Differential Geometry

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PIERRE BAYARD, Universidad Michoacana de San Nicolás de Hidalgo, Morelia, México

Entire spacelike hypersurfaces with prescribed curvature in Minkowski space

We present some new results concerning existence and uniqueness of entire spacelike hypersurfaces with prescribed scalar and prescribed Gauss curvature in Minkowski space. The constructions rely on analyzing a fully nonlinear elliptic partial differential equation on $\mathbb{R}^n$.

CHARLES BOYER, University of New Mexico, Albuquerque, NM 87131, USA

On Toric Sasakian Geometry

A toric Sasakian structure is a toric contact structure with a compatible Sasakian metric whose isometry group contains the torus of the toric contact stucture. We lay the foundations for the study of toric Sasakian geometry by studying the Sasaki cone lying in the Lie algebra of the torus together with its underlying CR structure. In particular, we discuss the existence of both regular and irregular toric Sasakian structures in dimension 5 as well as its relation to the Sasaki–Einstein case.

ALBERT CHAU, University of Waterloo, Pure Math Dept.

On the uniformization of complete non-negatively curved Kahler manifolds

First introducted in 1982 by Richard Hamilton, the Ricci flow is among the most important differential equations in geometry. It has provided the solution to many fundamental problems in topology, geometry and geometric analysis. In recent joint work with Prof. L. F. Tam, we study the Ricci flow on non-compact non-negatively curved Kahler manifolds and apply this to Yau's uniformization conjecture. In the talk I will discuss recent results arising from this study.

JINGYI CHEN, The University of British Columbia

Minimal surfaces with isotropic link

Let Σ be an immerse closed minimal surface in S^5 which is isotropic. We show that: if the genus of Σ is 0 then it is Legendrian and totally geodesic, and if the genus g is larger than 0 then either Σ is Legendrian or it has exactly $2g-2$ Legendrian points.

KENNETH CHU, University of Texas at Austin

On the geometry of the moduli space of real binary octics

The moduli space of smooth real binary octics has five connected components, respectively parametrizing the real binary octics with $0, 1, \ldots, 4$ complex-conjugate pairs of roots. In this talk, we describe a hyperbolic structure on the GIT-stable completion of each component as an arithmetic quotient of real hyperbolic 5-space, following earlier work of Allcock–Carlson–Toledo on real cubic surfaces. We will also explain how to see that the Allcock–Carlson–Toledo construction of the moduli space of stable real binary octics fails to be a hyperbolic orbifold.

RAFAEL HERRERA, CIMAT, Centro de Investigación en Matemáticas, Calle Jalisco s/n, Mineral de Valenciana, Guanajuato, GTO, CP 36240, México
Parallel Quaternionic Spinors and Riamnnian holonomy

Spin manifolds are distinguished among oriented smooth manifolds by admitting a principal bundle double-covering their orthonormal-frame bundle, which gives rise to new vector bundles whose sections are called spinors. The condition can be relaxed to allow complex-spin structures (well-known due to Seiberg–Witten theory) and, more generally, quaternionic-spin structures. I will describe the geometric consequences of the existence of a parallel spinor on quaternionic-spin manifolds from the holonomy view-point, and how this generalizes the spin and complex-spin cases.

NIKY KAMRAN, McGill University
Analytic Lie pseudogroups of infinite type

We will first review Elie Cartan's construction of the generalized Maurer–Cartan equations for Lie pseudogroups of infinite type. We will then show how to construct charts for isotropy subgroups in terms of convergent infinite products of exponentials of vector fields chosen in a suitable bounded filtered basis. The existence of such a basis follows from an estimate of Malgrange, which is central to his proof of the Cartan–Kaehler Theorem.

JESÚS MUCIÑO, Instituto de Matemáticas UNAM, Unidad Morelia
Moduli spaces of singular flat metrics from meromorphic one forms

Meromorphic one forms on Riemann surfaces give origin to singular flat Riemannian metrics. We consider the associated moduli spaces. Applications to the Jacobian conjecture are given.

JIMMY PETEAN, CIMAT, Guanajuato, México
On the Yamabe invariant of products

The Yamabe invariant of a closed manifold appears naturally when studying the Hilbert–Einstein functional, the integral of the scalar curvature over the manifold. Computations of the invariant are difficult, in particular when it is positive (and there is no unicity of constant scalar curvature metrics on a conformal class). In this talk I will survey what is known about the computations and discuss some new results (joint work with K. Akutagawa and L. Floti) concerned with the Yamabe constants of Riemannian products.

RAUL QUIROGA, Cimat–Cinvestav
Superrigidity, semisimple Lie groups and pseudoRiemannian geometry

Consider a smooth action of a simple noncompact Lie group G on a compact manifold M preserving some sort of geometric structure. The work led by Zimmer, among others, has shown that such actions are extremely rigid in the sense that there are strong restrictions on the manifold M. A conjecture of Zimmer states that, in the presence of a finite G-invariant ergodic measure, such manifold M is essentially of the form $M = K\backslash H/\Gamma$, where H is a Lie group containing G as a subgroup, Γ is a lattice in H and K is a compact subgroup of H that centralizes G. In this talk we will discuss some advances in proving such conjecture in the case where M is a pseudoRiemannian manifold and G acts preserving the pseudoRiemannian metric of M.

ADOLFO SANCHEZ, CIMAT
Looking for a natural notion of superspace

It will be shown, in a self-contained and rather elementary fashion, how to classify all the Lie superalgebras that are associated naturally (*i.e.,* via the adjoint representation) to a given real or complex 3-dimensional Lie algebra. The same classification problem over the 4-dimensional real Lie algebra of the unitary group U_2 will also be approached, and its connection with Minkowski spacetime will be discussed.

FEDERICO SANCHEZ, Universidad Autónoma de México
Geometrical extrinsic dynamics of Riemannian submanifolds

An n-dimensional submanifold M of a Riemannian m-dimensional manifold Q, $n < m$ endowed with the second fundamental form has associated a set of foliations with singularities depending on its normal fields. These foliations, defined by quadratic differentials on M, are closely related to the extrinsic geometry of the submanifold. We analyze some properties of them in this context: The index of certain types of its isolated singularities and the possibility to reduce the codimension of the submanifold keeping an optimal class of these foliations.