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BOOK OF ABSTRACTS

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Solvability of nonsingular closed 1-forms on compact manifolds

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To a nonsingular closed 1-form ω on a smooth manifold M , one naturally associates a subbundle of TM , which is integrable by Frobenius Theorem. A well-known construction then gives rise to a first-order differential complex, whose global solvability (meaning: closedness of the range in the Fréchet topology of smooth sections) we address in the first degree of the said complex when M is compact and connected. We provide a complete characterization of the latter property in terms of certain number-theoretic approximation conditions on ω , loosely connected with the topology of the leaves of the foliation associated with ω (or, more precisely, how they embed into M). As a happy side effect of our techniques, we are able to fulfill the program started by A. Meziani (Comm. PDE, 2002) and settle, without further assumptions, the related problem of global hypoellipticity of the same differential operator.

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Smooth and Gevrey Microlocal Hypoellipticity for a Class of Hypocomplex Tube Structures

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In this talk I'll present some results concerning smooth and Gevrey- s microlocal hypoellipticity for a system of complex vector fields associated with a real-analytic locally integrable structure of tube type, that is also microlocal hypocomplex. We employ the use of a certain partial F.B.I. transform adapted to the locally integrable structure, first introduced by M. S. Baouendi, C. H. Chang and F. Treves, and we prove a microlocal characterization of the smooth and Gevrey- s wave front set in terms of the decay of this partial F.B.I. transform.

References

- [1] Braun Rodeigues, N, *Smooth and Gevrey Microlocal Hypoellipticity for a Class of Hypocomplex Tube Structures*, Journal of Functional Analysis, 290 (**2**), 111230, 2025.

Parametrization of automorphisms via stationary discs

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Let $M \subset \mathbb{C}^n$ be a Levi nondegenerate real hypersurface, and fix $p \in M$. It is well known that local CR automorphisms of M are determined by a finite jet at p . We will discuss some recent approaches to the jet parametrization problem which are based on the dynamics of stationary discs attached to M . In particular, this point of view can be applied to hypersurfaces satisfying the finite smoothness required for the construction of such discs. This is joint work with A. Hussein (University of Ljubljana).

Ultradifferentiable regularity of CR mappings

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The study of CR mappings between real submanifolds of $\mathbb{C}^N$, i.e. mappings which are invariant under the structure inherited from the Hermitian space, is of vital interest in CR geometry and the wider theory of several complex variables. The problem of regularity of CR mappings in particular lies in the intersection of CR geometry and partial differential equations. More directly, it can locally be viewed as a regularity problem for an overdetermined system of PDEs of first order with a (highly) nonlinear side condition. On the other hand, ultradifferentiable classes have been used in the theory of partial differential equations to measure more precisely the regularity of solutions between real-analyticity and smoothness.

The work (joint with B. Lamel) presented in this talk extends the regularity theory of CR mappings in the smooth domain developed by Lamel and Mir in [2] and [3] to the ultradifferentiable case. This requires that the ultradifferentiable class $\mathcal{U}$ under consideration satisfies certain invariance properties, in particular that we can define manifolds of class $\mathcal{U}$, but also that there is a microlocal theory for $\mathcal{U}$, i.e. there is a notion of a wavefront set $\text{WF}_{\mathcal{U}}u$ of distributions u , which is compatible with the geometric structure.

In this talk after briefly discussing ultradifferentiable classes which satisfy these requirements, and presenting an outline of the arguments of Lamel and Mir, I am going to present as an application a few results on the ultradifferentiable regularity of CR mappings.

References

- [1] S. Fürdös and B. Lamel, Ultradifferentiable regularity of CR mappings, in preparation.
- [2] B. Lamel and N. Mir, Convergence and divergence of formal CR mappings, *Acta Math.* **220** (2018), no. 2, 367–406
- [3] B. Lamel and N. Mir, Regularity of CR mappings of abstract CR structures, *Internat. J. Math.* **31** (2020), no. 1, 2050009, 38 pp.

Trace of ultradistributions and applications

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In this talk we discuss sufficient conditions that guarantee when a pullback of ultradistributions is well defined. This involves appropriate transversality conditions. As an application, we characterize the Gevrey wave-front set of solutions to locally integrable structures when restricted to maximally real submanifolds.

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Herglotz for general domains

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The Herglotz integral is classically defined in the context of the unit disc; it gives rise to an integral formula that allows to represent holomorphic functions which are, say, continuous up to the boundary of the disc, in terms of a boundary integral of their sole real part (the Schwarz formula). In this talk I will formulate a notion of Herglotz integral that extends the classical definition (for the disc) to a rather general class of domains in one and several variables which includes the Lipschitz domains, and I will discuss further developments. This is work in progress with J. Verdera (U. Autònoma Barcelona).

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Regularity of sums of squares in two variables and Treves' conjecture

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In the nineties Treves stated a well-known conjecture for which the analytic hypoellipticity (or hypoanalyticity) of a sum of squares depends on the Poisson stratification of its characteristic manifold. Although it has recently been shown that this conjecture is false in dimension greater than 3, in dimension 2 the geometric setting of a sum of squares appears to be well described by the conjecture, which we therefore suspect to be true. In this seminar, we will show how the two-variable case can be reduced to the analysis of the following model operator:

$$Q = D_x^2 + p(x, y)^2 D_y^2,$$

where $p(x, y)$ is a polynomial in two variables that suitably vanishes at the origin. According to Treves' conjecture, Q should never be analytically hypoelliptic, but only s_0 -Gevrey hypoelliptic, with $s_0 > 1$. We will show what this threshold s_0 is in some meaningful cases, and how it is related to the Newton polygon associated with the polynomial $p(x, y)$.

Behavior of the q -type under Biholomorphic Mappings

Andreea Nicoara

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D'Angelo and Catlin q -types are two ways of measuring the order of contact of q -dimensional complex varieties with the boundary of a domain in $\mathbb{C}^n$ that arose from the problem of finding effective subelliptic estimates for the $\bar{\partial}$ -Neumann problem on (p, q) forms. They coincide when $q = 1$, and in that case, it is an elementary fact that they are invariant under biholomorphic mappings. For $q > 1$ linear forms come into the definitions of both the D'Angelo and the Catlin q -types, and these are not necessarily mapped to linear forms by a biholomorphic map unless the map itself is linear. We define E_q , another way of measuring the order of contact of q -dimensional complex varieties with the boundary of a domain in $\mathbb{C}^n$, which is quasi tautologically a biholomorphic invariant, and compare it to the D'Angelo and Catlin q -types.

Top-degree local solvability for $\bar{\partial}_b$ on rigid hypersurfaces of complex space

Vinicius Novelli
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We discuss the problem of top-degree local solvability for $\bar{\partial}_b$ on a hypersurface $M \subset \mathbb{C}^n$ near a point $p \in M$. This property is conjectured [?] to be equivalent to the existence of an open neighborhood $U \subset M$ of p at no point of which the Levi form is definite. We establish the validity of this conjecture when M is rigid. The main point is a weighted Poincaré inequality, which appears to have independent interest. This is joint ongoing work with Paulo Cordaro.

References

- [1] P. Cordaro and J. Hounie, *Local Solvability for Top Degree Forms in a Class of Systems of Vector Fields*, American Journal of Mathematics, Vol. 121, No. 3 (1999).

Relation between different type of hypoellipticity

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*Luis Fernando Ragnette*¹

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In this talk we will discuss how to give a systematic treatment to the concept of hypoellipticity, this abstract approach allows us to deal with several different notions within the same framework. We will discuss when some hypoellipticity implies another one and we also present a relation between certain types of hypoellipticity and local solvability.

References

- [1] B.L. Victor, L.F. Ragnette, *Relations between different types of Hypoellipticity: A systematic approach*, arXiv preprint arXiv:2505.11801, 2025

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