Abstracts

Jaehyun Hong, Seoul National University, Korea

Characterization of a Smooth Schubert Variety

Geometric structures on a Fano manifold of Picard number one defined by the variety of minimal rational tangents have been studied by Hwang and Mok in a series of works. On a rational homogeneous manifold G/P of Picard number one it is defined by the space of tangent directions to lines contained in G/P after we consider G/P as a projective manifold by the first canonical embedding. In this talk we will consider the geometric structure on a smooth Schubert variety in a rational homogeneous manifold of Picard number one, defined by the space of tangent directions to lines contained in it. Using this geometric structure we will give a characterization of a smooth Schubert variety of a rational homogeneous manifold of Picard number one. This is a joint work with N. Mok.

Xiangdong Li, Fudan University, China

On the L^p-cohomology of $\bar{\partial}$ over Complete Kähler Manifolds

In this talk, we present a finiteness theorem of the reduced L^2-cohomology of $\bar{\partial}$ on a class of holomorphic vector bundles over complete Kähler manifolds. Moreover, we establsih some L^p-estimates and existence theorems of $\bar{\partial}$ and prove some vanishing theorems of the L^p-cohomology of $\bar{\partial}$ on complete Kähler manifolds with suitable curvature conditions.

Joel Merker, Ecole Normale Supérieure, Paris

On the Green-Griffiths Conjecture

In 1979, Green and Griffiths conjectured that in every projective algebraic variety X of general type, there exists a certain *proper* subvariety Y with the property that every *nonconstant* entire holomorphic curve $f\colon \mathbb{C} \to X$ landing in X must in fact lie inside Y. For projective hypersurfaces X, Siu showed in 2004 that there is an integer d_n such that every generic hypersurface X in $\mathbb{P}^{n+1}(\mathbb{C})$ of degree $d \geqslant d_n$, such an Y exists. The talk, based on the bundle of invariant jet differentials and on a new construction of explicit slanted vector fields tangent to the space of vertical jets to the universal hypersurface (realizing an idea of Siu), will present a recent complete detailed proof of such a kind of algebraic degeneracy statement, with the effective degree bound :

$$d \geqslant n^{5n^7},$$

improving the double exponential bound announced (joint with S. Diverio and E. Rousseau) on arxiv.org in November 2008.

Ngaiming Mok, HKU, Hong Kong

Geometry of Holomorphic Maps into Bounded Symmetric Domains

Consider bounded symmetric domains $D \Subset \mathbb{C}^n$ and $\Omega \Subset \mathbb{C}^N$ in their Harish-Chandra realizations. In this talk we will discuss recent work on germs of holomorphic maps $f : (D; 0) \to (\Omega; 0)$ with special geometric properties such as holomorphic isometries and measure-preserving holomorphic maps. By means of analytic continuation they lead eventually to the study of asymptoptic behavior of holomorphic embeddings defined on a neighborhood of a regular boundary point of D, especially in the case where D is the unit disk and Ω is an irreducible bounded symmetric domain.

Our discussion will involve (a) extension results on germs of holomorphic isometries between bounded domains with algebraic Bergman kernels, such as bounded symmetric domains; (b) holomorphic isometries of the unit disk into bounded symmetric domains: asymptotic behavior and construction of examples; (c) the general problem of holomorphic maps preserving invariant (p, p)-forms. Our methods incorporate techniques in Several Complex Variables, while we exploit at the same time particular features of Bergman metrics on bounded symmetric domains. Especially, there is an interesting geometry for holomorphic curves on bounded symmetric domains of higher rank due to the lack of homogeneity in the space of tangent vectors. We study holomorphic curves on them by means of normal forms of tangent vectors and moving families of maximal polydisks.

Sui-Chung Ng, HKU, Hong Kong

On Holomorphic Maps Induced from Measure-preserving Correspondences of Bounded Symmetric Domains

Let Ω be an irreducible bounded symmetric domain and $d\mu_\Omega$ be the canonical measure induced by the Bergman metric. Let Ω^p be a Cartesian product of Ω and $\pi_k : \Omega^p \longrightarrow \Omega$, $1 \leq k \leq p$ be the canonical projections. In relation to a problem in arithmetic geometry, Clozel and Ullmo were led to study measure-preserving correspondences of irreducible bounded quotients of Ω. Such a correspondence will induce a holomorphic map $f : \Omega \longrightarrow \Omega^p$ such that $f^*(\pi_1^* d\mu_\Omega + \cdots + \pi_p^* d\mu_\Omega) = q d\mu_\Omega$, where p, q are positive integers. In this talk, we will talk about the recent work (with N. Mok) about this kind of holomorphic maps. In particular, when $\dim(\Omega) = 1$, f is a holomorphic isometric embedding of the unit disk into the $p-$disk and we will also discuss some results on the classification problem of these isometric embeddings.

Tuen-Wai Ng, HKU, Hong Kong

Exact Meromorphic Solutions of the Falkner-Skan Differential Equation

In this talk, we shall apply a method first developed by A. Eremenko to find the exact solutions of some interesting non-linear autonomous differential equations including the Falkner-Skan differential equation

$$f''' + ff'' + \beta(1 - f'^2) = 0 \ .$$

This third order O.D.E describes the boundary-layer flow over a wedge of included angle $\beta\pi$ and it has been studied intensively in fluid mechanics. The solution f, if it exists, is called the shape function, or the dimensionless stream function and its first derivative, after suitable normalization, represents the velocity.

Mounir Nisse, Université de Paris 6, France

Complex and Non-Archimedean Coamoebas

Amoebas (resp. Coamoebas) are the link between the classical complex geometry and the tropical (resp. complex tropical) geometry. I will start by briefly introducing these objects in the complex algebraic hypersurfaces cases.

The purpose of my talk will be to explain the relation between complex and non-Archimedean coamoebas on one hand, and Newton polytope on the other hand. Moreover, a brief survey of the further development of complex and non-Archimedean amoebas will be given, as well as a description of some new results.

However, the same circle of ideas used on amoebas, also shows that the coamoebas have a similar geometric and combinatorial structure. Application for $n = 2$ will be outlined. Many examples, with pictures, will be given.

Yum-Tong Siu, Harvard University, USA

Techniques of Value Distribution Theory - Past, Present and Future

The talk will start with the important historic techniques of value distribution theory, in the context of both one and several complex variables. Will go on to discuss the currently actively used techniques from the viewpoint of several complex variables and the interface with diophantine approximation. Finally will talk about directions of future developments.

Wing-Keung To, National University of Singapore

Gonality, Seshadri Numbers and Singular Potentials

In this talk, I will discuss a recent joint work with J.-M. Hwang on obtaining a lower bound of the gonality of compact Riemann surfaces in terms of hyperbolic geometric invariants. The lower bound is obtained through the construction of suitable singular potential functions. I will also discuss the relevance of the present work with our earlier works on Seshadri numbers.

Jonathan Tsai, CUHK, Hong Kong

Conformally Invariant Random Curves on Riemann Surfaces Satisfying the Restriction Property

Let $S = \{\Gamma_{D,a,b}\}$ be a family of random curves such that for each planar domain D with a and b on the boundary, $\Gamma_{D,a,b}$ is a random curve in D from a to b. We say that the family of curves S satisfies the restriction property if for any compact set K in D avoiding a and b, $\Gamma_{D,a,b}$ conditioned to avoid K is just $\Gamma_{D\setminus K,a,b}$. Lawler, Schramm and Werner discovered a way of constructing the family of curves S when D is a simply-connected domain. In particular, it is Stochastic Loewner evolution with parameter $8/3$.

In this talk, we will outline an extension of this construction to non-simply connected finite Riemann surfaces with boundary. From this, we can deduce some asymptotic properties of the family of curves S.

Weihong Yao, Shanghai Jiaotong University, China

Distribution of Normalized Zero-Sets of Random Entire Functions

This paper is concerned with the distribution of normalized zero-sets of random entire functions. The normalization of the zero-set is performed in the same way as that of the counting function for an entire function in Nevanlinna theory. The results generalize the Shiffman and Zelditch theory on the distribution of the zeroes of random holomorphic sections of powers for positive Hermitian holomorphic line bundles from polynomial functions to entire functions. Our results can also be viewed as the generalization of Nevanlinna's First Main Theorem in the theory of the distribution of zero-sets of random entire functions.

Sai-Kee Yeung, Purdue University, USA

Some Geometric Results Related to Fake Projective Planes

We present the complete classification of fake projective planes by Prasad-Yeung and Cartwright-Steger, and present some geometric and topological consequences.