Title & Abstract

Raul Agiular

Title: Higher order curvature inequalities and the radius of a Grauert tube.

Abstract:

We introduce a sequence of functions in the tangent bundle of a Riemannian manifold and use them to give a new characterization via curvature inequalities of those Riemannian metrics whose Grauert tubes extend up to a radius R.

Daniel Burns

Title: Toric Degenerations and Exact Bohr-Sommerfeld Correspondences

Abstract:

We consider compact, k□ahler Hamiltonian toric manifolds, where the underlying integrable systems are smooth, but the associated torus action is singular. Interesting
examples are provided by the (classical) Gelfand-Cetlin systems. On such a manifold, there are two natural quantizations possible, one by holomorphic quantization
considering sections of a quantizing line bundle, and the other is by the real polarization given by the simultaneous levels of the Hamiltonians at integer values, so-called Bohr-Sommerfeld quantization. The Bohr-Sommerfeld correspondence
should show an isomorphism to as high a degree as possible between these two quantizations. The exact Bohr-Sommerfeld correspondence should be a linear map between the two Hilbert spaces giving such an isomorphism. This question was considered a few years ago by Andrey Tjurin.

The Bohr-Sommerfeld condition yields distributional sections to the quantizing line bundle supported on the Bohr-Sommerfeld levels. The natural guess for the implementation for the Bohr-Sommerfeld correspondence would be the Bergman projector from distributional sections to holomorphic suggestions. For toric varieties with smooth Hamiltonians, this is true and easy to see, by character decompositions.

For systems like the Gelfand-Cetlin systems this is impossible because the singular torus action is not holomorphic and does not give a representation on the holomorphic sections of the quantizing line bundle. We describe a method to show this which uses degeneration to singular toric varieties, singular algebraic varieties with holomorphic torus action, and a continuity under deformation of integrals of holomorphic sections taken along Bohr-Sommerfeld levels. In passing we discuss geometric quantization for the real polarization given by the torus action, and the relation to classical Delzant theory generalized to singular integrable systems like Gelfand-Cetlin. Relations with classical geodesic ows on rank one symmetric spaces are also discussed.

Parts of this work are joint projects with V. Guillemin and A. Uribe-Ahumada.

Cheol-Hyun Cho (조철현)

Title: Lagrangian Floer theory on toric orbifolds

Abstract:

For Lagrangian torus fibers in toric manifolds, Floer homology and related mirror symmetry phenomenon have been explicitly and extensively studied. We explore the case of toric orbifolds by analyzing the appearance of holomorphic orbi-discs.

Urs Frauenfelder

Title: Rabinowitz Floer homology

Abstract:

The Morse inequalities provide a lower bound on the number of critical points of a Morse function in terms of topological data. The Arnold conjecture which asks for a topological lower bound on the number of 1-periodic solutions of a Hamiltonian system can be interpreted as an infinite dimensional analogon of the Morse inequalities. Floer managed it to define a Morse homology in this infinite dimensional setting now called Floer homology. The Arnold conjecture comes from the fixed period problem. The period of the periodic orbit is fixed but its energy is arbitrary. Instead of fixing the period one often wants to fix the energy and ask for periodic solutions on a fixed energy hypersurface whose period is arbitrary. The Floer homology which corresponds to the fixed energy problem is Rabinowitz Floer homology.

Siqi Fu

Title: Spectral theory for the dbar-Neumann Laplacian

Abstract:

This is an expository talk on spectral theory of the dbar-Neumann Laplacian. We will discuss results on the interplay of spectral behavior of the dbar-Neumann Laplacian and geometry of the underlying space, with focus on stability of the spectrum.

Chong-Kyu Han (한종규)

Title: Quasi-linear system of PDEs of first order

Abstract:

In the classical theory of quasi-linear PDE of first order, the key idea is that the level surfaces of the first integral of the associated vector field give rise to implicit solutions. This is part of the method of characteristics. Extending these ideas to systems, we prove that a quasi-linear system of PDEs of first order has a solution if and only if the associate system of vector fields admit a first integral on the zero set. We present an algorithmic method of finding the first integrals on the zero set. Then I will discuss recent results of the joint work with Jongdo Park on the non-linear Cauchy-Riemann equations and the associated almost complex structures.

Richard Hind

Title: Some obstructions to symplectic embeddings

Jun-Muk Hwang (황준묵)

Title: Syzygies of compact complex hyperbolic manifolds

Abstract:

In a jointwork with Wing-Keung To, we give a sufficient condition for the pluri-canonical bundles of a compact complex hyperbolic manifold to satisfy the property (N_p) on linear syzygies in terms of the hyperbolic injectivity radius. In the process, we obtain sharp lower bounds for the volumes of one-dimensional complex analytic subvarieties in geodesic tubular neighborhoods of the Cartesian self-product of a compact complex hyperbolic manifold.

Howard Jacobowitz

Title: Totally Real Immersions

Abstract:

A smooth immersion $f:M^n₩to {₩bf C}^N$ is called totally real if $f_*(TM) $ does not contain any complex line. This is equivalent to requiring that $$ f_*(TM)₩cap i(f_*(TM))=₩{ 0₩}.$$

Theorem 1.

There exists a totally real immersion of M^n into ${₩bf C}^N $ provided $N> ₩frac{3}{2} n -1. $

This is proved by a straight-forward transversality argument.

Theorem 2 (Gromov)

M^n has a totally real immersion into ${₩bf C}^n$ if and only if ${₩bf C}₩otimes (TM)$ is trivial.

Gromov's proof may be modified to yield necessary and sufficient conditions for all values of N between n and $₩frac{3n}{2}$.

Theorem 3

M^n has a totally real immersion into ${₩bf C}^N$ if and only if there exists a bundle Q over M of rank $N-n$ for which the bundle $$ ({₩bf C}₩otimes (TM))₩oplus Q $$ is trivial.

Theorem 1 is not optimal, at least when restricted to compact and orientable manifolds. It is known that every such M^2 has a totally real immersion into ${₩bf C} ^2$ and every such M^3 has a totally real immersion into ${₩bf C} ^3$, rather than requiring $N=3$ and $N=4$, respectively. This is in contrast with the case $n=4$ where the value $N=6$ cannot be improved.

Theorem 4

There exists a compact and orientable manifold M^4 which does not have a totally real immersion into ${₩bf C} ^5$.

(Howard Jacobowitz선생님의 TeX file도 첨부합니다. Abstract_Korea_2011.tex)

Su-Jen Kan

Title: Grauert tubes and some applications.

Jong Hae Keum (금종해)

Title: Fake Projective Planes

Bumsig Kim (김범식)

Title: Wall-crossings for Twisted Quiver Bundles

Abstract:

This is joint work with Hwayoung Lee. In this talk, I will define the generalized Donaldson-Thomas invariants of the abelian category of framed twisted quiver sheaves on a smooth projective curve and present a wall-crossing formula in the framework of Joyce - Song theory. For the usage of Joyce - Song theory, I will begin with some homological algebra of twisted quiver sheaves with the moment map relation. To derive the wall-crossing, the approach of Chuang, Diaconescu, and Pan for the ADHM quiver case will be adapted. The invariants virtually count framed twisted quiver sheaves with the moment map relation.

Hoil Kim (김호일)

Title: Generalized complex structures in geometric Langlands

Abstract:

We describe and analyze the various generalized complex structures appearing in geometric Langlands program.

Kang-Tae Kim (김강태)

Title: Semicontinuity theorems for automorphism groups

Abstract:

Widely known semicontinuity theorem for the holomorphic automorphism groups by Greene and Krantz (1982) concerns the bounded strongly pseudoconvex domains with $C^₩infty$ smooth boundary. Although the natural smoothness requirement for a strongly pseudoconvex domain is C^2, such assumptions were necessary since they used Fefferman's extension theorem, Klembeck's asymptotic curvature analysis and stable extension results for the biholomorphisms under the perturbation of domains. I would like to present a method, recently developed, that can work in the $C^{2,₩epsilon}$ category, and the proof is simpler than the original one. This talk is from a collaboration of Greene, Kim, Krantz and Seo.

Namhoon Lee (이남훈)

Title: A type of Leftschetz Hyperplane section theorem on Q-Fano 3-folds with Picard number one and $₩frac{1}{2}(1,1,1)$ singularities

Abstract:

We prove a type of Leftschetz Hyperplane section theorem on ₩Q-Fano 3-folds with Picard number one and $₩frac{1}{2}(1,1,1)$ singularities by using degeneration method. As a byproduct, we obtain a new example of Calabi--Yau 3-folds with Picard number one.

Eugene Lerman

Title: Non-compact symplectic toric manifolds

Abstract:

This is joint work with Yael Karshon. The result that started symplectic *toric* geometry is the paper of Delzant that classifies compact connected symplectic manifolds with effective completely integrable torus actions, the so called (compact) symplectic toric manifolds. The moment map induces an embedding of the quotient of the manifold by the torus action into the dual of the Lie algebra of the torus; its image is a simple unimodular ("Delzant") polytope. This gives a bijection between simple unimodular polytopes and isomorphism classes of compact symplectic toric manifolds. For a non-compact symplectic toric manifold the image of the moment map need not be convex and the induced map of the quotient need not be an embedding. Moreover, even when the map of the quotient is an embedding, its image no longer determines the symplectic toric manifold; a degree two characteristic class makes an appearance. None the less there is a classification non-compact symplectic toric manifolds and I will explain what it is.

Ngaiming Mok

Title: Holomorphic maps between quotients of the complex unit ball.

Sai Kee Yeung (Purdue U.)

Title: Finsler metrics and Kobayashi hyperbolicity of moduli spaces of canonically polarized manifolds

Abstract:

It is well-known from the work of Ahlfors, Royden and Wolpert that the moduli spaces of smooth algebraic curves (compact Riemann surfaces) are equipped with a Hermitian metric with holomorphic sectional curvature bounded from above by a negative constant and hence are Kobayashi hyperbolic.

It is natural to ask the same question on a moduli space of K₩"ahler-Einstein manifolds of negative scalar curvature of arbitrary dimension. In this talk, I am going to explain a recent joint work of Wing-Keung To and myself which answers the above question.
