GT04

Geometric Analysis

Análisis Geométrico

Organizers **Organizadores** **Antolatzaileak**

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Description **Descripción** **Deskribapena**

In this session, we will cover several topics related to geometric analysis, such as fluid dynamics, minimal surfaces, spectral analysis or problems related to the physical theory of General Relativity (models, solutions to the Einstein equation, etc).
The aim of this session is to allow PhD students in geometric analysis to present their research and to establish a meeting point among them.

En esta sesión trataremos diversos temas relacionados con el análisis geométrico, que cubrirán áreas como teoría de fluidos, superficies mínimas, análisis espectral o problemas relacionados con la teoría de la relatividad general (modelos de la teoría, soluciones de la ecuación de Einstein, etc).
Esta sesión tiene como objetivo permitir a los y las doctorandos en análisis geométrico dar a conocer los resultados obtenidos durante su tesis así como establecer un punto de encuentro entre ellos.

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

53C21
(primary)

58J05
(secondary)

Slots **Bloques** **Blokeak**

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

QR Code **Código QR** **QR Kodea**

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

L13 | 17:30-17:50 | 0.19
The Vlasov equation in de Sitter spacetime
Mónica Tapia del Moral (University of Cambridge)

L13 | 18:00-18:20 | 0.19
Schur theorem in Finsler geometry
Fidel F. Villaseñor (Universidad de Granada)

L13 | 18:30-18:50 | 0.19
The Mittag-Leffler theorem for proper minimal surfaces and directed meromorphic curves
Tja a Vrhovnik (Universidad de Granada)

L13 | 19:00-19:20 | 0.19
Bryant surfaces
Jorge Hidalgo Calderón (Universidad de Granada)

L17 | 9:00-9:20 | 0.19
The geometry of fluid flows in the low regularity regime
Javier Peñafiel Tomás (Instituto de Ciencias Matemáticas)

L17 | 9:30-9:50 | 0.19
Beyond Dvoretzky's Theorem
Victoria Pelayo (Universidad Autónoma de Madrid)

L17 | 10:00-10:20 | 0.19
Mean exit time function comparison criteria in Riemannian manifolds
Erik Sarrión Pedralva (Universidad Rey Juan Carlos)

L17 | 10:30-10:50 | 0.19
Spectrum, eigenfunctions and Geometry
Santiago Verdasco Ramos (Universidad Politécnica de Madrid)

Monday 13
17:30-17:50
[Room 0.19]

Lunes 13
17:30-17:50
[Aula 0.19]

Astelehena 13
17:30-17:50
[Gela 0.19]

The Vlasov equation in de Sitter spacetime

Mónica Tapia del Moral
(University of Cambridge)

A simple way of modelling matter in a spacetime is by a nonnegative function defined on the (co)tangent bundle of the spacetime manifold that has to be constant along the particle trajectories, i.e. geodesics. This condition translates into the function having to satisfy the so-called Vlasov equation, widely studied in Mathematics and Physics. In this talk, we briefly recall the geometry underlying the Vlasov equation and discuss some of its features when studied in a particular spacetime model.

Monday 13
18:00-18:20
[Room 0.19]

Lunes 13
18:00-18:20
[Aula 0.19]

Astelehena 13
18:00-18:20
[Gela 0.19]

Schur theorem in Finsler geometry

Fidel F. Villaseñor
(Universidad de Granada)

In Finsler geometry, a key challenge is extending the Schur theorem from Riemannian geometry or finding counterexamples. While the flag curvature version extends easily to Finsler geometry, the Ricci curvature version has few known results, often relying on specific Finsler classes of metrics. This talk presents a new approach that extends the Ricci-Schur theorem to "weakly Landsberg"Finsler metrics, which includes all Riemannian ones. The proof uses Noether's theorem, inspired by physics.

arXiv:2304.08933

Monday 13 | **Lunes 13** | **Astelehena 13**
18:30-18:50 | **18:30-18:50** | **18:30-18:50**
[Room 0.19] | **[Aula 0.19]** | **[Gela 0.19]**

The Mittag-Leffler theorem for proper minimal surfaces and directed meromorphic curves

Tja a Vrhovnik
(Universidad de Granada)

This talk studies meromorphic A-immersions from an open Riemann surface M into $\mathbb{C}^n$ (with $n \geq 3$) and relates it to the Mittag-Leffler theorem (1884), that addresses meromorphic functions in $\mathbb{C}$. In 2022, A. Alarcón and F. J. López proved an analogue for complete minimal surfaces in $\mathbb{R}^n$. In this talk we introduce a generalization of their result, showing a Mittag-Leffler-type theorem for proper directed immersions into $\mathbb{C}^n$ and some applications to the theory of minimal surfaces.

Joint work with Antonio Alarcón.

Monday 13 | **Lunes 13** | **Astelehena 13**
19:00-19:20 | **19:00-19:20** | **19:00-19:20**
[Room 0.19] | **[Aula 0.19]** | **[Gela 0.19]**

Bryant surfaces

Jorge Hidalgo Calderón
(Universidad de Granada)

Constant mean curvature one surfaces in hyperbolic space are also known as Bryant surfaces, as he introduced in 1987 a holomorphic representation of these. This fact motivated its study from a complex analytic viewpoint, and, in 2015, A.Alarcón and F.Forstneri posed the following problem: ¿is every open Riemann surface conformally equivalent to a properly immersed Bryant surface? In this talk, I will discuss recent progress in answering this question.

Friday 17 **Viernes 17** **Ostirala 17**
9:00-9:20 **9:00-9:20** **9:00-9:20**
[Room 0.19] **[Aula 0.19]** **[Gela 0.19]**

The geometry of fluid flows in the low regularity regime

Javier Peñafiel Tomás
(Instituto de Ciencias Matemáticas)

In this talk we will discuss new ideas on convex integration methods for the 3d Euler equations, and present some applications of a strongly geometric nature.

Joint work with Alberto Enciso, and Daniel Peralta-Salas.

Friday 17 **Viernes 17** **Ostirala 17**
9:30-9:50 **9:30-9:50** **9:30-9:50**
[Room 0.19] **[Aula 0.19]** **[Gela 0.19]**

Beyond Dvoretzky's Theorem

Victoria Pelayo
(Universidad Autónoma de Madrid)

Dvoretzky's theorem essentially states that in normed spaces of high dimension, there exist subspaces that are nearly Euclidean. A geometric interpretation of this fact is that every high-dimensional symmetric convex body has a section of dimension of order $\log(n)$ that is almost a Euclidean ball. This can be understood in terms of a radial function defined on the Euclidean sphere. Our goal will be to explain this interpretation and generalize it to other spaces, like complex projective space.

Friday 17	**Viernes 17**	**Ostirala 17**
10:00-10:20	**10:00-10:20**	**10:00-10:20**
[Room 0.19]	**[Aula 0.19]**	**[Gela 0.19]**

Mean exit time function comparison criteria in Riemannian manifolds

Erik Sarrión Pedralva
(Universidad Rey Juan Carlos)

We will show some explicit upper and lower bounds for the Poisson hierarchy, the averaged moment spectra, and the torsional rigidity of a geodesic ball in a Riemannian manifold which satisfies some conditions for the mean curvatures of its geodesic spheres. As a consequence, we will see a first Dirichlet eigenvalue comparison theorem and show that equality between the first eigenvalues characterizes the moment spectrum and vice-versa.

Joint work with Vicente Palmer.

arXiv:2110.03330

Friday 17	**Viernes 17**	**Ostirala 17**
10:30-10:50	**10:30-10:50**	**10:30-10:50**
[Room 0.19]	**[Aula 0.19]**	**[Gela 0.19]**

Spectrum, eigenfunctions and Geometry

Santiago Verdasco Ramos
(Universidad Politécnica de Madrid)

For any finite-dimensional Riemannian manifold, through very simple manipulations, one can show that the Laplace-Beltrami operator determines uniquely the Riemannian metric. The goal of this talk is to introduce some results that explain the link between the geometry of a Riemannian manifold and of the spectrum of its Laplace-Beltrami operator.