List of Talks

Brian C. Hall University of Notre Dame

Segal–Bargmann transform for unitary groups in the large-N limit

Abstract

My talk will consist of three parts. First, I will review the properties of the generalized Segal–Bargmann transform for compact Lie groups. Second, I will specialize to the case of the unitary group $U(N)$ and discuss the behavior of the transform in the limit as N tends to infinity. Third, I will discuss applications of the large-N limit to a problem in random matrix theory.

Mauro Spera Università Cattolica del Sacro Cuore Dipartimento di Matematica e Fisica "Niccolo' Tartaglia"

Geometric Quantization, Landau Levels, Helicity and the Homflypt Polynomial

Abstract

In this talk, mostly reporting on joint work with Andrea GALASSO ([G-S]) and Antonio Michele MITI ([M-S]), we first concisely review Geometric Quantization (GQ) using Landau levels as a basic example and testing ground. Subsequently, we outline a GQ-construction of the HOMFLYPT polynomial via classical fluid-dynamical helicity, with a view of providing a solid basis to the ingenious Liu-Ricca construction thereof ([L-R]), building on previous work of A.Besana and the author ([B-S]).

References:

[B-S] A. Besana and M. Spera, On some symplectic aspects of knots framings, J. Knot Theory Ram. 15 (2006), 883-912.

[G-A] A. Galasso and M. Spera, Remarks on the geometric quantization of Landau levels, Int. J. Geom. Methods Mod. Phys. 13 (10) (2016),1650122 (19 pages)

[L-R] X. Liu and R.L. Ricca, On the derivation of the HOMFLYPT polynomial invariant for fluid knots, J. Fluid Mechanics 773 (2015), 34-48.

[M-S] A.M. Miti and M. Spera On some (multi)symplectic aspects of link invariants, Preprint arXiv:1805.01696 math.DG and Quaderno Seminario Matematico di Brescia 1/2018

Kadri İlker Berktav, Department of Mathematics, METU

An Introduction to Geometric Quantization

Abstract

A number of remarkable techniques arising from particular gauge theories in physics have long been incarnated into different branches of mathematics; especially they have been employed to study low dimensional topology and geometry in a rather sophisticated way, such as Donaldson theory on four-manifolds, the work of Floer on the topology of 3-manifolds and Yang-Mills instantons that serves as a Morse-theoretic interpretation of Chern-Simons gauge theory, and hence an infinite-dimensional counterpart of the classical (smooth) Morse theory, and Witten's knot invariants arising from a certain *three-dimensional* Chern-Simons theory. This talk, which essentially consists of three parts, serves as a conceptional introduction to the certain underlying mathematical structure encoding the above techniques: *geometric quantization formalism*. Main motivations of this current discussion are as follows: *(i)* to provide a

brief introduction to the notion of quantization, *(ii)* to introduce the *geometric quantization formalism* and try to understand how the notion of *quantization* boils down to the study of representation theory of classical observables in a sense that one can construct the quantum Hilbert space $\mathcal{H}$ and a certain Lie algebra homomorphism, and *(iii)* to elaborate in a rather intuitive manner the quantization of Chern-Simons theory and Witten's construction of quantum invariants in three-dimensions, and where geometric quantization formalism comes into play.

Romero Solha, The Pontifical Catholic University of Rio de Janeiro

Real geometric quantization of K3 surfaces

Abstract

The aim of this talk is to illustrate through an example how geometric quantisation behaves when the real polarisations have nodal singularities. I am going to present a construction of singular lagrangian fibrations over a K3 surface and to compute their real geometric quantisation. The Hilbert spaces obtained are in general finite dimensional (although different from the Kähler quantisation); however, they can be infinite dimensional if the nodal fibres satisfy the Bohr–Sommerfeld condition.

Roberto Paolettti, Dipartimento di Matematica e Applicazioni Università di Milano Bicocca

Equivariant Asymptotics of Szeg o kernels under Hamiltonian $U(2)$ and $SU(2)$ actions

Abstract

Let M be complex projective manifold, and A a positive line bundle on it. Assume that $U(2)$ acts on M in a Hamiltonian manner, and that this action linearizes to A. Then there is an associated unitary representation of $U(2)$ on the associated algebro-geometric Hardy space. If the moment map is nowhere vanishing, the isotypical component are all nite dimensional; they are generally not spaces of sections of some power of A. We study the local and global asymptotic properties the isotypical component associated to a weight $k\nu$, when $k \to +\infty 1$. A similar analysis is carried out in the case of $SU(2)$ (joint work with A. Galasso)

Joachim Hilgert University of Paderborn

The quantum-classical correspondence of resonant states for hyperbolic surfaces

Abstract

I will explain the close relation between the spectral theory of the Laplacian on compact and convex cocompact hyperbolic surfaces and the spectral theory of the geodesic flow on the corresponding sphere bundles. The material is based on joint work with Colin Guillarmou and Tobias Weich.