Abstracts

Vincenzo Ancona

Modifications of Complex Spaces: the contribution of Pino Tomassini

Abstract. The problem of the existence of a blowing-down goes back to Castelnuovo and Enriques for algebraic surfaces. Later the existence of modifications has been investigated by many people from various points of view: K. Kodaira, H. Grauert, H. Hironaka, M. Artin, B.G. Moishezon, P.Griffiths, S. Nakano, M. Cornalba, V.A. Krasnov, A. Fujiki, J. Mazur... We summarize their results and we outline the contributions of Pino Tomassini to the case of modifications of complex spaces.

Fabrizio Broglia

Analytic setting from $\mathbb{C}$ to $\mathbb{R}$

Abstract. The theory of complex analytic spaces was fully developped from fifties to sixties mainly in France and in Germany. In this talk I will show some of the classical obstructions, already stated by Cartan, to extend this theory to the real case. In addition, prooving a Nullstellensatz for real analytic sets, we well see the role of representation of positive functions as sums of squares, i.e. the Hilbert seventieth problem. The lack of general solution of this problem makes analytic results different from the ones available in real algebraic geometry.

Giovanna Citti

Uniqueness of mean curvature flow in a contact manifold with subriemannian metric

Abstract. Existence results for mean curvature flow in contact manifolds with a subriemannian metric are well known, but uniqueness is known only for graphs and for radially symmetric surfaces in the Heinseberg group, which is the simplest 3D contact surface. Indeed due to the presence of characteristic points standard techniques do not allow to prove a comparison principle. Here we establish uniqueness approximating the subriemannian metric with riemannian ones.

Giuseppe Della Sala

The Borel property in certain algebras of function

Abstract. (Joint work with P. Cordaro and B. Lamel) Let K be a compact set of $\mathbb{C}^n$ with a distinguished point p. We consider the algebra $A(K)$ obtained by the closure of the algebra of restrictions of entire functions to K, with a suitable Fréchet topology, and the Borel map sending an element f of $A(K)$ to its formal power series expansion at K. We study the link between the algebraic behavior of the Borel map and the geometry of K. Particularly interesting is the case of a compact set K coming from a locally integrable structure on a smooth manifold.

Sorin Dragomir

Cauchy-Riemann geometry and subelliptic theory

Abstract. We review results describing the interplay between Cauchy-Riemann geometry (cfr. [2]) and subelliptic theory (cfr. [1]) starting from pioneering work by E. Lanconelli (cfr. [5]) up to the findings on quasilinear subelliptic PDE systems of variational origin due to J. Jost and C-J. Xu (cfr. [4]) and P. H ájlasz and P. Strzelecki (cf. [3]). In particular we report on the properties of Canot-Carathéodory spaces attached to a strictly pseudoconvex CR manifold M, in a neighborhood of each point $x \in M$, versus the pseudohermitian geometry of M arising from a fixed positively oriented contact form θ on M. A natural degenerate elliptic second order operator Δ_b arising on a pseudohermi- tian manifold [the sublaplacian of $(M,)$] turns out to be subelliptic of order $= 1/2$ (cfr. [6]). Among the many applications (of subelliptic theory to CR geometry) that we survey, we demonstrate the solution to the weak Dirichlet problem for the sublaplacian Δ_b on domains $\Omega \subset M$ supporting a Poincar é type inequality.

REFERENCES

[1] D. Danielli, N. Garofalo and D-M. Nhieu, *Non-doubling Ahlfors measures, perimeter measures, and the characterization of the trace spaces of Sobolev functions in Carnot-Carath éodory spaces*, Memoirs of Amer. Math. Soc., No. 857, Vol. 182, July 2006.

[2] S. Dragomir and G. Tomassini, *Differential geometry and analysis on CR manifolds*, Progress in Mathematics, Vol. 246, Birkh auser, Boston-Basel-Berlin, 2006.

[3] P. H ájlasz and P. Strzelecki, *Subelliptic p-harmonic maps into spheres and the ghost of Hardy spaces*, Math. Ann., 312(1998), 341–362.

[4] J. Jost and C-J. Xu, *Subelliptic harmonic maps*, Trans. Amer. Math. Soc., (11)350(1998), 4633–4649.

[5] E. Lanconelli, *Regolarità H ölderiana delle soluzioni deboli di certe equazioni ellittiche fortemente degeneri*, Seminario di Analisi Matematica, Istituto Matematico dellUniversità di Bologna, Aprile 22-29, 1982, IX-1-IX-27, Centro Stampa Lo Scarabeo, Bologna, 1983.

[6] O.A. Oleinik and E.V. Radkevic, *Second order equations with non-negative characteristic form*, Plenum Press, New York, 1973.

Antonella Nannicini

Norden Structures on Cotangent Bundles via Generalized Geometry

Abstract. We describe prolongation of Norden structures on manifolds to their generalized tangent bundles and to their cotangent bundles. In particular, by using methods of generalized geometry, we prove that the cotangent bundle of a complex Norden manifold (M, J, g) admits a structure of Norden manifold, $(T^\star(M), \tilde{J}, \tilde{g})$. Moreover if (M, J, g) has flat natural canonical connection then $\tilde{J}$ is integrable, that is $(T^\star(M), \tilde{J}, \tilde{g})$ is a complex Norden manifold. Finally we prove that if (M, J, g) is Kähler Norden flat then $(T^\star(M), \tilde{J}, \tilde{g})$ is Kähler Norden flat.

Nikolay Shcherbina

On totally disconnected sets with nontrivial polynomial hull that has no analytic structure

Abstract. We discuss some examples of totally disconnected sets E in $\mathbb{C}^n$ such that their additional polynomial hull $\hat{E} \setminus E$ has no analytic subsets of positive dimension. We also explain how to construct a subset of the unit sphere $\mathbb{S}^3 = b\mathbb{B}^2 \subset \mathbb{C}^2$ which has this property.

Zbigniew Slodkowski

Pseudoconcave decompositions in complex manifolds

Abstract. The notion of the *minimal kernel* of a weakly complete manifold (of a given regularity class) was introduced by Z.S. and G. Tomassini (J.Funct. Anal. **210** 2004) as the set of points at which every plurisubharmonic exhaustion functions of given regularity class fails to be strongly plurisubharmonic. The relevant regularity classes are continuous or k times

differentiable ($k = 1, 2, \ldots, \infty$). We consider the decomposition of any of these minimal kernels into parts defined as maximal subsets on which any plurisubharmonic exhaustion function of corresponding regularity is constant and show that every part has the local maximum property (i.e. is pseudoconcave).

A related notion of a *core* of a complex manifold was introduced by Harz, Shcherbina and Tomassini (Math Z. **286** 2017) in which only uniformly bounded plurisubharmonic functions of suitable regularity class are used. They proved that the cores are pseudoconcave, and asked if the cores decompose into pseudoconcave components (analogs of parts above) on which all bounded plurisubharmonic functions of a suitable class are constant. We present the proof of this conjecture for all regularity classes considered above. (The case of continuous core was obtained independently by Poletsky and Shcherbina).

We discuss generalization of these notion and results where a, rather general, admissible class of plurisubharmonic functions is considered as reference base for the definitions.

We also present similar concepts and results in the context of uniform approximation and regularization, in the spirit of Richberg, of unbounded continuous plurisubharmonic functions.

Viorel Vajaitu

Pseudoconvex spaces

Abstract. We discuss a vanishind result on pseudoconvex spaces and some embedding consequences.

Dmitri Zaitsev

Invariant ideal and submodule sheaves on real hypersurfaces

Abstract. Catlin's boundary systems is currently the only known approach to proving subelliptic estimates for general pseudoconvex finite type domains. We present some new geometric invariants aiming to better understand and simplify some of Catlin's technique.