

Courses' Titles and Abstracts

1. Xiaojun Huang, Rutgers University, New Brunswick, USA
Title: A quick course on the CR Invariant theory and applications
Abstract: It contains three parts
(1) Chern-Moser theory and Cartan-Chern-Moser-Weyl tensor
(2) Fefferman's invariant functions and some explicit computations
(3) Applications to the Ramadanov conjecture in the complex spaces of dimension two.
2. Slawomir Kolodziej, Jagiellonian University, Poland
Title: Weak solutions of the complex Monge-Ampère equation on compact Hermitian manifolds
Abstract: The aim of the course is to show how the pluripotential methods can be adapted (and developed) to deal with existence and stability of weak solutions of the Monge-Ampère equation on Hermitian (non-Kähler) manifolds. We begin with a very brief introduction to Hermitian geometry and related geometric equations. Then the basic notions and results of pluripotential theory are discussed. Using them we will sketch the proof of a priori estimates and the existence of solutions of the complex Monge-Ampère equation on Hermitian manifolds when the right hand side is in $L^p(X, \omega^n)$, $p > 1$. We conclude with a discussion of stability of those solutions and its implications.
3. Emil Straube, Texas A & M University, USA
Title: L^2 -Sobolev theory for $\bar{\partial}_M$
Abstract: In this mini course, I will discuss the L^2 -Sobolev theory of the tangential Cauchy-Riemann equations on a closed CR submanifold of \mathbb{C}^n which is of hypersurface type. The plan for the four lectures is roughly as follows.
Lecture 1: CR submanifolds of hypersurface type
Lecture 2: The $L^2 - \bar{\partial}_M$ complex
Lecture 3: Compactness estimates for the complex Green operator
Lecture 4: Sobolev estimates for the complex Green operator
4. Song Sun, Stony Brook University, USA
Title: Ricci curvature and complex geometry
Abstract: The main theme of this mini course will involve the interplay between the differential geometry of Ricci curvature and algebraic/complex-analytic geometry. The first two lectures will cover the relevant background material on Ricci curvature, Kähler geometry and K-stability. Then we will briefly sketch the proof of the Kähler-Einstein result on Fano manifolds, and explain a key ingredient in the proof—the application of Hörmander L^2 estimate. Time permitting we will discuss more recent work on singularities of Kähler-Einstein metrics.

Short Talks' Titles and Abstracts

1. Severine Biard, Texas A & M University , USA
Title: Nonexistence of smooth Levi-flat hypersurface with positive normal bundle in compact Kähler manifolds of dimension ≥ 3
Abstract: Among results of nonexistence of Levi-flat hypersurfaces in $\mathbb{C}P^n$, $n \geq 2$, conjectured by D. Cerveau in 1993, there are some generalizations to compact Kähler manifolds, particularly the conjecture given by Marco Brunella in 2008 : there is no smooth Levi-flat hypersurface such that the normal bundle to the Levi foliation is positive along the leaves in compact Kähler manifolds of dimension ≥ 3 . In a joint work with Andrei Iordan, we obtained a positive answer to this conjecture by using L^2 -weighted estimates for $\bar{\partial}$. If time allows, I will talk about future works around this subject.
2. Fusheng Deng, School of Mathematical Sciences, UCAS
Title: Hamiltonian density property of coadjoint orbits
Abstract: We talk about the proof of Hamiltonian density property of coadjoint orbits of all complex Lie groups. Application to Hamiltonian Carleman approximation will be discussed. This talk is based on a joint work with E. F. Wold.
3. Slawomir Dinew, Jagiellonian University, Poland
Title: Mukai threefolds with C^* action
Abstract: We shall discuss the existence of Kähler-Einstein metrics on a special class of Fano threefolds. In particular we show, using rather elementary methods, that the Kähler-Einstein examples are dense in the whole family. This is a joint work with G. and M. Kapustka.
4. Xin Dong, Nagoya University, Japan
Title: Boundary Asymptotics of the Relative Bergman Kernel Metric for Hyper-elliptic Curves
Abstract: We obtain asymptotic formulas of the relative Bergman kernel metric for a holomorphic family of hyper-elliptic curves near the boundary of their moduli space. It turns out that the Levi form is asymptotic at each node to the Weil-Petersson metric, implying the incompleteness, which is different from the elliptic curve case where hyperbolic growth exists. As a corollary, lower bounds of the Bergman kernels on hyper-elliptic curves can be shown by the Berndtsson-Lempert method.
5. Luke D. Edholm, The Ohio State University, USA
Title: Bergman Theory of Fat Hartogs Triangles
Abstract: The Bergman theory of domains which generalize the Hartogs triangle is explored. We define $\Omega_\gamma := \{|z_1|^\gamma < |z_2| < 1\}$. For each $\gamma \in \mathbb{Q}^+$, we give an explicit formula for the Bergman kernel of the domain. Using these formulas, we explore

the action of the Bergman projection of Ω_γ on the associated Lebesgue and Sobolev function spaces. We also show that these results are drastically different in the case when γ is irrational. This is joint work with Jeff McNeal.

6. Zhenghui Huo, University of Illinois at Urbana-Champaign, USA

Title: The Bergman kernel on some Hartogs domains

Abstract: We obtain new explicit formulas for the Bergman kernel function on two families of Hartogs domains. To do so, we first compute the Bergman kernels on the slices of these Hartogs domains with some coordinates fixed, evaluate these kernel functions at certain points off the diagonal, and then apply a differential operator to them. We find, for example, explicit formulas for the kernel function on

$$\{(z_1, z_2, w) \in \mathbb{C}^3 : e^{|w|^2}|z_1|^2 + |z_2|^2 < 1\},$$

and on

$$\{(z_1, z_2, w) \in \mathbb{C}^3 : |z_1|^2 + |z_2|^2 + |w|^2 < 1 + |z_2 w|^2 \text{ and } |w| < 1\}.$$

We also use our formulas to determine the boundary behavior of the kernel function of these domains on the diagonal.

7. Hao Wen, Peking University, China

Title: A twisted $\bar{\partial}$ -Neumann problem and Toeplitz n -tuples

Abstract: Assume D is a bounded strongly pseudo-convex domain with C^∞ boundary in \mathbb{C}^n and f_1, \dots, f_n are holomorphic functions defined on \bar{D} . Assume moreover the f_i 's have only isolated common zeros and no common zeros on ∂D . Let $\bar{\partial}_f = \bar{\partial} + \sum_i f_i df_i \wedge$, then we can define a twisted $\bar{\partial}$ -Neumann problem: the Neumann problem of $\bar{\partial}_f$ with the boundary condition being the $\bar{\partial}$ -Neumann boundary condition. I would solve the problem, prove the regularity theorem and show its connection with joint spectra theory.

8. Jujie Wu, Henan University, China

Title: Ohsawa-Takegoshi type theorem and extension of plurisubharmonic functions

Abstract: We prove a Thullen type extension theorem of plurisubharmonic functions across a closed complete pluripolar set, which generalizes a theorem of Siu. Our approach depends on an Ohsawa-Takegoshi type extension theorem for a single point in a bounded complete Kähler domain.