CRC Retreat 2019: Abstracts

September 30 – October 1, 2019

On a class of infinite-dimensional singular stochastic control problems

Giorgio Ferrari

We study a class of infinite-dimensional singular stochastic control problems with applications in economic theory and finance. The control process linearly affects an abstract evolution equation on a suitable partially-ordered infinite-dimensional space X, it takes values in the positive cone of X, and it has right-continuous and nondecreasing paths. We first provide a rigorous formulation of the problem by properly defining the controlled dynamics and integrals with respect to the control process. We then exploit the concave structure of our problem and derive necessary and sufficient first-order conditions for optimality. The latter are finally exploited in a specification of the model where we find an explicit expression of the optimal control. The techniques used are those of semigroup theory, vector-valued integration, convex analysis, and general theory of stochastic processes. This talk is based on a joint work with Salvatore Federico, Michael Röckner, and Frank Riedel.

Numerics of stochastic games with asymmetric information

Tsiry Avisoa Randrianasolo

In this talk, we will present a convergent numerical approximation of the value function $V(t, x, p)$ of a stochastic game with asymmetric information. We will combine 3 numerical methods in t, in x, and in p and find the continuous approximation of V by piecewise linear interpolation. In particular a suitable choice of triangulation allows to construct a piecewise linear function that preserves the convexity in p of the solution. Eventually we will use a test problem to illustrate how the numerical method works. We use a particular algorithm to compute the convex data point and convex envelope but the whole numerical method is built so that general convex hull algorithms for high dimension (more than 4) such as the *Quickhull* algorithm works as well. This is a joint project with Ľubomí r Baňas and Giorgio Ferrari.

Christian Vieth, Andre Wilke

Abstract

Analysis on the Wasserstein space

Feng-Yu Wang

By constructing the diffusion processes generated by second-order differential operators on the Wasserstein space, non-linear Fokker-Planck equations are described by the corresponding linear ones. As applications, the exponential ergodicity as well as Schrödinger type PDEs on the Wasserstein space are investigated.

Martina Hofmanová

Abstract

Herbert Dawid

Abstract

Emanuela Gussetti

Abstract

Ancestral lines in the diffusive mutation-selection model with pairwise interaction

Luigi Esercito

Dealing with selection is one of the main tasks in population genetics. The aim of this talk is to describe the Moran model with mutation and a particular type of frequency-dependent selection, introducing a backward process called the ancestral selection graph, and examining the relationship between the two.

Expectation values of characteristic polynomials in polynomial ensembles

Tim Würfel

Random matrices appear in a wide variety of scientific fields and applications, from statistical physics, signal and communication systems to multivariate statistics. We study random matrix ensembles with an external source which yield a biorthogonal structure in the sense of A. Borodin. In particular we are interested expectation values of characteristic polynomials which yield expressions for the correlation functions of the respective random matrix ensemble.

Max Nendel

Abstract

Some mathematical aspects of machine learning

Zhiming Ma

In recent years the technique of machine learning has practically achieved great success. But its theoretic basis is still weak, the mathematical aspects of machine learning are far from satisfied. In this talk I shall briefly report some progress on machine learning. The progress is being made by my students and the colleagues working in MSRA, and its developement involves some mathematical thinking and mathematical methods.

Quantum graphs, aperiodic order, and locally constant cocycles

David Damanik

We discuss unbounded quantum graphs with spectra that are small in a suitable sense. For example, if the structure is generated by mechanisms from the theory of aperiodic order, it can be shown that the spectra have Lebesgue measure zero. In the proof of this statement one encounters the need to develop a trace map analysis for locally constant cocycles over suitable subshifts. This bears a resemblance to related work on random products of matrices with local correlations, which will be briefly discussed as well if time permits.

Luigi Esercito

Abstract

Lubormi Baňas

Abstract

Michael Baake

Abstract

Jodi Dianetti

Abstract

Numerical approximation of parabolic problems with fractional differentiability

Jörn Wichmann

We consider parabolic p-Laplace systems under fractional differentiability assumptions. At first we present a well known optimal convergence result for the implicite Euler finite element method. Then we adapt the method to the fractional setting and prove optimal convergence with dependents on the fractional differentiability index $\alpha_t, \alpha_x \in (0, 1]$.