Summer School 2014,
Berlin–Bedlewo

	Monday	Tuesday	Wednesday	Thursday	Friday
09:00-10:30	Obloj	den Hollander	Obloj	Obloj	den Hollander
10:30-11:00	Break	Break	Break	Break	Break
11:00-12:30	den Hollander	Obloj	Obloj	den Hollander	den Hollander
12:30-14:30	Lunch	Lunch	Lunch	Lunch	Lunch
14:30-15:00	Flegel	Boryc	Excursion to Poznan	Mazzonetto	
15:00-15:30	Falkowski	Bilarev		Chojecki	
15:30-16:00	Prömel	Luz		Conforti	
16:00-16:30	Break	Break		Break	
16:30-17:00	Makogin	Krüger		Kosenkova	
17:00-17:30	Müller	Pytel		Nguyen	
17:30-18:00	Altmayer	Lang		Shekhar	
18:00-18:30	tba			tba	
19:00	Dinner	Dinner	Bonfire Supper	Conference Dinner	Dinner

Contributed Talks

Randolf Altmayer (RTG, HU Berlin)

Title: Estimating integrated and spot volatility in semimartingale models

Abstract: I will review some basic results on estimating integrated volatility and present a few projects I am working on. These include efficient (or at least rate optimal) estimation of spot volatility, estimation of the Brownian dimension (i.e. the minimal rank of the spot volatility) and also estimation in high dimensions which involves random matrix theory.

Todor Bilarev (RTG, HU Berlin)

Title: Optimal Liquidation in a Market Impact Model

Abstract: In this talk, we will discuss a market model where the actions of a large trader can affect the price of the underlying risky asset. In addition to continuous trading, the large trader can also implement market orders corresponding to block trades. We will explain why

the proceeds from block trades should have a certain form by linking our model to the so-called Marcus integrals, for which a Wong-Zakai type of approximation result holds due to Kurtz, Pardoux, Protter (1995). As a corollary, the proceeds from general trading strategies come as a limit of proceeds from absolutely continuous strategies. In addition, we will justify the absence of arbitrage opportunities in our setup. In the proposed model, we will solve a stochastic optimization problem arising from the question of how to optimally liquidate a number of shares of the risky asset. We first solve a variant of the problem that allows for monotone trading strategies only. In the infinite time horizon case, the associated value function is described by a certain variational inequality that we solve explicitly. The optimal (monotone) liquidation strategy is characterized by a free boundary dividing our state space (market impact together with remaining shares) into a sell region and a wait region. In the case when intermediate buying is allowed, it turns out that the state space is divided into a sell region and a buy region with the same free boundary. If time allows, we will also discuss an extension of our model where addi- tional noise is considered in the impact process. In this case, we argue why the optimal liquidation strategy could be described by the local-time process of a certain reflected diffusion.

Marcin Boryc (UMCS)

Title: Reciprocal class of jump processes

Abstract: TBA

Tymoteusz Chojecki (UMCS)

Title: On positivity of the variance of a trace moving in a divergence-free Gaussian random field

Abstract: TBA

Giovanni Conforti (U Potsdam)

Title: Reciprocal class of jump processes

Abstract: We characterize the reciprocal class associated to a Markov jump process by mean of conditional invariants, which we explicitly compute and interpret as short time asymptotics for the probability of following a given loop. Some examples, such as compound Poisson processes and Random walks on a graph will be discussed in more detail. Here we try to extract the minimal number of invariants needed in the characterization, by exploiting geometrical properties of the underlying path spaces.

Adrian Falkowski (UMK)

Title: SDEs with time-dependent reflecting barriers driven by processes with bounded p-variation

Abstract: TBA

Franziska Flegel (WIAS Berlin)

Title: Dynamical localization in the one-dimensional random trap model

Abstract: We investigated two models for random walks in random potential landscapes on lattices: the random barrier model (or random conductance model) and the random trap model (random capacitance model). We describe them as Markov processes with rates that are random but fixed. It is known that in dimension one the one-particle properties of the trap and barrier model (i.e. mean squared displacement, probability to be at the origin etc.) are equivalent in the average over all possible trajectories. However, this does not hold for two-particle quantities such as the probability that two arbitrary particles are at the same site. In fact, the one-dimensional trap model with a power-law distribution of mean sojourn times exhibits a phenomenon of dynamical localization in the case where diffusion is anomalous. It was shown that in this case in almost every landscape the probability that two arbitrary particles are at the same site does not converge to zero. We numerically investigate this phenomenon, using a method based on spectral decomposition of the transition rate matrix in finite lattices. The simulation results suggest that it is only marginally connected with the spectrum of the transition rate matrix, and is dominated by the properties of its eigenfunctions.

Tetjana Kosenkova (U Kyiv)

Title: Weak convergence of a sequence of step processes to Lévy-type processes and related topics

Abstract: TBA

Jennifer Krüger (RTG, TU Berlin)

Title: A Multiscale Analysis of Front Propagation in Stochastic Neural Fields

Abstract: Modelling the spatiotemporal evolution of neural activity in thin layers of cortical tissue the neural field equation can be classified as a nonlinear, nonlocal differential equation, which, in the deterministic case, allows for the existence of monotone travelling- wave solutions. It is well known that additional extrinsic stochastic forcing terms result in two distinct phenomena: perturbations of the front shape as well as a horizontal displacement of the wave profile from its uniformly translating position. In this talk we introduce a mathematical framework which captures these effects and allows us to realise a stochastic neural field as a stochastic evolution equation on a suitable function space. We then discuss new stability results for the unique strong solution to this equation.

Eva Lang (RTG, TU Berlin)

Title: Finite-Size Effects on Traveling Wave Solutions to Neural Field Equations

Abstract: The evolution of the activity in a network consisting of a large number of populations of neurons with nonlocal interactions is in the continuum limit described by an integro-differential equation, the neural field equation. Since the communication of neurons is subject to noise, it is of interest to study stochastic versions of this equation. While on the single neuron level several sources of intrinsic and extrinsic noise have been identified, the question of how this translates to the population level is not yet settled. The neural field equation describes the mean field behavior of the coupled populations and the usual effects of noise have been averaged out on this level. The underlying assumption here is that the size of the populations is infinite. Their actual finite size leads to deviations from the mean field behavior, suggesting finite-size effects as an intrinsic source of noise. We derive a neural field equation as the continuum limit of a discrete network, including a suitable stochastic correction term accounting for finite size effects. Using a geometric approach, we show that traveling wave solutions to the neural field equation are stable in the derived setting. With large probability, the finite-size effects do not cause the solution to escape from the basin of attraction of the traveling wave.

Maksym Luz (U Kyiv)

Title: Robust extrapolation of stochastic sequences with stationary increments and cointegrated sequences

Abstract: TBA

Vitalii Makogin (U Kyiv)

Title: Fractional Brownian sheet and self-similarity

Abstract: TBA

Sara Mazzonetto (RTG, U Potsdam)

Title: Exact simulation of a Brownian diffusion whose drift admits some jumps

Abstract: In this talk we present recent developments (including our own progress) concerning the exact simulation of one-dimensional Brownian diffusions with discontinuous drift. This involves a fine analysis of the semigroup of real-valued Brownian dynamics undergoing their motion through semipermeable boundaries. Our study is based on papers by Pierre Étoré and Miguel Martinez (2013).

Marvin Müller (RTG, TU Berlin)

Title: Stochastic Free Boundary Problems

Abstract: Free boundary problems allow for modelling of multiphase systems with separating boundaries evolving in time. While the deterministic problems are in general well understood, introducing additional stochastic terms to the equations makes the analysis more complicated. In this talk, we study a class of stochastic second-order PDEs with non-linear Stefan-type boundary interaction. To solve the equation we transform the problem into a stochastic evolution equation. Regularity properties of the linear term in the equation allow to establish local existence and uniqueness results. This provides a framework to analyse the solutions for this class of semilinear stochastic free boundary problems.

Adam Pytel (PW)

Title: Markov consistency of Archimedean Survival processes

Abstract: TBA

Tuan Anh Nguyen (BMS, TU Berlin)

Title: Quenched Invariance Principle for the Random Conductance Model

Abstract: We study a continuous time random walk, $(X_t)_{t\geq 0}$ on $\mathbf{Z}^d$ in an environment of random conductances taking values in $[0,\infty)$. The law of the environment is assumed to be an ergodic law on the supercritical bond-percolation cluster. We prove a quenched (almost sure) invariance principle for X under some moment conditions of the environment. My talk will introduce two important results of my master thesis: the L^1-sublinearity of the corrector and a Sobolev inequality on the supercritical bond-percolation cluster.

David Prömel (RTG, HU Berlin)

Title: Skorokhod embedding via FBSDE

Abstract: We solve the Skorokhod embedding problem for a class of Gaussian processes including Brownian motion with non-linear drift. Our approach relies on solving an associated strongly coupled Forward Backward Stochastic Differential Equation (FBSDE) and investigating the regularity of the obtained solution. For this purpose we extend the existence, uniqueness and regularity theory of so called decoupling fields for Markovian FBSDE with locally Lipschitz continuous coefficients. This talk is based on a joint work with Alexander Fromm and Peter Imkeller.

Athul Shekar (BMS, TU Berlin)

Title: Towards understanding the trace of Loewner evolution

Abstract: Loewner evolution is family of continuously growing compact sets in plane having the local growth property. There is a one to one correspondence between Loewner evolutions and real valued continuous functions called its driver. When the driver is chosen to be Brownian motion, it gives rise to Schramm-Loewner evolutions (SLE). In this talk, we will look at properties of the driver to generate a curve in the plane. We will apply this to Cameron-Martin paths. Curves in this case turns out to be Lipchitz under suitable time reparametization and thus of bounded variation. We also get a stability result in $\alpha < \frac{1}{2}$ Hölder norm for piecewise linear approximations.