

Extended Abstracts

GEOMVAP

Editors

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Foreword

The Geometry of Varieties and Applications Group (GEOMVAP) is a group of researchers with interests in a wide range of fields, which include algebraic, differential and symplectic geometries, algebraic topology, commutative algebra and their applications. The group is composed of researchers rooted or formed at the Universitat Politècnica de Catalunya (UPC).

The main objective of GEOMVAP is to deep dive in the study of geometric structures and their applications. The geometric structures that are considered are algebraic varieties, symplectic and differentiable manifolds and the application are mainly focused in the fields of Phylogenetics, Robotics, Mathematical Physics, Control Theory, Dynamical Systems and Celestial Mechanics. In order to achieve that end a broad range of tools are used (geometric, algebraic, topological, arithmetic, differential and computational) and in many cases techniques from different fields are combined.

The members of the group work in interdisciplinary teams and transversal research topics. GEOMVAP promotes, in particular, Responsible, Research and Innovation within the framework of Horizon 2020. Among the RRI initiatives it strives for gender equality, public engagement, science communication and the visibility of women in Science and Society.

The extended abstracts in this volume stem from the contributions in two events organized by GEOMVAP during the year 2019.

On January 23rd and 24th of 2019, the GEOMVAP group organized an offside meeting on the *Parador de Cardona*, a large ninth century castle perched

on a steep hill overlooking the town and salt mine of Cardona. The goal of that meeting was to share the different objectives, strategies and advances of the different research topics of GEOMVAP. The event consisted of 22 talks from different members of the group: PhD students, postdoctoral members and professors.

A list of the contributed talks is included below.

List of talks

- Maria Alberich Carramiñana. *Action of Cremona maps on planar polynomial differential systems.*
- Patricio Almirón Cuadros. *On the Tjurina number of plane curve singularities.*
- Josep Àlvarez Montaner. *D-modules over direct summands.*
- Miguel Angel Barja. *Clasificación de variedades irregulares y el Teorema Fundamental del Cálculo.*
- Guillem Blanco. *Bernstein-Sato polynomials of plane curves.*
- Roisin Braddell. *Group symmetries of cosymplectic and b-symplectic manifolds.*
- Joaquim Brugués. *La construcció de l'homologia de Floer.*
- Robert Cardona. *Estructures geomètriques en hidrodinàmica.*
- Franco Coltraro. *Mechanics of inextensible surfaces.*
- Josep Elgueta. *Representacions categòriques.*
- Marina Garrote López. *Semi-algebraic conditions for phylogenetic varieties.*
- Xavier Gràcia. *Hamilton-Jacobi theory and geometric mechanics.*
- Juan Margalef. *De la mecànica clàssica a la mecànica quàntica.*
- Anastasiia Matveeva. *Group valued moment maps and equivariant cohomologies.*
- Eva Miranda. *From Celestial Mechanics to Fluid Dynamics: contact structures with singularities, part I.*
- Miguel C. Muñoz Lecanda. *Sobre distribucions no integrables.*
- Cédric Oms. *From Celestial Mechanics to Fluid Dynamics: contact structures with singularities, part II.*

- Alessandro Oneto. *Looking for equations of mixtures of phylogenetic models.*
- Arnau Planas. *A b^m -symplectic KAM theorem.*
- Xavier Rivas Guijarro. *Singular Lagrangian field theories and k -cosymplectic geometry.*
- Jordi Roca-Lacostena. *On the embedding problem for evolutionary Markov matrices.*
- Narciso Román Roy. *Multisymplectic formulation of Lagrangian models in gravitation (GR).*

The workshop *Women in Geometry and Topology* was an endeavour organized by the GEOMVAP research group and financed under the AGAUR project 2017SGR932. It took place at the *Centre de Recerca Matemàtica*, Barcelona, from September 25th to 27th, 2019.

The Workshop Women in Geometry and Topology featured nine plenary talks by top female mathematicians and several contributed talks and poster presentations by speakers of any gender identity. Two of the plenary lectures were addressed to the general public, not only for mathematicians but for anyone with curiosity. A panel open to the public was also organized in order to discuss the situation of women in mathematics, the gender gap and strategies to break the glass-ceiling inside and outside academia.

Below there is a list of plenary, contributed talks and poster presentations.

List of Plenary Talks

- Başak Gürel (University of Central Florida) *From Hamiltonian systems with infinitely many periodic orbits to pseudo-rotations via symplectic topology.*
- Kathryn Hess (École Polytechnique Fédérale de Lausanne, EPFL SV BMI UPHESS) *What does topology have to do with neuroscience?*
- Ann Lemahieu (Laboratoire de Mathématiques J.A. Dieudonné) *On the monodromy conjecture for nondegenerate hypersurface singularities.*
- Marta Macho-Stadler (Universidad del País Vasco-Euskal Herriko Unibertsitatea) *Sesgos de género en la Academia: cuando las matemáticas no funcionan.*
- Catherine Meusburger (FAU Erlangen-Nürnberg) *Ideal tetrahedra and their duals.*
- Emmy Murphy (Northwestern University) *The Koras-Russel cubic and Weinstein flexibility.*

- Rita Pardini (Università di Pisa) *Deformations of semi-smooth varieties.*
- M. Eugenia Rosado María (Universidad Politécnica de Madrid) *Second-order Lagrangians admitting a first-order Hamiltonian formalism.*
- Lidia Stoppino (Università degli Studi di Pavia) *Clifford-Severi inequalities for varieties of maximal Albanese dimension.*
- Ulrike Tillman (University of Oxford) *Geometric groups via homotopy theory.*
- Carme Torras (Institut de Robòtica i Informàtica Industrial (CSIC-UPC)) *Cloth manipulation in assistive robotics: Research challenges, ethics and fiction.*

List of Contributed Talks

- Daria Alekseeva (National Research University Higher School of Economics) *Presentations of symplectic mapping class group of rational 4-manifolds.*
- Patricio Almirón (Universidad Complutense de Madrid) *Milnor and Tjurina, a $4/3$ relation.*
- Guillem Blanco Fernandez (Universitat de Politècnica de Catalunya) *Yano's conjecture.*
- Melanie Bondorevsky (Universidad de Buenos Aires & IMAS-CONICET) *Topological degree and periodic orbits of semi-dynamical systems.*
- Robert Cardona (Universitat de Politècnica de Catalunya) *A contact topology approach to Euler flows universality.*
- Joana Cirici (Universitat de Barcelona) *Hodge theory of almost Kähler manifolds.*
- Franco Coltraro (Institut de Robòtica i Informàtica Industrial, CSIC-UPC) *Collisions and friction for inextensible cloth simulation.*
- Aina Ferrà Marcús (Universitat de Barcelona) *Localizations of models of theories with arities.*
- Marina Garrote-López (Universitat de Politècnica de Catalunya) *Distance to the stochastic part of phylogenetic varieties.*
- Jordi Gaset (Universitat de Politècnica de Catalunya) *A contact geometry approach to symmetries in systems with dissipation.*
- Debora Gil (Computer Vision Center and Computer Science Department at Universitat Autònoma de Barcelona) *Topological Radiomics (TOPiomics): Early Detection of Genetic Abnormalities in Cancer Treatment Evolution.*

- Matias V. Moya Giusti (Université Paris-Est) *Dimension formulas for the cohomology of arithmetic groups.*
- Cédric Oms (Universitat de Politècnica de Catalunya) *Do overtwisted contact manifolds admit infinitely many periodic Reeb orbits?*
- Sinem Onaran (Hacettepe University) *Legendrian knots in contact 3-manifolds.*
- Maryam Samavaki (University of Eastern Finland) *On several classes of Ricci tensor.*
- Julia Semikina (University of Bonn) *G-theory of group rings for finite groups.*
- Paola Supino (Roma Tre University) *On complete intersections containing a linear subspace.*
- M. Pilar Vélez (Universidad Antonio de Nebrija) *Automated proving and discovery in elementary Geometry by means of algebraic geometry.*

List of Poster Presentations

- Joaquim Brugués (Universitat de Politècnica de Catalunya) *Towards a Floer homology for singular symplectic manifolds.*
- Luciana Bonatto (University of Oxford) *Decoupling in Higher Dimensions.*
- Marta Mazzocco (Universitat de Birmingham) *Poisson Structures on Painlevé Monodromy Manifolds.*
- Pau Mir (Universitat de Politècnica de Catalunya) *Invariants in Semitoric Integrable Systems. Looking for a new interpretation.*
- Inasa Nakamura (Institute of Science and Engineering, Kanazawa University) *Branched covering surfaces in 4-space and simplifying numbers.*

We are very happy to attest that the atmosphere created by the participants of the workshop was very open and friendly, and we hope that it led to effective further collaborations.

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