Workshop at Bielefeld University

Stochastics and Real World Models 2009

International Graduate College
"Stochastics and Real World Models"
Beijing – Bielefeld

Bielefeld University
Lecture Hall H10
May 25–29, 2009

Spokesmen of the IGK:
Zhi-Ming Ma (Beijing), Michael Röckner (Bielefeld)

Contact: Sven Wiesinger,

Monday Morning

8:50–9:00 Welcome and Opening

9:00–9:50 *Markowitz Strategies Revised*
Yan J.A.

10:00–10:50 *Vlasov scaling for Markov evolutions in continuum*
Yu.G. Kondratiev

11:00–11:20 — *Coffee Break* —

11:20–12:10 *A stochastic model for information transmission in large systems of neurons*
R. Höpfner

12:20–14:00 — *Lunch Break* —

Afternoon Sessions; see next page

Notes.

Venue. Main venue is the lecture hall H10, which can be entered from the main hall.

Coffee Breaks take place in front of the lecture hall H10.

Lunch Breaks. Different places inside the university building offer warm and cold food. Please check the floor plan and information on the last page of the programme.

Sessions on Monday Afternoon

Time	**Session 1** H10	**Session 2** D5-153 (BiBoS Lecture Hall)	**Session 3** V3-201 (Common Room)
14:00–14:50	*Analytical Methods in the Theory of Gibbs Measures* T. Pasurek	*Numerical algorithms, convergence and simulations of backward stochastic differential equations with constraint* Xu M.	*Diffusion Mechanism for Alpha Decay, Cluster Radioactivity and Spontaneous Fission* V. Rusov
15:00–15:25	*Diffusions with time-dependent singular drifts* Jin P.	*Meta-stable behaviour of the Chafee-Infante equation in the limit of small alpha-stable noise* M. Högele	*Non-local Dirichlet forms: Intrinsic metric and Sch'nol type inequality* D. Wingert
15:35–16:00	*Construction and analysis of Langevin dynamics in continuous particle systems* F. Conrad	*A Trotter type result for the stochastic porous media equations* I. Ciotir	*Fluctuation of the longest common subsequence for sequences of independent blocks* F. Torres
16:10–16:30	— *Coffee Break* —		
16:35–17:25	*Approximations of stochastic BAD dynamics and its applications in image processing* E. Zhizhina	*Kolmogorov operators associated to stochastic Cahn-Hilliard equations* A. Es Sarhir	*On the foundations of Lévy finance: Equilibrium for a single-agent financial market with jumps* F. Herzberg
17:35–18:00	*On the invariant measure for branching diffusions with immigration* M. Hammer	*Mosco convergence of weighted Φ-Laplace operators along a sequence of Banach spaces* J. Tölle	*Networks of Mixed Canonical-Dissipative Systems with Plastic Dynamics* J. Rodriguez

Tuesday

9:00–9:50 *Symmetric Markov Processes and Heat Kernel Estimates*
Chen Z.Q.

10:00–10:50 *Classical versus Quantum Aspects of Quantum States*
Luo S.L.

11:00–11:20 — *Coffee Break* —

11:20–12:10 *Improved a priori estimates on invariant measures for SPDE*
W. Stannat

12:20–14:00 — *Lunch Break* —

14:00–14:50 *On Ito Volterra backward equations*
W. Grecksch

15:00–15:25 *Harnack Inequalities and Applications for Stochastic Equations*
Ouyang S.X.

15:35–16:00 *Relative Entroy between Quantum Ensembles*
Li N.

16:10–16:30 — *Coffee Break* —

16:30–16:55 *Asymptotic Behavior of some Stochastic Evolutions in Continuum*
S. Struckmeier

17:05–17:55 *Potential theoretical methods in the construction of measure-valued Markov branching processes*
L. Beznea

Wednesday

9:00–9:50 *On bounded solutions of a balanced pantograph equation*
L. Bogachev

10:00–10:50 *Optimal Stopping under Multiple Priors – The Case of Continuous Time*
F. Riedel

11:00–11:20 — *Coffee Break* —

11:20–12:10 *Some stochastic models of neurodynamics*
S. Albeverio

12:20–14:00 — *Lunch Break* —

14:00–14:50 *A variational formula for the free energy of a many-Boson system*
W. König

15:00–15:50 *Analysis of Fourier transform valuation formulas and applications*
E. Eberlein

16:00–16:20 — *Coffee Break* —

16:20–16:45 *Soliton-like nuclear burning waves in the neutron multiplicating media*
O. Byegunova

16:55–17:20 *Fine Properties of Stochastic Evolution Equations and Their Applications*
Liu W.

17:30–18:20 *An invariance principle for a tagged particle process in continuum with singular interactions*
M. Grothaus

Thursday

9:00–9:50 *When remote past vanishing implies ergodicity*
P. Malliavin

10:00–10:50 *From transience to recurrence via reflection*
Fukushima M.

11:00–11:20 — *Coffee Break* —

11:20–12:10 *The Integral Model of the Fock Space and Representations of the Current Groups*
A. Vershik

12:20–14:00 — *Lunch Break* —

14:00–14:45 *Stationary Distribution of Browsing Processes*
Ma Z.M.

14:50–15:35 *Sergio and the Ground State*
L. Streit

15:40–16:25 *A Network Perspective on the Tower of Babel*
Ph. Blanchard

16:30–16:50 — *Coffee Break* —

16:50–17:35 *Long time asymptotics of solutions of the Camassa-Holm equation*
A. Boutet de Monvel

17:40–18:25 *Limit Motion on a Graph*
G. Dell'Antonio

19:00 — *Conference Dinner* —

Friday

9:00–9:50 *Stabilization by noise of Navier–Stokes equations*
V. Barbu

10:00–10:50 *Asymptotic Spectral Distributions and Free Probability*
F. Götze

11:00–11:20 — *Coffee Break* —

11:20–12:10 *Random conjunctions matrices*
M. Rudelson

12:20–14:00 — *Lunch Break* —

14:00–14:50 *Poisson cluster processes on manifolds*
A. Daletskii

15:00–15:50 *Ergodicity for nonlinear evolution equations with jumps and applications to nonlocal Kolmogorov equations*
C. Marinelli

16:00–16:20 — *Coffee Break* —

16:20–17:10 *The size of fish*
G. Delius

17:20–18:10 *Diffusion approximation for Kawasaki dynamics in continuum*
E. Lytvynov

18:20 — *Closing* —

Abstracts

(sorted alphabetically by the family names of the speakers)

Viorel BARBU

Stabilization by noise of Navier–Stokes equations

The equilibrium solutions of Navier Stokes equations are exponentially stabilizable by a linearly multiplicative stochastic feedback controller whose form is precisely constructed.

Lucian BEZNEA

Potential theoretical methods in the construction of measure-valued Markov branching processes

We develop potential theoretical methods in the construction of measure-valued branching processes. We complete results of P.J. Fitzsimmons and E.B. Dynkin on the construction, regularity and other properties of the superprocess associated with a given right process and a branching mechanism.

Philippe BLANCHARD

A Network Perspective on the Tower of Babel

We show how spectral methods developed in the study of complex networks can be used to decipher accurately symmetry records on the language phylogeny of the Indo-European and the Austronesian language families.

Leonid BOGACHEV

On Bounded Solutions of a Balanced Pantograph Equation

A functional-differential equation with rescaled argument of the form $y'(x) = ay(qx) + by(x)$ ("pantograph equation") was introduced by J. Ockendon et al. (1971) in connection with the dynamics of a current collection system for an electric locomotive. Soon thereafter, T. Kato posed a problem of existence and characterization of bounded solutions of such an equation. In this talk, we address this problem for a "balanced" pantograph equation $y'(x) + y(x) = \mathsf{E}\, y(\alpha x)$, with a random $\alpha > 0$, and show that any bounded solution is constant if and only if $\mathsf{E} \log \alpha \le 0$. The result in the critical case ($\mathsf{E} \log \alpha = 0$) settles a long-standing problem due to G. Derfel (1989). The proof exploits a link with the theory of Markov processes, in that any solution of the balanced pantograph equation is an L-harmonic function relative to the generator L of a certain diffusion process with "multiplication" jumps. The talk is based on joint work with G. Derfel, S. Molchanov and J. Ockendon.

Anne BOUTET DE MONVEL

Long-time asymptotics of solutions of the Camassa-Holm equation

We develop a Riemann–Hilbert approach for the Camassa–Holm equation $u_t - u_{txx} + 2u_x + 3uu_x = 2u_xu_{xx} + uu_{xxx}$ on the line $-\infty < x < \infty$. This approach allows us to study the long-time behavior of solutions of initial value problems for this equation. Regions of the half plane $-\infty < x < \infty$, $t \geq 0$, with different long-time behavior are specified. In the transition regions the asymptotics are expressed in terms of Painlevé transcendents.

We obtain analogous results for initial-boundary value problems for the Camassa–Holm equation on the half-line $x > 0$ with time decaying boundary conditions at $x = 0$. Regions of the quarter plane $x \geq 0$, $t \geq 0$, with different long-time behavior are specified.

Work in collaboration with Dmitry Shepelsky.

CHEN Zhen-Qing

Symmetric Markov Processes and Heat Kernel Estimates

In this talk, I will describe recent development of the DeGiorgi-Nash-Moser-Aronson type theory for a class of symmetric discontinuous processes (or equivalently, a class of symmetric integro-differential operators). A prototype of the Markov processes under consideration is the mixture of symmetric diffusion of uniformly elliptic divergence form operator and symmetric stable-like processes on R^d.

I will focus on the sharp two-sided estimates for the transition density functions (or heat kernels) of the processes, a priori Holder estimate and parabolic Harnack inequalities for their parabolic functions. To establish these results, we employ methods from both probability theory and analysis.

Joint work with Takashi Kumagai.

Ioana CIOTIR

A Trotter type result for the stochastic porous media equations

In this work we study the stochastic porous media equation with multiplicative noise and diffusivity function depending on the space variable. The first part of the paper establish an existence and uniqueness result for this equations. The second part prove a Trotter type theorem for the same equations with the aim to use it for an homogenization result.

Florian CONRAD

Construction and analysis of Langevin dynamics in continuous particle systems

We consider the Langevin equation

$$dx_t^i = v_t^i\,dt$$
$$dv_t^i = -\kappa v_t^i - \sum_{i\neq j}\nabla\phi(x_i - x_j)\,dt + \sqrt{\frac{2\kappa}{\beta}}db_t^i, \quad i \in I \subset \mathbb{N}, t \geq 0,$$

for a large class of potentials ϕ (singular in 0, merely weakly differentiable in $\mathbb{R}^d \setminus \{0\}$). Using functional analytic tools (and a recent existence result from potential theory by Beznea, Boboc and Röckner), we establish existence and (if one adds a restoring force) the weak mixing property of equilibrium dynamics for finitely many particles. Under more restrictive conditions we obtain a result on the rate of convergence in the ergodicity statement.
An infinite dimensional "equilibrium" dynamics (i.e. having a grand canonical Gibbs measure as invariant initial distribution) is constructed as weak accumulation point of finite dimensional dynamics. Finally, we discuss to which assumptions one is led attempting a rather direct proof of the weak mixing property.

Gustav DELIUS

The size of fish

We study a simple stochastic model that describes the main process determining the size spectrum of organisms in marine ecosystems: larger organisms preying on smaller organisms and growing in size. Instead of the spatial location of the organisms we model their weight, but the techniques are the same. The feeding interaction is non-local, determined by an integral kernel expressing the preference for a certain range of predator/prey weight ratios.

We treat the model both as an individual-based model (stochastic process on configuration space) and as a stochastic population model and compare the approaches. The deterministic equation derived from our stochastic model turns out to be a modification of the McKendrick-von Foerster equation that has traditionally been used to model size spectra. The steady state is found to be given by a power law weight distribution, in agreement with observation, but we also observe travelling-wave solutions. We discuss the difficulties that arise when trying to model the coexistence of different species.

This will be a relatively non-technical talk.

Gianfausto DELL'ANTONIO

Limit Motion an Metric Graphs

Often in Physics at the nanoscale one deals with systems which can be regarded as having support in a very small neighborhood $\Omega_\epsilon \in R^3$ of a one dimensional graph Γ. The parameter ϵ is a measure of the distance of $\partial\Omega_\epsilon$ from Γ and is very small as compared to the a typical edge of the graph.

The dynamics of such systems is described by a propagation equation, which can be the wave equation in the case of optical wires or the Schroedinger equation in the case of conduction electrons in a macromolecule or in the case of conducting nano-devices.

In the case of optical wires it reasonable to choose Neumann (reflecting) boundary condi- tions at the boundary $\partial\Omega_\epsilon$. In the case of macromolecules or nano-devices on the other hand the system is confined in the region Ω_ϵ by very strong forces at the atomic scale, which provide a potential in the form of a very deep and narrow valley. In this case Dirichlet b.c. can be regarded as a reasonable approximation.

The inital value problem is well posed for both boundary conditions, but in general one is not able to give a somewhat explicit form of the solution. In order to be able to compute quantities of interest in Physics it is appropriate to search for a dynamical system which provides an approximation to the physical one when ϵ is very small.

It is reasonable to expect that the limit dynamical system be described by a Schroedinger equation on the graph. In order to have a well posed problem one must specify boundary conditions at the vertices. So the problem becomes: which boundary condition is to be used in order that evolution equation on the graph gives (approximate) information on the evolution in Ω_ϵ?

In the case of Neumann boundary conditions the answer is known, at least for initial data with not too large energy. Indeed in this case the initial wave function can be chosen smooth uniformly in ϵ. As a consequence one can define a smooth trace map and prove strong resolvent convergence when $\epsilon \to 0$ to a Schroedinger operator on Γ with Kirchkoff boundary condition at the vertices.

The situation is entirely different in the case of Dirichlet b.c. on $\partial\Omega_\epsilon$. In this case the H^1 norm of the initial datum increases without bound when $\epsilon \to 0$ and there is no limit trace on Γ. For this reason, the question of the existence of a limit flow has gone unanswered so far, in spite of the obvious physical and mathematical interest.

In concrete cases of physical devices, models of limit dynamics have been constructed phenomenologically to fit the experimental data. For instance, in the case of a sharply bend conducting device experiments show that the appropriate limit model has Dirichlet boundary conditions at the vertices.

On the other hand the standard treatment of conducting electrons in aromatic molecules (such as graphene or benzene) shows that results in fair accordance with experiments are obtained if the limit model is constructed with conditions at the vertices that are of Kirchkoff type. The phenomenological values of the proportionality constants entering this type of conditions are different for different molecules. One can consider this as an evidence that the "right" boundary conditions should depend on the shape of Ω_ϵ (the images seen at the electronic microscope are very different for different molecules).

In this talk we will show that the appropriate boundary condition depend on Ω_ϵ through the spectral properties of the restriction H_L^ϵ of the Schroedinger operator H^ϵ to a bounded "mesoscopic domain" Ω_ϵ^L. More precisely they depend on the asymptotic behavior of those eigenvalues of H_L^ϵ that converge when $L(\epsilon) \to \infty$, $\epsilon L(\epsilon) \to 0$ to the threshold of the continuum spectrum of H^ϵ.

Ernst EBERLEIN

Analysis of Fourier transform valuation formulas and applications

The aim of this article is to provide a systematic analysis of the conditions such that Fourier transform valuation formulas are valid in a general framework; i.e. when the option has an arbitrary payoff function and depends on the path of the asset price process. An interplay between the conditions on the payoff function and the process arises naturally. We also extend these results to the multi-dimensional case, and discuss the calculation of Greeks by Fourier transform methods. As an application, we price options on the minimum of two assets in Lévy and stochastic volatility models.

Abdelhadi ES-SARHIR

Kolmogorov operators associated to stochastic Cahn-Hilliard equations

Consider the following operator with Cahn-Hilliard type drift term

$$L_F\varphi = L\varphi + \langle F, (-A)^{\frac{1}{2}} D\varphi \rangle, \quad \varphi \in D(L).$$

Here, F is a nonlinear function on a separable Hilbert space H and L denotes the Ornstein-Uhlenbeck operator associated with the linear operator A. We will study existence and a priori estimates of infinitesimally invariant measures for L_F, i.e., probability measures μ on the Borel subsets $\mathcal{B}(H)$ of H, satisfying $L_F^*\mu = 0$. Furthermore, we discuss the corresponding parabolic Cauchy-problem in $L^1(\mu)$.

FUKUSHIMA Masatoshi

From transience to recurrence via reflection

We say that an m-symmetric right process X on E admits a reflecting extension (RE in abbreviation) if the Dirichlet space of X is a proper subspace of its active reflected Dirichlet space. The possibility of a RE depends not only on the geometry of the underlying space E and the Beurling-Deny forumula of the Dirichlet form (the road map of X) but also on the underlying measure m (the speed of X).

We shall consider the possibility of RE in the case where X are time changed transient reflecting Brownian motions on unbounded multidimensional Euclidean regions in parallel to the simplest case where X are absorbing diffusion processes on a one-dimensional interval.

A joint work with Zhen-Qing Chen.

Martin GROTHAUS

An invariance principle for a tagged particle process in continuum with singular interactions

We present an invariance principle for the dynamics of a tagged particle in an infinite particle environment of interacting particles for a large class of interaction potentials as e.g. the Lennard–Jones potential. In order to apply a general concept of De Masi et al, 1989, to this problem, we have to provide several properties of the tagged particle and the environment process. These are discussed in detail.

Frederik HERZBERG

On the foundations of Lévy finance: Equilibrium for a single-agent financial market with jumps

For a continuous-time financial market with a single agent, we establish equilibrium pricing formulae under the assumption that the dividends follow an exponential Lévy process. The agent is allowed to consume a lump at the terminal date; before, only flow consumption is allowed.

The agent's utility function is assumed to be additive, defined via strictly increasing, strictly concave smooth felicity functions which are bounded below (thus, many CRRA and CARA utility functions are included). For technical reasons we require that only pathwise continuous trading strategies are permitted in the demand set.

The resulting equilibrium prices depend on the agent's risk-aversion through the felicity functions. It turns out that these prices will form the (stochastic) exponential of a Lévy process essentially only if this process is geometric Brownian motion.

Yuri G. KONDRATIEV

Vlasov scaling for Markov evolutions in continuum

We will discuss a scaling limit for stochastic dynamics of continuous systems which corresponds to the large density and weak interaction regime. Under quite general conditions, this scaling leads (heuristically) to an infitite particle evolution with very special properties. In the limiting dynamics, the density of the system is evolving due to a non-linear Vlasov-type kinetic equation. For particular models we show rigirously corresponding convergence of stochastic dynamics. In particular, the cases of the Glauber dynamics and some spacial ecology models will be considered.

Wolfgang KÖNIG

A variational formula for the free energy of a many-Boson system

We consider N bosons in a box in $\mathbb{R}^d$ with volume N/ρ under the influence of a mutually repellent pair potential. The particle density $\rho \in (0, \infty)$ is kept fixed. Denote by $\mathcal{H}_N$ the corresponding Hamilton operator. The symmetrised trace of $\mathrm{e}^{-\beta \mathcal{H}_N}$ describes the bosons at positive temperature $1/\beta$. The existence of the limiting free energy, $f(\beta, \rho)$, is well known, as well as the fact that its value does not depend on the boundary condition.

Our main result is the identification of $f(\beta, \rho)$ in terms of an explicit variational formula, for all sufficiently small β. The main tools are a description in terms of a marked Poisson point process and a large-deviation analysis of the stationary empirical field. The formula in particular describes the asymptotic cycle structure that is induced by the symmetrisation in the Feynman-Kac formula. Our identification concerns the non-condensation phase, where "infinitely long" cycles do not contribute.

We also derive a related variational formula as a general upper bound for $f(\beta, \rho)$ for any β, which we hope to use in future work to distinguish between the non-condensation phase and the condensation phase. (joint work with Stefan Adams and Andrea Collevecchio.)

LI Nan

The quantumness of quantum ensembles

In both theoretical analysis (such as selective measurements) and practical situations (such as random experiments), one is often encountered with quantum ensembles, which are families of quantum states with certain prior probability distributions. How to quantify the quantumness and distinguishability of quantum ensembles? We provide two approaches to this issue and study quantification of relative entropy between two quantum ensembles. The first is based on a probabilistic coupling technique, and the second is a measurement-based approach. Both methods lead to natural generalizations of the relative entropy between quantum states. Moreover, these generalizations enjoy most of the basic and important properties of the original relative entropy. As an application, we use the notion of relative entropy between quantum ensembles to define a measure for quantumness of quantum ensembles. By use of this measure of quantumness, we demonstrate that a set consisting of two pure states is the most quantum when the states are 45° apart.

LIU Wei

Fine Properties of Stochastic Evolution Equations and Their Applications

The main aim of this talk is to show some properties of stochastic evolution equations (SEE) within the variational framework. Firstly, we have established the Fredlin-Wentzell type Large deviation principle for general SEE with small noise. Secondly,

the dimension-free Harnack inequality and strong Feller property are proved for the transtion semigroups associated with SEE drived by additive noise. Consequently, the exponential ergodicity, compactness and some contractive (hypercontractive, ultracontractive) properties are derived for the associated transition semigroups. Lastly, we will show some regularity property for the solution to a class of SEE. As applications, those results are applied to many concrete examples such as stochastic reaction-diffusion equations, the stochastic p-Laplace equation, stochastic porous media equations and fast diffusion equations in Hilbert space.

LUO Shun-Long

Classical versus Quantum Aspects of Quantum States

A quantum state is a fundamental and subtle entity in quantum theory. In generic cases, quantum states encode both classical and quantum information, and these two different kinds of information are intertwinned. It is desirable to distinguish these fundamenatally different aspects of quantum states. Exploiting the themes of commuting/noncommuting aspects of operators and disturbance/non-disturbance features of measurements, we will review various approaches to the study of classical and quantum aspects of quantum states, and discuss implications for the Heisenberg uncertainty relations, the non-clonning and no-broadcasting theorems, etc.

MA Zhi-Ming

Stationary Distribution of Browsing Processes

In this talk I shall tell you how can we construct a stochastic process (Browsing process) describing real users' browsing behavior on the Internet Web, and how can we compute the stationary ditribution of a Browsing process. The stationary distribution has found an application in evaluating the importance of Web pages. To stimulate my talk, I shall first recall the Markov chain used in PageRank of Google Company.

OUYANG Shun-Xiang

Harnack Inequalities and Applications for Stochastic Equations

We establish Harnack inequalities in the sense of [F.-Y. Wang, Logarithmic Sobolev inequalities on noncompact Riemannian manifolds, Probab. Theory Related Fields 109 (1997) 417–424] for the transition semigroups of some stochastic equations such as stochastic differential equations with singular drifts, Ornstein-Uhlenbeck processes with Lévy noise and multivalued stochastic evolution equations. As applications, we study regularizing properties, contractivity properties and heat kernel bound etc. for the transition semigroups.

Julio RODRIGUEZ

Networks of Mixed Canonical-Dissipative Systems with Plastic Dynamics

We study the dynamics of a complex system consisting of N diffusively coupled, stable-limit-cycle oscillators on which individual frequencies are parametrized by ω_k, $k = 1, \ldots, N$. We introduce a "plastic", dynamics which influences the ω_k by driving the system towards a consensual oscillatory state in which all oscillators share a common frequency ω_c. We are able to analytically calculate ω_c. The topology of the network strongly affects the relaxation rate but not the consensual ω_c. We report numerical simulations to show the plastic dynamics at work and confirm our theoretical assertions.

Mark RUDELSON

Random conjunctions matrices

Consider an $d \times n$ matrix A, whose entries are independent $\{0, 1\}$ random variables. For a given number k we construct a $\binom{d}{k} \times n$ random conjunction matrix B, whose rows are entry-wise products of k rows of A. Such matrices appear in various instances in privacy protection problems. In particular, they are used to analyze contingency tables, which are a method of releasing statistical summaries of categorical data. Random conjunction matrices are also used in internet hacking attack algorithms.

In these questions the parameter of interest is the condition number of a matrix, which characterizes the distortion of the Euclidean norm under the action of the matrix. We show that if the number of rows of a random conjunction matrix is significantly bigger than the number of columns, then the condition number of it behaves like that for a random matrix with independent entries. This bound is used to estimate the amount of noise necessary to protect sensitive data, while releasing statistical summaries of it.

Joint work with Shiva Kasiviswanathan, and Adam Smith.

Vitaly D. RUSOV

Diffusion Mechanism for Alpha Decay, Cluster Radioactivity and Spontaneous Fission

(joint work with S.Ch. Mavrodiev, M.A. Deliyergiyev, D.S. Vlasenko)

Wilhelm STANNAT

Improved a priori estimates on invariant measures for SPDE

Stochastic partial differential equations (spde) are used to model stochastic infinite particle systems with complex interaction. The statistical properties can be understood with the help of invariant probability measures for the associated spde. In the talk, a

survey on recent results concerning existence and a priori estimates for spde with additive noise is given. Applications to the uniqueness of stationary martingale solutions are given. Special emphasis is put on stochastic Navier-Stokes equations in 2D.

Sven STRUCKMEIER

Asymptotic Behavior of some Stochastic Evolutions in Continuum

In this talk, we discuss two models of stochastic dynamics in continuum.

The first one is about the diffusive motion of a particle interacting with an infinite configuration of other particles. We will discuss an invariance principle for this dynamics, i.e. the convergence of the dynamics to a Brownian motion under a space-time-scaling.

The second part is about a continuous contact model with jumps. The contact model is a special case of a population dynamics of infinitely many individuals. Originally a dynamics on lattices, a continuous version of this model has been developed and studied in the last years. The contact model only considers birth-and-death of individuals, hence it is only appropriate to describe populations of plants. We show how adding the possibility of jumps of individuals improves results on stationarity of the dynamics in low dimensions.

Jonas Marius TÖLLE

Mosco convergence of weighted Φ-Laplace operators along a sequence of Banach spaces

Given weights w_n, $n \in \mathbb{N} \cup \{\infty\}$ on some fixed domain $\Omega \subset \mathbb{R}^d$ we require $\lim_{n\to\infty} w_n dx = w_\infty dx$ vaguely. Fix an N-function $\Phi \in \Delta_2 \cap \nabla_2$ with Young conjugate Ψ. Denote by $L^\Phi(\Omega, wdx)$ the Orlicz space with weight w.

Completing the results on strong topologies of metric spaces in [KS08] towards weak topologies of Banach spaces we give sense to variational convergence of functionals along a sequence of Banach spaces. In our case the topology on the "asymptotic space"

$$\mathcal{L}^\Phi = \bigsqcup_{n\in\mathbb{N}} L^\Phi(\Omega, w_n dx) \sqcup L^\Phi(\Omega, w_\infty dx)$$

is given by a so-called linear metric approximation sequence of linear operators $\{\Theta_n : C_0^\infty(\Omega) \to L^\Phi(\Omega, w_n dx)\}_{n\in\mathbb{N}}$. The "dual" $\mathcal{L}^\Psi$ is defined in the obvious way.

A weighted Φ-Laplace operator $\Delta_{\Phi,n}$ with weight w_n is the Gâteaux derivative $\nabla_{\text{Gât}} F_n : \mathrm{dom}(\nabla_{\text{Gât}} F_n) \subset L^\Phi(\Omega, w_n dx) \to L^\Psi(\Omega, w_n dx)$ of the strictly convex functional

$$F_n(u) = \begin{cases} \int_\Omega \phi(|\nabla u|)|\nabla u|\, w_n dx, & \text{if } u \in W^{1,\Phi}(\Omega, w_n dx), \\ +\infty, & \text{if } u \in L^\Phi(\Omega, w_n dx) \setminus W^{1,\Phi}(\Omega, w_n dx), \end{cases}$$

where $\phi = \frac{d^-}{dt}\Phi$, ∇ is the weak gradient and each $W^{1,\Phi}$ is an Orlicz-Sobolev space of order 1.

We impose suitable regularity conditions on the weights w_n and the domain Ω (needed in particular for the definition of $W^{1,\Phi}(\Omega, w_n dx)$).

On smooth functions with compact support $\partial F_n = \Delta_{\Phi,n}$ admits a representation

$$\Delta_{\Phi,n} u = -\operatorname{div}[w_n \phi(|\nabla u|)\operatorname{sign}(\nabla u)], \quad u \in C_0^\infty(\Omega).$$

We give conditions on the weights w_n such that $\lim_{n\to\infty} F_n = F_\infty$ in the Kuwae-Shioya-Mosco sense. We prove the generalized version of a Theorem originated in [Att84] which states that Mosco convergence of convex functionals is equivalent to the graph convergence of the Gâteaux derivatives. This yields $\lim_{n\to\infty} \Delta_{\Phi,n} = \Delta_{\Phi,\infty}$ in the Kuwae-Shioya-graph sense.

References.

[Att84] H. Attouch, *Variational convergence for functions and operators*, Pitman, Boston–London–Melbourne, 1984.

[KS08] K. Kuwae and T. Shioya, *Variational convergence over metric spaces*, Trans. Amer. Math. Soc. **360** (2008), no. 1, 35–75.

Felipe TORRES TAPIA

Fluctuation of the longest common subsequence for sequences of independent blocks

Let X and Y be two binary random strings of length n independent of each other. Let L_n denote the length of the Longest Common Subsequence (LCS) of X and Y. In general the order of magnitude in n of $\mathrm{VAR}[L_n]$ is not known. So far, Matzinger and his collaborators had been able to prove that $\mathrm{VAR}[L_n]$ has order $\Theta(n)$ in few cases depending on the distribution of symbols in the sequences X and Y. In this thesis, we prove that $\mathrm{VAR}[L_n]$ has order $\Theta(n)$ considering a model which is not low entropy, in comparison with some previous cases which are low entropy models. The model for the distribution we consider here is i.i.d. sequences of blocks, where blocks are words consisting only of one symbol. In the present case all the blocks have length $l-1$, l or $l+1$ with probability $1/3$ for a given integer parameter $l > 0$. We reduce the problem of proving that $\mathrm{VAR}[L_n] = \Theta(n)$ to showing that a function under an entropy constraint does not go below zero. The method which we develop could be used for many other more complex cases wherever one pattern tends to influence the LCS score in a biased way. Also, a natural question is what happens if one has a more realistic situation than i.i.d, like Markov chains of words for instance (DNA models). This thesis partially answers this question since the model considered is a Markov chain, but the more general case where one can have blocks with different lengths (for instance, in the Bernoulli case a block of length $j > 0$ has length 0.5^j) is still open for future research though the techniques shown here give us new tools for approaching it.

Daniel WINGERT

Non-local Dirichlet forms: Intrinsic metric and Sch'nol type inequality

Subject of this talk are non-local, symmetric Dirichlet forms and generalized eigenfunctions of measure perturbations. We give definitions for the energy measure and intrinsic metrics in this non-local case and establish basic properties of them. After all we apply them to proof types of Cacciopolli and Sch'nol inequality.

XU Mingyu

Numerical algorithms, convergence and simulations of backward stochastic differential equations with constraint

We study different algorithms for backward stochastic differential equations (BSDE in short) with constraint basing on random work framework. Implicit and explicit schemes for both reflected BSDE and BSDE with constraint are introduced, as well as penalisation method. Then we prove the convergence of different algorithms and present simulation results for different types of BSDEs with constraint. At last some numerical simulations are presented.

YAN Jia-An

Markowitz Strategies Revised

In this talk I will show that parameterized continuous-time Markowitz's mean–variance efficient strategies could reach any given target with arbitrarily high probabilities. This result indicates that the very popular risk measure VaR (Value at Risk) may not be a proper measure in guiding investment practice. This, in turn, motivates the introduction of certain stopped strategies where stock holdings are liquidated whenever the parameterized Markowitz strategies reach the present value of the mean target. The risk aspect of the revised Markowitz strategies are examined via expected discounted loss from the initial budget. A new portfolio selection model is suggested. This talk is based on a joint work with Xunyu Zhou.

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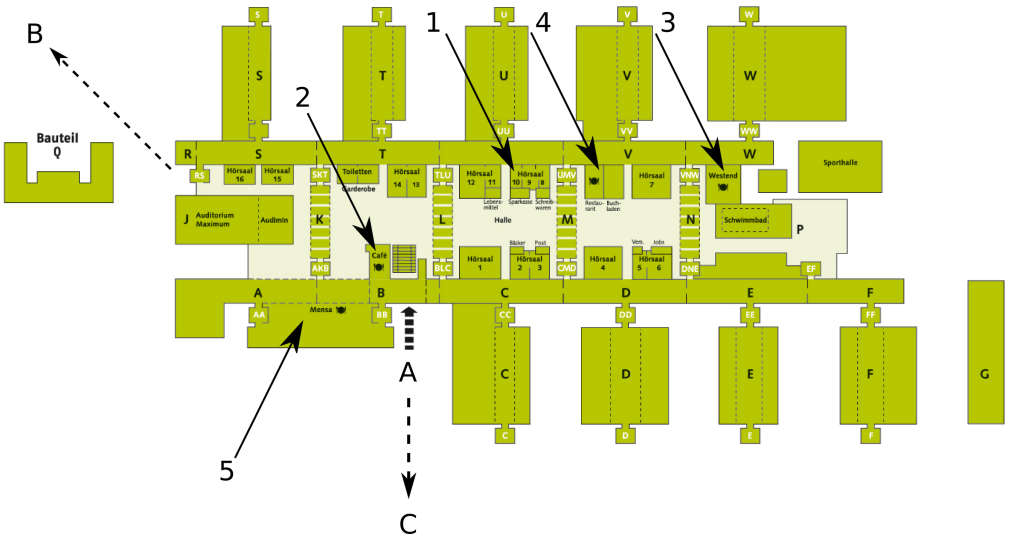
Places



On the above floor plan of the university building, **A** denotes the main entrance, **C** the local train ("Stadtbahn") station and **B** the footpath towards the ZiF (Center for Interdisciplinary Research), where some participants have their accommodation.

Inside the university building,

1. denotes the conference venue, lecture hall H10.

During the lunch break, you can find food in the following places:

2. University Cafeteria (warm and cold drinks, sandwiches, cakes, warm 'fast food', breakfast; self service; open Monday–Friday 8–20 and Saturday 9–14:30)

3. Restaurant "WestEnd" (German and international dishes; self service; open Monday–Friday 11–16 and Saturday 11–14:30)

4. Restaurant "UniVarza" (Anatolian and mediterranean dishes; open Monday–Friday 10–24)

5. Mensa (Refectory, offers menus for lunch; self service; open Monday–Friday 11:30–14; *menus in the Mensa can only be purchased with a student or employee ID card, but the self-service salad bar with fresh salads and vegetables and a small choice of warm dishes does accept cash*)