GT01

Differential Geometry and Submanifold Theory

Geometría Diferencial y Teoría de Subvariedades

Organizers **Organizadores** **Antolatzaileak**

Andrea Del Prete
(Università Degli studi di Pavia)

Lilia Mehidi
(Instituto de Matemáticas de Granada)

José Santiago Santiago Villanueva
(Universidad de Jaén)

Description **Descripción** **Deskribapena**

This is a session specialized in differential geometry and submanifold theory. The main idea is to address topics of this nature from different points of view. Within this scope, there will be talks covering perspectives from algebraic approaches, through common issues in Riemannian and semi-Riemannian geometry, to a somewhat more analytical focus.
It is hoped that this will serve as a meeting and discussion point among colleagues in the same field, but who may have different approaches to similar situations.

Esta es una sesión especializada en geometría diferencial y teoría de subvariedades. La idea principal es tratar temas de esta índole desde diferentes puntos de vista. Dentro de este ámbito, se darán charlas que abarquen desde una perspectiva más algebraica, pasando por cuestiones habituales de geometría riemanniana y semi-riemanniana, hasta un enfoque algo más analítico.
Se espera que esto sirva como punto de encuentro y de discusión entre compañeros de la misma área, pero que pueden tener un enfoque distinto de situaciones similares.

MSC Codes **Códigos MSC** **MSC Kodeak**

53-XX
(primary)

Slots **Bloques** **Blokeak**

1.B (Aula 0.19); 1.C (Aula 0.19); 2.A (Aula 0.19)

QR Code **Código QR** **QR Kodea**

Session Schedule **Horario de la Sesión** **Saioaren Ordutegia**

M14 | 15:30-15:50 | 0.19
Cohomogeneity one actions in products
Tomás Otero Casal (Universität Münster)

M14 | 16:00-16:20 | 0.19
Completeness of Unchanged Direction Trajectories in Galilean Spacetimes
Jose Torrente Teruel (Universidad de Córdoba)

M14 | 16:30-16:50 | 0.19
What do large finite group actions tell us about the structure of a manifold?
Jordi Daura Serrano (Universitat de Barcelona)

M14 | 17:30-17:50 | 0.19
Minimal complex Lagrangian in the bi-complex hyperbolic space
Nicholas Rungi (Grenoble University)

M14 | 18:00-18:20 | 0.19
Rigidity of Einstein manifolds with positive Yamabe invariant
Letizia Branca (Milano University)

M14 | 18:30-18:50 | 0.19
Some canonical metrics via Aubin's local deformations
Davide Dameno (Milano University)

J16 | 11:00-11:20 | 0.19
Codimension two spacelike submanifolds in Lorentzian manifolds and conformal structures.
Rodrigo Morón (University of León)

J16 | 11:30-11:50 | 0.19
Towards a 'complete description' of compact Brinkmann manifolds
Lilia Mehidi (IMAG)

J16 | 12:00-12:20 | 0.19
Foliated geometric structures, symmetric spaces and completeness
Malek Hanounah (Greifswald University)

Tuesday 14
15:30-15:50
[Room 0.19]

Martes 14
15:30-15:50
[Aula 0.19]

Asteartea 14
15:30-15:50
[Gela 0.19]

Cohomogeneity one actions in products

Tomás Otero Casal
(Universität Münster)

The classification of cohomogeneity one actions on Euclidean and hyperbolic spaces follows from classical work of Segre, Levi-Civita and Cartan. However, obtaining similar results for manifolds has proven to be a difficult problem. In this talk, we study cohomogeneity one actions on products of Riemannian manifolds. We are able to classify homogeneous codimension one foliations on simply connected symmetric spaces.

Joint work with Hiroshi Tamaru.

Tuesday 14
16:00-16:20
[Room 0.19]

Martes 14
16:00-16:20
[Aula 0.19]

Asteartea 14
16:00-16:20
[Gela 0.19]

Completeness of Unchanged Direction Trajectories in Galilean Spacetimes

Jose Torrente Teruel
(Universidad de Córdoba)

The notion of Unchanged Direction (UD) motion in non-relativistic Galilean spacetimes is introduced, providing a mathematical framework for the notion "proper acceleration does not change its direction". The initial value problem for prescribed acceleration is analyzed and UD trajectories are shown to be the projection of integral curves in some fibre bundle. Under physical hypotheses, we prove a completeness result of inextensible UD motions, meaning that UD observers live forever.

Joint work with Rafael M. Rubio and Daniel de la Fuente.

Tuesday 14	**Martes 14**	**Asteartea 14**
16:30-16:50	**16:30-16:50**	**16:30-16:50**
[Room 0.19]	**[Aula 0.19]**	**[Gela 0.19]**

What do large finite group actions tell us about the structure of a manifold?

Jordi Daura Serrano
(Universitat de Barcelona)

The theory of finite transformation groups studies topologic and geometric properties of manifolds by means of finite group actions. In this talk we will explain a how we can use finite group actions to study rigidity questions on aspherical manifolds. We will introduce a new invariant, called the discrete degree of symmetry of a manifold, and we will show how this invariant can be helpful for the study of nilmanifolds and manifolds admitting a non-zero degree map to them.

arXiv:2407.13602

Tuesday 14	**Martes 14**	**Asteartea 14**
17:30-17:50	**17:30-17:50**	**17:30-17:50**
[Room 0.19]	**[Aula 0.19]**	**[Gela 0.19]**

Minimal complex Lagrangian in the bi-complex hyperbolic space

Nicholas Rungi
(Grenoble University)

Given a closed oriented surface S of genus $g > 1$, we introduce a class of smooth immersions which are equivariant with respect to a surface group representation into $\mathrm{SL}_3(\mathbb{C})$. These immersions simultaneously generalize hyperbolic affine spheres which are equivariant with respect to the real split form $\mathrm{SL}_3(\mathbb{R})$ and minimal Lagrangians in complex hyperbolic space which are equivariant with respect to the real Hermitian form $\mathrm{SU}(2,1)$. Such immersions permit finding a parameterization of an open subset in $\mathrm{SL}_3(\mathbb{C})$.

Tuesday 14	**Martes 14**	**Asteartea 14**
18:00-18:20	**18:00-18:20**	**18:00-18:20**
[Room 0.19]	**[Aula 0.19]**	**[Gela 0.19]**

Rigidity of Einstein manifolds with positive Yamabe invariant

Letizia Branca
(Milano University)

In this talk I will present some optimal pinching results on closed Einstein manifolds with positive Yamabe invariant in any dimension, extending the optimal bound for the scalar curvature due to Gursky and LeBrun in dimension four. I will also present an improvement the known bounds of the Yamabe invariant via the $L^{n/2}$-norm of the Weyl tensor for low-dimensional Einstein manifolds. Finally, we discuss some advances on an algebraic inequality involving the Weyl tensor for dimensions 5 and 6.

Giovanni Catino, Davide Dameno and Paolo Mastrolia.

Tuesday 14	**Martes 14**	**Asteartea 14**
18:30-18:50	**18:30-18:50**	**18:30-18:50**
[Room 0.19]	**[Aula 0.19]**	**[Gela 0.19]**

Some canonical metrics via Aubin's local deformations

Davide Dameno
(Milano University)

In this talk, we will present some recent results concerning the existence of some canonical Riemannian metrics on closed manifolds: in particular, applying a local deformation method due to Aubin, we show that there exist infinitely many metrics with nowhere vanishing Bach tensor on a closed Riemannian four-manifold. We also show the lack of topological obstructions for the existence of "weak half harmonic Weyl" metrics and discuss some advances concerning the Bach tensor

Giovanni Catino and Paolo Mastrolia.

Thursday 16	**Jueves 16**	**Osteguna 16**
11:00-11:20	**11:00-11:20**	**11:00-11:20**
[Room 0.19]	**[Aula 0.19]**	**[Gela 0.19]**

Codimension two spacelike submanifolds in Lorentzian manifolds and conformal structures.

Rodrigo Morón
(University of León)

Starting from a Riemannian conformal structure on a manifold M, a method is introduced to construct a family of Lorentzian manifolds. This construction involves choosing a metric from the conformal class and a smooth 1-parameter family of self-adjoint tensor fields. Each metric in the conformal class corresponds to the induced metric on M, viewed as a codimension two spacelike submanifold. A lightlike normal vector provides a Möbius structure on the Riemannian conformal structure and viceversa.

Thursday 16	**Jueves 16**	**Osteguna 16**
11:30-11:50	**11:30-11:50**	**11:30-11:50**
[Room 0.19]	**[Aula 0.19]**	**[Gela 0.19]**

Towards a 'complete description' of compact Brinkmann manifolds

Lilia Mehidi
(IMAG)

Transversally Riemannian 1-dimensional foliations generalize those defined by an isometric flow of a Riemannian metric. A natural question is whether such a foliation arises from an isometric flow on M. Carrière showed the answer can be negative. In positive cases, the flow is called equicontinuous. In the context of Brinkmann manifolds (admitting a parallel lightlike vector field V, we investigate if there exists a Riemannian metric on M for which the flow of V is isometric in the compact case.

Joint work with A. Zeghib.

Thursday 16	**Jueves 16**	**Osteguna 16**
12:00-12:20	**12:00-12:20**	**12:00-12:20**
[Room 0.19]	**[Aula 0.19]**	**[Gela 0.19]**

Foliated geometric structures, symmetric spaces and completeness

Malek Hanounah
(Greifswald University)

In the first part, we will explore the notion of tangential (G, X)-foliations, a natural generalization of (G, X)-structures. A general question in this context is how the topology of the manifold M affects the geometry of the leaves. We begin with a structure arising in a class of Lorentzian manifolds called pp-wave spacetimes. We show the completeness of the leaves under the assumption that M is compact and discuss pseudo-Riemannian variants that naturally arise.

Joint work with Lilia Mehidi.