Titles and Abstracts

1. Leandro Arosio, Unversity of Rome II, Italy
   Title: Models For Holomorphic Self-Maps of the Unit Ball
   Abstract: In order to study the forward or backward iteration of a holomorphic self-map $f: X \to X$ of a complex manifold, it is natural to search for a semi-conjugacy of f with some automorphism of a complex manifold. Examples of this approach are given by the Schroeder, Valiron and Abel equation in the unit disc $D \subset C$. Given a holomorphic self-map f of the ball $B^q \subset C^q$, we show that f is canonically semi-conjugate to an automorphism (called a canonical model) of a possibly lower dimensional ball B^k, and this semi-conjugacy satisfies a universal property. This approach unifies in a common framework recent works of Bracci, Gentili, Poggi-Corradini, Ostapyuk.

   This is done performing a time-dependent conjugacy of the autonomous dynamical system defined by f, obtaining in this way a non-autonomous dynamical system admitting a relatively compact forward (resp. backward) orbit, and then proving the existence of a natural complex structure on a suitable quotient of the direct limit (resp. subset of the inverse limit). As a corollary we prove the existence of a holomorphic solution with values in the upper half-plane of the Valiron equation for a hyperbolic holomorphic self-map of B^q. We also show how to obtain simultaneous canonical models for commuting holomorphic self-maps $f_1, \ldots f_k$.

2. Simone Diverio, University of Paris VI, France
   Title: About rational curves on Calabi–Yau manifolds.
   Abstract: A celebrated conjecture by Kobayashi states that a compact Kähler hyperbolic manifold should have positive canonical bundle. One crucial step in order to prove this conjecture consists in showing that compact Kähler manifolds with trivial first Chern class are not hyperbolic. We shall concentrate on a special class of such manifolds, namely Calabi–Yau's, and show that in some cases it is possible to obtain a very strong non-hyperbolicity statement, *i.e.* existence of rational curves.

3. Peter Ebenfelt, University of California, San Diego, USA
   Title: Existence of Umbilical Points on Three-dimensional *CR* Manifolds.
   Abstract: In classical geometry, points on a surface embedded in R^3 are umbilical if the principal curvatures at the point are equal. These points correspond to points where the surface can be osculated to a higher-than-expected degree by a sphere (or a plane). The Caratheodory Conjecture (proved in the real-analytic case by Hamburger in the 1940's; still open in the smooth case) states that every compact surface bounding a convex domain in R^3 has at least two umbilical points. An analogous notion of umbilical can be defined on CR manifolds and the question of existence of umbilical points on compact three-dimensional CR manifolds was raised by S.-S. Chern and J. Moser in their seminal paper from 1974. In this talk we shall describe some recent results on existence of umbilical points on three-dimensional CR manifolds with a U(1)-action. For example, every compact, complete circular CR manifold in C2 has at least one circle of umbilical points.

4. Qi'an Guan, Peking University, China
   Title: Multiplier ideal sheaves with weights of Lelong number one
   Abstract: In this talk, we present our characterization of multiplier ideal sheaves with weights of Lelong number one, which depends on our solution of Demailly's strong openness conjecture and Ohsawa-Takegoshi L^2 extension theorem. We also present a new proof of the related well known integrability criterion due to Skoda, which depends on Ohsawa-Takegoshi L^2 extension theorem and some ideas in our solution of the strong openness conjecture. This is joint work with Professor Xiangyu Zhou.

5. Josip Globevnik, University of Ljubljana, Slovenia
   Title: A Complete Complex Hypersurface in the Ball of C^N
   Abstract: In the talk we will describe the recent result of the author how to construct a holomorphic function on the open unit ball B_N of C^N , N ≥ 2, whose real part is unbounded on every path in B_N of finite length that ends on bB_N . Level sets of such functions are examples of complete complex hypersurfaces in the ball and give a complete answer to a question of P. Yang from 1977 about the existence of bounded complete complex manifods. We will also present a generalization of this result to pseudoconvex domains in C^N and a related result obtained jointly with A. Alarcon and F. J. Lopez about a construction of a complete proper holomorphic embedding from the open unit disc $\Delta \subset C$ to B_2.

6. Xianghong Gong, University of Wisconsin, USA
   Title: The Frobenius-Nirenberg Theorem with Parameter
   Abstract: The Newlander-Nirenberg theorem says that a formally integrable complex structure is locally equivalent to the complex structure in the complex Euclidean space. We will show two results about Newlander-Nirenberg theorem with parameter. The proof of the first result extends Webster's proof of the Newlander-Nirenberg theorem, and it yields a sharp regularity result. The second result concerns a parameterized version of Nirenberg's complex Frobenius theorem with a mild loss of regularity.

7. Friedrich Haslinger, University of Vienna, Austria
   Title: The $\bar{\partial}$-Neumann operator, spectral properties and Sobolev inequalities
   Abstract: Let $\Omega \subseteq C^n$ be a smoothly bounded pseudoconvex domain and let $1 \leq q \leq n-1$. We consider the $\bar{\partial}$-complex

$$L^2_{(0,q-1)}(\Omega) \underset{\bar{\partial}^*}{\overset{\bar{\partial}}{\rightleftarrows}} L^2_{(0,q)}(\Omega) \underset{\bar{\partial}^*}{\overset{\bar{\partial}}{\rightleftarrows}} L^2_{(0,q+1)}(\Omega)$$

   and we set

$$\square_q = \bar{\partial}\bar{\partial}^* + \bar{\partial}^*\bar{\partial}$$

   By pseudoconvexity, we have the basic estimate: there exists a constant c > 0 such that

   (1) $$\|u\| \leq c(\|\bar{\partial}u\|^2 + \|\bar{\partial}^*u\|^2)^{1/2},$$

   for each $u \in \mathrm{dom}(\bar{\partial}) \cap \mathrm{dom}(\bar{\partial}^*)$.

   The basic estimate (1) implies that $\square_q : \mathrm{dom}(\square_q) \to L^2_{(0,q)}(\Omega)$ is bijective and has a bounded inverse

$$N_q : L^2_{(0,q)}(\Omega) \to L^2_{(0,q)}(\Omega),$$

   the $\bar{\partial}$-Neumann operator.

   Remark: If $\square_q$ has a bounded inverse, then inequality (1) holds.

   Now, suppose that one can replace the L^2 −norm in the left-hand side of (1) by the L^r −norm, for some r > 2 :

   (2) $$\|u\|_{L^r} \leq c(\|\bar{\partial}u\|^2 + \|\bar{\partial}^*u\|^2)^{1/2},$$

   for each $u \in \mathrm{dom}(\bar{\partial}) \cap \mathrm{dom}(\bar{\partial}^*)$. Then the $\bar{\partial}$- Neumann operator

$$N_q : L^2_{(0,q)}(\Omega) \to L^2_{(0,q)}(\Omega),$$

is compact. This situation is related to the so-called subelliptic estimates which in turn correspond to the geometric notion of finite type (see the work of Catlin and D'Angelo). Using classical Sobolev inequalities we show the following result:
Let Ω be a bounded pseudoconvex domain in C^n with boundary of class $\mathcal{C}^\infty$. Suppose that $0 < \varepsilon \leq 1/2$ and that

$$\mathrm{dom}(\bar{\partial}) \cap \mathrm{dom}(\bar{\partial}^*) \subseteq W^{\epsilon}_{(o,q)}(\Omega)$$

and that there exists a constant C > 0 such that

(3) $$\|u\|_{\epsilon,\Omega} \leq C(\|\bar{\partial}u\|^2 + \|\bar{\partial}^* u\|^2)^{1/2},$$

for all $u \epsilon \mathrm{dom}(\bar{\partial}) \cap \mathrm{dom}(\bar{\partial}^*)$, where $W^{\epsilon}_{(o,q)}(\Omega)$ is the standard $\epsilon - Sobolev$ space. Then the $\bar{\partial}$-Neumann operator

$$\mathrm{N}: L^2_{(0,q)}(\Omega) \to L^2_{(0,q)}(\Omega),$$

is compact and N can be continuously extended as an operator

$$\widetilde{\mathrm{N}}: L^{\frac{2n}{n+\epsilon}}_{(0,q)}(\Omega) \to L^{\frac{2n}{n-\epsilon}}_{(0,q)}(\Omega),$$

which means that there is a constant C > 0 such that

(4) $$\|\widetilde{\mathrm{N}}u\|_{L^{\frac{2n}{n-\epsilon}}} \leq C\|u\|_{L^{\frac{2n}{n+\epsilon}}},$$

for each $u \in L^{\frac{2n}{n+\epsilon}}_{(0,q)}(\Omega)$.

In addition we describe spectral properties of the complex Laplacian $\square_{p,q}$ on weighted spaces $L^2(C^n, e^{-\varphi})$, where φ is a plurisubharmonic weight function and

$$L^2_{(0,q-1)}(C^n, e^{-\varphi}) \underset{\bar{\partial}^*_\varphi}{\overset{\bar{\partial}}{\rightleftarrows}} L^2_{(0,q)}(C^n, e^{-\varphi}) \underset{\bar{\partial}^*_\varphi}{\overset{\bar{\partial}}{\rightleftarrows}} L^2_{(0,q+1)}(C^n, e^{-\varphi})$$

and

$$\square_{p,q} = \bar{\partial}\bar{\partial}^*_\varphi + \bar{\partial}^*_\varphi\bar{\partial}.$$

We derive a necessary condition for compactness of the corresponding $\bar{\partial}$-Neumann operator and a sufficient condition, both are not sharp. So far, a characterization can only be given in the complex 1-dimensional case.

8. Christine Laurent-Thiébaut, Université Grenoble Alpes, France
Title: On the L^2-Dolbeault cohomology of annuli
Abstract: We study the L^2-Dolbeault cohomology of annuli, $\Omega = \widetilde{\Omega}\backslash V$, in $\mathbb{C}^n$ in the special case when V is a product domain. In particular we solve the so called chinese coin problem : let $\widetilde{\Omega}$ be the ball of radius 2 in $\mathbb{C}^2$ and V be the bidisc, then the cohomology group $\mathrm{H}^{0,1}_{L^2}(\widetilde{\Omega}\backslash V)$is Hausdorff and infinite dimensional. In addition we get W^1 estimates for the $\bar{\partial}$-equation in product domains.
This is a joint work with Debraj Chakrabarti and Mei-Chi Shaw.

9. Long Li, McMaster University, Canada
Title: Subharmonicity of the Conic Mabuchi Functional
Abstract: In this talk, we will discuss how to generalize the notion of conic Kähler-Einstein metrics to

conic cscK metrics. Then the conic Mabuchi functional is introduced in such a way that conic cscK metrics are its critical points. Finally, the main result is that the conic Mabuchi functional is a convex and continuous function along conic geodesics. This is a generalization of my previous joint work with X.X. Chen and M. Păun.

10. Loredana Lanzani, Syracuse University, USA
    Title: Singular Integral techniques in Several complex variables
    Abstract: I will give a survey of recent joint work with E. M. Stein [LS-1]-[LS-5] concerning the L^p-regularity of orthogonal projections, and other singular integral operators, in the non-classical context of domains with non-smooth boundary. Specifically, I will discuss the interplay of the following entities:
    • Singular integral operators of Càlderon-Zygmund type with holomorphic kernel: C(w, z), $z \in D \Subset \mathbb{C}^n$ ("Holomorphic Cauchy Integrals");
    • The Szegö projection (also known as the Cauchy-Szegö projection) for a broad class of bounded domains $D \Subset \mathbb{C}^n$;
    • Hardy spaces of holomorphic functions for a broad class of bounded domains $D \Subset \mathbb{C}^n$.
    All of the above in the situation when
    • the complex dimension of the ambient space is $n \geq 2$, and
    • the ambient domain *D* has *minimal* boundary regularity.
    This kind of problems are fairly well understood in the context of one complex variable [LS-6]; the situation in higher dimensions requires a different analysis.

11. Song-Ying Li, University of California, Irvine, USA
    Title: Ridigity Problems and Theorems Associated to the Degeneralted Elliptic Operators
    Abstract: In this talk, I will talk about some rigidity theorems associated to the solution of some degenerated Elliptic equations, which include Laplace-Beltrami operators and complex Monge-Amp\`ere operators. I will also talk about the bottom of the spectrum, and the characterization theorem for the ball in $\CC^n$.

12. Taishun Liu, Huzhou University, China
    Title: A Boundary Schwarz Lemma on the Classical Domain of Type I
    Abstract: Let R_I (m, n) be the classical domain of type *I* in Cm×n with $1 \leq m \leq n$. We give some basicI properties of the smooth boundary points of R_I (m, n) and establish a Schwarz lemma at the boundary for holomorphic self-mappings of R_I (m, n).

13. Takeo Ohsawa, Nagoya University, China
    Title: Remarks on optimal L^2 extension theorems
    Abstract: Recent results and methods on the L^2 extension theorems of holomorphic functions will be reviewed. In particular, a direct method (to appear in Nagoya Math. J) will be explained. As an application, an improvement of an "optimal" L^2 extension theorem of Guan and Zhou will be given.

14. Chunhui Qiu, Xiamen University, China
    Title: Vanishing theorems and Hodge theorems on Finsler holomorphic vector bundles
    Abstract: In this paper, we research the vanishing theorems and Hodge theorems on complex Finsler holomorphic vector bundles. Firstly, by means of the isomorphism theorem of Le Potier, we give the generalization of the Girbau theorem on complex Finsler holomorphic vector bundles. Secondly, by using the dbar-dbar Bochner-Kodaira technique obtained by Y.T. Siu, we get the vanishing theorems on the pull back bundle p*E. In the third, in order to discuss the horizontal differential forms, we get the dbar-dbar Bochner-Kodaira technique for the horizontal differential forms. Moreover, under the

assumption of some positivity, we obtain the vanishing theorems for the horizontal harmonic (0,q) forms. Finally, we discuss the Hodge theorems on complex Finsler holomorphic vector bundles, and get the vanishing theorems on Berwald holomorphic vector bundles. This work is joint with Jinling Li and Tongde Zhong.

15. Feng Rong, Shanghai Jiao Tung University, USA
    Title: On holomorphic endomorphisms of Hopf manifolds
    Abstract: First, we briefly recall the definition and basic properties of Hopf manifolds. Then, we give a complete description of holomorphic endomorphisms of all types of Hopf surfaces. Next, we describe holomorphic endomorphisms of three-dimensional Hopf manifolds in many cases, following a similar but much more involved study. Finally, we summarize and briefly discuss the higher dimensional cases.

16. Min Ru, University of Houston, USA
    Title: Holomorphic Curves into Projective Varieties Intersecting Divisors
    Abstract: In this talk, I will report some progress towards the study of holomorphic curves into projective varieties intersecting given divisors. Part of them will be a joint work with Paul Vojta at UC Berkeley.

17. Tyson Ritter, University of Oslo, Noway
    Title: A Soft Oka Principle for Proper Holomorphic Embeddings of Riemann Surfaces into $(C^*)^2$
    Abstract: Let X be an open Riemann surface. We prove an Oka property on the approximation and interpolation of continuous maps from X into $(C^*)^2$ by proper holomorphic embed-dings, provided we allow a deformation of the complex structure on X. This generalises and strengthens a recent result of Alarcón and López on proper embeddings of open Rie-mann surfaces into C^2.

18. Marko Slapar, Univeristy of Ljubljana, Slovenia
    Title: On the Thom conjecture in CP^3
    Abstract: The Thom Conjecture, proven by Kronheimer and Mrowka in 1994, states that complex curves in CP^2 are genus minimizers and their homology class. The conjecture has also been extended and proved for symplectic surfaces in symplectic 4-manifolds by Ozsvath and Szabo in 2000. In CP^n, an analogous question can be asked about complex hypersurfaces. This question has been studied by Freedman in his thesis (1973), where it was shown that for $n > 2$ and even, complex hypersurfaces are not the simplest taut submanifolds in their homology class. We plan to present some results in addressing the question in CP^3. This is joint work with Daniel Ruberman and Sašo Strle.

19. Iris Marjan Smit, University of Trondheim, Norway
    Title: Understanding wandering domains in several complex variables
    Abstract: Sullivan's famous non-wandering domains theorem states that the Fatou components of a rational function on the Riemann sphere are all periodic or pre-periodic. It was shown in 2014 by M. Astorg, X. Buff, R. Dujardin, H. Peters and J. Raissy that wandering domain can exist for polynomial maps in C^2. Their examples are parabolic skew products. In this talk, I will discuss joint work with Han Peters, where we investigate the existence of wandering domains for attracting skew products.

20. Wei Wang, Zhejiang University, China
    Title: On the quaternionic Monge-Ampere operator and the pluripotential theory
    Abstract: I will discuss the quaternionic Monge-Ampere operator, closed positive currents on the quaternionic space and their Lelong numbers, the mixed Monge-Ampere measures of locally bounded quaternionic plurisubharmonic functions and Lelong-Jensen type formula.

21. Yuan Yuan, Syracuse University, USA

Title: On local holomorphic maps between bounded symmetric domains

Abstract: The study of local holomorphic maps preserving invariant forms between bounded symmetric domains has two motivations. One is from number theory, and the other one is rigidity/classification in the differential geometric point of view. I will describe the developments on the extension and the rigidity for such maps and explain the connection to algebraic geometry, CR geometry and etc. The talk is based on several works, including joint works with Huang, Xiao and Zhang.

22. Yu Zeng, Stony Brook University, USA

Title: Deformations of Twisted Csck Metrics

Abstract: Recently, X. Chen has introduced a continuity path for the con-stant scalar curvature Kähler(cscK) metric as an analogy of the classical Aubin-Yau path. More precisely, on a closed Kähler manifold (M, ω) with complex dimension n, he has considered a family of solutions to the equations with parameter $t \in [0, 1]$,

$$\mathrm{tR}_{\varphi} - (1-t)tr_{\varphi}\omega = C_t \qquad (1)$$

Where $\mathrm{R}_{\varphi} \coloneqq -g_{\varphi}^{i\bar{j}}(\frac{\partial^2}{\partial z_i \partial \bar{z}_j}\log\det(g_{\varphi}))$ is the scalar curvature of the Kähler metric g_{φ}, $\mathrm{tr}_{\varphi}\omega \coloneqq g_{\varphi}^{i\bar{j}}\omega_{i\bar{j}}$ and C_t is a topological constant depending on t. In this talk, I will show some openness results of this path including the openness at t = 0 and the openness at t = 1. Based on the later result, we(joint with X. Chen and M. Păun) gave a new proof of the uniqueness of the extremal/cscK metrics modulo holomorphic automorphisms.

23. Xiangyu Zhou, Chinese Academy of Science

Title: Proper holomorphic maps between invariant domains

Abstract: TBA