

**ABSTRACTS FOR LIGHTNING TALKS AT THE 2024 JUNIOR
WORKSHOP IN SEVERAL COMPLEX VARIABLES**

Degeneration techniques in complex geometry

Roberto Albesiano

In 2009, B. Berndtsson proved a theorem on the positivity of direct image bundles of positive line bundles. Berndtsson's theorem has been successfully used to give radically new proofs of some fundamental theorems in the part of complex geometry often referred to as L2 methods. In this talk we will have a glimpse at the main idea behind these new proofs.

Rational m -fold Sphere Maps

Abdullah Al Helal

We introduce and study rational m -fold sphere maps, that is, rational maps taking m spheres to m spheres. We show that a polynomial m -fold sphere map of degree m or less is an ∞ -fold sphere map, that is, takes infinitely many spheres to spheres. Similarly, every rational m -fold sphere map of degree less than m is an ∞ -fold sphere map. We then prove that ∞ -fold sphere maps are, up to a unitary transformation, direct sums of finitely many homogeneous sphere maps.

**The Laplace and Leray transforms on some (weakly) convex
domains in \mathbb{C}^2**

Agniva Chatterjee

In this short talk, we focus on two integral transforms — the Laplace and Leray transforms. The range of the holomorphic Hardy space under the Laplace transform has been completely characterized as a weighted Bergman space of entire functions in two different cases: for arbitrary convex domains in \mathbb{C} by Lutsenko–Yumulmukhametov (1991), and for strongly convex domains in \mathbb{C}^n by Lindholm (2002). The common feature of these two classes of domains is the L^2 -boundedness of the Leray transform, which appears to be deeply connected to the Laplace transform. We extend the above-mentioned Paley–Wiener and L^2 -boundedness results to a class of (weakly) convex Reinhardt domains in \mathbb{C}^2 . The Leray transform was previously studied on this class by Barrett–Lanzani (2009).

Isometries in Diamond

Anand Chavan

The problem of holomorphicity of Kobayashi isometries on domains in \mathbb{C}^n and a recent result on the domain diamond will be discussed.

Classifying 2 dimensional pseudoconvex domains on Stein spaces based on properties of Bergman kernel and metric

Soumya Ganguly

We will present some results where we characterize certain pseudoconvex domains in two dimensional Stein spaces with isolated, normal singularities. The criteria for our classification would be Kähler-Einstein property of the Bergman metric and the algebraicity of Bergman kernel.

The Pluricomplex Green Function and the Lempert Function

Jesse Hulse

Plurisubharmonic functions, pseudoconvex domains, and pluripotential theory play an important part in several complex variables. We will learn about the pluricomplex Green function and the Lempert function in bounded opens sets of \mathbb{C}^n and in the bidisk.

Visibility domains in complex manifolds

Rumpa Masanta

In this talk, we extend the notion of visibility with respect to the Kobayashi distance to domains in arbitrary complex manifolds. Visibility here refers to a property resembling visibility in the sense of Eberlein–O’Neill for Riemannian manifolds. However, we do not assume Cauchy-completeness, with respect to the Kobayashi distance, of the domains in question. The visibility property of a domain D can be used to deduce many properties of certain holomorphic mappings into D , ranging from their continuous extendibility to the iterative dynamics of such self-maps of D . Here, we present a sufficient condition for visibility in the above setting, and with this criterion, we see that the class of domains with the visibility property is very large.

Eigenfunction bounds and microlocal analysis in the complex domain

Francis White

In mathematical physics, non self-adjoint operators arise in connection with processes that do not conserve energy. From the mathematical point of view, such operators are of interest because they arise as the quantizations of complex-valued symbols, and the associated classical dynamics must be extended into the complex domain. In this talk, I will discuss the special class of non self-adjoint pseudodifferential operators with double characteristics, and I will present some new results on L^p -bounds for eigenfunctions of such operators in the semiclassical limit. The main tools in the proof are the Fourier-Bros-Iagolnitzer (FBI) transform and microlocal analysis in exponentially weighted spaces of holomorphic functions.

Asymptotics of Fubini Study Currents of Sequences of Line Bundles

Melody Wolff

We look at sequences of line bundles equipped with continuous metrics, and generalize a theorem of Tian to this setting. We discuss methods used to prove the result, such as the Ohsawa–Takegoshi theorem and Demailly’s $\bar{\partial}$ -bar estimates. As well, we look at the equilibrium Metric, as introduced by Berman, and its applications to this particular theorem.