45	51
b11	**Lihu Xu** (*TU Berlin*) On stochastic Burger and 2D Navier-Stokes equations driven by α-stable noises	Mon 18.00	52

c.

c1	**Muhammad Adil Khan** (*Sbdus Salam School*) Further results on convex functions and separable sequences with applications	Mon 18.15	52
c2	**Purvee Bhardwaj** (*Barkatullah University*) High pressure behaviour of yttrium antimonid	Thu 15.50	52
c3	**Syeda Rabab Mudakkar** (*Lahore School of Economics*) Rademacher inequality with applications	Thu 16.05	52

d.

d1	**Jinping Zhang** (*North China Electric Power University, Beijing*) Set-valued stochastic integrals with respect to Poisson processes in a Banach space	Tue 9.55	52
d2	**Sonja Cox** (*Delft University of Technology*) Convergence rates of the implicit Euler scheme for SPDE's in UMD Banach spaces	Tue 10.10	53

f.

f1	**Akeju Adeyemi Olu** (*University of Ibadan*) Heat equation asymptotic of option pricing	Wed 17.45	58
f2	**Antonis Papapantoleon** (*TU Berlin*) On efficient and accurate log-Lévy approximations for the Lévy Libor model	Tue 18.00	58

g.

g1	**Samuel Herrmann** (*Institut de Mathématiques Elie Cartan, Nancy*) A random walk on moving spheres approach for the simulation of Bessel hitting times	Wed 9.55	58
g2	**Morteza Nattagh Najafi** (*Sahrif University of Technology*) Observation of SLE(κ, ρ) on the critical statistical models	Wed 10.10	59
g4	**Christoph Thäle** (*University of Osnabrück*) The size of visibility sets for some continuum percolation models in the hyperbolic plane	Wed 11.10	59
g5	**Mikhail Neklyudov** (*Universität Tübingen*) Influence of noise to ferromagnetic systems	Wed 11.25	60
g6	**Grygoriy Torbin** (*University of Ukraine*) On calculation of the Hausdorff dimension: Faithful and non-faithful vitality coverings	Wed 11.40	60

h.

h1	**Hatem Hajri** (*Université de Paris sud*) Tanaka's equation and the Csaki-Vincze transformation	Thu 9.55	60
h2	**Wei Yang** (*University of Warwick*) Controlled nonlinear Markov processes	Thu 10.10	61
h3	**Francisco Bernal** (*Insituto Superior Technico, Lisbon*) A comparison of high-order methods for probabilistically solving elliptic boundary value problems	Thu 10.25	61
h4	**Nate Eldredge** (*Cornell University*) Widder's theorem for Dirichlet spaces	Thu 11.10	61
h5	**Fajin Wei** (*University of Leicester*) Pathwise stationary solutions of the stochastic infinity-Laplacian equation	Thu 11.25	61
h6	**Tomoko Takemura** (*Nara Women's University*) Recurrence/transience criteria for skew product diffusion processes	Thu 11.40	62
h7	**Sebastian Riedel** (*TU Berlin*) Convergence rates for the full Gaussian rough paths	Thu 12.05	62

i.

i1	**Philip Yam** (*University of Hong Kong*) Linear quadratic mean field games	Thu 12.20	63

	onditional processes induced by one-dimensional generalized diffusion processes related to stochastic models in population genetics		
l6	**Pilar Moreno** (*Pablo de Olavide University*) Distribution of the successful and blocked events in a Geo/Geo/c retrial queue	Fri 12.35	68
l7	**Tomasz Luks** (*Université d'Angers*) Hardy spaces of α-harmonic functions on the complement of the sphere and of the hyperplane	Fri 14.40	68
l8	**Serguei Popov** (*UNICAMP*) Conditional quenched CLT for random walks among random conductances on $\mathbb{Z}^d$	Fri 14.55	69
l9	**Chang-Song Deng** (*Beijing Normal University*) Exponential convergence rates of second quantization semigroups and applications	Fri 15.10	69

4.4 Poster Session

A poster session will be held in Kleiner Hörsaal (KHS) on Tuesday from 17.45 to 18.30.

5 Abstracts

Abbreviations:

GHS	-	Großer Hörsaal
KHS	-	Kleiner Hörsaal
TP	-	Hörsaal Theoretische Physik

5.1 Main Lectures

Tunneling for spatially cut-off $P(\phi)_2$-Hamiltonians

Shigeki Aida
Mathematical Institute Tohoku University, Sendai

Let $-L+V_\lambda$ be a spatially cut-off $P(\phi)_2$-Hamiltonian. The operator $-L$ is the free Hamiltonian and the potential function V_λ is given by a Wick polynomial

$$V_\lambda(\omega) = \lambda \int_{\mathbb{R}} : P\left(\frac{\omega(x)}{\sqrt{\lambda}}\right) : g(x)dx,$$

where $\lambda = 1/\hbar$ is a large positive parameter and g is a cut-off function. Let $E_0(\lambda)$ be the lowest eigenvalue of $-L + V_\lambda$. One of the main result of this talk is the determination of the limit (semi-classical limit) $\lim_{\lambda\to\infty} E_0(\lambda)$ under suitable assumptions on P. Second, we study the tunneling for the spatially cut-off $P(\phi)_2$-Hamiltonian. That is, we give an upper bound for the gap of the spectrum $E_1(\lambda) - E_0(\lambda)$ and prove that the gap is exponentially small in the case where the "potential function" is a symmetric double-well type when $\lambda \to \infty$. To obtain such tunneling estimates, we introduce a certain kind of distance function which is closely related with the classical Agmon distance.

M21 *Thu. 15.35-16.20 – GHS*

Metric measure spaces with Riemannian Ricci curvature bounded from below

Luigi Ambrosio
Scuola Normale Superiore Pisa

We introduce a synthetic notion of Riemannian Ricci bounds from below for metric measure spaces $(X, \mathsf{d}, \mathfrak{m})$ which is stable under measured Gromov-Hausdorff convergence and rules out Finsler geometries. It can be given in terms of an enforcement of the Lott, Sturm and Villani geodesic convexity condition for the entropy coupled with the linearity of the heat flow. Besides stability, it enjoys the same tensorization, global-to-local and local-to-global properties. In these spaces, that we call $RCD(K,\infty)$ spaces, we prove that the heat flow (which can be equivalently characterized either as the flow associated to the Dirichlet form, or as the Wasserstein gradient flow of the entropy) satisfies Wasserstein contraction estimates and several regularity properties, in particular Bakry-Emery estimates and the $L^\infty - \mathrm{Lip}$ Feller regularization. We also prove that the distance induced by the Dirichlet form coincides with d, that the local energy measure has density given by the square of Cheeger's relaxed slope and, as a consequence, that the underlying Brownian motion has continuous paths. All these results are obtained independently of Poincaré and doubling assumptions on the metric measure structure and therefore apply also to spaces which are not locally compact, as the infinite-dimensional ones.

M1 *Mon. 09.55-10.40 – GHS*

Loop erased walk and uniform spanning trees

Martin Barlow
University of British Columbia

The uniform spanning tree U in $\mathbf{Z}^2$ is a random one-sided tree, which can be constructed in a number of ways. It is the weak limit of uniform spanning trees on finite boxes, and can also be obtained as a limit of the random cluster model. It can also be constructed via a collection of loop erased random walks via an algorithm due to David Wilson. Using techniques developed by Robert Masson, we obtain tightness estimates for the length of a loop erased walk in a domain D in $\mathbf{Z}^2$. These then enable us to compare the Euclidean and graph metrics on U.
Finally, we can study random walk X on the tree U, and obtain estimates on its transition probabilities - for example we have $P^0(X_{2n} = 0) \approx n^{-\frac{8}{13}}$. (Joint work with Robert Masson.)

P2 *Tue. 9.00-9.45 – GHS*

Burning cars in a parking lot

Jean Bertoin
Université Pierre et Marie Curie, Paris 6

Knuths parking scheme is a model in computer science for hashing with linear probing. One may imagine a circular parking lot with n sites; cars arrive at each site with unit rate. When a car arrives at a vacant site, it parks there; otherwise it turns clockwise and parks at the first vacant site which is found. We incorporate fires to this model by throwing Molotov cocktails on each site at a smaller rate $n^{-\alpha}$ where $0 < \alpha < 1$ is a fixed parameter. When a car is hit by a Molotov cocktail, it burns and the fire propagates to the entire occupied interval which turns vacant. We show that with high probability when $n \to \infty$, the parking lot becomes saturated at a time close to 1 (i.e. as in the absence of fire) for $\alpha > \frac{2}{3}$, whereas for $\alpha < \frac{2}{3}$, the average occupation approaches 1 at time 1 but then quickly drops to 0 before the parking is ever saturated.

P3 *Wed. 9.00-9.45 – GHS*

The hypoelliptic Laplacian and probability

Jean-Michel Bismut
Université Paris-Sud

Let X be a Riemannian manifold, let $\mathcal{X}$ be the total space of its tangent bundle. The hypoelliptic Laplacian is a second order hypoelliptic Laplacian $\mathcal{L}_b|_{b>0}$ on $\mathcal{X}$, that interpolates in the proper sense between the ordinary Laplacian of X and the generator of the geodesic flow. Up to lower order terms, it is a scaled sum of the harmonic oscillator along the fibre and of the generator of the geodesic flow.
Several points are to be noted:
(1) The hypoelliptic Laplacian is a 'Laplacian' that is associated with an exotic Hodge theory.
(2) Its probabilistic interpretation is in terms of a Langevin process.
(3) In many ways, the hypoelliptic Laplacian is simpler than its elliptic counterpart.
(4) The large deviation functional associated with the hypoelliptic Laplacian is not a distance on $\mathcal{X}$.
(5) The hypoelliptic deformation may preserve the spectrum of the considered manifold.
In the talk, I will review the probabilistic aspects of the construction of the hypoelliptic Laplacian, review the role of the Malliavin calculus in its analysis, and explain some applications.

M17 *Thu. 9.55-10.40 – GHS*

On Bergman spaces

Krzysztof Bogdan
Wrocław University of Technology

I will report joint work in progress with Adam Bielaszewski on weighted Bergman spaces of martingales and harmonic functions on the disc. Atomic decomposition and dual spaces will also be discussed.

M27 *Fri. 14.40-15.25 – GHS*

Generalized stochastic Navier-Stokes flows

Ana-Bela Cruzeiro
Universidade de Lisboa

In the spirit of Brenier's work for Euler flows, we introduce the notion of generalized stochastic flows associated with Navier-Stokes equation.
This is joint work with M. Arnaudon (Université de Poitiers).

M18 *Thu. 11.10-11.55 – GHS*

A quenched invariance principle for non-elliptic random walk in balanced random environment

Jean-Dominique Deuschel
Technische Universität Berlin

We prove a quenched invariance principle for random walk in i.i.d. balanced random environment, without any assumption of ellipticity, thus improving the results of Lawler and Guo-Zeitouni to the non-elliptic setting. The proof is based on the analytical tools, in particular on the maximum principle, and and uses percolation ideas.
Joint work with Noam Berger (Hebrew university of Jerusalem).

M10 *Tue. 12.05-12.50 – GHS*

Feynman path integrals in curved spaces

Bruce Driver
University of California

In a first (perhaps second) course on quantum mechanics one learns to quantize a classical mechanical system in the operator formalism via "canonical quantization". However, when dealing with classical systems with non-flat configuration spaces, canonical quantization may be ambiguous due to problems with "operator orderings". On the other hand at first blush, Feynman's path integral interpretation of quantum mechanics does not seem to suffer from these ambiguities. However, there is no free lunch and the same ambiguities reappear in the Feynman picture when one actually tries to precisely define these path integral expressions. This talk will describe some mathematical interpretations of Feynman's picture for quantum mechanical systems in geometric settings. We will review some previous results of the speaker with Lars Andersson, along with Adrian Lim's more recent results and the new results by Tom Laetsch and myself.

M20 *Thu. 14.40-15.25 – GHS*

Aging in mean field spin glasses

Veronique Gayrard
Université de Provence, Marseille

Key models of spin glass dynamics are Glauber dynamics associated to random Hamiltonians, such as the the p-spin SK model, given by correlated Gaussian processes indexed by the hypercube $\{-1,1\}^n$. Their study has attracted considerable attention over the last decade in connection with the concept of *aging*: such dynamics are expected to show very slow convergence to equilibrium, the older the dynamics is the slower it converges. To quantify this phenomenon one introduces a *clock process*, namely, a partial sum process that measures the total time elapsed along trajectories of a given length. It is today well understood that aging occurs when the clock process converges to a stable subordinator. Thus questions about aging link up directly to the classical and well studied field of convergence of sums of random variables to Lévy processes. In this talk I will explain this link and give a general criterion for the convergence of clock processes in the abstract setting of random dynamics in random environments. I will then show how to apply this criterion to a toy model first (Bouchauds trap model) and to the p-spin SK model next, for a particular variant of Glauber dynamics known as the random hopping time dynamics.

M14 *Tue. 17.45-18.30 – GHS*

Multiscale analysis of emerging rare mutants

Andreas Greven
Universität Erlangen-Nürnberg

The work is concerned with a spatial mean-field model with N geographic sites of a $2M$-type population, M-types of low fitness and M type of higher fitness (with small fitness differences) which evolve by mutation, selection, resampling and migration. At rate N^{-1} types of low fitness mutate to higher fitness. We start the system with a population concentrated on types of lower fitness.
We show in an asymptotic analysis for $N \to \infty$ that we pass through five regimes: the regime of small droplet formation in times of order 1, global emergence of the fitter types after times $\alpha^{-1} \log N + t$, subsequent fixation on the higher level types in times $\alpha^{-1} \log N + t_N$ with $t_N \to \infty$ at any speed and finally evolving towards an higher-level mutation-selection equilibrium in times of order N after passing through a phase of neutral evolution during times of order $o(N)$. All five regimes are identified in their limiting dynamics, a measure-valued droplet dynamic, an entrance law of a McKean-Vlasov dynamic, a neutral dynamic and finally the establishment of a higher-level equilibrium process after times of order N. The talk explains the scenario based on the two-type case, i.e. $M = 1$.
(Joint work with D. Dawson, School of Mathematics and Statistics, Carleton University, Ottawa.)

M12 *Tue. 15.35-16.20 – GHS*

On escape rate of Brownian motion on Riemannian manifolds

Alexander Grigor'yan
Universität Bielefeld

We prove an upper bound for the escape rate of Brownian motion on a Cartan-Hadamard manifold in terms of the volume growth function.

M2 *Mon. 11.10-11.55 – GHS*

Uniform convergence in Wasserstein distance

Arnaud Guillin
Université Blaise Pascal, Clermont-Ferrand II

We consider here the problem of the uniform convergence towards equilibrium for Fokker-Planck type equation in Wasserstein distance. If contraction properties in Wasserstein distance are well characterized by a uniformly strict positive cruvature, since the work of Sturm and Von Renesse (2005), it is not the case for the uniform convergence. To dos so, we introduce a new functional inequality equivalent to this property (even in the non reversible case) and give practical criterion to establish it as well as properties. Quite surprisingly it holds in some negative curvature cases.
Work with F. Bolley (CEREMADE, Paris Dauphine) and I. Gentil (ICJ, Lyon 1).

M5 *Mon. 15.35-16.20 – GHS*

Rough stochastic PDEs

Martin Hairer
University of Warwick

There are several natural situations giving rise to stochastic PDEs with solutions that are so "rough" that their, nonlinearity cannot be defined classically. However, in some typical cases, the situation is very close to "borderline". One classical example is the case of ordinary stochastic differential equations where the stochastic integral is "almost well-posed" in the sense that, if Brownian motion were to have sample paths that are α-Hölder continuous for some $\alpha > \frac{1}{2}$, one could use classical Riemann-Stieltjes integration and there would be little need for a stochastic calculus. We will explore two examples of stochastic PDEs where a similar situation arises, but due this time to the lack of spatial regularity. In particular, we will see that the behaviour of the solutions as their regularity approaches the critical value is quite different in both cases.

P5 *Fri. 15.35-16.20 – GHS*

Invariant matching

Alexander E Holroyd
Microsoft Research

Suppose that red and blue points occur as independent point processes in $\mathbb{R}^d$, and consider translation-invariant schemes for perfectly matching the red points to the blue points. What is best possible cost of such a matching, measured in terms of the edge lengths? What happens if we insist that the matching is non-randomized, or if we forbid edge crossings, or if the points act as selfish agents? I will review recent progress and open problems on this topic, as well as on the related topic of fair allocation. In particular I will address some surprising new discoveries on multi-colour matching and multi-edge matching.

M9 *Tue. 11.10-11.55 – GHS*

Geometry and transition densities of jump-type processes

Niels Jacob
Swansea University

First we will discuss a natural geometric interpretation of the transition density of symmetric Lévy processes and we will see how this resonates with results on estimates for jump-type processes on metric measure spaces obeying certain scaling properties. Eventually we turn to the case of more general Feller processes with the n-dimensional Euclidean spaces as state space and will sketch some ideas and problems.

M16 *Wed. 11.10-11.55 – GHS*

Behavior of heat kernel for jump process

Panki Kim
Seoul National University

In this talk, we discuss the behavior of heat kernel for symmetric jump-type process with jumping kernels comparable to radially symmetric function on the spaces. Parabolic Harnack principle and sharp two-sided heat kernel estimates for both small and large time will be discussed. This talk is based on joint works with Zhen-Qing Chen and Takashi Kumagai.

M15 *Wed. 9.55-10.40 – GHS*

Markov chain approximations to non-symmetric diffusions with bounded coefficients

Takashi Kumagai
Kyoto University

We consider a certain class of non-symmetric Markov chains and obtain heat kernel bounds and parabolic Harnack inequalities. Using the heat kernel estimates, we establish a sufficient condition for the family of Markov chains to converge to non-symmetric diffusions. As an application, we approximate non-symmetric divergence forms with bounded coefficients by non-symmetric Markov chains. This extends the results by Stroock-Zheng to the non-symmetric divergence forms.
This is a joint work with J-D. Deuschel (TU-Berlin).

M3 *Mon. 12.05-12.50 – GHS*

Forward and backward stochastic partial differential equations of super-Lévy processes

Zenghu Li
Beijing Normal University

The process of distribution functions of a one-dimensional super-Lévy process is characterized as the pathwise unique solution of a stochastic integral equation driven by a time-space white noise, which generalizes the recent work of Xiong (2010) on super-Brownian motion. To prove the pathwise uniqueness of the solution we establish a connection of the stochastic integral equation with some backward doubly stochastic equation with jumps. This is a joint work with Xu Yang.

M13 *Tue. 16.50-17.35 – GHS*

The expected signature of a stochastic process. Some new PDEs.

Terry J. Lyons
University of Oxford

How can one describe a probability measure of paths? And how should one approximate to this measure so as to capture the effect of this randomly evolving system. Markovian measures were efficiently described by Strook and Varadhan through the Martingale problem. But there are many measures on paths that are not Markovian and a new tool, the expected signature provides a systematic ways of describing such measures in terms of their effects.
We explain how to calculate this expected signature I the case of the measure on paths corresponding to a Brownian motion started at a point x in the open set and run until it leaves the same set. A completely new (at least to the speaker) PDE is needed to characterise this expected signature.

M23 *Fri. 9.00-9.45 – GHS*

McKean-Vlasov equations and functional inequalities

Florent Malrieu
Université de Rennes

The aim of this talk is to emphasize the role of some functional inequalities (as Poincar, logarithmic Sobolev or concentration inequalities) in the quantitative study of the long time behavior of a large class of nonlinear partial differential equations. The McKean-Vlasov equations and the associated particle systems are a perfect example of such interactions between functional analysis, pde's and stochastic processes. After a presentation of known results, I will deal with challenging open questions (hypoelliptic equations, singular interactions, etc).

M6 *Mon. 16.50-17.35 – GHS*

Random modeling of adaptive dynamics for sexual populations

Sylvie Méléard
CMAP Palaiseau

We study models describing the evolution of a sexual (diploid) population with mutation and selection in the specific scales of the biological framework of adaptive dynamics. We take into account the genetics of the reproduction. Each individual is characterized by two allelic traits and the associated phenotypic trait. The population is described as a point measure valued process with support on the genotype space. Its dynamics is a birth and death dynamics with selection and Mendelian rule in the reproduction and competition between individuals. Allelic mutations may occur during the reproduction events. The population size is assumed to be large and the mutation rate small. We prove that under a good combination of the scales, and if the mutation steps are small, the population process converges in a long time scale by a jump process jumping from a monomorphic homozygote equilibrium to another one. This study involves a three-types diploid nonlinear dynamical system, which is studied using small perturbations of a neutral case. The behavior of the process is thus studied near the evolutionary singularities.
This work is a joint work with Pierre Collet (École Polytechnique) and Hans Metz (Leiden University).

M11 *Tue. 14.40-15.25 – GHS*

tba

Shige Peng
Shandong University

P4 *Thu. 9.00-09.45 – GHS*

The heat kernel in inner uniform domains

Laurent Saloff-Coste
Cornell University

In this talk, I will present joint work with Pavel Gyrya and Janna Lierl.
We consider the Laplacian (or more general diffusion operators) with either Neumann or Dirichlet boundary condition in Euclidean domains (or domains in more general spaces).
We give two-sided Gaussian bounds (up to the boundary) for the associated heat kernels when the domain is assumed to be inner-uniform. When the Dirichlet boundary condition is assumed, the bound in question capture the boundary effect, uniformly over time and space. The inner-uniformity condition is a purely metric condition (for doubling measure length spaces) that allows for a wide variety of boundaries and is applicable in many different context.

P1 *Mon. 9.00-9.45 – GHS*

The spectrum of non-symmetric operators and Markov processes

Ichiro Shigekawa
Kyoto University

This is a joint work with Y. Ikeno. We discuss the spectrum of non-symmetric operators, in particular, normal operators. We first give an criterion of normal operators on a Riemaniann manifold. And we give examples of normal operators. We also give the precise description of the spectrum. For example, we consider the two dimensional Euclidean Laplacian with rotation and the two dimensional Ornstein-Uhlecbeck operator with rotation. We show that their spectrum can be determined explicitly. We also discuss the relation between the sector condition and the spectrum.

M24 *Fri. 9.55-10.40 – GHS*

Stochastic Navier-Stokes equations with Coriolis force

Wilhelm Stannat
TU Darmstadt

Navier-Stokes equations with rotation have attracted considerable interest in recent years because of remarkable progress concerning global strong solutions in the 3D case (see Babin, Mahalov, Nicolaenko (Asymptot. Anal. 15, 1997)). In our talk we consider the Navier-Stokes equations with Coriolis term perturbed by cylindrical Wiener process both in 2D and 3D. Weak and stationary martingale solutions to the associated stochastic evolution equation are constructed and uniqueness results are given in 2D. The distribution of stationary martingale solutions can be interpreted as the longtime statistics of random fluctuations of the stochastic evolution around the Ekman spiral, which is an explicit stationary solution of the Navier-Stokes equations with Coriolis force. This is the stochastic analogue of the asymptotic stability of the Ekman spiral proven by Hess in 2009.

M25 *Fri. 11.10-11.55 – GHS*

Random interlacements and the Gaussian free field

Alain-Sol Sznitman
ETH Zürich

Random interlacements are a microscopic model for the trace left at suitable time scales by random walks on large recurrent graphs, which are locally transient.
In this talk we plan to describe some of the relations between random interlacements and the Gaussian free field.

M8 *Tue. 9.55-10.40 – GHS*

A tightness property of a symmetric Markov process and the uniform large deviation principle

Masayoshi Takeda
Tohoku University

Let X be an irreducible, strong Feller m-symmetric Markov process on a locally separable metric space E. Assume that X possesses a *tightness property*, i.e., for any $\epsilon > 0$, there exists a compact set K such that $sup_{x\in E} R_1 1_{K^c}(x) \leq \epsilon$. Here 1_{K^c} is the indicator function of the complement of K and R_1 is the 1-resolvent of X. We consider the uniform large deviation principle for empirical measures of X.
We show that the tightness property implies the uniform upper bound. We also show that if , in addition, X is conservative and there exists an increasing sequence $\{K_n\}_{n=1}^{\infty}$ of compact sets such that the union of $\{K_n\}_{n=1}^{\infty}$ equals E and each part (or absorbing) process X^{D_n} on D_n ($D_n := K_n^c$) is irreducible, then X also has the uniform lower bound.

M7 *Mon. 17.45-18.30 – GHS*

Stochastic calculus with respect to moving metrics and connections

Anton Thalmaier
University of Luxembourg

We discuss some notions of stochastic differential geometry in the case when the underlying geometry (Riemannian metric, linear connection) evolves as a function of time. Interesting examples for such deformations of the metric come from Ricci flow.

M22 *Thu. 16.50-17.35 – GHS*

Equivalent semigroup properties for the curvature-dimension condition

Feng-Yu Wang
Beijing Normal University

Some equivalent gradient and Harnack inequalities of a diffusion semigroup are presented for the curvature-dimension condition of the associated generator. As applications, the first eigenvalue, the log-Harnack inequality, the heat kernel estimates, and the HWI inequality are derived by using the curvature-dimension condition. The transportation inequality for diffusion semigroups is also investigated.

M4 *Mon. 14.40-15.25 – GHS*

A pathwise approach to parabolic SPDE in metric measure spaces

Martina Zähle
University of Jena

Pathwise defined stochastic parabolic (pseudo) differential equations in metric measure spaces are studied. The spatial operators are given by (fractional powers of) the generators of ultracontractive strongly continuous symmetric Markovian semigroups. Unique solutions are determined in associated Bessel potential spaces, where the spatial noises are elements of certain dual spaces and their time 'derivatives' are realized by means of operator-valued fractional calculus. In particular, we consider fractional heat equations driven by fractional Brownian noise. This approach extends former Euclidean versions and can be applied to known classes of fractal sets.
(Joint work with Michael Hinz and Elena Issoglio.)

M19 *Thu. 12.05-12.50 – GHS*

A probabilistic approach to mixed boundary value problems for elliptic operators with singular coefficients

Tusheng Zhang
University of Manchester

In this talk, I will present the existence and uniqueness of solutions of a class of mixed boundary value problems for elliptic operators with singular coefficients. Our approach is probabilistic. The theory of Dirichlet forms and backward stochastic differential equations plays an important role.

M26 *Fri. 12.05-12.50 – GHS*

5.2 Invited Lectures

A. Dirichlet forms and stochastic analysis

Stationary distributions for jump processes with inert drift

Tadeusz Kulczycki
Polish Academy of Sciences and Wrocław University of Technology

We analyze a jump process Z with a jump measure determined by a "memory" process S. The state space of (Z, S) is the Cartesian product of the unit circle and the real line. We prove that the stationary distribution of (Z, S) is the product of the uniform probability measure and a Gaussian distribution.

A1 *Tue. 14.40-15.00 – KHS*

Minimal thinness for subordinate Brownian motion

Zoran Vondracek
University of Zagreb

We study minimal thinness in the d-dimensional half-space H for a large class of rotationally invariant Levy processes, including symmetric stable processes and sums of Brownian motion and independent stable processes. We show that the same test for the minimal thinness of a subset of H below the graph of a nonnegative Lipschitz function is valid for all processes in the considered class. In the classical case of Brownian motion this test was proved by Burdzy.

A2 *Tue. 15.05-15.25 – KHS*

Nondegenerate nonlocal Dirichlet forms

Moritz Kassmann
Universität Bielefeld

We report on recent progress made in the regularity theory for solutions to nonlocal operators generating jump processes. We give conditions on the jumping kernel of a nonlocal Dirichlet form which are sufficient for comparability of these forms. As an application we obtain Hölder regularity estimates for solutions to corresponding equations. As a byproduct we obtain a formulation of Harnack's inequality which is applicable to local and nonlocal operators at the same time. We show that this version of Harnack's inequality implies regularity estimates for solutions to several integrodifferential operators.
The talk is based on a joint work with B. Dyda.

A3 *Tue. 15.35-15.55 – KHS*

Diffusion processes in thin tubes and their limits on graphs

Seiichiro Kusuoka
Kyoto University

We consider the limit process of diffusion processes running on tubular domains where the thin tubular domains are shrinking to graphs. For shrinking, we use potentials. This means that we are considering Dirichlet boundary conditions for the processes on the boundary of the tubes. We show that there exists a unique limit process of the diffusion processes on tubular domains which, shrink to a given graph and characterize the limit process by a second-order differential generator acting on functions defined on the graph. Kirchhoff boundary conditions at the vertices are obtained for the limit process. This method is also available for diffusion processes reflecting on the boundary of tubes.

A4 *Tue. 16.00-16.20 – KHS*

Reflection coupling and Wasserstein contractivity without convexity

Andreas Eberle
Universität Bonn

By using coupling by reflection, we show that even if convexity of the potential U fails locally, overdamped Langevin diffusions in $\mathbb{R}^d$ are contractions w.r.t. the Kantorovich-Rubinstein-Wasserstein distance based on an appropriately chosen concave distance function equivalent to the Euclidean distance. The choice of the distance function is then optimized to obtain a large exponential decay rate.

The results yield dimension-independent bounds of optimal order in $R, L \in [0,\infty)$ and $\kappa \in (0,\infty)$ if $\nabla^2 U(x)$ is bounded from below by $-L \cdot I_d$ for $|x| < R$ and by $\kappa \cdot I_d$ for $|x| \geq R$.

A5 *Tue. 16.50-17.10 – KHS*

Potential theory of one-dimensional geometric stable processes

Michal Ryznar
Wrocław University of Technology

The purpose of this talk is to present results concerning potential theory of the one-dimensional geometric stable process with parameter $\alpha \in (0,2]$. This process has an infinitesimal generator of the form $\log(1+\Delta^{\frac{\alpha}{2}})$ and is the basic example of the subordinated Brownian motion with the Laplace exponent of the underlying subordinator being slowly varying at ∞. We show the scale invariant Harnack inequality and the boundary Harnack principle. We also provide optimal estimates for the Green functions and the Poisson kernels for intervals, which reflect their size. The potential theory of subordinated Brownian motions is quite well developed for a wide class of subordinators which have the Laplace exponent of regulary varying type with positive order. Thus our results complement the existing theory.

A6 *Tue. 17.15-17.35 – KHS*

B. Jump processes

A fractional derivative on the Wiener space and applications to approximation theory

Stefan Geiss
University of Innsbruck

Given an abstract Wiener space on a probability space (M,Σ,μ) and $Z \in L_2$, we introduce a fractional differential operator $(D_t^\theta Z)_{t\in[0,1)}$ as a martingale defined on an extension of (M,Σ,μ). This martingale is obtained by applying a Riemann-Liouville type operator to the state derivative of the solution of a parabolic PDE related to Z. The operator is justified as the existence of an L_p-closure of $(D_t^\theta Z)_{t\in[0,1)}$ relates one-to-one to an L_p-approximation problem, which is of interest in different applications. Furthermore, the properties of $(D_t^\theta Z)_{t\in[0,1)}$ relative to the Besov spaces on the Wiener space, obtained by the real interpolation method, are studied.

B1 *Mon. 14.40-15.00 – KHS*

The stochastic reaction diffusion equation driven by Lévy noise

Erika Hausenblas
Montanuniversität Leoben

Within the talk I will present my joint work with Brzezniak about the existence of the Stochastic Reaction Diffusion Equation with Lévy noise. In the first part I will present the preliminaries, i.e. stochastic integration in Banach spaces and maximal Inequalities. In the second part, I will outline the existence of a solution due to a SPDE with only continuous coefficients and will explain the proof. Finally I will apply this result to get the existence of the solution to a stochastic Reaction Diffusion Equation driven by Lévy noise.

B2 *Mon. 15.05-15.25 – KHS*

Spectral Theory for symmetric one-dimensional Lévy Processes in domains

Matheusz Kwaśnicki
Polish Academy of Sciences, Warsaw

I will present my recent results, obtained jointly with Kamil Kaleta, Tadeusz Kulczycki, Jacek Małecki and Michał Ryznar, concerning spectral theory for some one-dimensional Lévy processes killed after leaving one of the following domains:
(a) half-line $D = (0,\infty)$;
(b) interval $D = (-a,a)$;
(c) complement of a point $D = \mathbf{R} \setminus \{0\}$.
"Spectral theory" here refers to the study of eigenvalues and eigenfunctions of the transition operators of the killed process, defined by

$$T_t^D f(x) = \mathbf{E}^x \left(f(X_t); t < \tau_D\right)$$

where $\tau_D = \inf\{t \geq 0 : X_t \notin D\}$ is the first exit time.
When D is an interval, $D = (a, a)$, then T_t^D are compact operators, and hence there is an orthonormal basis $\varphi_n \in L^2(D)$ of eigenfunctions, such that $T_t^D \varphi_n = e^{-\lambda_n t}\varphi_n$, where $0 < \lambda_1 < \lambda_2 \leq \lambda_3 \leq \cdots \to \infty$. I will discuss two-term asymptotic formulae for λ_n, simplicity of eigenvalues and shape of the eigenfunctions. For example, for symmetric stable processes (with Lévy-Khintchine exponent $\Psi(\xi) = |\xi|^\alpha, 0 < \alpha \leq 2$) we prove that

$$\lambda_n = \left(\frac{\pi n}{2a} - \frac{(2-\alpha)\pi}{8a}\right)^\alpha + \mathcal{O}\left(\frac{1}{n}\right)$$

Other examples include relativistic processes ($\Psi(\xi) = (m^2+\xi^2)^{\frac{1}{2}} - 1, m > 0$). This case is particularly interesting from the point of view of the relativistic quantum theory.
In the cases (a) and (c), the operators T_t^D are not compact and their spectrum is purely continuous. We find (under some additional hypotheses) a formula for generalized eigenfunctions F_μ ($\mu > 0$), satisfying the relation $T_t^D F_\mu = e^{-t\Psi(\mu)} F_\mu$ (Ψ is again the Lévy-Khintchine exponent of X_t). These functions are not in $L_2(D)$, but nevertheless they yield an integral-type eigenfunction expansion in $L_2(D)$. Our formulae are rather involved, but applicable in numerical computation. As a corollary, we obtain an expression for the kernel of T_t^D, that is, the transition density of the killed process.
For the half-line, we assume that X_t is a subordinate Brownian motion, corresponding to a complete Bernstein function. Our results for $D = (0, \infty)$ can be applied to the detailed study of the supremum functional; this topic will be covered in the talk of Jacek Małecki. When $D = \mathbf{R} \setminus \{0\}$, we can work in a much more general setting. As an application, we obtain a new formula for the distribution of the hitting time of a point.

B3 *Mon. 15.35-15.55 – KHS*

Continuity properties of harmonic functions for jump processes

Ante Mimica
Universität Bielefeld

We consider a particular class of jump processes and use probabilistic techniques which are used to obtain some continuity properties of harmonic functions. As a special case, we consider geometric α-stable process ($0 < \alpha \leq 2$), i.e. a Lévy process in $\mathbb{R}^d$ with the characteristic exponent

$$\Psi(\xi) = \ln(1 + |\xi|^\alpha),\ \xi \in \mathbb{R}^d.$$

B4 *Mon. 16.00-16.20 – KHS*

The coupling of Lévy processes

Jian Wang
Fujian Normal University and TU Dresden

We present recent results on the coupling property of Lévy and Lévy-type jump processes; this talk is focussed on Lévy processes, and it contains three parts:
(1) a criterion of the existence of successful couplings for Lévy processes;
(2) constructions of successful couplings for Lévy processes;
(3) the explicit coupling property of Lévy processes via the symbol (characteristic exponent).
The talk is based on joint papers with B. Böttcher (TU Dresden), R.L. Schilling (TU Dresden) and P. Sztonyk (TU Wrocław).

B5 *Mon. 16.50-17.10 – KHS*

On universal sigma-finite measures for penalisations by multiplicative weights

Kouji Yano
Kobe University

By *penalisation* we mean a limit theorem of the form

$$\frac{\Gamma_t \cdot P_x}{P_x[\Gamma_t]} \xrightarrow[t\to\infty]{} Q_x \text{ along } (\mathcal{F}_s)$$

where $\{(X_t), (\mathcal{F}_t)\}$ is the coordinate process, P_x and Q_x are probability laws of some Markov processes, and (Γ_t) is a suitable non-negative process

called a weight process. We say that $\mu_n \to \mu$ *along* $(\mathcal{F}_s)$ if $\int F_s d\mu_n \to \int F_s d\mu$ for all $s \geq 0$ and all bounded $\mathcal{F}_s-$measurable functional F_s.
Najnudel-Roynette-Yor (2007) has introduced σ-finite measures defined by

$$\mathcal{W}_0 = \int_0^\infty \frac{d\mu}{\sqrt{2\pi u}} \left(P_{0\to 0;u}^{\mathrm{Br.bridge}} \bullet P_0^{3BES} \right)$$

and $\mathcal{W}_x = \mathcal{W}_0 \circ (x+X)^{-1}$ and proved that several Brownian penalisations obtained by Roynette-Vallois-Yor are unified by this measure $\mathcal{W}_x$ in the sense that

$$\frac{\Gamma_\infty \cdot \mathcal{W}_x}{\mathcal{W}_x[\Gamma_\infty]} = Q_x.$$

For stable Lévy penalisations, Yano-Yano-Yor (2009, 2010) and Y. Yano (2010) proved that Kac killing penalisations and supremum ones are unified by different σ-finite measures which are mutually singular.
Our aim is to study when two penalisations are unified by a common σ-finite measure. We give a criterion in terms of the divergence order of the function φ such that $\varphi(X_t)\Gamma_t$ is a P_x-martingale.

B6 *Thu. 17.15-17.35 – KHS*

C. Stochastic partial differential equations

Stochastic partial differential equations via non-time-homogeneous evolution systems

Martin Grothaus
Department of Mathematics, University of Kaiserslautern

An existence and uniqueness result for stochastic partial differential equations via non-time-homogenous evolution systems is presented. The studies are motivated by a non-linear stochastic partial differential algebraic equation arising in industrial mathematics.

C1 *Mon. 9.55-10.15 – KHS*

Rough Burgers-like equations and their approximations

Hendrik Weber
Warwick University

In this talk we discuss stochastic PDEs of the type $du(t,x) = \big(\partial_{xx}u(t,x) + G(u)\partial_x u(t,x)\big)dt + \theta\big(u(t,x)\big)dW(t,x)$, where $u \in \mathbb{R}^n$ is vactor valued, $x \in [0,1]$ is one-dimensional, and dW denotes space-time white noise. Due to the irregular noise term the non-linear term cannot be defined classically. We use a stochastic integration theory to define and construct solutions. This is carried out in the framework of Terry Lyons' rough path theory. Then different approximations are discussed. Depending on the approximation scheme used, different extra terms appear. These can be interpreted as (spatial) Itô-Stratonovich correction.
This is joint work with Martin Hairer and Jan Maas.

C2 *Mon. 10.20-10.40 – KHS*

On diffusion processes taking values in direct product spaces of Bohr compactification of $\mathbb{R}$

Minoru W. Yoshida
Dept. Math. Tokyo City University

The existence of compact topological Abelian group that is an extension of the additive group $\mathbb{R}$ is well known as the Bohr compactification of $\mathbb{R}$. On the compact group, there exists the Haar probability measure, and by making use of this measure, the so called homogenization problems of diffusions are formulated. In short, the properties of homogenization of diffusion processes on $\mathbb{R}^d$ (or more generally on $\mathbb{R}^{\mathbb{Z}}$) are discussed by using the corresponding transformed processes on direct product spaces of the Bohr compactification of $\mathbb{R}$ which are ergodic. In a probabilistic point of view, properties of these corresponding processes are not clear. Here, we explicitly show what are the corresponding processes.

C3 *Mon. 11.10-11.30 – KHS*

Strong uniqueness of diffusions to Gibbs measures on a path space with exponential interactions

Hiroshi Kawabi
Okayama University

In this talk, we discuss L^p -uniqueness of diffusion operators for Gibbs measures with exponential interaction potentials on an infinite volume path space $C(\mathbb{R}, \mathbb{R}^d)$. We also give an SPDE characterization of the corresponding dynamics. In particular, we show existence and uniqueness of a strong solution for the SPDE though the interaction potential is not assumed to be differentiable, hence the drift is possibly discontinuous. If time permits, we discuss some applications (Riesz transforms, functional inequalities) of the uniqueness results.
This talk is based on jointwork with Sergio Albeverio and Michael Rökner.

C4 *Mon. 11.35-11.55 – KHS*

Random attractors for stochastic porous media equations perturbed by space-time linear multiplicative noise

Benjamin Gess
University of Bielefeld

We prove the unique existence of solutions to rough porous media equations (RPME) and rough fast diffusion equations (RFDE) driven by general continuous linear multiplicative space-time rough signals for initial data in $L^1(\mathcal{O})$. The solutions are shown to satisfy a comparison theorem and uniform L^∞ bounds and uniform space-time continuity for solutions to RPME is obtained. Based on this, the generation of a random dynamical system (RDS) on $L^1(\mathcal{O})$ for stochastic porous media (SPME) and stochastic fast diffusion equations (SFDE) perturbed by linear multiplicative space-time noise is proven. General noise including fractional Brownian Motion (fBM) for all Hurst parameters is treated. For SPME the existence of a "small" random attractor is shown.

C5 *Mon. 12.05-12.25 – KHS*

BSDE and generalized Dirichlet forms

Rongchan Zhu
Beijing University / University of Bielefeld

We consider the following quasi-linear parabolic system of backward partial differential equations

$$(\partial_t+L)u+f(\cdot,\cdot,u,\nabla u\sigma) = 0 \text{ on } [0,T]\times\mathbb{R}^d \quad u_T = \phi,$$

where L is a second order differential operator with measurable coefficients. We solve this system in the framework of generalized Dirichlet forms and employ the stochastic calculus associated to the Markov process with generator L to obtain a probabilistic representation of the solution u by solving the corresponding BSDE. The solution satisfies the mild equation which is equivalent to the generalized solution of the PDE. We generalize the martingale representation theorem using the stochastic calculus associated to the generalized Dirichlet form. The nonlinear term f satisfies a monotonicity condition with respect to u and a Lipschitz condition with respect to ∇u.

C6 *Mon. 12.30-12.50 – KHS*

D. Stochastic analysis and geometry

Stochastic processes on Lorentzian manifolds: construction and applications

Fabrice Debbasch
UPMC, LERMA

Stochastic processes on Lorentzian manifolds have been introduced by Dudley in 1965. The first physically realistic Lorentzian process was proposed in 1997 by Debbasch, Mallick and Rivet. Since then, the field has been developing quickly at the interface between the physics and mathematics communities. I will review the basic ideas underlying the construction of Lorentzian processes and compare all the existing processes with each other. Applications to both relativistic and non relativistic physics will be discussed as well. The spirit of the talk will respect the interdisciplinary aspect of the field.

D1 *Tue. 9.55-10.15 – KHS*

SDE with non-smooth coefficients

Xue-Mei Li
University of Warwick

We investigate stochastic differential equations with non-coefficients. The driving vector fields (coefficients) are assumed to belong to some Sobolev classes. We show in this case there is a solution to the linearised SDE driven by the weak derivatives of the vector fields. We will need to make sense of the concept of a solution and show that the derivative flows of the approximating SDEs converge to this solution. As by product we obtain results on the existence of stochastic flows. Bismut type formulae and integration by parts formulae for diffusion measures determined by the solution follow naturally. The growth conditions on the weak derivatives are comparable to the best possible for SDEs with non-smooth coefficients, as in Strong p-completeness of stochastic differential equations and the existence of smooth flows on non-compact manifolds, Probab. Theory Relat. Fields, 100, 4, 485-511.

D2 *Tue. 10.20-10.40 – KHS*

The master field on the plane

Thierry Lévy
Université de Genève

Gauge theories are physical theories of elementary particles and their interactions in which the dynamical variables include a connection on a principal bundle over space-time. This connection is called the gauge field and it carries the interaction, whose physical nature is reflected in the choice of the structure group of the bundle. For example, in electromagnetism, the structure group is $U(1)$ and the gauge field is the electromagnetic field. In the standard model, the structure group is $U(1) \times SU(2) \times SU(3)$ and the gauge field represents a mixture of photons, of W and Z bosons which carry the weak interaction, and of gluons which carry the strong interaction.

As long as the presence of matter is ignored, the mathematical core of a gauge theory is a probability measure on the space of connections on a principal bundle. Constructing this measure is notoriously difficult, except when the space-time is taken to be two-dimensional, in which case some simplifications occur and several constructions have been given. These mathematical constructions allow any structure group to be chosen, without any pretention to physical significance. A typical choice is the unitary group $U(N)$, for arbitrary N. In the 1960's, 't Hooft discovered that the large N asymptotics of $U(N)$ gauge theories were unexpectedly simple and meaningful. The large N limit of the Yang-Mills theory on the plane was later informally but more mathematically described by Singer, who pointed out the relation between this limit, which is called the master field, and free probability theory.
We will discuss the large N limit of the Yang-Mills theory on the plane as a free unitary stochastic process indexed by loops traced on the plane. We shall describe how this process arises from the usual $U(N)$ Yang-Mills theory and explain how it is possible to perform concrete computations with it. We shall in particular derive in this context the so-called Makeenko-Migdal equations, also called Kazakov-Kostov equations, loop equations, or Schwinger-Dyson equations. These equations allow one to recursively compute the trace of the free process on a loop by successively resolving the self-intersections of the loop and ultimately reducing the problem to a collection of simple loops with disjoint interiors.

D3 *Tue. 11.10-11.30 – KHS*

Curvature dimension inequalities for subelliptic diffusion operators

Fabrice Baudoin
Purdue University

Let M be a smooth connected manifold endowed with a smooth measure μ and a smooth locally subelliptic diffusion operator L and which is symmetric with respect to μ. Associated with L one has *le carré du champ* Γ and a canonical distance d, with respect to which we suppose that (M, d) be complete. We assume that M is also equipped with another first-order differential bilinear form

Γ^Z. With these forms we introduce a generalization of the curvature-dimension inequality from Riemannian geometry. In our main results we prove that, using solely this curvature dimension inequality, one can develop a theory which parallels the celebrated works of Yau, and Li-Yau on complete manifolds with Ricci bounded from below. We also obtain an analogue of the Bonnet-Myers theorem. In order to prove the relevance of the generalized curvature dimension inequality, we construct large classes of sub-Riemannian manifolds with transverse symmetries which satisfy the generalized curvature-dimension inequality. Such classes include all Sasakian manifolds whose horizontal Webster-Tanaka-Ricci curvature is bounded from below, all Carnot groups with step two, and wide subclasses of principal bundles over Riemannian manifolds whose Ricci curvature is bounded from below.

D4 *Tue. 11.35-11.55 – KHS*

Perelman's W-entropy for the Witten Laplacian and the Fokker-Planck equation on Riemannian manifolds

Xiangdong Li
Chinese Academy of Sciences

In 2002, G. Perelman introduced the mysterious W-entropy functional for the conjugate heat equation associated with Ricci flow and proved its monotonicity on closed Riemannian manifolds. In this talk, we will present an entropy formula for the W-functional along the heat equation of the Witten-Laplacian, from which we derive a monotonicity and a rigidity theorem of the W- entropy for the Witten-Laplacian on complete Riemannian manifolds with non-negative Bakry-Emery Ricci curvature. Moreover, we will establish similar results for the Fokker-Planck equation on complete Riemannian manifolds.

D5 *Tue. 12.05-12.25 – KHS*

Relativistic processes: where we are and what is ahaid of us

Ismael Bailleul
Cambridge University

Relativistic processes are models of random motion of particles in spacetime. The properties of these processes in physically interesting models of spacetimes remain largely mysterious. Yet, their intrinsic nature means that their properties are caracteristic of a spacetime, together with some associated physical elds in some cases. The task of understanding these processes presents a new challenge to stochastic analysis and oers the possibility to raise new questions and to introduce new techniques to the study of Lorentzian manifolds. Following some seminal work of in the mid-nineties, the physics community is getting more and more involved in understanding the role of these relativistic Brownian motions. The close relationship between these processes and the relativistic Boltzmann equation make them model tools to investigate irreversibility phenomena linked with the relativistic statistical mechanics and kinetic theory. The appearance of one of these processes in the context of some discrete quantum spacetime theory also relates these processes with the quantum world. This talk will provide an overview of the subject emphasizing open questions and potentially rich research directions.

D6 *Tue. 12.30-12.50 – KHS*

E. Optimal transport and allocation problems

Ergodic properties of stochastic curve shortening flows in the plane

Max von Renesse
TU Berlin

Stochastic motion by mean curvature is a famous but essentially unsolved SPDE problem arising as a model for a phase separation dynamics subject to random forcing. The most general cases lead to fully nonlinear SPDE which cannot be solved by standard methods. In this talk we study two particular cases in the 1+1 dimensions where a modification of of the variational method of Pardoux-Krylov-Rozovski yields well posedness of the models. We also derive qualitative and quantitative statements on ergodicity and polynomial convergence towards equilibrium.

E1 *Wed. 9.55-10.15 – KHS*

Gradient flows of the entropy for finite Markov chains

Jan Maas
University of Bonn

At the end of the 1990s, Jordan, Kinderlehrer, and Otto discovered a new interpretation of the heat equation in $\mathbb{R}^n$, as the gradient flow of the entropy in the Wasserstein space of probability measures. In this talk, I will present a discrete counterpart to this result: given a reversible Markov kernel on a finite set, there exists a Riemannian metric on the space of probability measures, for which the law of the continuous time Markov chain evolves as the gradient flow of the entropy.

E2 *Wed. 10.20-10.40 – KHS*

Optimal transport maps on spaces with Ricci curvature bounded below

Nicola Gigli
Université de Nice

I will show how a slight strengthening of the definition of Ricci bound on metric measure spaces leads to existence of optimal maps. Applications in term of stability of this new notion and of the role of the non branching assumption will also be discussed.

E3 *Wed. 11.10-11.30 – KHS*

Comparison theorems in 3D contact subriemannian manifolds

Paul Lee
University of California, Berkeley

We will discuss a definition of generalized Ricci curvature bound on three dimensional contact subriemannian manifolds and some of its consequences. This includes a sharp Bishop comparison theorem and a Laplacian comparison theorem. This is a joint work with A. Agrachev.

E4 *Wed. 11.35-11.55 – KHS*

Optimal transport between random measures

Martin Huesmann
Universität Bonn

We study couplings of two invariant random measures λ and μ on some manifold M. If $\lambda \ll vol_M$ we show existence and uniqueness of an "optimal" coupling between these two whenever the "asymptotic transportation cost" is finite. Moreover, we give explicit constructions for these couplings. The couplings are stable under weak convergence. In the case of λ the d-dimensional Lebesgue measure, μ a Poisson point process, $M = \mathbb{R}^d$ and cost function the squared distance, the coupling constitutes a random mosaic of convex polyhedra (Laguerre tessellation) each of which has Lebesgue measure one.

E5 *Fri. 9.00-9.20 – KHS*

A Poisson allocation of optimal tail

Adam Timar
University of Vienna

Consider the Poisson point process in Euclidean space. We are interested in functions on this random point set whose value in each configuration point is given by some "local" rule (no "central planning"). One example is the so-called allocation problem, where we want to partition the space to sets of measure 1 and match them with the point process, in a translation equivariant way. We want to make the allocated set optimal in some sense (e.g., the distribution of the diameter shows fast decay). Our construction with R. Marko is an allocation scheme with an optimal tail for dimension at least 3.

E6 *Fri. 09.25-09.45 – KHS*

F. Functional analysis

Free functional inequalities on the circle

Ionel Popescu
IMAR and Gatech

We investigate the Log-Sobolev, transportation and Poincare inequalities on the circle that appear naturally as limits of the classical inequalities applied to large unitary random matrices. We however treat them from an independent point of view using mass transportations on one hand and on the other hand operator theoretical tools.

F1 *Fri. 9.55-10.15 – KHS*

Log-Sobolev inequality for Kawasaki dynamics with superquadratic single-site potential

Georg Menz
MPI Leipzig

In this talk about a joint work with Felix Otto, we consider a non-interacting unbounded spin system with conservation of the mean spin. We derive a uniform log-Sobolev inequality (LSI) provided the single-site potential is a bounded perturbation of a strictly convex function. The scaling of the LSI constant is optimal in the system size. The argument adapts the two-scale approach of Grunewald, Otto, Westdickenberg, and Villani from the quadratic to the general case. Using an asymmetric Brascamp-Lieb type inequality for covariances we reduce the task of deriving a uniform LSI to the convexification of the coarse-grained Hamiltonian, which follows from a general local Cramèr theorem.

F2 *Fri. 10.20-10.40 – KHS*

The rectified cost function in mass transportation

Aldo Pratelli
Universita di Pavia

In mass transportation duality plays an important role, and it is well known that the equality between the infimum of the primary problem and the supremum of the dual one holds under mild conditions, for instance when the cost is l.s.c., or when it is almost surely finitely valued. However, it is easy to observe with simple examples that the equality does not always hold true.
In this talk we will show that it is possible to modify every cost function into a "rectified" one, in such a way that the equality between primal and dual problem becomes true. Moreover, existence of optimal transport plans with this rectified cost function always holds true. We will present the costruction of this new cost, and we will discuss its meaning, which is basically a suitable variant of the standard relaxation in Calculus of Variations, even though the standard l.s.c. relaxation does not work.
(Joint work with Mathias Beiglboeck.)

F3 *Fri. 11.10-11.30 – KHS*

Convexity in the Wasserstein space over R^d

Nicolas Juillet
Université de Strasbourg

After Gigli the probability measures of an Euclidean space can be classified into regular and singular measures. For instance a.c. measures are regular because they behave well with respect to the quadratic Monge problem. The regular measures are also the regular points of the Wasserstein space, seen as a positively curved space. We address the question of displacement convexity of the set of regular measures. Suprisingly this set is not convex. We will construct a counterexample in the talk.

F4 *Fri. 11.35-11.55 – KHS*

Spectral gap estimate for fractional Schrödinger operator in the interval

Kamil Kaleta
Wrocław University of Technology

We study the difference $\lambda_2 - \lambda_1$ between first two eigenvalues of the fractional Schrödinger operator $(-\Delta)^{\frac{\alpha}{2}} + V$ with symmetric differentiable single-well potential V in the interval (a, b), $\alpha \in (0, 2)$. For $\alpha \in (1, 2)$ we show the estimate $\lambda_2 - \lambda_1 \geq C_\alpha(b-a)^{-\alpha}$, where the constant C_α is independent of the potential V. In general case of $\alpha \in (0, 2)$, we also find uniform lower bound for the difference $\lambda_* - \lambda_1$, where λ_* denotes the smallest eigenvalue related to the antisymmetric eigenfunction φ_* . We discuss some properties of the corresponding ground state eigenfunction φ_1 . In particular, we show that it is symmetric and unimodal in the interval (a, b).

F5 *Fri. 12.05-12.25 – KHS*

Maximal L^p-regularity for stochastic evolution equations

Jan van Neerven
TU Delft

We prove maximal L^p-regularity for the stochastic evolution equation

$$dU(t)+AU(t)\,dt = F(t, U(t))\,dt+B(t, U(t))\,dW_H(t)$$

under the assumption that the operator A admits a bounded H^∞-calculus of angle less than $\frac{1}{2}\pi$ on a space $L^q(\mathcal{O}, \mu)$. The driving process W_H is a cylindrical Brownian motion in an abstract Hilbert space H. As an application, we prove the existence of a unique strong local solution with values in $(H^{1,q}(\mathcal{O})^d$ for the Navier-Stokes equation on a smooth bounded domain $\mathcal{O} \subseteq \mathbb{R}^d$ with $d \geq 2$.
This is joint work with Mark Veraar and Lutz Weis.

F6 *Fri. 12.30-12.50 – KHS*

G. Random media, percolation clusters and fractals

Invariance principle for the random conductance model

Sebastian Andres
University of British Columbia

In this talk a quenched invariance principle for the random conductance model is presented. More precisely, we consider a continuous time random walk X in an environment of i.i.d. random conductances $\mu_e \in [0, \infty)$ in $\mathbb{Z}^d$. We assume that $\mathbb{P}(\mu_e > 0) > p_c$, so that the bonds with strictly positive conductances percolate. In recent years quenched invariance principles have been proven for X under various assumptions on the law of the μ_e , while we present here the result for general i.i.d. environments. In the last part of the talk, we will also discuss an extension to time-dependent environments.
This is joint work with Martin Barlow, Jean-Dominique Deuschel and Ben Hambly.

G1 *Thu. 14.40-15.00 – KHS*

Critical behaviour of the vacant set of random walk on random graphs

Černý, Jiří
ETH Zürich

The vacant set is the set of vertices not visited by a random walk on a finite graph before a given time. In the talk, I will discuss properties of this random subset of the graph, the phase transition conjectured in its connectivity properties, and its relations to the random interlacement percolation. In the case where the graph is chosen uniformlyat random from the set of all regular graphs with fixed number of vertices, I will show that this phase transition occurs and will describe the behaviour of the vacant set in the vicinity of the critical point.
This talk is based on joint works with Augusto Teixeira and David Windisch.

G2 *Thu. 15.05-15.25 – KHS*

Diffusive limits on the Penrose tiling

András Telcs
Budapest University of Technology and Economics

The Penrose tiling is an unfailing source of beautiful properties and phenomena to be explored. Domokos Szász formulated the conjecture that the simple nearest neighbor random walk on Penrose tiling, satisfies the invariance principle. The lecture gives some insight into the beauty of the construction of the Penrose tiling and the proof of the conjecture.

G3 *Thu. 15.35-15.55 – KHS*

A large deviation principle for a stochastic wave equation

Marta Sanz-Solé
University of Barcelona

Using the variational approach from Dupuis and Ellis, we prove a large deviation principle in Hölder norm for a stochastic wave equation in spatial dimension three. The noise of the equation is Gaussian, white in time and with a stationary spatial covariance given by a Riesz kernel. The free terms of the equation are nonlinear with Lipschitz continuous coefficients.

G4 *Thu. 16.00-16.20 – KHS*

On-diagonal oscillation of the heat kernels on p.c.f. self-similar fractals

Naotaka Kajino
Universität Bielefeld

It is a general belief that the heat kernels on fractals should exhibit highly oscillatory behaviors as opposed to the classical case of Riemannian manifolds. For example, on the Sierpinski gasket, the canonical *"Brownian motion"* has been constructed by Goldstein and Kusuoka, and Barlow and Perkins have proved that its transition density (heat kernel) $p_t(x,y)$ is subject to the sub-Gaussian bound

$$c_1 t^{-d_s/2} \exp\left(-\left(\frac{\rho(x,y)^{d_w}}{c_1 t}\right)^{\frac{1}{d_w-1}}\right) \le p_t(x,y)$$
$$\le c_2 t^{-d_s/2} \exp\left(-\left(\frac{\rho(x,y)^{d_w}}{c_2 t}\right)^{\frac{1}{d_w-1}}\right)$$

for $t \in (0,1]$; here ρ is a suitably defined geodesic metric on the Sierpinski gasket, $c_1, c_2 \in (0,\infty)$ are some constants, and $d_s := \log_5 3$ and $d_w := \log_2 5 > 2$ are called the *spectral dimension* and the *walk dimension* of the gasket, respectively. In particular, for any point x of the gasket we have

$$c_1 \le t^{d_s/2} p_t(x,x) \le c_2, \qquad t \in (0,1].$$

Then it is natural to ask whether the limit

$$\lim_{t\downarrow 0} t^{d_s/2} p_t(x,x)$$

exists or not. Barlow and Perkins conjectured that this limit does NOT exist, but this problem has been open since then. Of course we can consider the same problem also for (affine) nested fractals, a class of finitely ramified fractals where the "Brownian motion" has been constructed. In this talk, we will present partial affirmative answers to this conjecture. First, for a general (affine) nested fractal, the non-existence of the limit $\lim_{t\downarrow 0} t^{d_s/2}$ $p_t(x,x)$ is shown to be true for a "generic" (in particular, almost every) point x. Secondly, the same is shown to be valid for ANY point x of the fractal in the particular cases of the d-dimensional standard Sierpinski gasket with $d \ge 2$ and of the N-polygasket with $N \ge 3$ odd, e.g. the pentagasket ($N = 5$) and the heptagasket ($N = 7$).

G5 *Thu. 16.50-17.10 – KHS*

On the law of the occupation time for Brownian motion on the Sierpinski gasket

Yuko Yano
Kyoto University

Let us consider a Brownian motion $B = ((B_t)_{t\ge 0}, (\mathbb{P}_x)_{x\in G})$ on the 2-dimensional unbounded Sierpinski gasket $G = G_+ \cup G_-$ with $G_+ \cap G_- = \{0\}$ and its occupation time $A_+(t)$ on G_+ up to time t, i.e., $A_+(t) = \int_0^1 \mathbf{1}_{G_+}(B_s)ds$. Our aim is to study the asymptotic behavior of the density (if it exists) of the law of $A_+(t)$.
Our results are as follows: The density of the law exists, i.e., for every $t > 0$, there exists a continuous function $f_t(x)$ such that $\mathbb{P}_0(A_+(t)/t \in dx) = f_t(x)dx$, and the order of divergence of $f_t(x)$ as $x \to 0+$ is determined by the spectral dimension $d_s = 2\log 3/\log 5$:

$$f_t(x) \asymp x^{-d_s/2} \quad \text{as} \quad x \to 0+$$

These results are proved by applying Watanabe-Yano-Yanos results.
This presentation is based on the joint work with Naotaka Kajino, Takashi Kumagai, Mateusz Kwaśnicki and Shinzo Watanabe.

G6 *Thu. 17.15-17.35 – KHS*

H. Stochastic models in physics and biology

Infinite system of Brownian balls with Brownian radii

Sylvie Roelly
Universität Potsdam

We are interested in an infinite system of interacting non overlapping Brownian balls whose radii undergo Brownian fluctuations. The dynamics is given by an infinite dimensional Reflected Stochastic Differential Equation involving local times which represent the constraints satisfied by the process at each time (e.g. positivity of the radii, non overlapping of the balls).
We study existence, uniqueness of strong solutions, and some property like time reversibility.

H1 *Thu. 9.55-10.15 – KHS*

Random partitions in statistical mechanics

Sabine Jansen
WIAS

Partitions play a role in various combinatorial and probabilistic problems and appear in numerous applications: biology (Ewens sampling formula), quantum many-body theory (cycle lengths in a Bose gas), statistical physics (geometric approaches to phase transitions) and physical chemistry (coagulation-fragmentation models), to cite only a few.
This talk presents results on the large n-asymptotics in a model of random partitions with multiplicative weights, with n the integer that is partitioned. One of the motivations comes from the study of cluster sizes in the canonical ensemble in classical statistical mechanics; in this context there is a relationship with dynamic nucleation models. Depending on parameter values, there are either only small cluster sizes, or there is a finite amount of mass on large cluster sizes. In the second scenario, we investigate in detail the distribution of cluster sizes that grow with n. The proofs combine techniques from probability and analytic combinatorics. The talk is based on joint work with Nicholas Ercolani and Daniel Ueltschi.

H2 *Thu. 10.20-10.40 – KHS*

Aldous' move on cladograms in the diffusion limit

Anita Winter
University Duisburg-Essen

A *n-phylogenetic tree* is a semi-labeled, unrooted and binary tree with n *leaves* labeled $\{1, 2, \dots, n\}$ and with $n-2$ unlabeled internal leaves and positive edge lengths representing the time spans between common ancestors. In biological systematics *n-phylogenetic trees* are used to represent the evolutionary relationship between n species. If one does focus only on the kinship (that is taking all edge length of unit length), a more precise term is *cladogram.* Aldous constructed a Markov chain on cladograms and gave bounds on their mixing time. On the other hand, Aldous also gave a notion of convergence of cladograms which shows that the uniform cladogram with N leaves and edge length re-scaled by a factor of $\frac{1}{\sqrt{N}}$ converges to the so-called Brownian continuum random tree (CRT) which is the tree "below" a standard Brownian excursion and can be thought of as the "uniform" tree. These two results suggest that if we re-scale edge lengths by a factor of $\frac{1}{\sqrt{N}}$ and speeding up time by a factor of $N^{\frac{3}{2}}$ the Aldous move on cladograms converges in some sense to a continuous tree-valued diffusion.
The main emphasis of the talk is to give precise statements towards that direction.
(This is joint work with Leonid Mytnik, Technion Haifa)

H3 *Thu. 11.10-11.30 – KHS*

On the limit distributions of continuous-state branching processes with immigration

Martin Keller-Ressel
TU Berlin

We consider the class of continuous-state branching processes with immigration (CBI-processes), introduced by Kawazu and Watanabe [1971], and give a characterisation for the convergence of a CBI-process to a limit distribution L, which also turns out to be the stationary distribution of the CBI-process, as time tends to infinity. We give an explicit description of the Lévy-Khintchine triplet of L in terms of the characteristic triplets of the Lévy subordinator and the spectrally positive Lévy process, which arise in the definition of the CBI-process and determine it uniquely. We show that the Lévy density of L is given by the generator of the Lévy subordinator applied to the scale function of the spectrally positive Lévy process. This formula allows us to describe the support of L and characterise the absolute continuity and the asymptotic behavior of the density of L at the boundary of the support. Finally we show that the class of limit distributions of CBI-processes is strictly larger (resp. smaller) than the class of self-decomposable (resp. infinitely divisible) distributions. Our results generalize several known results on Ornstein-Uhlenbeck-type processes and self-decomposable distributions.
This is joint work with Aleksandar Mijatovic, University of Warwick.

H4 *Thu. 11.35-11.55 – KHS*

Hierarchically interacting Λ-Cannings processes

Sandra Kliem
University Duisburg-Essen

We consider interacting populations on the hierarchical group of order N. The dynamics of the interacting populations involve migration between sites of blocks of varying sizes k and resampling inside blocks of varying sizes k. Migration is modeled via a random walk kernel on each block level. The resampling is modeled via so-called interacting Lambda-Cannings processes that arise as the continuum-mass limits of Cannings models and are dual to Lambda-coalescents. In one reproductive step an ancestor is chosen from the current population of the block and creates a positive fraction of children in the block.
The focus of this talk is to introduce the ideas and models involved, including the construction of a dual to the interacting Lambda-Cannings process, the spatial Lambda-Coalescent with block coalescence.
This is joint work with Andreas Greven, Frank den Hollander and Anton Klimovsky.

H5 *Thu. 12.05-12.25 – KHS*

Renormalisation of hierarchically interacting Λ-Cannings processes in the mean-field limit

Anton Klimovsky
Eindhoven University of Technology

We employ a renormalisation analysis to study the *universal patterns* that emerge in a class of dynamical stochastic models for genetics of spatially extended populations. These models, called *hierarchically interacting* C^Λ*-processes*, take into account the effects of migration between the spatially structured colonies of individuals, local resampling within the colonies (reproduction under constrained amount of resources), and occasional global resampling (extinction-colonisation events that abruptly affect the whole patches of the geographical space).
On a given space-time scale, in the hierarchical mean-field limit, the *spatial averages* of the hierarchically interacting C^Λ-process converge to a certain non-spatial process. This limiting process turns out to be the superposition of (a) the *Fleming-Viot diffusion* with the constant (but scale-dependent) volatility and the scale-dependent im-/e-migration *linear drift*, and (b) the scale-dependent (non-spatial) *single-colony* C^Λ*-process*. Interestingly, the volatility constants can be expressed as the (inhomogeneous) iterates of the *Möbius transformation* with scale-dependent parameters given by the migration and resampling rates of the hierarchically interacting C^Λ-process. By analysing the limiting behaviour of the volatility constant, we show that the ergodic behaviour of the process is *dichotomous*: in the long run, the hierarchically interacting process displays either (1) *local coexis-*

tence of several allelic types within colonies, or (2) *clustering* emergence of mono-type colonies. The dichotomy shows more subtle sensitivity to the parameters of the model than just transience/recurrence of the migration mechanism. In particular, we show that clustering is amplified by the global resampling. Coexistence occurs only for transient migration and weak enough global resampling. The crossover between weak and strong resampling mechanisms is also identified.
(Joint work with A. Greven, F. den Hollander, and S. Kliem)

H6 *Thu. 12.30-12.50 – KHS*

5.3 Contributed Lectures

a.

On gaugeability for generalized Feynman-Kac functionals and its applications

Kazuhiro Kuwae
Kumamoto University

I will talk on the analytic characterization of the gaugeability for generalized Feynman-Kac functionals including continuous additive functionals of zero energy and non-local additive functionals in the framework of transient irreducible symmetric Markov processes with strong Feller property and a Green-tightness condition. Moreover, under some conditions, we show that the subcriticality of the generalized Feynman-Kac functional is equivalent to the gaugeability. As an application, for symmetric alpha-stable processes, this analytic characterization is equivalent to the ultracontractivity of the generalized Feynman-Kac semigroup without using the notion of measures of finite energy, which is a generalization of the work by M. Takeda.
This is a joint work with Daehong Kim.

a1 *Mon. 9.55-10.10 – TP*

On drift-type perturbation for stable processes

Peng Jin
Wuppertal University

In this talk we consider the drift-type perturbation for stable processes. Under some appropriate integrability condition on the drift we will prove that the corresponding martingale problem is well-posed.

a2 *Mon. 10.10-10.25 – TP*

Fractional Laplacian on power functions

Bartlomiej Dyda
Universität Bielefeld

We will show how to obtain formulae for fractional Laplacian of functions of the form $u(x) = (1 - |x|^2)_+^p$, $x \in \mathbb{R}^d$ and $v(x) = x_d u(x)$. We will also show how these formulae may be applied to estimate eigenvalues of the fractional Laplacian in the ball.

a3 *Mon. 10.25-10.40 – TP*

Recurrence and transience property for a class of Markov chains

Nikola Sandrić
University of Zagreb

Let (S_n) be a random walk in $\mathbb{R}^d$, $d \geq 1$. We say that (S_n) is recurrent if

$$P\left(\liminf_{n\to\infty} |S_n| = 0\right) = 1,$$

and (S_n) is transient if

$$P\left(\lim_{n\to\infty} |S_n| = \infty\right) = 1.$$

It is well known that every random walk is either recurrent or transient. In the class of α-stable random walks in $\mathbb{R}$, a symmetric α-stable random walk is recurrent if and only if $\alpha \geq 1$. We consider the recurrence and transience problem for the time homogeneous Markov chain on real line with transition densities asymptotically equivalent to the densities of stable distributions. The index of stability depends on the state of the chain and is given by the function $\alpha : \mathbb{R} \to (0, 2)$. The chain jumps from the state x with the $\alpha(x)$-stable-like law. We prove that when $\liminf_{|x|\to\infty} \alpha(x) > 1$, then the chain is recurrent, while when $\limsup_{|x|\to\infty} \alpha(x) < 1$, then the chain is transient. As a special case of these results we give a new proof for the recurrence and transience property of a symmetric α-stable random walk on $\mathbb{R}$ with index of stability $\alpha \in (0, 1) \cup (1, 2)$.

a4 *Mon. 11.10-11.25 – TP*

Estimates of transition densities and their derivatives for jump Lévy processes

PAWEL SZTONYK
Wrocław University of Technology

We investigate a class of jump Lévy processes and obtain off-diagonal estimates of their transition densities from above and from below. The estimates depends on specific assumptions on the Lévy measure and the symbol of the process. We obtain similar results also for derivatives of the densities.

a5 *Mon. 11.25-11.40 – TP*

Suprema of Lévy processes

JACEK MAŁECKI
Wrocław University

We study the supremum functional $M_t = \sup_{0\leq s\leq t} X_s$, where $X_t, t \geq 0$, is a one-dimensional Lévy process. Under very mild assumptions we provide a simple uniform estimate of the cumulative distribution function of M_t. In the symmetric case we find an integral representation of the Laplace transform of the distribution of M_t if the Lévy-Khintchin exponent of the process increases on $(0,\infty)$. If the process X_t is a subordinated Brownian motion and the Laplace exponent of the underlying subordinator is a complete Bernstein function, satisfying certain conditions, we are able to find integral formulas for $P(M_t < x)$, as well as of its derivatives in t. Applying these integral formulas we examine the asymptotic behaviour of $P(M_t < x)$ and its t-derivatives, either if $t \to \infty$ or $x \to 0^-$.
Joint work with Mateusz Kwaśnicki and Michaa Ryznar.

a6 *Mon. 11.40-11.55 – TP*

On stochastic completeness of symmetric jump processes

XUEPING HUANG
Universität Bielefeld

We discuss a volume growth type criterion for stochastic completeness of symmetric jump processes on metric measure spaces: if the volume of the metric balls grows at most exponentially with radius and if the distance function is adapted in a certain sense to the jump kernel then the process is stochastically complete. This general result can be applied to stochastic completeness of continuous time random walks on a graph with a counting measure: if the volume growth of the graph with respect to the graph distance is at most cubic then the random walk is stochastically complete.
This talk is based on joint work with Grigor'yan and Masamune.

a7 *Mon. 12.05-12.20 – TP*

On pathwise uniform approximation of processes with càdlàg trajectories by processes with minimal total variation

RAFAL ŁOCHOWSKI
Warsaw School of Economics

For a given stochastic process $(X_t)_{t\geq 0}$ with càdlàg trajectories and for $c > 0$ we define its truncated variation process as

$$TV^c(X,t) := \sup_n \sup_{0\leq t_0<t_1<\cdots<t_n\leq t} \sum_{i=0}^{n-1} \max\left\{\left|X_{t_{i+1}} - X_{t_i}\right| - c, 0\right\}.$$

Moreover, we define its upward and downward truncated variation processes as

$$UTV^c(X,t) := \sup_n \sup_{0\leq t_0<t_1<\cdots<t_n\leq t} \sum_{i=0}^{n-1} \max\left\{X_{t_{i+1}} - X_{t_i} - c, 0\right\},$$

$$DTV^c(X,t) := \sup_n \sup_{0\leq t_0<t_1<\cdots<t_n\leq t} \sum_{i=0}^{n-1} \max\left\{X_{t_i} - X_{t_{i+1}} - c, 0\right\}.$$

We prove that the process defined as

$$X_t^c = UTV^c(X,t) - DTV^c(X,t)$$

is the process with minimal total variation possible on any interval $[0;t]\,, t > 0$ among all processes $\tilde{X}$ such that

$$\left\|X - \tilde{X}\right\|_{osc,[0;t]} := \sup_{s,u\in[0;t]} \left|\{X_s - X_u\} - \left\{\bar{X}_s - \bar{X}_u\right\}\right| \leq c.$$

Moreover, the total variation of X^c on the intervall $[0;t]\,, t > 0$, reads as

$$TV^c(X,t) := \sup_n \sup_{0\le t_0<t_1<\cdots<t_n\le t} \sum_{i=0}^{n-1} \left| X^c_{t_{i+1}} - X^c_{t_i} \right|$$

and is finite for any càdlàg process X.
We apply truncated variation to any semimartingale process X and obtain that for any other semimartingale Y,

$$\int_0^T Y_- dX^c \to \int_0^T Y_- dX + [X^{cont}, Y^{cont}]_T$$

where the integral $\int_0^T Y_- dX^c$ is a pathwise Riemann-Stieltjes integral and the convergence holds in probability.
We apply these results also to $X_t = \mu t + B_t$ being a Brownian motion with drift μ and covariance function $\mathrm{cov}(X_t, X_s) = t \wedge s$, and obtain that "vertical" length of any random function f such that $\|X - f\|_{\infty,[0;t]} \le \epsilon$ is bounded from below by

$$\tfrac{t}{2\epsilon} + \sqrt{\tfrac{t}{3}} R + r,$$

where R is a random variable with standard normal distribution $\mathcal{N}(0;1)$ and r is some residual random variable such that $r \to 0$ in law as $\epsilon \to 0$.

a8 *Mon. 12.20-12.35 – TP*

Density of solutions to stochastic differential equations driven by gamma processes

Atsushi Takeuchi
Osaka City University

Gamma processes are one-sided pure-jump Lévy processes in $[0, +\infty)$, and its marginal density of the process is given in closed form. Making use of the Girsanov transform for gamma processes enables us to obtain the integration by parts formula. In this talk, we shall focus on stochastic differential equations driven by gamma processes, whose coefficients of the noise terms satisfy uniformly elliptic conditions. Our goals are to study the sensitivity and the error estimate on the density for the solution process. The results are based upon the representation of the density via the Riesz transform.

a9 *Mon. 12.35-12.50 – TP*

---

b.

The stochastic reflection problem on an infinite dimensional convex set and BV functions in a Gelfand triple

Xiangchan Zhu
University of Bielefeld

In this paper, we introduce a definition of BV functions in a Gelfand triple which is an extension of the definition of BV functions by using Dirichlet form theory. By this definition, we can consider the stochastic reflection problem associated with a self-adjoint operator A and a cylindrical Wiener process on a convex set Γ in a Hilbert space H. We prove the existence and uniqueness of a strong solution of this problem when Γ is a regular convex set. The result is also extended to the non-symmetric case. Finally, we extend our results to the case when $\Gamma = K_\alpha$, where $K_\alpha = \{f \in L^2(0,1) | f \ge -\alpha\}, \alpha \ge 0$.

b1 *Mon. 14.40-14.55 – TP*

Approximation of SPDEs driven by Lévy noise

Thomas Dunst
Universität Tübingen

We consider parabolic stochastic partial differential equations driven by space-time Lévy noise. Different discretization methods to accurately simulate jumps are proposed and analyzed in the context of an implicit time discretization. Computational studies based on a finite element discretization are provided to illustrate combined truncation and time-discretization effects.
This talk is based on a joint work with E. Hausenblas and A. Prohl.

b2 *Mon. 14.55-15.10 – TP*

Stochastic Burgers PDEs with random coefficients and a generalization of the Cole-Hopf transformation

Nikolaos Englezos
University of Piraeus

Burgers equation is a quasilinear partial differential equation, proposed in 1930's to model the evolution of turbulent fluid motion, which can be linearized to the heat equation via the celebrated Cole-Hopf transformation. This work introduces and studies in detail general versions of stochastic Burgers equation with random coefficients, in both forward and backward sense. Concerning the former, the Cole-Hopf transformation still applies and we reduce a forward stochastic Burgers equation to a forward stochastic heat equation that can be treated in a "pathwise" manner. In case of deterministic coefficients, we obtain a probabilistic representation of the Cole-Hopf transformation by associating the backward Burgers equation with a system of forward-backward stochastic differential equations. Returning to random coefficients, we exploit this representation in order to establish a stochastic version of the Cole-Hopf transformation. This generalized transformation allows us to find solutions to a backward stochastic Burgers equation through a backward stochastic heat equation, subject to additional constraints that reflect the presence of randomness in the coefficients. In both settings, forward and backward, stochastic Feynman-Kac formulae are derived for the solutions of the respective stochastic Burgers equations, as well. Finally, an application that illustrates the obtained results is presented to a pricing/hedging problem in a tax regulated financial market with a money market and a stock.
This is joint work with E. Frangos, I. Kartala and A. Yannacopoulos.

b3 *Mon. 15.10-15.25 – TP*

Displacement convexity and Ricci curvature for finite Markov chains

Matthias Erbar
Universität Bonn

Since the work of Jordan, Kinderlehrer and Otto it is known that the heat equation can be interpreted as a gradient flow in the Wasserstein space of probability measures. Recently Maas developed a discrete counterpart to this result: given a reversible Markov kernel on a finite set, there exists a Riemannian metric on the set of probability measures for which the law of the chain evolves as the gradient flow of the entropy. In this talk, I will present a new notion of Ricci curvature for Markov chains based on the geodesic convexity of the entropy functional. I will show that the discrete hypercube has positive Ricci curvature in this sense and derive functional inequalities from lower Ricci bounds.
This is joint work with Jan Maas.

b4 *Mon. 15.35-15.50 – TP*

Weak variational solutions with applications to stochastic partial differential equations

Leszek Gawarecki
Kettering University

We consider examples of Stochastic Partial Differential Equations that are cast as infinite dimensional Stochastic Differential Equations in a Gelfand triplet $V \hookrightarrow H \hookrightarrow V^*$ of real separable Hilbert spaces. Under continuity, growth, and coercivity conditions on the coefficients a weak variational solution exists. The solution is continuous in H and belongs to $L_\infty([0,T],H) \cap L_2([0,T],V)$. If the coefficients of the equation are monotone, the solution is strong and unique.

b5 *Mon. 15.50-16.05 – TP*

Stochastic Volterra equations in Hilbert space

Anna Karczewska
University of Zielona Gora

A goal of the talk is to present recent results on stochastic Volterra equations of the form

$$(1) \quad X(t) = X_0 + \int_0^t a(t-\tau)AX(\tau)\,d\tau + \int_0^t \Psi(\tau)\,dW(\tau), \quad t \geq 0$$

in a separable Hilbert space H. In (??), $X_0 \in H$, $a \in L_{loc}1(R_+;R)$, A is a closed linear unbounded operator, $\Psi(t)$ is an appropriate operator-valued process and $W(t)$ is a cylindrical Wiener process.

We would like to emphasize that the equation (??) contains a big class of equations and it is an abstract version of several problems appearing in engineering and physics.
We study the equation (??) using the resolvent approach, which enables us to obtain results in an analogous way as in the semigroup approach usually applied to stochastic differential equations. It is worth to emphasize that in our, resolvent case, new difficulties arise because the solution operator corresponding to the Volterra equation (??) in general does not create any semigroup. So, in consequence, powerful semigroup tools are not available in our case.
During the talk the results concerning fundamental and the most important questions related to the equation (??) will be presented. We shall provide the existence of strong solutions to the equation (??) and some kind of time and space regularity results for these solutions.
We shall point out some consequences and complications coming from deterministic and stochastic convolutions connected with the stochastic Volterra equations (??). Next, we will show, how to overcome some of these difficulties for several classes of kernel functions $a(t)$, $t \geq 0$, and the operators A.

b6 *Mon. 16.05-16.60 – TP*

Uniqueness for stochastic continuity equation, Wiener chaos and superposition solutions

Mario Maurelli
Scuola Normale Superiore, Pisa

I will provide a new result about pathwise uniqueness for stochastic continuity equation (SCE) on $\mathbb{R}^d$:

$$d\mu_t + \mathrm{div}(b\mu_t)dt + \sum_{k=1}^{d} \delta_{x_k}\mu_t \circ dW_t^k = 0$$

In the deterministic context, uniqueness for continuity equation (in a class where solutions exist) is known only with some weak-differentiability assumptions on b and a boundedness condition on its divergence. I will prove that, in the stochastic case, only some integrability assumptions on b are needed (at least for solutions adapted to Brownian filtration). The method is based on Wiener chaos decomposition and allows to reduce the SCE to a family of deterministic equations with a random force, which have uniqueness property by a Laplacian term. Generalizations of this method to general linear SPDEs are possible. Another method could be based on superposition solutions (Ambrosio-Crippa 2008); in this way uniqueness for SCE would be implied by uniqueness for the associated SDE

$$dX_t = b(X_t)dt + dW_t,$$

which is true by known results (Krylov-Röckner 2005); this is a work in progress. In the end, I will show an example where uniqueness for continuity equation does not hold in the deterministic case, but is restored by the noise.

b7 *Mon. 16.50-17.05 – TP*

Solution to the Navier-Stokes equations with random initial data

Evelina Shamarova
University of Porto

We construct a solution to the spatially periodic d-dimensional Navier-Stokes equations with a given distribution of the initial data. The solution takes values in the Sobolev space H^α, where the index $\alpha \in \mathbb{R}$ is fixed arbitrary. The distribution of the initial value is a Gaussian measure on H^α whose parameters depend on α. The Navier-Stokes solution is then a stochastic process verifying the Navier-Stokes equations almost surely. It is obtained as a limit in distribution of solutions to finite-dimensional ODEs which are Galerkin-type approximations for the Navier-Stokes equations. Moreover, the constructed Navier-Stokes solution $U(t, \omega)$ possesses the property:

$$\mathbb{E}\left[f(U(t,\omega))\right] = \int_{H^\alpha} f(e^{t\nu\Delta}u)\gamma(du),$$

where $f : H^\alpha \to \mathbb{R}$ is γ-measurable, ν is the viscosity in the Navier-Stokes equations, and γ is distribution of the initial data.
This work generalizes, in several directions, the technique and the results of [1] where the authors prove the existence of the solution to the two-dimensional spatially periodic Euler equations. Unlike [1], our results hold for all viscosities $\nu \geqslant 0$

which includes the Euler ($\nu = 0$) and the Navier-Stokes ($\nu > 0$) cases. They hold for all dimensions $d \geqslant 2$, and for any Sobolev space index $\alpha \in \mathbb{R}$ whereas the result of (Albeverio-Cruzeiro 1990) was proved for $\alpha < -\frac{1}{2}$.

b8 *Mon. 17.05-17.20 – TP*

Ergodicity and random attractors for singular stochastic evolution inclusions

Jonas M. Tölle
TU Berlin

We provide an abstract variational existence and uniqueness result for monotone non-coercive multi-valued stochastic evolution inclusions with additive Gaussian noise

$$dX_t + A(X_t)\,dt \ni B\,dW_t, \quad t > 0,$$

$$X_0 = x.$$

As examples we include certain singular diffusion equations as the stochastic 1-Laplacian evolution in all space dimensions

$$dX_t \in \operatorname{div}\left[\frac{\nabla X_t}{|\nabla X_t|}\right] dt + B\,dW_t, \quad t > 0,$$

and the stochastic singular fast diffusion equation

$$dX_t \in \Delta\left[\frac{X_t}{|X_t|}\right] dt + B\,dW_t, \quad t > 0.$$

This generalizes the results of Barbu, Da Prato and Röckner.
In many situations, in particular, for the equations mentioned above, we are able to prove existence of an ergodic invariant measure. This solves an open problem raised by Barbu and Da Prato. We also discuss the existence of random attractors.
This is a joint work with Benjamin Gess.

b9 *Mon. 17.20-17.35 – TP*

BV functions in the classical Wiener space and an extension of the Clark-Ocone-Karatzas formula

Dario Trevisan
Scuola Normale Superiore, Pisa

Functions of bounded variation (BV) in abstract Wiener spaces generalize Malliavin derivation, requiring only the existence of the derivative as a measure, which satisfies by definition an integration-by-parts identity.
These spaces of functions were firstly studied by M. Fukushima and M. Hino]. Then, L. Ambrosio et al. provided an integralgeometric approach for characterizing them.
The classical Wiener space, namely $\Omega = C_0(0,T)$ with the Wiener measure, is a setting where we can study concrete examples and obtain new results.
First of all, we will show that the derivative measure of a BV function F can be identified with a measure DF on the product space $\Omega \times [0,T]$. This measure is usually *not* absolutely continous with respect to the product measure $P \otimes ds$. Nevertheless, we will show that the absolute continuity holds, if DF is restricted to the predictable σ-algebra, and that, if H is a version of the density, the following representation is valid:

$$F = \mathbb{E}[F] + \int_0^T H_s dW_s.$$

This extends the well-known Clark-Ocone-Karatzas formula since, if F has a Malliavin derivative ∇F , the process $(\mathbb{E}[\nabla_s F|\mathcal{F}_s])_s$ is such a version of the density. Explicit formulas can be written with the help of a chain rule that we found, which is valid for a wide class of functions.
These results are going to be included into our dissertation for a Master's Degree in Mathematics at the University of Pisa, under the supervision of M. Pratelli and L. Ambrosio.

b10 *Mon. 17.45-18.00 – TP*

On stochastic Burger and 2D Navier-Stokes equations driven by α-stable noises

Lihu Xu
TU Berlin

I shall study the stochastic Burgers and 2D Navier-Stokes equations driven by α-stable noises. For Burgers equation we shall use semigroup approach and show the existence of invariant measures, while for Navier-Stokes equations we show the existence of invariant measures by Galerkin approximation. This is the joint work with Z.Dong and X.Zhang.

b11 *Mon. 18.00-18.15 – TP*

---

c.

Further results on convex functions and separable sequences with applications

Muhammad Adil Khan
Sbdus Salam School

In this paper, generalizations are given for some recent results of Niezgoda (2008). As applications, two mean value theorems are derived. Gram type inequality is proved. Exponential convexity for differences of power means is shown. Finally, Monotonicity of Cauchy type means is shown.
This is a joint work with: M. Niezgoda (University of Life Sciences Lublin) and J. Pecaric (University of Zagreb).

c1 *Mon. 18.15-18.30 – TP*

High pressure behaviour of yttrium antimonid

Purvee Bhardwaj
High pressure Physics Lab., Department of Physics, Barkatullah University

We have investigated the high-pressure structural phase transition of Yttrium antimonide (YSb). The Three Body Potential model (TBPM) has been developed. Phase transition pressures are associated with a sudden collapse in volume. The phase transition pressures and associated volume collapses obtained from present potential model show a generally good agreement with others. The elastic constants and their pressure derivatives are also reported. Our results are in general in good agreement with experimental and theoretical data.

c2 *Thu. 15.50-16.05 – TP*

Rademacher inequality with applications

Syeda Rabab Mudakkar
Lahore School of Economics

This work is motivated by optimal bounds in Rosenthal and Khintchine type moment inequalities. We establish several comparison results for commutative and non-commutative random variables including random matrices and freely independent variables.
(This is a joint work with Dr. Sergey Utev)

c3 *Thu. 16.05-17.20 – TP*

---

d.

Set-valued stochastic integrals with respect to Poisson processes in a Banach space

Jinping Zhang
North China Electric Power University, Beijing

This talk is on stochastic integrals with respect to Poisson random measure and compensated Poisson random measure for set-valued stochastic processes.
In a separable Banach space $\mathfrak{X}$, after studying $\mathfrak{X}$-valued stochastic integrals with respect to Poisson random measure $N(dsdz)$ and the compensated Poisson random measure $\tilde{N}(dsdz)$ generated by stationary Poisson stochastic process $\mathbf{P}$, we prove that if the characteristic measure ν of $\mathbf{P}$ is finite, the stochastic integrals (denoted by $\{J_t(F)\}$ and $\{I_t(F)\}$ separately) for set-valued stochastic process $\{F(t)\}$ are integrably bounded and convex a.s. Furthermore, the set-valued integral $\{I_t(F)\}$ with respect to compensated Poisson random measure

is a right continuous (under Hausdorff metric) set-valued martingale.
This is a joint work with Itaru Mitoma (Saga University, Japan).

d1 *Tue. 9.55-10.10 – TP*

Convergence rates of the implicit Euler scheme for SPDE's in UMD Banach spaces

Sonja Cox
Delft University of Technology

An straightforward way to perform a time-discretisation of an (stochastic) semi-linear PDE is by means of the implicit-linear Euler scheme. Recently, we have proven near-optimal convergence rates of this scheme for parabolic stochastic PDE's in a UMD Banach space. I will sketch the set-up for the proof and thereby discuss one of the tools we used to prove this, namely the concept randomized boundedness.
This concerns joint work with Jan van Neerven (Delft).

d2 *Tue. 10.10-10.25 – TP*

Fractional partial differential equations driven by fractional Gaussian noise

Mahmoud M. El-Borai
Alexandria University

Some fraction parabolic partial differential equations driven by fraction Gaussian noise are considered. Initial-value problems for these equations are studied. Some properties of the solutions are given under suitable conditions and with Hurst parameter less than half.
(Joint work with Khairia El-Said El-Nadi.)

d3 *Tue. 10.25-10.40 – TP*

Real ideals of compact operators of W^*-algebras

Rashidkhon A. Dadakhodjaev
University of Tashkent

Real ideals of compact operators for W^*-algebras are definited and investigated. A description (up to isomorphisms) of real two-sided ideals of relatively compact operators of a complex W^*-factors is given. The classical Hilbert characterization of compactness of operators is extended to the compact operators in semifinite real W^*-algebras.
This is a joint work with A.A. Rakhimov.

d4 *Tue. 11.10-11.25 – TP*

Lévy processes in Banach spaces

Markus Riedle
University of Manchester

The objective of this talk is the introduction of cylindrical Lévy processes and their stochastic integral in Banach spaces.
The degree of freedom of models in infinite dimensions is often reflected by the request that each mode along a dimension is independently perturbed by the noise. In the Gaussian setting, this leads to the *cylindrical Wiener process* including from a model point of view the very important possibility to model a Gaussian noise in both time and space in a great flexibility (space-time white noise). Up to very recently, there has been no analogue for Lévy processes.
Based on the theory of cylindrical processes and cylindrical measures we introduce *cylindrical Lévy processes* as a natural generalisation of cylindrical Wiener processes. We continue to characterise the distribution of cylindrical Lévy processes by a cylindrical version of the Lévy-Khintchine formula.
Without any geometric constraints on the underlying Banach space a stochastic integral with respect to a cylindrical Lévy process is introduced. Its usability is demonstrated by considering different kind of stochastic differential equations in arbitrary Banach spaces driven by a cylindrical Lévy process.
(part of this talk is based on joint work with D. Applebaum)

d5 *Fri. 11.25-11.40 – TP*

Moment estimates for Poisson stochastic integrals in L^q-spaces

Sjoerd Dirksen
TU Delft

Motivated by the study of stochastic partial differential equations we consider the following question: suppose that we are given a Banach space $X, 1 \leq p < \infty$, a compensated Poisson random measure $\tilde{N}$ on $\mathbb{R}_+ \times J$, where J is a σ-finite measure space, and a simple, adapted X-valued process F. Can we find estimates of the form

$$c_{p,X}|||F|||_{p,X} \leq (\mathbb{E}||\int_{\mathbb{R}_+ \times J} F d\tilde{N}||_X^p)^{\frac{1}{p}} \leq C_{p,X}|||F|||_{p,X},$$

for a suitable norm $||| \cdot |||_{p,X}$ on the integrand F and constants $c_{p,X}$, $C_{p,X}$ depending only on p and X? The right hand side estimate plays an important role in the study of existence, uniqueness and regularity of solutions to SPDEs driven by a (compensated) Poisson random measure. The left hand side estimate shows that the right hand estimate is, in a sense, the best possible. The existing results in the literature only give a partial answer to the above question by providing certain (non-optimal) upper estimates. In my talk I will show that one can improve these known results in the case where X is an L_q-space (with $1 < q < \infty$), by finding a norm $||| \cdot |||_{p,L^q}$ such that both inequalities in hold simultaneously.
The talk is based on joint work with Jan van Neerven (TU Delft) and Jan Maas (Universität Bonn).

d6 *Tue. 11.40-11.55 – TP*

Spatiotemporal chaos of spiral waves due to core expansion

Ali Sabbagh
American University of Iraq

We present a new type of meandering of spiral waves leading to spiral break up and spatiotemporal chaos. The end of the spiral follows itself an outward spiral-like trajectory as the core expands in time. This type of destabilization of simple rotation is attributed to curvature effects and wave-fronts interactions in the case of oscillatory damped recovery to the rest state in excitable media. The spiral wave is found to break up into smaller spirals near the centre of rotation when the spiral period falls below the minimal period allowed for plane wave propagation.

d7 *Tue. 12.05-12.20 – TP*

State spaces of JWB*-triples

Abdugafur Rakhimov
University of Tashkent

The notion of diameter of state spaces for JWB*-triples is defined. It is proved that if JWB*-triple is not a factor, then the diameter of state spaces is equal 2.
(Joint work with F.M. Zakirov.)

d8 *Tue. 12.20-12.35 – TP*

Some common fixed point theorems in Banach spaces for random operator

Ramakant Bhardwaj
University Bhopal

The study of non-contraction mapping concerning the existence of fixed points draws attention of various authors in non- linear analysis. It is well known that the differential and integral equations that arise in physical problems are generally non-linear, therefore the fixed point methods specially Banach contraction principle provides a powerful tool for obtaining the solutions of these equations which were very difficult to solve by any other methods. In the present paper we establish common fixed point theorems for self mappings taking rational expressions Banach spaces for random operator.

d9 *Tue. 12.35-12.50 – TP*

Malliavin fractional smoothness in terms of the number operator

Christel Geiss
Universität Innsbruck

Let $X = (X_t)_{t\geq 0}$ be a Lévy process. The random measure M generated by X is given by

$$M(ds, dx) = \begin{cases} \sigma dW_s & \text{if } x = 0 \\ x\tilde{N}(ds, dx) & \text{if } x \neq 0 \end{cases}$$

where W is the Brownian motion and $\tilde{N}$ the compensated Poisson random measure appearing in the Lévy-Itô decomposition of X. Assume a random variable $F \in L_2$ has the chaos decomposition $F = \sum_{n=0}^{\infty} I_n(f_n)$ where the $I_n(f_n)$ are multiple integrals w.r.t. the random measure M. The number operator L with

$$\text{dom}(L) = \left\{ F \in L_2 : \sum_{n=1}^{\infty} n^2 ||I_n(f_n)||^2_{L_2} < \infty \right\}$$

is defined by

$$LF = -\sum_{n=1}^{\infty} nI_n(f_n).$$

It is well known that $L = -\delta D$, where D is the Malliavin derivative and δ its adjoint. In the Brownian motion case (i.e. $X = W$) L coincides with the infinitesimal generator of the Ornstein-Uhlenbeck process. We introduce a set $\mathcal{S}$ of *smooth random variables* F assuming that there exist $0 \leq t_0 < t_1 < \cdots < t_m$ with

$$F = f(X_{t_1} - X_{t_0}, X_{t_2} - X_{t_1}, \ldots, X_{t_m} - X_{t_{m-1}}),$$

where f is bounded and C^∞ with bounded derivatives. The set $\mathcal{S}$ is dense in dom(L) and dom(D), and for $F \in \mathcal{S}$ one can represent LF by the help of the forward integral with respect to the random measure M and a correction term. If g is a Borel function on $\mathbb{R}^m$ and $\alpha \in (0, 1/2)$ we prove a characterization such that

$$F = g(X_{t_1} - X_{t_0}, \ldots, X_{t_m} - X_{t_{m-1}}) \in \text{dom}((-L)^\alpha)$$

where $(-L)^\alpha$ is the fractional power of $-L$. Because of $\text{dom}((-L)^{1/2}) = \text{dom}(D)$ we interpret $F \in \text{dom}((-L)^\alpha)$ as Malliavin fractional smoothness, a useful property in discrete approximation problems.
This is a joint work with Eija Laukkarinen.

d10 *Fri. 14.40-14.55 – KHS*

Martingale problems on Banach spaces

Markus Kunze
University of Ulm

We present some abstract results about local martingale problems on Banach spaces and discuss well-posedness of the local martingale problems associated with stochastic reaction-diffusion type equations with polynomially bounded nonlinearity and Hölder continuous multiplicative noise with linear growth.

d11 *Fri. 14.55-15.10 – KHS*

---

e.

Optimal transport and coupled diffusion by reflection

Kazumasa Kuwada
Ochanomizu University

This talk is based on an ongoing joint work with Karl-Theodor Sturm. On Riemannian manifolds with a lower Ricci curvature bound in the Bakry-Émery sense, we show that a Kendall-Cranston type coupling by reflection of diffusion processes yields a monotonicity in time of a time-inhomogeneous optimal transportation cost between two diffusions. As an analogous result, a coupling by parallel transport was known to yield a monotonicity of time-scaled L^p-Wasserstein distance. Similar to that case, our cost function is also a function of the distance function, but it is concave unlike p-th power function. This new monotonicity property is also related with a gradient estimate of the diffusion semigroup as Kendall-Cranston couplings are. In addition, it is stable under the (Gromov-Hausdorff) convergence of underlying spaces and diffusions with uniform lower Ricci curvature bounds.

e1 *Tue. 14.40-14.55 – TP*

Concentration of measure phenomenon and eigenvalues of Laplacian

Kei Funano
Kyoto University

In this talk we discuss the relation between the concentration of measure phenomenon and (behavior of) eigenvalues of Laplacian on a closed manifold. M. Gromov and V. D. Milman was first studied for the case of the first non-trivial eigenvalue of Laplacian. Under non-negative Ricci curvature assumption we study the case of the k-th eigenvalues of Laplacian for any k. The key ingredient of our study is the curvature dimension condition on manifolds. As an application we obtain the universal inequality between eigenvalues of Laplacian.
This talk is based on joint work with T. Shioya.

e2 *Tue. 14.55-15.10 – TP*

Generalized relative entropies between Feller-type branching diffusions and their approximations

Wolfgang Stummer
University of Erlangen-Nürnberg

We compute exact values respectively bounds of "distances" - in the sense of (transforms of) power divergences and relative entropy - between two Feller-type branching diffusion processes FBD. Implications for the contiguity and entire separation of the involved FBDs are given, too. Some applications to (static random environment like) Bayesian decision making and Neyman-Pearson testing are presented as well. Furthermore, we determine the corresponding approximating quantities for the context in which the two FBDs arise as the limits of discrete-time Poissonian Galton-Watson branching processes with immigration.
(Joint work with Niels B. Kammerer.)

e3 *Tue. 15.10-15.25 – TP*

Displacement convexity of generalized relative entropy

Asuka Takatsu
IHES

The purpose of this talk is to discuss a generalization of the relative entropy, which is a functional measuring the energy difference between two probability measures. We show that, on a weighted Riemannian manifold, the convexity of the generalized relative entropy is equivalent to the combination of the non-negativity of the weighted Ricci curvature and the convexity of the potential density function for the energy functional. From the convexity property of the generalized relative entropy, we derive several functional inequalities, the concentration of measure phenomenon for the equilibrium of the energy functional, and the contraction of the evolution equation associated to the energy functional. This is joint work with Shinichi Ohta (Kyoto University).

e4 *Tue. 15.35-15.50 – TP*

Gradient flow of nonlocal aggregation models and superconductivity models

Edoardo Mainini
Università degli Studi di Pavia

We consider aggregation diffusion models of the form

$$\partial_t \mu = \operatorname{div}((\nabla W * \mu)\mu) \qquad \text{in } (0,\infty)\times\mathbb{R}^n.$$

Here, μ represents a particle density, $W:\mathbb{R}^n\to\mathbb{R}$ is a potential representing their pairwise interaction. We discuss well-posedness, asymptotic properties and possible blow up in finite time, in the framework of gradient flows in probability spaces equipped with the optimal transport distance. We consider in particular the case of the newtonian potential $W(x,y) = -\frac{1}{2\pi}\log|x-y|$, which appears in different contexts, such as superconductivity models: in the evolution equations for Ginzburg-Landau vortices in superconductors, we discuss some results in the more general framework of signed measures.

e5 *Tue. 15.50-16.05 – TP*

Local CD implies global MCP

Fabio Cavalletti
Universität Bonn

In this talk we prove that, in the setting of non-branching metric measure spaces (M, d, m), local curvature-dimension condition $\mathsf{CD}_{loc}(K, N)$ implies global version of the measure-contraction property $\mathsf{MCP}(K, N)$.

e6 *Tue. 16.05-16.20 – TP*

Construction and asymptotics of relativistic diffusions on Lorentz manifolds

Jürgen Angst
IRMAR, University Rennes 1

We will briefly recall the construction of a relativistic Brownian motion on a general Lorentz manifold. We will then describe its long-time asymptotic behavior in a large class of Lorentz manifolds : Robertson-Walker space-times. We will see emerge links between the asymptotic behavior of the process and the geometry at infinity of the underlying manifold.

e7 *Tue. 16.50-17.05 – TP*

Dynamics of the stochastic flow generated by a relativistic diffusion

Camille Tardif
IRMA Strasbourg

In 1966 Dudley constructed a Lorentz covariant diffusion with value in the future unit tangent bundle of the Minkowski space made of the couple of the hyperbolic Brownian motion with its time integral. This diffusion is obtained by projecting an invariant diffusion in the Poincar group. We propose here to study the dynamics of the stochastic flow associated to this diffusion. In particular we compute the Lyapunov exponents and the stable manifolds in function of the asymptotic variable which describes the Poisson boundary.

e8 *Tue. 17.05-17.20 – TP*

The asymptotic solution of a singular Mendelian system of differential equations and its geometric interpretation

Ketill Ingólfsson
Elkins Park

Consider the one-parametrical ordered triple $(x, y, z)(t)$. It can be understood as a system of flux-functions $x(t)$, $y(t)$, and $z(t)$ to be used in the life-sciences. We will then assume that the functions are differentiable and monotone increasing for $t > 0$ while the one-sided limits named x_0, y_0, and z_0 all exist for $t \downarrow 0$ and moreover generally satisfy the inequalities $x_0 > z_0 > 0$ and $x_0 z_0 > \frac{1}{2} y_0^2 \geq 0$. By ordering y_0 to be zero we have set the clock in our dynamical system. We introduce as probability frequencies the functions $q(t) = \frac{z+y/2}{x+y+z}$, $p(t) = 1-q$, and $w(t) = \frac{z}{x+y+z}$, while $s = x+y+z$ and $\sigma = \frac{xz-1/4y^2}{s}$ represent total population and variance respectively. These concepts generate the identity $\sigma = s(w-q^2)$, which further produces the identity-relations

$$x = p^2 s + \sigma = p^2 s \left(1 + (w - q^2)/p^2\right)$$

$$y = 2pqs - 2\sigma = 2pqs \left(1 - (w - q^2)/pq\right)$$

$$z = q^2 s + \sigma = q^2 s \left(1 + (w - q^2)/q^2\right).$$

From these expressions we may read the Weinberg-Hardy relations when $\frac{w-q^2}{q^2} \ll 1$, if $q < \frac{1}{2} < p$ for all t and we will then name our system $(x, y, z)(t)$ "Mendelian". We will determine such system from the analytic solutions of an autonomous nonlinear system of differential equations in x, y, and z, involving the parameter ε. The system is singular under ε, if $0 < \varepsilon \leq \frac{1}{2}$. If $\varepsilon = 0$ in the equations, the p, q, and σ are all constants of motion. If $\varepsilon > 0$ we may phrase the differential relations $\frac{dp}{dt} = \varepsilon(\frac{1}{2} - q)pw$ and $\frac{d\sigma}{dt} = \varepsilon p^2 qsw$. In order to exactly solve the equations, we introduce three new functions, $U = \frac{q^2}{1/2-q}$, $V = \frac{1/2-q}{w}$, and $\tau = (\frac{1}{2} - q)s$. The x, y, and z depend on these new functions through the new identity relations

$$x = \tau\,(2 + 1/V)\,,\; y = \tau\,(2U(q)/q - 2(1/V))\,,$$
$$z = \tau\; 1/V.$$

The (U, V, τ) system is determined by the equation

$$\frac{dU}{dt} = -\varepsilon p^2 q \frac{1}{V}, \quad \frac{dV}{dt} = V(1 - VU), \quad \frac{d\tau}{dt} = \tau$$

The solution of τ is of course at once available, but a geometrical interpretation of V will allow us to treat the system as a problem in phenomenological thermodynamics.

e9 *Tue. 17.20-17.35 – TP*

f.

Heat equation asymptotic of option pricing

Akeju A. Olu
University of Ibadan

The evaluation of option pricing in the financial market, over the years has largely been carried out by the Black-Schole formula such that, any function that satisfies the equation becomes a fair price of the derivative security.
To determine this fair price, a payoff function is required to ascertain the time to exercise the option. This payoff function is obtained from the solution of a heat equation with certain initial cindition.

f1 *Tue. 17.45-18.00 – TP*

On efficient and accurate log-Lévy approximations for the Lévy Libor model

Antonis Papapantoleon
TU Berlin

LIBOR market models are the favorite models of practitioners for the pricing of interest rate derivatives, however they suffer from severe intractability problems due to the random terms that enter the SDEs during the construction of the model. As a result, exact "closed form" (meaning, e.g. by Fourier methods) pricing formulas are not available even for the most liquid interest rate derivatives, such as caps and swaptions, and the calibration of the model might require time-consuming Monte Carlo simulations. The typical remedy is the so-called "frozen drift" approximation, which however does not perform well, especially for exotic derivatives and long time horizons. Alternative approximation methods have been developed mainly for the log-normal LIBOR market model, cf. e.g. Schoenmakers (2005), and Joshi and Stacey (2008).
In this work, we consider a Lévy-driven LIBOR model and develop log-Lévy approximations for the dynamics of the rates. These approximations are based on the truncation of the drift term and the Picard approximation of suitably defined processes. They are faster to simulate than the actual dynamics of the LIBOR rates and produce very accurate option prices. Numerical examples illustrate the accuracy and efficiency of the method. In addition, we also consider the log-Lévy approximation of annuities, which offers good approximations for the high volatility regime. This last approximation can be also interpreted as a variance reduction technique for LIBOR models.
This is based on joint work John Schoenmakers and David Skovmand.

f2 *Tue. 18.00-18.15 – TP*

g.

A random walk on moving spheres approach for the simulation of Bessel hitting times

Samuel Herrmann
Institut de Mathématiques Elie Cartan, Nancy

The Laplace transform permits in general to describe the hitting times of Bessel processes but seems difficult to be used for simulations. The aim of the talk is to present a new simulation method. This efficient algorithm used for hitting times of a general Bessel process needs two essential tools : first the method of images (Daniels) associated with the first time the Brownian motion hits a moving boundary and secondly the walk on spheres algorithm usually used for solving the heat equation.
Comparing with Euler scheme this new method allows to approach unbounded stopping times. Numerically, the algorithm needs only few steps.
This is a joint work with Madalina Deaconu.

g1 *Wed. 9.55-10.10 – TP*

Observation of SLE(κ, ρ) on the critical statistical models

Morteza Nattagh Najafi
Sahrif University of Technology

Schramm-Loewner Evolution (SLE) is a stochastic process that helps classify critical statistical models using one real parameter κ. Numerical study of SLE often involves curves that start and end on the real axis. To reduce numerical errors in studying the critical curves which start from the real axis and end on it, we have used hydrodynamically normalized SLE(κ, ρ) which is a stochastic differential equation that is hypothesized to govern such curves. In this paper we directly verify this hypothesis and numerically apply this formalism to the domain wall curves of the Abelian Sandpile Model (ASM) ($\kappa = 2$) and critical percolation ($\kappa = 6$). We observe that this method is more reliable for analyzing interface loops.

g2 *Wed. 10.10-10.25 – TP*

Non-reversible stochastic Ising model and signaling networks

Eduardo Jordao Neves
University of Sao Paulo

We introduced recently a non-reversible version of the stochastic Ising Model where spins may influence each other in an asymmetric fashion, somehow analogous to typical biochemical interactions. The mean-field version of this model, that we call type-dependent interaction spin model, provides simple toy models for the dynamics of cellular signaling networks in cancer research. In the thermodynamic limit of this mean-filed model, trajectories of the associated stochastic density-profiles converge almost surely to deterministic trajectories of a dynamical system which may have complex bifurcation diagrams.

g3 *Thu. 10.25-10.40 – TP*

The size of visibility sets for some continuum percolation models in the hyperbolic plane

Christoph Thäle
University of Osnabrück

Consider an isometry-invariant Poisson point process η_λ of intensity $\lambda > 0$ in the hyperbolic plane $\mathbb{H}^2$ and attach to each point x of η_λ a ball $B(x,R)$ of radius R. The occupied and the vacant phase of the percolation model associated with data (η_λ, R) are defined by

$$\mathcal{O} = \bigcup_{x\in\eta_\lambda} B(x,R) \quad \text{and} \quad \mathcal{V} = \overline{\mathbb{H}^2 \setminus \mathcal{O}},$$

respectively. We pick some fixed point o in $\mathcal{V}$ and ask if it is possible to see from o at infinity within $\mathcal{V}$. Benjamini, Jonasson, Schramm and Tykesson (ALEA **6** (2009), 323-342) have shown that this is possible within the vacant phase $\mathcal{V}$ if and only if $2\lambda \sinh R < 1$. In the talk we address a question concerning the size of the set $D(\mathcal{V})$ of directions in which visibility from o to infinite is possible. For our above setting we show that if $2\sinh R < 1$, on the event $D(\mathcal{V}) \neq \emptyset$ we have

$$\dim_H D(\mathcal{V}) = 1 - 2\lambda \sinh R$$

with probability one, confirming thereby a conjecture from the above mentioned paper. The problem will be addressed in an axiomatic way via so-called well-behaved percolation sets $\mathcal{Z}$, which allows in many cases a simultaneous treatment of occupied and vacant phase. Moreover, it is possible to investigate more general models than our above example. In terms of their so-called α-value we determine the Hausdorff dimension of $D(\mathcal{Z})$ and show that if $\alpha < 1$, on $Z \neq \emptyset$ we have $\dim_H D(\mathcal{Z}) = 1 - \alpha$ almost surely. Our example fits into this class and satisfies $\alpha = 2\lambda \sinh R$.

g4 *Wed. 11.10-11.25 – TP*

Influence of noise to ferromagnetic systems

Mikhail Neklyudov
Universität Tübingen

In this talk I discuss two semi phenomenological models of systems of N classical spins interacting with a surrounding heat bath modeled by stochastic Langevin fields. In the first part I discuss the model where the dimension of driving noise is low and show that such noise leads to appearance of multiple degenerate invariant measures.
In the second part we present the model of spin system with high dimensional noise, establish existence and uniqueness of invariant measure and prove that the system is ergodic with exponential rate of convergence to equilibrium. Furthermore, in this case we show that invariant measure is a Gibbs measure. Computational examples will be reported to illustrate the theory. This is a joint work with A. Prohl.

g5 *Wed. 11.25-11.40 – TP*

On calculation of the Hausdorff dimension: Faithful and non-faithful vitality coverings

Grygoriy Torbin
National Pedagogical University, Kyiv
Institute for Mathematics of NASU, Kyiv

Exact calculation or sharp estimation of the Hausdorff dimension of a given set is one of crucial problems of the Fractal Geometry. This problem can be essentially simplified if one can prove that to calculate the Hausdorff dimension it is enough to consider a rather narrow family of admissible coverings. Such families are said to be faithful. To be precise let (M,ρ) be a metric space, let M_1 be a bounded subset of M and let $\Phi(M_1)=\Phi$ be a Vitaly system of coverings of the set M_1, i.e., a family of subsets of M such that for an arbitrary set $E\subset M_1$, and for any $\varepsilon>0$ there exists an at most countable ε-covering E_j of E $(E_j\in\Phi, |E_j|\leq\varepsilon)$. Let α be a positive number. We recall that the α-dimensional Hausdorff measure of a bounded subset E with respect to a given family of subsets Φ is defined by

$$H^\alpha(E,\Phi)=\lim_{\varepsilon\to0}\left[\inf_{d(E_j)\leq\varepsilon}\left\{\sum_j|(E_j)|^\alpha\right\}\right] =\lim_{\varepsilon\to0}m^\alpha_\varepsilon(E,\Phi)$$

and the nonnegative number

$$\dim_H(E,\Phi)=\inf\{\alpha:\ H^\alpha(E,\Phi)=0\}$$

is said to be the Hausdorff dimension of the set E with respect to the family of subsets Φ.
Definition 1. A Vitaly covering system Φ is said to be faithful on M_1 if for any subset $E\subset M_1$ one has

$$\dim_H(E,\Phi)=\dim_H(E).$$

We shall discuss some new results on faithful resp. non-faithful Vitaly covering systems. In particular, starting from the Yuval Peres approach for proving non-faithfulness of the family of continued fraction cylinders, we shall discuss some fractal phenomena connected with infinite IFS and related singular probability measures.

g6 *Wed. 11.40-11.55 – TP*

---

h.

Tanakas equation and the Csaki-Vincze transformation

Hatem Hajri
Université de Paris Sud

Consider Tanaka's equation:

$$(1)\quad X_t=\int_0^t\operatorname{sgn}(X_u)dW_u$$

where W is a standard Brownian motion. This is an example of a stochastic differential equation which admits a weak solution but has no strong solution. Starting from a simple random walk S, Csaki and Vincze have defined a simple random walk $\bar S$ such that

$$(2)\quad \left|\bar Y_n-|S_n|\right|\leq 2\quad \forall n\in\mathbb{N} \text{ where } \bar Y_n:=\bar S_n-\min_{k\leq n}\bar S_k.$$

Let $t\mapsto S(t)$ (resp. $\bar S(t)$) be the linear interpolation of S (resp. $\bar S$) on $\mathbb{R}$. An immediate consequence of (2), is the following

$$(\bar S^{(n)}_t, S^{(n)}_t)_{t\geq0}\xrightarrow[n\to\infty]{law}(W_t,X_t)_{t\geq0}\text{ in } C([0,\infty],\mathbb{R}^2).$$

where $S_t^{(n)} = \frac{1}{\sqrt{n}}S(nt), \bar{S}_t^{(n)} = \frac{1}{\sqrt{n}}\bar{S}(nt), n \geq 1$ and X, W are two Brownian motions satisfying (1). In this talk we study some correspondences between Tanaka's equation and the Csaki-Vincze transformation. Then we construct the unique coalescing flow $(X_{s,t}(x))$ satisfying

$$X_{s,t}(x) = x + \int_s^t \operatorname{sgn}(X_{s,u}(x))dW_u, \quad s \leq t, x \in \mathbb{R},$$

where $(W_{s,t}, s \leq t)$ is a real white noise on a probability space $(\Omega, \mathcal{A}, \mathbb{P})$.

h1 *Thu. 9.55-10.10 – TP*

Controlled nonlinear Markov processes

Wei Yang
University of Warwick

A general problem of optimal control of a nonlinear Markov process (or a mean-field process) is considered. Its solution is expressed via the Cauchy problem for an infinite dimensional Hamiltonian-Jacob-Bellman equation with a viscosity solution. First, we prove the well-posedness of the Cauchy problem using discrete time approximation. Then we prove the convergence of the corresponding controlled interacting particle system to the optimal controlled nonlinear Markov processes. Our results generalise and unify the variety of concrete schemes which are used in practice where the evolutions are usually defined on discrete state spaces.
(Joint work with Vassili Kolokoltsov, University of Warwick, UK.)

h2 *Thu. 10.10-10.25 – TP*

A comparison of high-order methods for probabilistically solving elliptic boundary value problems

Francisco Bernal
Insituto Superior Técnico, Lisbon

When solving a boundary value problem with Dirichlet boundary conditions by a probabilistic method at a single point (typically, through the celebrated Feynman-Kac formula for parabolic and the Dynkin formula for elliptic equations), three kinds of error arise. Two of them are well understood - namely, the integration and statistical errors. The third one, which is particular to the solution of a PDE problem defined in a bounded domain, is the more elusive first exit time error. In the last years, a number of strategies have been developed which improve the convergence rate of the latter from $O(h^{\frac{1}{2}})$ to $O(h)$, where h is the time step. From there, further improvement to $O(h^2)$ might be possible using extrapolation. In this contribution, we have implemented the following techniques into a single code: Brownian bridge, exponential time-stepping, boundary shift, walk on spheres, and Milstein's weak methods. We review all of them and compare their performance over a range of PDEs and realistic domains.
This is a joint work with Juan Acebrón, Instituto Superior Técnico, Lisbon.

h3 *Thu. 10.25-10.40 – TP*

Widder's theorem for Dirichlet spaces

Nate Eldredge
Cornell University

Classically, Widder's theorem states that a nonnegative solution of the heat equation in $\mathbb{R}^n$ is uniquely determined by its initial values. We consider extensions of this theorem to local weak solutions of the heat equation on a strongly local Dirichlet space satisfying certain added conditions.

h4 *Thu. 11.10-11.25 – TP*

Pathwise stationary solutions of the stochastic infinity-Laplacian equation

Fajin Wei
University of Leicester

We investigate the initial-boundary value problem of the 'stochastic infinity-Laplacian equation'

$$\begin{aligned} du(x,t) &= \Delta_\infty u dt + g(x)dW_t \\ &:= \frac{\langle D^2uDu, Du\rangle}{|Du|^2}dt + g(x)dW_t \end{aligned}$$

on a bounded domain $U \subset \mathbb{R}^n$. After transformed to a random PDE the uniqueness of its solutions in the viscosity sense is demonstrated. The existence of this stochastic PDE's solutions is obtained by approximation of smooth solutions for a class of related equations. Barrier functions are constructed to get estimates of the smooth solutions and Arzelà-Ascoli lemma guarantees the existence of the limit function, which is the solution of the SPDE by the consistency-stability property. A version of relative compactness criterion in $C(U \times [0,T], L^2(\Omega))$ is given, by which we prove the measurability of the solution via estimate of the smooth solutions' Malliavin derivatives. The existence of pathwise stationary solutions $\tilde{u}(x,t,\omega) = u(x,0,\theta_t\omega)$ of this SPDE is achieved as the limit of the solution of the SPDE when time tends to infinity, combined with a pullback procedure. We proposed this SPDE as a random model of the interpolation of continuous data for the image restoration problem in (Wei-Zhao 2011). The deterministic elliptic '∞-Laplacian' equation $\Delta_\infty u = 0$ also arises from the calculus of variations in L^∞ as the 'absolute minimal Lipschitzextension' problem.

The notion of pathwise stationary solutions of random dynamical systems is a natural extension of equilibria in deterministic systems. As a 'one-force, one-solution' setting, a pathwise stationary solution describes the pathwise invariance of the stationary solution over time along the measurable and $\mathbb{P}$-preserving transformation θ_t and the pathwise limit of the solutions of RDS's. For RDS's generated by SPDEs such random fixed points consist of infinitely many random moving invariant surfaces on the configuration space caused by the random external force input to the system constantly. They demonstrate some complicated phenomena such as turbulence and their existence and stability are of great interests in both mathematics and physics. However the existence of pathwise stationary solutions of RDSs is generally a difficult and subtle problem.

h5 *Thu. 11.25-11.40 – TP*

Recurrence/transience criteria for skew product diffusion processes

Tomoko Takemura
Nara Women's University

We give a simple necessary and sufficient condition for which $\mathbb{M}$ is recurrent/transient when $\mathbb{M}$ is a skew product of a one dimensional diffusion process R and the spherical Brownian motion Θ with respect to a positive continuous additive functional of R. We denote by X the skew product as above. Further we show that the same condition is necessary and sufficient for which a time changed process Y of X is recurrent/transient. Fukushima and Oshima (1989) obtained a recurrent criterion for the skew product of diffusions. By using their result, we can show that our criterion is sufficient for recurrence of X. In this talk we however give a direct proof of our necessary and sufficient condition by means of eigenfunction expansion for transition probability density of X.
(Joint work with Matsuyo Tomisaki, Nara Womens University.)

h6 *Thu. 11.40-11.55 – TP*

Convergence rates for the full Gaussian rough paths

Sebastian Riedel
TU Berlin

We present sharp convergence rates for approximations of the Gaussian rough paths. Using key results of rough paths theory, we show how one can use this to obtain convergence rates for simplified (and implementable) higher order Euler schemes solving SDEs driven by Gaussian signals.

h7 *Thu. 12.05-12.20 – TP*

---

i.

Linear quadratic mean field games

Philip Yam
University of Hong Kong

The theory of mean field games has grown rapidly after the pioneering paper by Lasry and Lions (2007). For the recent development and its applications, please refer to the survey (Guéant et al. 2011) and the references therein. In this talk, I shall introduce a class of mean field games in which both the payoff function and cost functional are quadratic in state variable, control variable together with the mean field term; besides, the controlled dynamics is linear and also consists of a mean field term.
This is a joint work with A. Bensoussan (University of Texas at Dallas and The Hong Kong Polytechnic University), K. C. J. Sung (The University of Hong Kong), S. P. Yung (The University of Hong Kong).

i1 *Thu. 12.20-12.35 – TP*

A model of an open queueing network with several types of customers and parameters depending on system state

Elmira Yu. Kalimulina
Institute for Control Sciences, Moscow

We deal with a queueing network model with m nodes, n servers and r waiting rooms at each node, where different types of customers may be served. Let $X_j(t)$ be a number of customers of j type at the network at time t. The input rate at time t for certain type of customers depends on the total number of customers of this type in the network: $\lambda_j(t) = \lambda_j(X_j(t))$. The service rate for certain type of customers depends on nodes performance, number of customers, served at node, and the total load of network. We suppose the every node may be as input and as such output node, the network is open. Input rates are supposed to be non-exponential.
We derive non-stationary distributions of sate probabilities in explicit form. Also asymptotic behaviour of this probabilities, the rates of convergence for stationary as $t \to \infty$ and non-stationary cases and conditions for ergodicity have been studied in paper.

i2 *Thu. 12.35-12.50 – TP*

Perturbed rotation of a rigid body close to the lagrange case under stochastic oscillations of point of support

Dmytro Leshchenko
Odessa State Academy of Civil Engineering and Architecture

Perturbed rotation of a rigid body, similar to regular precession in the Lagrange case, under stochastic vertical oscillations of point of support is investigated. Motion of a body under the action of a restoring torque depending on slow time, as well as perturbation torque slowly varying with time, are studied. It is assumed that the angular velocity of the body is fairly large, its direction is close to the dynamics axis of symmetry of the body and the perturbation torques are small compared with the restoring torques. It is assumed that acceleration of point of support includes periodic and stochastic components.
A small parameter is introduced in a special way and the averaging method is used. The averaged system of equations of motion is obtained in the first approximation for the essentially nonlinear two-frequency system.
Note that, if we confine ourselves to constructing the first approximation, then the formulas for the nutation and precession angles do not contain parameters of the perturbation torques, and therefore the effect of perturbations on regular precession of the body will not be taken into account. In this case, therefore, construction of the second approximation is essential. Evolution of the nutation and precession angles is defined at the second approximation of the averaging method. In the expression for the nutation angle the bounded oscillation term contains nonzero initial data. For the precession angle the resultant terms one of which depends on the expression for the angular precession velocity that is known from approximate gyroscope theory.
Thus, the new class of motion of axially symmetric body with regard to nonstationary restoring and perturbation torques is investigated. Problem of rotation of a rigid body, meaning for applications is solved.

i3 *Thu. 14.40-14.55 – TP*

Vaccine development for malaria based on mathematical models of stochastic analysis

Isolde G. Lücht-Eisenbach
CEWS, HRZ, University of Bonn

Evidence is accumulating demonstrating the involvement of chemotactic receptors involved in the penetration of red blood cells by the infective stages causing malaria. The developmental stages of interest are related to the sporozoites and merozoites of all strains, but especially Plasmodium falciparum, because of the experimental data available.
It is hypothecised that the delta opiate receptor involved in chemotactic processes will be of significant relevance. For human B-lymphocytes of the mature stage, it is predicted that the delta opiate receptor is the ligand of choice when immunisation is to proceed with the recombinant anti-idiotype of IgG vaccine protocols. The specific anti-idiotype antibody bearing the internal image of the antigen of the parasitic delta opiate receptor will therefore provide the structural basis for immunisation at the delta opiate receptor (D-Ala, D-Leu-enkephalin) of mature B-lymphocytes.
Since the delta opiate receptor is believed to be the relevant receptor,methods must be chosen so that the structural prerequisites of the receptor of mature B-lymphocytes can be studied and defined in order to apply stochastic mathematical models. These when applied adequately, will indicate approaches to vaccine trials leading to the memory of the antigen of the parasite, providing immunity to the host.
Cellular developmental stages for B-lymphocytes include pre-B and mature B-lymphocytes. cell functions of the cell-cycle include differentiation, proliferation, chemotaxis and apoptosis. Thus it is of significance to decipher the receptor density where at the time of immunisation the optimum number of receptors has structural conformations and stereospecificity to ensure successful immunisation.
Each receptor has multiple binding sites which are utlilised during the progression of the cell, as well as within different functions. For anti-idiotype recombinant IgG immunisation purposes, it will be necessary to locate the binding site for the IgG immunoglobulin at the delta opiate receptor. Crystal structure analysis of IgG receptor morphology is able to give specific insight.
Thus detailed structural analysis will pave the way for mathematical models leading to an efficient immunisation with non recurring relapses of protective immunity.

i4 *Thu. 14.55-15.10 – TP*

Analytical and numerical study of a stochastic self-regulated gene expression model with jump and diffusion process

Romain Yvinec
Université de Lyon

We extend the analysis of a continuous stochastic gene expression model (Mackey et al. (2011)) using both PDEs and semigroup theory to study the existence and analytical expression of an invariant density of the one-dimensional stochastic differential equation driven by white noise and a jump process

$$dx = -\gamma x + \sqrt{x} d\omega(t) + \Theta(f(x), h).$$

The size of the jumps are specified by the function h (taken to be exponential here) and the intensity of the jumps is a bounded function of the varaible x, making this model enters the general class of Hybrid models. x is here either a mRNA or protein concentration, and hence has to stay positive. We then need to specify a boundary condition at $x = 0$. We will discuss the consequences of the choice of such boundary.
We also investigate the higher dimensional system (when both mRNA and protein dynamics are taken into account for example) and its adiabatic elimination to show the analogous stochastic bifurcation of the Hopf bifurcation of the deterministic model. We illustrate these results by numerical simulations. Finally we discuss what are the relevant biological implication of this very simple gene networks. Specifically, we discuss how the different time scales evolve according to the parameters (relaxation time, auto-correlation time and escape time), and how the noise is dependent on the self-regulation mechanism.

i5 *Thu. 15.10-15.25 – TP*

Ranking DMUs by coefficient of variation criterion

Mohammad Hassan Behzadi
Islamic Azad University, Tehran

Data Envelopment Analysis is a non-parametric technique which is based on mathematical programming for evaluating the efficiency of a set of Decision Making Units (DMUs). In this paper considering the concept of coefficient of variation among efficient DMUs, two ranking methods has been proposed. Within these ranking methods, a DMU will have a higher rank if it's coefficient of variation be smaller. These methods are suitable when managers are able to determine weights on coefficient of variations or on inputs and outputs. At the end we applied these methods on a numerical example.
(Joint work with Mahnaz Mirbolouki, Islamic Azad University , Tehran, Iran.)

i6 *Thu. 15.35-15.50 – TP*

---

k.

Kiefer-Wolfowitz type stochastic approximation in continuous time

Jürgen Dippon
Universität Stuttgart

To estimate the root of an unknown regression function $f(x) = E(Y|X = x)$ Robbins and Monro (1951) suggested to run the recursion

$$X_{n+1} = X_n - a_n Y_n$$

where $Y_n = f(X_n) + M_n$ is a noisy observation of the $f(X_n)$, (M_n) a martingale difference scheme und (a_n) a decreasing sequence of step lengths. To estimate the point of maximum of f one may estimate the zero of the derivative of f. As Kiefer and Wolfowitz (1952) showed this can be done consistently by

$$(1) \quad X_{n+1} = X_n - \frac{a_n}{c_n}(Y_n' - Y_n'')$$

where $Y_n' = f(X_n + c_n) + M_n'$, $Y_n'' = f(X_n - c_n) + M_n''$ and (c_n) is another sequence decreasing to zero.
Nevel'son and Khas'minski i (1973) formulated a time-continuous version of this method

$$(2) \quad dX_t = -\frac{a_t}{c_t}\{(f(X_t + c_t) - f(X_t - c_t))dt + \sigma(X_t)dW_t\}$$

which in the case of a Wiener process W is a stochastic differential equation of Itô type.
Using the general theory of semimartingales the processes (1) and (2) can
be considered as solutions of

$$X_t = X_0 - \int_0^t \frac{a_s}{c_x}\{(f(X_s + c_s) - f(X_s - c_s)\}\, dR_s - \int_0^t \frac{a_s}{c_s} M(ds, X_{s-})$$

where R is an increasing process and M is a random field. For example, if $R_t = \lfloor t \rfloor$ or $R_t = t$ and M appropriate, we obtain (1) or (2), respectively.
In this talk we discuss convergence properties of the generalized Kiefer-Wolfowitz process $(X_t)_{t\in[0,\infty]}$. For the discrete time K-W process it is well known that at the point of maximum the smallest eigenvalue of the Hessian of f must be larger than a certain number in order to achieve the best possible convergence rate of (X_n). Usually this condition cannot be checked in practice. However, if we take an appropriate weighted integral of the generalized K-W process (X_t) as an estimator of the point of maximum, this spectral condition can be dropped without loosing the optimal convergence rate.

k1 *Fri. 9.00-9.15 – TP*

Development of scalarization method for proximal point algorithm: Challenges and issues

Mahmudul Huq
Universität Halle

Rockefeller has developed Proximal Point Algorithm (PPA) for finding zero of a maximal monotone operator $T : \mathbb{R}^n \to \mathbb{R}^n$. PPA generates a sequence $\{x_k\}$, starting with $x_0 \in \mathbb{R}^n$, in order to find an element $x \in \mathbb{R}^n$ such that $0 \in T(x)$. The formula of PPA is $x_{k+1} = \arg\min T_k(x)$, where

$T_k(x) = f(x) + \frac{1}{2c_k}||x - x_k||^2$ ($\{c_k\}$ is the sequence of positive real numbers). An interesting extension of existing PPA would be multiple-objective PPA using scalarization approach. In this research paper we would like to describe the application of the scalarization approach, developed by Tammer et. al., on the development of multiple-objective PPA.

k2 *Fri. 9.15-9.30 – TP*

An approximation scheme for reflected stochastic differential equations

Lawrence Christopher Evans
University of Missouri at Columbia

In a series of famous papers E. Wong and M. Zakai showed that the solution to a Stratonovich SDE is the limit of the solutions to a corresponding ODE driven by the piecewise-linear interpolation of the driving Brownian motion. In particular, this implies that solutions to Stratonovich SDE "behave geometrically as we would expect from ODE theory". D. Stroock and I have shown that a similar approximation result holds, in the sense of weak convergence of distributions, for reflected Stratonovich SDE. We have also shown how this result can be used to give intuitive proofs of geometric properties of coupled reflected Brownian motion, especially those properties which have been used in recent work on the "hot spots" conjecture for special domains.

k3 *Fri. 9.30-9.45 – TP*

A split-step Adams-Moulton Milstein method for stiff stochastic differential equations

Abdul Khaliq
Middle Tenessee State University

We present a split-step method for solving Itô stochastic differential equations (SDEs). The method is based on a second order split Adams-Moulton Formula for stiff ordinary differential equations and modified for use on SDEs which are stiff in both the deterministic and stochastic components. Its order of strong convergence is proved and stability regions are displayed. Numerical experiments show the effectiveness of the method in the path-wise approximation of stiff SDEs.
(Joint work with David Voss, Western Illinois University.)

k4 *Fri. 9.55-10.10 – TP*

A numerical method for stochastic homogenization

Jack Urombo
Harare Institute of Technology

We consider a method for numerically solving the solution of the stochastic homogenization problem of the elliptic operator. These kinds of problems model porous flow and composite materials amongst others.
The elliptic operators are assumed to be of the form

$$-\nabla(\alpha(x,\omega)\nabla u(x,\omega)) = f(x) \quad \text{in } D \subset \mathbb{R}^2$$

$$u(x,\omega) = 0 \quad \text{on } \partial D$$

The method is based on the stochastic finite element method (SFEM) and the multiscale finite element methods (MFEMs).
A number of numerical experiments are given to illustrate the method.

k5 *Fri. 10.10-10.25 – TP*

Stability analysis of finite difference method and convergence of spectral collocation method for SPDEs

Minoo Kamrani
Tarbiat Modares University

In this paper we present an investigation of some new methods for solving stochastic partial differential equations (SPDEs). At first for the approximate solution of the following

$$u_t(x,t) + au_{xx}(x,t) + bu_x(x,t) + cu(x,t) + (du_x(x,t) + \gamma u(x,t))\dot{W}(t) = 0$$

the stability and application of a class of finite difference method with regard to the coefficients of the equation is analyzed.

Then spectral collocation method for numerical approximation of stochastic parabolic equation is presented.
(Joint work with S. Mohammad Hosseini.)

k6 *Fri. 10.25-10.40 – TP*

---

l.

Convergence of a self-stabilizing process

Julian Tugaut
Universität Bielefeld

A self-stabilizing process corresponds to a particle in a mean-field random dynamical system whose the dimension is infinity.
Benachour, Roynette and Vallois proved the weak convergence of this kind of processes. Cattiaux, Guillin and Malrieu extended this result by adding the gradient of a convex potential in the drift term. Carrillo, McCann and Villani proved a similar result in non-convex case by assuming the center of mass is fixed.
By using the thirdness of the stationary measures and the free-energy functional, I will prove the convergence under simple conditions and discuss about the basins of attraction.

l1 *Fri. 11.10-11.25 – TP*

On mutually catalytic branching, Brownian motion in a cone and generalized voter processes

Leif Döring
Université Pierre et Marie Curie, Paris 6

We discuss a mutually catalytic variant of the super-process with correlated branching mechanism. Interestingly, playing with the correlation and the branching parameters one finds as special cases the Wright-Fisher model, a parabolic Anderson model and the classical voter process. Since those have rather different longterm properties one can expect to find parameter regimes with very different behavior which can be partially understood via planar Brownian motion in a cone.

l2 *Fri. 11.25-11.40 – TP*

Minimal positions of branching random walks in random environment

Makoto Nakashima
Kyoto University

We consider a branching random walks in random environment (BRWRE) on $\mathbb{N}$ with only one particle at the origin at time n. Particles reproduce according to offspring distribution (which depends on its locations) and the newly produced particles move one step to the right (with a probability in $(0,1]$ which may also depend on the location), otherwise stay in the same site. We give an estimate to the minimal displacement of BRWRE at time n in the special case where mean number of offsprings which stay in the same place is strictly smaller than 1 and its supremum is 1.

l3 *Fri. 11.40-11.55 – TP*

Hydrodynamic limit for weakly asymmetric exclusion processes in crystal lattices

Ryokichi Tanaka
Kyoto University

We investigate the hydrodynamic limit for weakly asymmetric exclusion processes in crystal lattices. We construct the suitable scaling limit by using a discrete harmonic map. The quasi-linear parabolic equation appearing in the limit is defined on the torus equipped with the Albanese metric and depends on both the local structure of the crystal lattice and the discrete harmonic map. We formulate the local ergodic theorem on the crystal lattice by introducing the notion of the local function bundle, which is a family of local functions on the configuration space. We also introduce the ideas and methods taken from the discrete geometric analysis to this problem. Results we obtain are extensions of ones by Kipnis, Olla and Varadhan to crystal lattices.

l4 *Fri. 12.05-12.20 – TP*

Conditional processes induced by one-dimensional generalized diffusion processes related to stochastic models in population genetics

Masaru Iizuka
Kyushu Dental College

We consider a class of one-dimensional generalized diffusion processes (ODGDPs for brief) with finite state space whose speed measures are right continuous and strictly increasing functions or nondecreasing step functions. One-dimensional diffusion processes and the birth and death processes belong to this class of ODGDPs. For this class of ODGDPs, we consider stochastic processes induced by conditioning on hitting the right boundary point before hitting the left boundary point. These stochastic processes are referred to as the conditional processes. We show that the conditional processes are again Markov processes if the right boundary point is accessible with the absorbing boundary condition. On the other hand, the conditional processes do not satisfy the Markov property and hence they are not Markov processes if the right boundary point is accessible with the reflecting boundary condition. These results are applied to the diffusion model and the continuous-time Moran model in population genetics.
(Joint work with Matsuyo Tomisaki, Nara Womens University, Japan.)

l5 *Fri. 12.20-12.35 – TP*

Distribution of the successful and blocked events in a Geo/Geo/c retrial queue

Pilar Moreno
Pablo de Olavide University

The advent of the new technologies has made that the discrete-time queueing theory causes a great stir in the scientific literature on computers and operations research, applied mathematics and related fields. On the other hand, retrial queues arise to solve problems in telephony and have wide practical applications in call centers, computer and telecommunication networks. That is why the study of the discrete-time retrial queues has wakened up great interest from 1995, when Yang and Li published the first work about this type of queueing sytems.
The literature about retrial queues is extensive in the sense of researching several subjects on a wide variety of queueing models. However, Amador and Artalejo pioneered in defining and analyzing four new descriptors: the number of successful and blocked retrials / external arrivals during a busy period. Nevertheless, their analysis is restricted to the continuous-time field. That is why, the objective of this work is to analyze the distribution of these new descriptors for a Geo/Geo/c retrial queueing system, and so to extend the study to the discrete-time scope. Specifically, the probability distributions, the 1st and 2nd moments and the cross moments of the successful and blocked events made by the external and repeated customers are analyzed. Several numerical examples and a cost function illustrate the study.
(Joint work with Julia Amador.)

l6 *Fri. 12.35-12.50 – TP*

Hardy spaces of α-harmonic functions on the complement of the sphere and of the hyperplane

Tomasz Luks
Université d'Angers

The purpose of this talk is to present some results about the Hardy spaces of so-called α-harmonic functions, defined on the complement of the sphere or of the hyperplane in R^d, $d > 1$, with index $\alpha > 1$. By α-harmonic functions we mean the functions harmonic with respect to the symmetric α-stable processes. The Hardy spaces consist of α-harmonic functions satisfying some additional integrability condition. We give an another characterization of these spaces in terms of the Poisson and the Martin integrals.

l7 *Fri. 14.40-14.55 – TP*

Conditional quenched CLT for random walks among random conductances on $\mathbb{Z}^d$

Serguei Popov
UNICAMP

Consider a random walk among random conductances on $\mathbb{Z}^d$ with $d \geq 2$. We study the quenched limit law under the usual diffusive scaling of the random walk conditioned to have its first coordinate positive. Under some additional technical assumptions, we show that the conditional limit law is the product of a Brownian meander and a $(d-1)$-dimensional Brownian motion. This is a joint work with Christophe Gallesco, Nina Gantert, Marina Vachkovskaia.

l8 *Fri. 14.55-15.10 – TP*

Exponential convergence rates of second quantization semigroups and applications

Chang-Song Deng
Beijing Normal University

Exponential convergence rates in the L^2-tail norm and entropy are characterized for the second quantization semigroups by using the corresponding base Dirichlet form. This supplements the well known result on the L^2-exponential convergence rate of second quantization semigroups. As applications, birth-death type processes on Poisson spaces and the path space of Lévy processes are investigated. This talk is based on joint work with Prof. Feng-Yu Wang.

l9 *Fri. 15.10-15.25 – TP*

6

List of Participants

Akeju Adeyemi (*University of Ibadan*)

Muhammad Adil Khan (*Abdus Salam Scool*)

Ini Adinya (*University of Ibadan*)

Mohammed Ageel (*Jazan University*)

Ferhana Ahmad (*Oxford University*)

Shigeki Aida (*Tohoku University*)

Abdul Rahman (*Al-Hussein Quassim University*)

Luis Roberto (*Lucinger Almeida UNICAMP*)

Patricia Alonso-Ruiz (*LMU München*)

Luigi Ambrosio (*Scuola Normale Superiore Pisa*)

Eduardo Amorim Neves (*UNICAMP*)

Sebastian Andres (*University of British Columbia*)

Jürgen Angst (*IRMAR, University Rennes 1*)

Lorenzo Baglioni (*Universita di Pisa*)

Ismael Bailleul (*Cambridge University*)

Anashua Banerji (*University of Heidelberg*)

Martin Barlow (*University of British Columbia*)

Fabrice Baudoin (*Purdue University*)

Mohammad Hassan Behzadi (*Islamic Azad University, Tehran*)

Maria Simonetta Bernabei (*University of Camerino*)

Francisco Bernal (*Insituto Superior Technico, Lisbon*)

Jean Bertoin (*Université Pierre et Marie Curie, Paris 6*)

Ramakant Bhardwaj (*University Bhopal*)

Purvee Bhardwaj (*University Bhopal*)

Jean-Michel Bismut (*Université Paris-Sud*)

Krzysztof Bogdan(*Wrocław University of Technology*)

Michel Bonnefont (*Université Bordeaux 1*)

Anissa Boukali (*Uni Siegen*)

Anton Bovier (*Universtität Bonn*)

Toralf Burghoff (*Universität Jena*)

Fabio Cavalletti (*SISSA*)

Jiří Černý (*ETH Zürich*)

Zhen-Qing Chen (*University of Washington*)

Gilbert Chendjou (*University of Younde*)

Petru A. Cioica (*Philipps-Universität Marburg*)

Sonja Cox (*Delft University of Technology*)

Ana-Bela Cruzeiro (*Universidade de Lisboa*)

Rashidkhon A. Dadakhodjaev (*University of Tashkent*)

Fabrice Debbasch (*UPMC*)

Chang Song Deng (*Bejing Normal University*)

Jean-Dominique Deuschel (*TU Berlin*)

Jürgen Dippon (*Universität Stuttgart*)

Sjoerd Dirksen (*Delft University of Technology*)

Leif Döring (*UPMC*)

Bruce Driver (*University of California*)

Thomas Dunst (*Universität Tübingen*)

Barlomiej Dyda (*Universität Bielefeld*)

Andreas Eberle (*Universität Bonn*)

Mahmoud M. El-Borai (*Alexandria University*)

Nate Eldredge (*Cornell University*)

David Elworthy (*University of Warwick*)

Nikolaos Englezos (*University of Piraeus*)

Matthias Erbar (*Universität Bonn*)

Lawrence Christopher Evans (*University of Missouri at Columbia*)

Uta R. Freiberg (*Universität Jena*)

Ryoki Fukushima Tokyo Institute of Technology)

Kei Funano (*Kyoto University*)

Leszek Gawarecki (*Kettering University*)

Véronique Gayrard (*Université de Provence, Marseille*)

Christel Geiss (*Universität Innsbruck*)

Stefan Geiss (*Universität Innsbruck*)

Benjamin Gess (*University of Bielefeld*)

Nicola Gigli (*Université de Nice*)

Andre Oliveira Gomes (*Universidade de Lisboa*)

Andreas Greven (*Universität Erlangen-Nürnberg*)

Alexander Grigor'yan (*Universität Bielefeld*)

Martin Grothaus (*Universität Kaiserslautern*)

Arnaud Guillin (*Université Blaise Pascal, Clermont-Ferrand II*)

Martin Hairer (*University of Warwick*)

Hatem Hajri (*Université de Paris sud*)

Muntazim Abbas Hashmi (*ASSMS, GCU, Lahore*)

Erika Hausenblas (*Montanuniversität Leoben*)

Katharina Hees (*Uni Siegen*)

David Hess (*University of Giessen*)

Peter Helgesson (*Mathamitical Sciences, Chalmers*)

Samuel Herrmann (*Ecole des Mines Nancy*)

Alexander Holroyd (*Microsoft Research, Rochester*)

Xueping Huang (*Universität Bielefeld*)

Martin Huesmann (*Universität Bonn*)

Mahmudul Huq (*Universität Halle*)

Bogdan Iftimie (*Academy of Economic Studies of Bucharest*)

Masaru Iizuka (*Kyushu Dental College*)

Ketill Ingolfsson (*Elkins Park*)

Niels Jacob (*Swansea University*)

Benedikt Jahnel (*Universität Wuppertal*)

Sabine Jansen (*WIAS Berlin*)

Peng Jin (*Universität Wuppertal*)

Nicolas Juillet (*Université de Strasbourg*)

Naotaka Kajino (*University of Bielefeld*)

Kamil Kaleta (*Wrocław University*)

Elmira Kalimulina (*Russian Academy of Sciences, Moscow*)

Minoo Kamrani (*Tarbiat Modares University*)

Anna Karczewska (*University of Zielona Gora*)

Moritz Kassmann (*Universität Bielefeld*)

Hiroshi Kawabi (*Okayama University*)

Martin Keller-Ressel (*TU Berlin*)

Christian Ketterer (*Universität Bonn*)

Abdul Khaliq (*Middle Tenessee State University*)

Panki Kim (*Seoul National University*)

Sandra Kliem (*University Duisburg-Essen*)

Anton Klimovsky (*Eindhoven University of Technology*)

Ozan Kocadağli (*Mimar Sinan F.a. University*)

Eduard Kromer (*University of Giessen*)

Isabelle Kuhwald (*Universität Jena*)

Tadeusz Kulczycki (*Polish Academy of Sciences, Warsaw*)

Takashi Kumagai (*Kyoto University*)

Tobias Kuna (*University of Reading, UK*)

Markus Kunze (*University of Ulm*)

Seiichiro Kusuoka (*Kyoto University*)

Kazumasa Kuwada (*Ochanomizu University*)

Kazuhiro Kuwae (*Kumamoto University*)

Mateusz Kwaśnicki (*Polish Academy of Sciences, Warsaw*)

Elizabeth Lam (*University of Toronto*)

Sandra Landwehr (*University Düsseldorf*)

Michel Ledoux (*University of Toulouse*)

Paul Lee (*University of California, Berkeley*)

Dmytro Leshchenko (*Odessa State Academy of Civil Engineering and Architecture*)

Thierry Lévy (*Université de Genève*)

Xiangdong Li (*AMSS, Beijing*)

Xue-Mei Li (*University of Warwick*)

Zenghu Li (*Beijing Normal University*)

Janna Lierl (*Cornell University*)

Rafal Łochowski (*Warsaw School of Economics*)

Isolde G. Lücht-Eisenbach (*CEWS, HRZ, University of Bonn*)

Tomasz Luks (*Université d'Angers, France*)

Terry J. Lyons (*University of Oxford*)

Jan Maas (*University of Bonn*)

Thanh Tan Mai (*TU Kaiserslautern*)

Edoardo Mainini (*Università degli Studi di Pavia*)

Jacek Małecki (*Wrocław University*)

Florent Malrieu (*Université de Rennes*)

Alexa Manger (*Universität Duisburg-Essen*)

Utpal Manna (*Indian Institute of Science Education and Research, Thiruvananthapuram*)

Roland Marko (*University of Bonn*)

Mario Maurelli (*Scuale Normale Superiore, Pisa*)

Tai Melcher (*University of Virginia*)

Sylvie Méléard (*CMAP Palaiseau*)

Georg Menz (*MPI Leipzig*)

Ante Mimica (*University of Bielefeld*)

Pilar Moreno (*Pablo de Olavide University*)

Syeda Rabab (*Mudakkar Lahore School of Economics)*

Dawan Mustafa (*Mathematical Sciences, Chalmers*)

Morteza Nattagh Najafi (*Sahrif University of Technology*)

Makoto Nakashima (*Kyoto University*)

Mikhail Neklyudov (*Universität Tübingen*)

Eduardo-Jordao Neves (*IME-USP*)

Hong Noh (*University of Oxford*)

Olawale Obabiyi (*University of Ibadan*)

Stephen Okorie (*Yaba College of Technology*)

Akeju Adeyemi Olu*University of Ibadan*)

Ömer Önalan (*Marmara University*)

Antonis Papapantoleon (*TU Berlin*)

Shige Peng (*Shandong University*)

Serguei Popov (*UNICAMP*)

Ionel Popescu (*IMAR and Gatech*)

Pourkalbassi Esfahani (*University of Malaysia*)

Aldo Pratelli (*Universita di Pavia*)

Matthijs (*Pronk TU Delft*)

Abdugafur Rakhimov (*University of Tashkent*)

Joseph Raquepas (*USAF*)

Rezvani Majid (*Universität Bielefeld*)

Sebastian Riedel (*TU Berlin*)

Markus Riedle (*University of Manchester*)

Michael Röckner (*Universität Bielefeld*)

Roberta Rodrigues Albuquerque (*University of Warwick*)

Sylvie Roelly (*Universität Potsdam*)

Mauro Rosestolato (*Scuale Normale Superiore, Pisa*)

Eduard Rotenstein (*Alexandu Ioan Cuza University*)

Michal Ryznar (*Technical University of Wrocław*)

Ali Sabbagh (*American University of Iraq*)

Laurent Saloff-Coste (*Cornell University*)

Nikola Sandric (*University of Zagreb*)

Marta Sanz-Solé (*University of Barcelona*)

Barun Sarkar (*University of Wuppertal*)

Ishiwata Satoshi (*University of Tsukuba*)

Michael Scheutzow (*TU Berlin*)

René Schilling (*University of Dresden*)

André Schlichting (*Max-Planck-Institut, Leipzig*)

Mirco Schultka (*Universität Greifswald*)

Michael Scott (*Universirty of Warwick*)

Evelina Shamarova (*University of Porto*)

Ichiro Shigekawa (*Kyoto University*)

Boubaker Smii (*King Fahd University*)

Mihaela Stan (*University Plitehnica*)

Wilhelm Stannat (*TU Darmstadt*)

Wolfgang Stummer (*University of Erlangen-Nürnberg*)

Karl-Theodor Sturm (*Universität Bonn*)

André Sü (*Universitat de Barcelona*)

Alain-Sol Sznitman (*ETH Zürich*)

Pawel Sztonyk (*Wrocław University of Technology*)

Mohsen Taghavi (*Shiraz University*)

Asuka Takatsu (*IHES*)

Masayoshi Takeda (*Tohoku University*)

Tomoko Takemura (*Nara Women's University*)

Atsushi Takeuchi (*Osaka City University*)

Ryokichi Tanaka (*Kyoto University*)

Camille Tardif (*IRMA Strasbourg*)

Andrs Telcs (*Budapest University of Technology and Economics*)

Christoph Thäle (*University of Osnabrück*)

Horst Thaler (*University of Camerino*)

Anton Thalmaier (*University of Luxembourg*)

Alexandre Thiery (*University of Warwick*)

Adam Timar (*University of Vienna*)

Jonas M. Tölle (*TU Berlin*)

Grygoriy Torbin (*University of Ukraine*)

Dario Trevisan (*Scuale Normale Superiore, Pisa*)

Dimitrios Tsagkarogiannis (*University of Rome*)

Julian Tugaut (*Universität Bielefeld*)

Ahsan ul Haq (*University of the York*)

Jérémie Unterberger (*Université Nancy I*)

Jack Urombo (*Harare Institut of Technology, Belvedere*)

Jan van Neerven (*TU Delft*)

Guillaume Voisin (*University Duisburg-Essen*)

Max Kostja (*von Renesse TU Berlin*)

Zoran Vondracek (*University of Zagreb*)

Feng-Yu Wang (*Beijing Normal University*)

Jian Wang (*University of Hong Kong*)

Shidong Wang (*University of Bonn*)

Hendrik Weber (*Warwick University*)

Fajin Wei (*University of Leicester*)

Liu Wei (*University of Bielefeld*)

Anita Winter (*University Duisburg-Essen*)

Lihu Xu (*TU Berlin*)

Philip Yam (*University of Hong Kong*)

Wei Yang (*University of Warwick*)

Yuxin Yang (*University of Warwick*)

Yuko Yano (*Kyoto University*)

Kouji Yano (*Kobe University*)

Minoru W. Yoshida (*Tokyo University*)

Romain Yvinec (*Université de Lyon*)

Martina Zähle (*University of Jena*)

Furqat Zakirov (*The Tashkent automobile and road institute*)

Jinping Zhang (*North China Electric Power University, Beijing*)

Tusheng Zhang (*University of Manchester*)

Rong-chan Zhu (*Beijing University / University of Bielefeld*)

Xiangchan Zhu (*University of Bielefeld*)

Alphabetic List of Speakers

09.00-09.45	9.00-9.20	9.00-9.15
		9.15-9.30
	9.25-9.45	9.30-9.45
09.55-10.40	09.55-10.15	9.55-10.10
		10.10-10.25
	10.20-10.40	10.25-10.40
11.10-11.55	11.10-11.30	11.10-11.25
		11.25-11.40
	11.35-11.55	11.40-11.55
12.05-12.50	12.05-12.25	12.05-12.20
		12.20-12.35
	12.30-12.50	12.35-12.50
14.40-15.25	14.40-15.00	14.40-14.55
		14.55-15.10
	15.05-15.25	15.10-15.25
15.35-16.20	15.35-15.55	15.35-15.50
		15.50-16.05
	16.00-16.20	16.05-16.20
16.50-17.35	16.50-17.10	16.50-17.05
		17.05-17.20
	17.15-17.35	17.20-17.35
17.45-18.30	17.45-18.05	17.45-18.00
		18.00-18.15
	18.10-18.30	18.15-18.30

Monday

09.00-09.45	P1: Saloff-Coste		
09.55-10.40	M1: Ambrosio	C1: Grothaus	a1: Kuwae
			a2: Jin
		C2: Weber	a3: Dyda
11.10-11.55	M2: Grigor'yan	C3: Yoshida	a4: Sandrić
			a5: Sztonyk
		C4: Kawabi	a6: Małecki
12.05-12.50	M3: Kumagai	C5: Gess	a7: Huang
			a8: Łochowski
		C6: R.Zhu	a9: Takeuchi
Lunch			
14.40-15.25	M4: F.-Y. Wang	B1: S.Geiss	b1: X.Zhu
			b2: Dunst
		B2: Hausenblas	b3: Englezos
15.35-16.20	M5: Guillin	B3: Kwaśnicki	b4: Erbar
			b5: Gawarecki
		B4: Mimica	b6: Karczewska
16.50-17.35	M6: Malrieu	B5: J.Wang	b7: Maurelli
			b8: Shamarova
		B6: K.Yano	b9: Tölle
17.45-18.30	M7: Takeda		b10: Trevisan
			b11: L.Xu
			c1: Adil Khan

Tuesday

09.00-09.45	P2: Barlow		
09.55-10.40	M8: Sznitman	D1: Debbasch	d1: J.Zhang
			d2: Cox
		D2: X.-M. Li	d3: El-Borai
11.10-11.55	M9: Holroyd	D3: Levy	d4: Dadakhodjaev
			d5: Riedle
		D4: Baudoin	d6: Dirksen
12.05-12.50	M10: Deuschel	D5: X.-D. Li	d7: Sabbagh
			d8: Rakhimov
		D6: Bailleul	d9: R.Bhardwaj
Lunch			
14.40-15.25	M11: Méléard	A1: Kulczycki	e1: Kuwada
			e2: Funano
		A2: Vondracek	e3: Stummer
15.35-16.20	M12: Greven	A3: Kassmann	e4: Takatsu
			e5: Mainini
		A4: S.Kusuoka	e6: Cavalletti
16.50-17.35	M13: Z. Li	A5: Eberle	e7: Angst
			e8: Tardif
		A6: Ryznar	e9: Ingolfsson
17.45-18.30	M14: Gayrard	Poster Session	f1: Olu
			f2: Papapantoleon

Wednesday

09.00-09.45	P3: Bertoin		
09.55-10.40	M15: Kim	E1: von Renesse	g1: Herrmann
			g2: Najafi
		E2: Maas	g3: Neves
11.10-11.55	M16: Jacob	E3: Gigli	g4: Thäle
			g5: Neklyudov
		E4: Lee	g6: Torbin
Lunch			
Afternoon	Excursion		

Thursday

09.00-09.45	P4: Peng		
09.55-10.40	M17: Bismut	H1: Roelly	h1: Hajri
			h2: W.Yang
		H2: Jansen	h3: Bernal
11.10-11.55	M18: Cruzeiro	H3: Winter	h4: Eldredge
			h5: Wei
		H4: Keller-Ressel	h6: Takemura
12.05-12.50	M19: Zähle	H5: Kliem	h7: Riedel
			i1: Yam
		H6: Klimovsky	i2: Kalimulina
Lunch			
14.40-15.25	M20: Driver	G1: Andres	i3: Leshchenko
			i4: Lücht-Eisenbach
		G2: Černý	i5: Yvinec
15.35-16.20	M21: Aida	G3: Telcs	i6: Behzadi
			c2: P. Bhardwaj
		G4: Sanz-Sole	c3: Mudakkar
16.50-17.35	M22: Thalmaier	G5: Kajino	
		G6: Y.Yano	

Friday

09.00-09.45	M23: Lyons	E5: Huesmann	k1: Dippon
			k2: Huq
		E6: Timar	k3: Evans
09.55-10.40	M24: Shigekawa	F1: Popescu	k4: Khaliq
			k5: Urombo
		F2: Menz	k6.Kamrani
11.10-11.55	M25: Stannat	F3: Pratelli	l1: Tugaut
			l2: Döring
		F4: Juillet	l3: Nakashima
12.05-12.50	M26: T. Zhang	F5: Kaleta	l4: Tanaka
			l5: Iizuka
		F6: van Neerven	l6: Moreno
Lunch			
14.40-15.25	M27: Bogdan	d10: C.Geiss	l7: Luks
		d11: Kunze	l8. Popov
			l9: C. Deng
15.35-16.20	P5: Hairer		

P1-P5: Plenary Talks	GH: Großer Hörsaal
M1-M27: Main Talks	GH: Großer Hörsaal
A-F: Invited Talks	KH: Kleiner Hörsaal
a-l: Contributed Talks	TP: Hörsaal Theoretische Physik