15. Doktorandentreffen Stochastik

July 31 - August 2, 2019

TU Darmstadt

Organization: Micha Buck, Johannes Ehlert, Marvin Kettner

July 29, 2019

Contents

1 General Information

1.1 Accommodation

Participants are recommended to stay in the following hotel, located in walking distance (15 - 20 minutes) to the lecture venue.

HOTEL ATLANTA
Kasinostraße 129, 64293 Darmstadt
Tel: +49-6151-1789-0
Fax: +49-6151-1789-66

For directions please see the map on the back cover.

1.2 Registration

On Wednesday midday, starting from 12:00, registration is possible in S1|05 24, Magdalenenstraße 12 | 64289 Darmstadt.

1.3 Lecture Hall

Location: Technische Universität Darmstadt. The registration and all lectures will take place in building S1|05, Magdalenenstraße 12 | 64289 Darmstadt in lecture hall S1|05/22 and S1|05/23, respectively. There is a small blackboard and a projector in both lecture halls.

1.4 Map & Points of Interest

The map can be found on the back cover.

1.5 Public Transportation

The closest bus and tram stops to the venue of the workshop are **Schloss** (trams: 2, 3, 9) and **Willy-Brandt-Platz** (trams: 4, 5, 6, 7, 8). Both stops are within 10 minutes walking distance to the lecture hall.

1.6 Food & Beverage

Cheap and plain food can be purchased at the TU Darmstadt Refectory-Canteen, Alexanderstr. 4, building S1|11, Monday to Friday 11:15 to 14:00. Additionally there are lots of good restaurants and bistros near TU Darmstadt. Please dial +49 6151 preceding the number given below.

Name	Address	Phone	Cuisine	Opening Hours
Ratskeller	Marktplatz 8	26444	German	10:00 - 01:00
Pizzeria da Nino	Alexanderstr. 29	24220	Italian	18:00 - 23:00
Haroun's	Friedensplatz 6	23487	Oriental	11:00 - 22:30
Cafe Extrablatt	Marktplatz 11	5998820	Bistro	08:30 - 23:30
Ristorante Sardegna	Kahlertstraße 1	23029	Italian	11:30 - 15:00

1.7 Excursion

On Thursday, August 1^{st}, a guided city tour of Darmstadt will be offered. We will start around 15:30 at Luisenplatz. Afterwards we will go to the conference dinner with guided brewery tour.

1.8 Conference Dinner

On Thursday, August 1^{st}, there will be a conference dinner at the Restaurant Braustüb'l, Goebelstraße 7, 64293 Darmstadt, Phone: +49 6151 6273617, braustuebl.net.

1.9 Contact Information

If you have any questions concerning the workshop, please feel free to contact one of the local organizers:

- Micha Buck
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2 Acknowledgements

Financial support by d-fine, R+V Re and Fachgruppe Stochastik is acknowledged.

3 Programme

Wednesday, July 31, 2019

		Room S1|05 22	Room S1|05 23
12:00 – 13:00	Registration (S1|20 24)		
13:00 – 13:30	Welcome		
13:30 – 14:00		Talk: Bechtold	Talk: Neblung
14:00 – 14:30		Talk: Mandler	Talk: Kloodt
14:30 – 15:00	Coffee break		
15:00 – 15:30		Talk: Kolesnikov	Talk: Hufnagel
15:30 – 16:00		Talk: Ramzews	Talk: Jakubzik
16:00 – 16:30		Talk: Godland	Talk: Klein
16:30 – 17:00	Coffee break		
17:00 – 17:30	R+V Re (S1|20 011)		
from 17:30	Reception		

Thursday, August 1, 2019

		Room S1 | 05 22	Room S1 | 05 23
09:00 – 09:30		Talk: Röttger	Talk: Gutjahr
09:30 – 10:00		Talk: Seidel	Talk: Aleksandrov
10:10 – 10:40	d-fine (S1 | 20 24)		
10:45 – 11:15	Coffee break		
11:15 – 11:45		Talk: Drescher	Talk: Wulkow
11:45 – 12:15		Talk: Bröker	Talk: Kondakji
12:15 – 13:45	Lunch		
13:45 – 14:15		Talk: Reisser	Talk: Natarovskii
14:15 – 14:45		Talk: Gröber	Talk: Takam
15:30 – 17:30	City tour		
from 18:00	Conference dinner		

Friday, August 2, 2019

		Room S1|05 22	Room S1|05 23
09:00 – 09:30		Talk: Matzke	Talk: Sohr
09:30 – 10:00		Talk: Hao	Talk: Roth
10:00 – 10:30	Coffee break		
10:30 – 11:00		Talk: Fischer	Talk: Jula Vanegas
11:00 – 11:30		Talk: Kilian	Talk: Schertzer
11:30 – 12:00	End		

4 List of Talks

Boris Aleksandrov
Pearson residuals for checking conditional dispersion in count time series
Helmut-Schmidt-Universität, Germany

Abstract: After having fitted a model to a count time series, an important question with regard to the model adequacy is if the model's conditional variance is able to fully explain the conditional variation observed in the time series. A common approach is to compute either the empirical variance of the standardized Pearson residuals or their mean of squares, and to check this value for deviations from 1. But to be able to detect significant deviations from 1, and to also control the probability of a false rejection, distributional properties of the above statistics need to be known.

We consider two popular models from count time series analysis, the Poisson INAR(1) and Poisson INARCH(1) model. For both cases, we derive the asymptotic distribution of the mean of squared Pearson residuals. The finite-sample performance as well as the general ability of the Pearson statistics for analyzing conditional dispersion are investigated with simulations.

Florian Bechtold
Strong solutions of semilinear SPDEs with unbounded diffusion
Sorbonne Université, France

Abstract: We consider the problem

$$\begin{cases} du &= \Delta u dt + \mathrm{div} F(u_t) dt + (-\Delta)^{\delta/2} \sum_{k=1}^{d} B_k(u_t) dW_t^k \\ u(0) &= u_0 \in L^2(\mathbb{T}^N) \end{cases} \tag{4.1}$$

for $\delta \in [0,1)$. We prove a generalization to the classical maximal inequality for stochastic convolutions thanks to which one can establish existence and uniqueness of mild solutions u^δ via a fixed-point argument. By uniformly bounding the associated sequence of Picard iterations in suitable Sobolev spaces, one can show via Banach-Alaoglu and a uniqueness of limit argument that the constructed mild solution actually lives in Sobolev spaces provided smooth initial conditions. Thanks to the Sobolev embedding theorem, this permits to identify the mild solution as a strong one.

In case of excess time, we consider the limit case $\delta = 1$ to the above problem, showing existence of solutions in a "weak-mild" sense proposed during the talk via a Banach-Alaoglu argument on the sequence $(u^\delta)_{\delta<1}$.

Yannic Bröker
Supercritical Gaussian multiplicative chaos in the Wiener space
Westfälische Wilhelms-Universität Münster, Germany

Abstract: We fix any dimension $d \geq 1$ and consider the space of continuous functions $\Omega = C([0,\infty),\mathbb{R}^d)$ endowed with the topology of uniform convergence of compact subsets. The Gaussian field $\{\mathscr{H}_T(W)\}_{W\in\Omega}$ at level T, then is given by

$$\mathscr{H}_T(W) = \int_0^T \int_{\mathbb{R}^d} \phi(W_s - y)\dot{B}(s,y)\mathrm{d}y\mathrm{d}s,$$

where B is a space-time white noise and ϕ is a non-negative mollifier. The renormalized GMC measure is given by

$$\widehat{\mathscr{M}_{\beta,T}}(\mathrm{d}W) = \frac{1}{\mathscr{Z}_{\beta,t}}\mathscr{M}_{\beta,t}(\mathrm{d}W).$$

Here $\mathscr{M}_{\beta,t}(\mathrm{d}W) = \exp\{\beta\mathscr{H}_T(W) - \frac{\beta^2 T}{2}(\phi\star\phi)(0)\}\mathbb{P}_0(\mathrm{d}W)$ is the tilted measure, corresponding to the Gaussian field $\{\mathscr{H}_T(W)\}_{W\in\Omega}$ and $\mathscr{Z}_{\beta,T} = \int_\Omega \mathscr{M}_{\beta,T}(\mathrm{d}W)$ denotes the total mass.

The parameter β, known as the inverse temperature, captures the strength of the noise. In a recent work by Mukherjee, Shamov and Zeitouni, it was shown that, for β small enough, the total mass $\mathscr{Z}_{\beta,T}$ converges as $T \to \infty$ in distribution to a strictly positive random variable, while for β large, it converges in probability to zero.

We have proved that for β large, the endpoint is localized in random regions of the space. The methods of our proof are based on the translation-invariant compactification theory developed by Mukherjee and Varadhan. The present goal is to show that as $T \to \infty$, the GMC measure itself is localized in purely atomic states. This is a joint work with my supervisor Chiranjib Mukherjee.

Christian Drescher
Characterizing the second moment of non-negative multivariate distributions
Universität Augsburg, Germany

Abstract: A matrix $A \in \mathbb{R}^{n \times n}$ is completely positive if and only if it has an entry-wise non-negative root $B \geq 0$, i.e. $A = BB^\top$. We have developed a novel class of complete positivity tests by establishing a link to second moments of non-negative multivariate distributions, like the log-normal or chi-square distribution. A matrix is completely positive if and only if it is the second moment of a non-negative multivariate distribution. By providing fast tests for a variety of distribution classes, we obtain efficient tests for a large set of completely positive matrices.

We are looking for further non-negative multivariate distributions where the second moment can be easily characterized.
Joint work with: Ralf Werner

Simon Fischer
On the Chow-Robbins Game
Christian-Albrechts-Universität zu Kiel, Germany

Abstract: The Chow-Robbins Game $\frac{S_n}{n}$ is a classical still unsolved stopping problem introduced by Chow and Robbins in 1965. The Game is easy to describe: You repeatedly toss a fair coin. After each toss, you decide if you take the fraction of *heads* up to now as a payoff, otherwise you continue. Translated to rigorous math, this reads as: Maximize $\mathrm{E}\left[\frac{S_\tau}{\tau}\right]$ over all stopping times τ, where S_n is a random walk. We show a new method to gain tight bounds for the value function, using the analogous continuous problem $\frac{W_t}{t}$, where W is a Brownian motion. We deduce some generalizations to a bigger class of stopping Problems.

Philipp Godland
Markov renewal theory in the probabilistic analysis of random digital trees
Westfälische Wilhelms-Universität Münster, Germany

Abstract: A *trie* (from re*trie*val) is a digital tree that stores a set of input strings (e.g. words) and is the basis for algorithms especially for sorting and searching. It has lots of characteristic parameters which measure complexity and are worth being investigated for "typical" input strings. These strings are often modeled to be emitted by a sensible probabilistic source. Most results have been established for *memoryless sources*, fewer results exist for more general sources such as *Markov sources* or *dynamical sources*. We illustrate how Markov renewal theory offers a purely probabilistic approach to results concerning Markov sources.

Lukas Gröber
Die Hauptkomponentenanalyse des Poisson-Prozesses
Justus-Liebig-Universität Gießen, Germany

Abstract: Einer der bekanntesten stochastischen Prozesse in der Mathematik stellt der Poisson-Prozess dar. Dieser hat sich in vielen Modellen zur Beschreibung realer Phänomene in der Wirtschaft als äußert erfolgreich herausgestellt. Eine kritische Auseinandersetzung mit der Frage, ob bei der Modellierung die richtigen Annahmen getroffen wurden, ist dabei stets von entscheidender Bedeutung. Eines der wohl besten Verfahren zur Untersuchung dieses Umstandes stellt dabei die Hauptkomponentenanalyse dar. Diese liefert für den zugrundeliegenden stochastischen Prozess hochspezialisierte und genau zugeschnittene goodness-of-fit Testverfahren. Für die Herleitung der Hauptkomponenten ist jedoch zumeist ein größerer Aufwand vonnöten und im Falle des so essentiellen Poisson-Prozesses in der Literatur bisher noch nicht behandelt worden.

Im Rahmen meines Vortrages möchte ich diese Lücke schließen und dem in diesem Gebiet unerfahrenen Zuhörer einen Einstieg in die Thematik ermöglichen.

Tim Gutjahr
Ordinale Muster als Maß für die Komplexität von Zeitreihen
Universität zu Lübeck, Germany

Abstract: In der Statistik ist es oft von Interesse, zu quantifizieren, wie komplex eine gegebene Zeitreihe ist. Eine robuste Methode für die Analyse von Komplexität bietet die Betrachtung sogenannter ordinaler Muster. Ordinale Muster basieren auf den Ordnungsrelationen zwischen verschiedenen Werten einer Zeitreihe und sind invariant bezüglich monotoner Transformation der Daten.

In diesem Vortrag betrachten wir ordinale Muster zum einen im Kontext von maßerhaltenden dynamischen Systemen und zum anderen im Zusammenhang mit stochastischen Prozessen und erläutern jeweils interessante Fragestellungen.

Basierend auf der Verteilung von kurzen ordinalen Mustern in stochastischen Prozessen lassen sich spezielle Teststatistiken formulieren. Wir beschreiben die Verteilung dieser Teststatistiken für Tests auf fraktalen Brownschen Bewegungen und illustrieren ihre Anwendung anhand von Daten aus der Geologie.

Nannan Hao
Graph distances in scale-free percolation
Ludwig-Maximilians-Universität München, Germany

Abstract: Scale-free percolation is a model for inhomogeneous long-range percolation on $\mathbb{Z}^d$. Every vertex is assigned with i.i.d weight. Conditionally on these weights the edges are all independent. We are interested in the graph distances when the degree distribution of a single vertex in the resulting graph has finite variance, and establish a poly-logarithm bound as in the homogeneous long-range percolation.

Nicole Hufnagel
Martingale Estimation Functions for a stationary version of the Bessel process
Technische Universität Dortmund, Germany

Abstract: Martingale estimation functions are well studied by Bibby, Kessler and Sørensen (1995, 1999) in the case of discretely observed diffusion processes. Similarly to many applications of martingale estimation functions, the underlying process is therefore required to be ergodic. In this talk we adapt the methodology of Bibby, Kessler and Sørensen to achieve novel martingale estimation functions for a Bessel process, that is non-ergodic by default. We can tackle this problem by considering a space-time transformation of the Bessel process which is given by the stochastic differential equation

$$\begin{cases} \mathrm{d}X_t &= \mathrm{d}B_t + \left[\left(\vartheta + \frac{1}{2}\right)\frac{1}{X_t} - \alpha X_t\right]\mathrm{d}t, \\ X_0 &= x_0 > 0 \end{cases}$$

for a fixed $\alpha > 0$ and the parameter of interest $\vartheta \in \Theta \subset (-1, \infty)$.
We provide two martingale estimation functions for this transformed Bessel process. Following the approach of Bibby, Kessler and Sørensen, the consistency and asymptotic normality of these estimators can be derived. Eventually, we compare both martingale estimation functions through a simulation study and discuss the emerging complications.

Mirko Alexander Jakubzik
Statistical Inference for Intensity-Based Load Sharing Models With Damage Accumulation
Technische Universität Dortmund, Germany

Abstract: The theory of counting processes provides a general framework suitable for numerous applications in engineering, epidemiology or econometrics. The cumulative intensity process corresponding to a counting process serves as a predictor and represents the process's qualitative behaviour. We introduce semi-parametric load sharing models based on intensity processes that also encompass damage accumulation. Two competing approaches to obtain confidence sets for the parametric part of these models are discussed: The minimum distance estimation method of Kopperschmidt and Stute is based on a paper published in 2013 and yields consistent and asymptotically gaussian distributed estimates by minimizing the distance between the counting process and the estimated cumulative intensity. Utilizing the asymptotic properties of this estimator, a Wald-type confidence set can be derived. The novel maximum depth method rests upon the conditional cumulative hazard transform of a point process. The proposed confidence region is obtained through a test based on the K-sign depth, a generalization of the well-known sign test. Therefore, exact confidence sets can be determined even for small sample sizes, enhancing the method's applicability within the frame of expensive large-scale fatigue tests that were carried out at TU Dortmund University. In a case study, the herein discussed methods are applied to this fatigue test data. Furthermore, a comparison of the proposed confidence regions in terms of coverage rate and robustness is performed by virtue of a simulation study.

Laura Jula Vanegas
Modeling dependence on the superposition of Markov chains: An application to ion channels
Georg-August-Universität Göttingen, Germany

Abstract: Hidden Markov Models (HMM) are widely used for modeling temporal data in biostatistics (particularly for Ion channels), among other fields. Recent work has shown that the long-held belief that multiple ion channels in a membrane behave independently is often false. Models for dependence of multivariate Markov chains usually rely on the observation of each individual chain, whereas in our application we only have recordings for the superposition (sum) of the chains. We developed a coupled Hidden Markov Model for multiple dependent Markov chains, where the only information needed comes from the superposition of the

chains. The model can explain a wide range of behavior, including negative and positive coupling. Our work shows the presence of negative coupling behavior in RyR2 Channels found in cardiac muscle.

Martin Kilian
Penalizing fractional Brownian motion for being negative
Technische Universität Darmstadt, Germany

Abstract: In many physical applications, one wants to condition given stochastic processes on staying positive. The difficulty of defining the conditional law comes from the fact that for many processes of interest, the event of staying positive has probability zero. Nevertheless, due to the power of Markovian structures, this could be done for Lévy processes, especially Brownian motion. In view of the demand for generalizing this to fractional Brownian motion and thus covering also applications with long-range dependence, we calculate the weak limit of a fractional Brownian motion which is penalized – instead of being killed – when leaving the positive half-axis. Based on joint work with F. Aurzada and M. Buck.

Philipp Klein
A MOSUM approach for the estimation of change points in renewal processes
Otto-von-Guericke-Universität Magdeburg, Germany

Abstract: Change point analysis aims at finding structural breaks in stochastic processes and therefore plays an important role in a variety of fields, e. g. in finance, neuroscience and engineering.
In this talk, we consider stochastic processes which are piecewise compositions of independent renewal processes with different intensities. The aim is to identify the points in time where the stochastic process switches from one renewal process to another (so-called change points). Here, we present a procedure first introduced by Messer et al., (2014), which uses moving sum (MOSUM) statistics to estimate these change points and therefore segments these processes. By an invariance principle between renewal processes and Wiener processes, we can show the consistency of the corresponding change points estimators.

Nick Kloodt
Estimating and Testing in Nonparametric Transformation Models - a Brief Overview and some Thoughts about Reducing Simulation Time
Universität Hamburg, Germany

Abstract: Over the last years, transformation models have attracted more and more attention since they are often used to obtain desirable properties by first transforming the dependent random variable of a regression model. Applications for such models can reach from reducing skewness of the data to inducing additivity, homoscedasticity or even normality of the error terms. While completely nonparametric modelling is possible this might be accompanied by a loss in terms of estimating performance. Hence, it is desirable to test for the type of the model a priori in order to apply appropriate estimating approaches afterwards.
In this talk, a brief overview of some estimating and testing approaches in nonparametric transformation models is given. Due to the generality of the underlying models, many of these approaches are accompanied with massive computation costs since in general several model components have to be estimated nonparametrically. If bootstrapping is applied, this may cause the calculations for a single simulation run to take several days or even weeks or months. An experience report together with some methods to reduce the computation time is given (this is limited to conducting simulations with *R*). Far from being an expert on *R*, some basic ideas (not only on the level of implementing) are presented, that possibly can be applied in other contexts as well.

Leonid Kolesnikov
Activity expansions for correlation functions: Characterizing the domain of absolute convergence
Ludwig-Maximilians-Universität München, Germany

Abstract: In this talk, we consider Gibbs point processes with non-negative pair potentials (e.g., non-intersecting spheres in $\mathbb{R}^d$ or polymer models in $\mathbb{Z}^d$). For small activities, a cluster expansion allows us to express the corresponding correlation functions by (multivariate) power series in the activity around zero. We are primarily interested in the domain of absolute convergence of these activity expansions.

Those power series are given by exponential generating functions of certain combinatorial species - in other words, their coefficients can be represented by sums over a certain class of weighted combinatorial structures. Properties of these combinatorial structures can be translated to structural properties of the corresponding

generating functions - yielding the well-known Kirkwood-Salsburg relations between the activity expansions, from which one can derive a characterization of absolute convergence of the latter.

We present a selection of sufficient criteria for absolute convergence obtained in some particular set-ups with hard-core interactions using this approach.

Hakam Kondakji
Optimale Portfolios unter partieller Information in einem Finanzmarkt mit Gaußscher Drift und Expertenmeinungen
Brandenburgische Technische Universität Cottbus-Senftenberg, Germany

Abstract: Wir untersuchen optimale Portfoliostrategien für nutzenmaximierende Investoren in einem zeitstetigen Finanzmarktmodell, bei dem die Drift durch einen Ornstein-Uhlenbeck-Prozess modelliert wird, welcher nicht direkt beobachtbar und vom Investor aus den ihm zur Verfügung stehenden Information zu schätzen ist. Da optimalen Handelsstrategien sehr sensibel auf die Driftparameter reagieren, benötigen Investoren mölichst genaue Driftschätzungen auf der Basis der ihnen zur Verfügung stehenden Informationen. Die Konstruktion solcher Schätzungen allein aus der Kenntnis von historischen Marktdaten liefert allerdings in der Praxis nur unbefriedigende Ergebnisse, da Drifteffekte in den Daten durch eine starke Volatilität überlagert werden. Aus diesen Gründen beziehen Investoren für die Bestimmung ihrer Anlagestrategien auch andere externe Informationsquellen ein, um die Einschätzung der unbekannten Drift zu verbessern. Dabei handelt es sich z.B. um Wirtschaftsnachrichten, Unternehmensberichte, Ratings, Empfehlungen von Finanzanalysten oder die eigene individuelle Sicht auf die zukünftige Preisentwicklung. Solche externen Informationen werden in der Literatur Expertenmeinungen genannt.

Die Expertenmeinugen werden als normalverteilte Zufallsgrößen gesetzt und durch einen markierten Punktprozess modelliert. Beim Nutzenmaximierungsproblem für den Potenz-Nutzen ist die zugehörige DPE eine im Diffusionsteil des Differentialoperators degenerierte PIDE. Mit Hilfe einer Regularisierungstechnik definieren wir durch die Hinzufugung eines Diffusionstermes eine Familie von Kontrollproblemen und zeigen, dass die zugehörigen Wertfunktionen gegen die Wertfunktion des ursprünglichen Kontrollproblems konvergiert, wenn der Diffusionsterm gegen Null geht.

Es wird auch der Grenzfall betrachtet, wenn die Expertenmeinungen immer häufiger und häufiger eintreffen.

Christian Mandler
A Functional Itō Calculus for the Dawson-Watanabe Superprocess
Justus-Liebig-Universität Gießen, Germany

Abstract: Motivated by the extension of the Itō calculus by Dupire (2009), we derive a functional Itō formula for a certain class of measure-valued processes; the Dawson-Watanabe Superprocesses. This talk is based on joined work with Ludger Overbeck.

Kilian Matzke
Asymptotic expansion of the critical point of site percolation
Ludwig-Maximilians-Universität München, Germany

Abstract: We consider site percolation on the hypercubic lattice. As a consequence of the lace expansion, we obtain an explicit identity for the critical point in terms of so-called lace-expansion coefficients. Using the lace expansion mostly as a black box, we explain how to derive an expansion for the critical point in terms of inverse powers of the dimension, and we compute the first three coefficients of this expansion.

Viacheslav Natarovskii
Wasserstein contraction and spectral gap of simple slice sampling
Georg-August-Universität Göttingen, Germany

Abstract: We prove Wasserstein contraction of simple slice sampling for approximate sampling w.r.t. distributions with log-concave and rotational invariant Lebesgue densities. This yields, in particular, an explicit quantitative lower bound of the spectral gap of simple slice sampling. Moreover, this lower bound carries over to more general target distributions depending only on the volume of the (super-)level sets of their unnormalized density.

Sebastian Neblung
Projektionsbasierter Schätzer für den Tail-Spektralprozess
Universität Hamburg, Germany

Abstract: Die Abhängigkeitsstruktur im extremen Bereich von regulär variierenden stationären Zeitreihen kann durch den Tail-Spektralprozess $(\Theta_t)_{t\in\mathbb{Z}}$ beschrieben werden. $(\Theta_t)_{t\in\mathbb{Z}}$ ist der Grenzwert der reskalierten Zeitreihe bei einer gegebenen extremen Beobachtung zur Zeit 0 und erfüllt mit der "' Time-Change-Formula"' (TCF) eine spezielle Struktureigenschaft. Zur Schätzung der Verteilung von $(\Theta_t)_{t\in\mathbb{Z}}$ wurden bislang empirische Versionen oder ein ad-hoc Schätzer verwendet, der die Struktur der TCF nur partiell ausnutzt (Drees et al., 2015).

In diesem Vortrag wird eine neue Schätzmethode mittels einer speziellen Projektion vorgestellt, die die komplette Struktur der TCF verwendet. Diese Methode nutzt eine von Janßen (2019) eingeführte äquivalente Darstellung der TCF. Für den aus dieser Methode resultierenden Schätzer für $P(\Theta_t \in A)$ wird das asymptotische Verhalten analysiert. Der Schätzer beinhaltet sogenannte "' sliding-blocks"', für deren Behandlung ein modifizierter Grenzwertsatz für empirische Prozesse verwendet werden muss.

Der Vortrag basiert auf gemeinsamer Arbeit mit Prof. Dr. Holger Drees und Dr. Anja Janßen.

Literatur

Drees, H., Segers, J. and Warchol, M. (2015), Statistics for tail processes of markov chains, *Extremes* 18(3), 369–402.

Janßen, A. (2019), Spectral tail processes and max-stable approximations of multivariate regularly varying time series, *Stochastic Processes and Their Applications* 129(6), 1993–2009.

Leon Ramzews
Unlabelled Set Partitions with Many Components
Ludwig-Maximilians-Universität München, Germany

Abstract: We study combinatorial classes $\mathcal{G} = \textsc{Mset}(\mathcal{C})$ which satisfy the multiset-construction, that is, any structure in $\mathcal{G}$ is uniquely determined by the $\mathcal{C}$-objects it contains and their multiplicities. For example, unlabelled graphs can be viewed as multisets of their connected (unlabelled) components.
Let G_n be drawn uniformly at random from the set of all structures in $\mathcal{G}$ having size n. A central parameter in this setting is the distribution of the number of

components $\kappa(G_n)$ – the number of elements in the multiset – that is known to converge in distribution. As a first result we determine the *tails* of $\kappa(G_n)$ under the general assumption of $\mathscr{C}$ being subexponential. Under the same assumption our second result concerns the object $G_{n,N}$ drawn uniformly at random from all structures in $\mathscr{G}$ with N components having size n. We prove a phenomenon, which we call *extreme condensation*: let $m > 0$ be the smallest possible size of an object in $\mathscr{C}$. Then the random object $G_{n,N}$ consists, whp as $n, N, n - mN \to \infty$, of one single large component containing $n - mN + \mathscr{O}_p(1)$ atoms, $N - \mathscr{O}_p(1)$ components of size m and $\mathscr{O}_p(1)$ components of size $\mathscr{O}_p(1)$. More specifically, we determine the exact limiting distribution of the remainder obtained after removing the largest component and all the smallest ones.
The results presented here emerged in joint work with Konstantinos Panagiotou.

Simon Reisser
Robustness of Randomized Rumour Spreading
Ludwig-Maximilians-Universität München, Germany

Abstract: In this work we consider three well-studied broadcast protocols: Push, Pull and Push&Pull. A key property of all these models, which is also an important reason for their popularity, is that they are presumed to be very robust, since they are simple, randomized, and, crucially, do not utilize explicitly the global structure of the underlying graph. While sporadic results exist, there has been no systematic theoretical treatment quantifying the robustness of these models. Here we investigate this question with respect to two orthogonal aspects: (adversarial) modifications of the underlying graph and message transmission failures.

We explore in particular the following notion of *local resilience*: beginning with a graph, we investigate up to which fraction of the edges an adversary has to be allowed to delete at each vertex, so that the protocols need significantly more rounds to broadcast the information. Our main findings establish a separation among the three models. It turns out that Pull is robust with respect to all parameters that we consider. On the other hand Push may slow down significantly, even if the adversary is allowed to modify the degrees of the vertices by an arbitrarily small positive fraction only. Finally, Push&Pull is robust when no message transmission failures are considered, otherwise it may be slowed down.

On the technical side, we develop two novel methods for the analysis of randomized rumour spreading protocols. First, we exploit the notion of self-bounding functions to facilitate significantly the round-based analysis: we show that for any graph the variance of the growth of informed vertices is bounded by its expectation, so that concentration results follow immediately. Second, in order to control ad-

versarial modifications of the graph we make use of a powerful tool from extremal graph theory, namely Szemerèdi's Regularity Lemma.

Lukas Roth
Phase Transition for random loop models on trees via exploration schemes
Technische Universität Darmstadt, Germany

Abstract: The random loop model on graphs can be seen as a generalization of the Random Interchange model and it has some connections to other important models in statistical mechanics. Typically for statistical mechanics, we are interested in the existence of a phase transition, in this case from the phase of parameters where infinite loops can occur to the one where no infinite loops exist almost surely. We consider the d-regular tree and use a new approach which improves some of the already existing results and which might be a bit more catchy. The idea is to reduce this stochastic problem to a combinatorial one, which indeed can be solved algorithmically.

Frank Röttger
Geometry of optimal designs for the Bradley-Terry paired comparison model
Otto-von-Guericke-Universität Magdeburg, Germany

Abstract: The talk gives a brief introduction to the theory of optimal design and equivalence theorems, which will be exemplified for the Bradley-Terry paired comparison model. Via the Kiefer–Wolfowitz equivalence theorem, we obtain a fruitful connection between statistical optimization of experiments and algebraic structures, namely varieties and semi-algebraic sets. This happens because optimality conditions in the Kiefer–Wolfowitz equivalence theorem are given as algebraic constraints on the parameters. In special but important situations, optimality regions are non-negative real parts of varieties. Furthermore, the varieties and semi-algebraic sets appearing in equivalence theorems often show a lot of symmetry, which might be useful to simplify the algebraic computation of optimal designs.

Adrien Schertzer
TBA
Johann Wolfgang Goethe-Universität Frankfurt am Main, Germany

Abstract: TBA

Hauke Seidel
Convex Cones Spanned by Regular Polytopes and Random Sections
Westfälische Wilhelms-Universität Münster, Germany

Abstract: *Joint with Zakhar Kabluchko and Dmitry Zaporozhets*

Let P be an n-dimensional regular cross-polytope, simplex, or cube centred at the origin of $\mathbb{R}^n$. We consider convex cones of the form

$$C = \{\lambda x + \lambda e_{n+1} : \lambda \geq 0, x \in P\} \subset \mathbb{R}^{n+1},$$

where $e_1, \dots, e_{n+1}$ is the standard basis of $\mathbb{R}^{n+1}$.

We shall derive explicit probabilistic expressions for the inner and outer solid angles of these cones. As a corollary, we shall derive a formula for the inner and outer solid angles of a regular cross-polytope.

As an application we shall explain how these cones can be used to determine the expected number of faces of the intersection of a random linear subspace and a regular cross-polytope, cube or simplex.

Tobias Sohr
Some Insights into Optimal Stopping
Christian-Albrechts-Universität zu Kiel, Germany

Abstract: The topic of my talk is twofold. First I will introduce and motivate the topic of optimal stopping, present some prominent exmples and outline the ideas of some broadly used solution techniques. After that I will look more closely on an explicit stopping problem I am currently working on: Optimal stopping of a Lévy process with no discounting and gerenalized linear costs. Here I will explain how he aforementioned concepts help to sove the problem (or why the don't) and what the solution of the stopping problem is good for.

Paul Honore Takam
Stochastic Optimal Control of Thermal Energy Storages
Brandenburgische Technische Universität Cottbus-Senftenberg, Germany

Abstract: Climate change and energy dependency require urgent measures for the improvement of energy efficiency in all areas. District heating and cooling systems are known to be energy efficient in buildings. Can this efficiency be improved by introducting renewable energy sources to this systems? Besides the numerous technical challenges, economic issues such as the cost-optimal control and management of heating systems play a central role. The latter leads to challenging mathematical

optimization problems. This talk has emphasis on the mathematical modelling of uncertainties about the future dynamics of energy and fuel prices, heat demand, weather and environmental conditions driving the production of renewable energies. The problem is treated as a stochastic optimal control problem and solved using dynamic programming techniques. Model reduction techniques are adopted to cope with the controlled PDE describing the spatial and temporal distribution of the temperature in the storage.

This is a joint work with Ralf Wunderlich (BTU Cottbus-Senftenberg) and Olivier Menoukeu Pamen (AIMS Ghana, University of Liverpool).

Niklas Wulkow
Markov processes with memory
Freie Universität Berlin, Germany

Abstract: For many complex real-World phenomena, Markov processes are the standard modelling tool because of their simplicity and the rich amount of knowledge that exists about them. However, sometimes their assumption of the future solely depending on the present is not accurate. Then it is advisable to include memory effects into the modelling of the process and make it dependent on past observations. This yields an exponential increase in the modelling complexity which makes economic parametrisations necessary. I will talk about one well known family of these parametrisations, linear autoregressive processes, and explain the difficulties in extending them to nonlinear versions. In addition, I will introduce a method that identifies regime switching of these processes, meaning that for different time intervals, the process is governed by different sets of parameters.

5 Participants

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