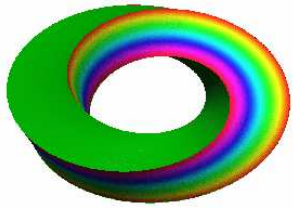
Universität Bielefeld

Fakultät für Mathematik



Infinite Dimensional Analysis and Representation Theory

December 10–14, 2007

All talks take place in A3-126: Senatssaal.

Mo, 10.12.2007

08:30		Registration
09.50 - 10.00		Opening
10.00 - 11.00	Vershik, Anatoly	New method of the construction of representations of current groups.
11.00 - 11.30		*Coffee break*
11.30 - 12.30	Tracy, Craig	Integral Formulas for the Asymmetric Simple Exclusion Process.
12.30 - 14.00		*Lunch break*
14.00 - 15.00	Thalmaier, Anton	Brownian motion on Jordan curves and univalent functions
15.00 - 16.00	Hille, Lutz	Fans and the volume of a tilting module.
16.00 - 16.30		*Coffee break*
16.30 - 17.30	Da Silva, Jos Lus	Ergodicity of canonical Gibbs measures with respect to the diffeomorphism group.

Tue, 11.12.2007

09.00 - 10.00	Goldin, Gerald	Anyons, Braids, Tangles, and Quantum Fields Intertwining Diffeomorphism Group Representations.
10.00 - 11.00	Airault, Helene	Probabilities on Siegel discs.
11.00 - 11.30		*Coffee break*
11.30 - 12.30	Bogachev, Vladimir	On the Monge-Ampere equation in infinite dimensions
12.30 - 14.00		*Lunch break*
14.00 - 15.00	Bödigheimer, Carl-Friedrich	Finite and infinite configuration spaces.
15.00 - 16.00	Daletskii, Alex	Analysis on configuration spaces and Gibbs cluster measures.
16.00 - 16.30		*Coffee break*
17.00 - 19.00		*Joint visit of the Christmas market*
19.00 -		*Joint dinner at Restaurant Bernstein*

Wed, 12.12.2007

09.00 - 10.00	Malliavin, Paul	Invariant or unitarizing probability measure for infinite dimensional Lie algebras.
10.00 - 11.00	O'Connell, Neil	Path-transformations in probability and representation theory.
11.00 - 11.30		*Coffee break*
11.30 - 12.30	Bogachev, Leonid	Gaussian fluctuations for Plancherel partitions
12.30 - 14.00		*Lunch break*
14.00 - 15.00	Lescot, Paul	An algebraic approach to the computation of the Ricci curvature of certain infinite-dimensional homogeneous spaces.
15.00 - 16.00		Round table.
16.00 - 16.30		*Coffee break*

Thu, 13.12.2007		
09.00 - 10.00	Biane, Philippe	Kerov Polynomials.
10.00 - 11.00	Soshnikov, Alexander	Spectral properties of large Wigner random matrices with non-symmetrically distributed entries.
11.00 - 11.30		*Coffee break*
11.30 - 12.30	Pickrell, Doug	Conformally invariant distributions on holomorphic differentials and configurations for the unit disk.
12.30 - 14.00		*Lunch break*
14.00 - 15.00	Gordina, Masha	Energy representation of path groups
15.00 - 16.00	Lytvynov, Eugene	Particle densities of quasi-free representations of the CAR and CCR.
16.00 - 16.30		*Coffee break*
16.30 - 17.30	Bozejko, Marek	Generalized Gaussian processes, second quantization with applications to classical probability and combinatorics.
Fr, 14.12.2007		
09.00 - 10.00	Kac, Victor	Chiralization and quantization.
10.00 - 11.00	Krause, Henning	An introduction to the Ziegler spectrum of an algebra.
11.00 - 11.30		*Coffee break*
11.30 - 12.30	Albeverio, Sergio	Tba.
12.30 - 14.00		*Lunch break*

Abstracts:

Vershik, Anatoly, "New method of the construction of representations of current groups."

The method is based on the so called Lebesgue measure on the infinite dimensional cone. Properties of Lebesgue measures have many connections with Poisson-Dirichlet measures. This measure allows to represent Fock space in the new form. The current group with the parabolic subgroups of the semi-simple groups of rank one - as the coefficients are the best illustration of that method. The results about representations were obtained with M.I.Graev.

Tracy, Craig, "Integral Formulas for the Asymmetric Simple Exclusion Process."

Joint work with Harold Widom.
ArXiv Article: http://arxiv.org/abs/0704.2633v2

Thalmaier, Anton, "Brownian motion on Jordan curves and univalent functions"

Starting with Brownian motion on the diffeomorphism group of the circle we explain construction and properties of Brownian motion on the space of Jordan curves in the plane as well as on univalent functions on the disk. This work is part of a project to construct unitarizing measures for representations of the Virasoro algebra.

Hille, Lutz, "Fans and the volume of a tilting module"

We are interested in actions of algebraic groups on vector spaces with a dense orbit. Many those problems are shown to be equivalent to the classification of tilting modules over certain finite dimensional algebras. For a tilting module we can define its volume and for an algebra we can define the sum of all volumes of tilting modules. If we consider the volume as a function we can compare properties of this function with properties of the set of all tilting modules. Finally, we also obtain properties of the group action we started with.

Da Silva, José Luís, "Ergodicity of canonical Gibbs measures with respect to the diffeomorphism group "

For general potentials we prove that every canonical Gibbs measure on configurations over a manifold X is quasi-invariant w.r.t. the group of diffeomorphisms on X. We show that this quasi-invariance property also characterizes the class of canonical Gibbs measures. From this we conclude that the extremal canonical Gibbs measures are just the ergodic ones w.r.t. the diffeomorphism group. Thus we provide a whole class of different irreducible representations.

Goldin, Gerald, "Anyons, Braids, Tangles, and Quantum Fields Intertwining Diffeomorphism Group Representations. "

In earlier work (with David Sharp) we described particles in two-dimensional space obeying anyon statistics by means of creation and annihilation fields. These fields naturally interpolate a hierarchy of unitary representations of the group of compactly-supported diffeomorphisms of the plane, induced by characters of the braid group. As a consequence of the construction, they satisfy q-commutation relations, where q is the anyonic phase shift. Subsequently (with Shahn Majid) we studied this construction in the framework of braided tensor categories, deriving a generalized exclusion principle when q is a root of unity. Here I shall describe two directions of current research building on these ideas. First (with Roger Picken) we address a generalization to accommodate the creation of anyon/anti-anyon pairs, so that in place of braids, the corresponding relative phases of multiparticle wave functions are associated with equivalence classes of tangles under bundle diffeomorphisms. Second (with Robert Owczarek and Sharp), we consider generalization of the construction of creation/annihilation fields to spaces of extended configurations, including for example quantum vortex filaments.

Airault, Helene, "Probabilities on Siegel discs."

The Brownian motion on the symplectic group and the Siegel disk (either finite or infinite dimensional) is expressed in the Hua-Siegel polar coordinates system. References are
Airault, Helene Stochastic analysis on finite dimensional Siegel disks, approach to the infinite dimensional Siegel disk and upper half-plane. Bull. Sci. Math. 128 (2004), no. 7, 605–659. and
Airault, H.; Malliavin, P. Regularized Brownian motion on the Siegel disk of infinite dimension. Ukraïn. Mat. Zh. 52 (2000), no. 9, 1158–1165.

Bödigheimer, Carl-Friedrich, "Finite and infinite configuration spaces"

We consider spaces of finite and infinite configurations in a manifold relative to a submanifold. These spaces are important in homotopy theory, e.g., as models for mapping spaces, and for transfer constructions. We give a survey on two results: (1) the configuration spaces have the homotopy type of spaces of sections in certain sphere bundles, (2) they split stably into the bouquet of Thom spaces.

Daletskii, Alex, "Analysis on configuration spaces and Gibbs cluster measures"

The distribution of a Gibbs cluster point process in a Euclidean space X is studied via the projection of an auxiliary Gibbs measure in the space of configurations in X^n. We show that it is quasi-invariant with respect to the group of compactly supported diffeomorphisms of X and prove an integration-by-parts formula. The corresponding equilibrium stochastic dynamics is then constructed by using the method of Dirichlet forms. (Joint work with L. Bogachev)

Bogachev, Leonid, "Gaussian fluctuations for Plancherel partitions"

The limit shape for Young diagrams under the Plancherel measure was found by Logan and Shepp (1977) and Vershik and Kerov (1977). We obtain a central limit theorem for fluctuations of Young diagrams in the bulk of the partition "spectrum". More specifically, we prove that, under a suitable (logarithmic) normalization, the corresponding random process converges, in the FDD sense, to a Gaussian process with independent values. We also discuss the link with an earlier result by Kerov (1993) on the convergence to a generalized Gaussian process. The proof is based on the poissonization of the Plancherel measure and an application of a general central limit theorem for determinantal point processes. (Joint work with Zhonggen Su.)

Lescot, Paul, "An algebraic approach to the computation of the Ricci curvature of certain infinite-dimensional homogeneous spaces."

Given a Lie group G, a closed subgroup H of G and a Riemannian structure on G/H, the determination of the Ricci curvature has been reduced by Milnor to a purely algebraic computation relating to a certain quadratic form on the Lie algebra of G.
We shall consider an axiomatization of this situation: for a given reductive (in a certain sense) real Lie algebra, we shall define a formal covariant derivative and give a meaning to the computation of the formal Ricci curvature.
In particular these results apply to the Kirillov space (canonically identified to $\frac{Diff(S^1)}{S^1}$) and allow us to recover the results of a joint work with M. Gordina (J. Funct. Anal., 2006).

Biane, Philippe, "Kerov Polynomials"

Kerov polynomials express characters of symmetric groups in terms of quantities known as free cumulants of Young diagrams. They provide an exact formula which is useful for understanding asymptotics for large symmetric groups. We shall present these polynomials, as well as the recent proof, due to V. Fray, of Kerov conjecture that all their coefficient are nonnegative.

Soshnikov, Alexander, "Spectral properties of large Wigner random matrices with non-symmetrically distributed entries"

The talk will be based on our recent joint work with Sandrine Peche where we studied the spectral norm of the Wigner matrices with centered but non-symmetrically distributed entries. Our results improve the earlier bounds on the spectral norm due to Komlos and Furedi (1981) and Van Vu (2005).

Pickrell, Doug, "Conformally invariant distributions on holomorphic differentials and configurations for the unit disk."

The universal covering of the group $PSU(1,1)$ acts naturally on the space of holomorphic differentials, and the space of configurations, for the unit disk. The map from a holomorphic differential to its zero set is equivariant. In this talk I will discuss examples of invariant distributions on holomorphic differentials, and (when I am able) their zero sets. The main examples are conjecturally matrix coefficient distributions for invariant measures associated to loop groups.

Lytvynov, Eugene, "Particle densities of quasi-free representations of the CAR and CCR"

Let X be a locally compact, second countable Hausdorff topological space.
We consider a family of commuting Hermitian operators $a(\Delta)$ indexed by all measurable, relatively compact sets Δ in X. For such a family, we introduce the notion of a correlation measure. We prove that, if the family of operators possesses a correlation measure which satisfies some condition of growth, then there exists a point process over X having the same correlation measure. Furthermore, the operators $a(\Delta)$ can be realized as multiplication operators in the L^2-space with respect to this point process. As applications, we discuss particle densities of the quasi-free representations of the CAR and CCR, which lead to fermion, boson, fermion-like, and boson-like (e.g. para-fermions and para-bosons of order 2) point processes. In particular, we prove that any fermion point process corresponding to a Hermitian kernel may be derived in this way.

Gordina, Masha, "Energy representation of path groups"

We will talk about structure of representation spaces of path groups. These representations are induced by quasi-invariance of the Wiener measure on these groups. It has been studied by Albeverio, Hoegh-Krohn, Vershik et al, but we use methods of classifying von Neumann factors due to Connes and Takesaki which were not available at the time.

Kac, Victor, "Chiralization and quantization"

The four fundamental frameworks of physical theories are classical mechanics, quantum mechanics, classical field theory and quantum field theory. The related algebraic structures are Poisson algebras, associative algebras, Poisson vertex algebras and vertex algebras. I will discuss connections between these structures and explain the general picture on the example of W-algebras.