Juan Viu-Sos

PhD in Mathematics
– Geometry, Topology and Singularities –

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Introduction

Current position: Associate Professor at *Universidad Politécnica de Madrid* (UPM), Spain.

Keywords: complex singularities, low-dimensional topology, hyperplane arrangements, motivic integration, zeta functions, logarithmic vector fields, effective periods, computational algebra (`Sagemath`).

Articles and preprints

Publications

- **Introduction to p-adic and motivic integration, zeta functions and invariants of singularities**, *In p-adic analysis, arithmetic and singularities, Contemporary Mathematics (778), p.103–176. Amer. Math. Soc. (2022)*.

- **On the equality of periods of Kontsevich-Zagier**, with J. Cresson, *Journal de théorie des nombres de Bordeaux, Volume 34 (2022) no. 2, pp. 323-343* .

- **Motivic zeta functions on $\mathbb{Q}$-Gorenstein varieties**, with E. León-Cardenal, J. Martín-Morales and W. Veys, *Advances in Mathematics 370 (2020)*.

- **Configurations of points and topology of real line arrangements**, with B. Guerville-Ballé, *Mathematische Annalen 374 (2019), no. 1-2, 1–35*.

- **Fundamental groups of real arrangements and torsion in the lower central series quotients**, with E. Artal-Bartolo and B. Guerville-Ballé, *Experimental Mathematics 29 (2020), no. 1, 28–35.* .

- **A semi-canonical reduction for periods of Kontsevich-Zagier**, *International Journal of Number Theory 17 (2021), no. 01, 147-174*.

- **On the minimal degree of logarithmic vector fields of line arrangements**, with B. Guerville-Ballé, *Proceedings of the XIII International Conference Zaragoza-Pau on Mathematics and its Applications*, Monografías Mathémáticas García de Galdeano, 40, 61-66, 2015.

Preprints

preprint - **Connectedness and combinatorial interplay in the moduli space of line arrangements**, `arXiv:2309.00322`, with B. Guerville-Ballé.

preprint - **Combinatorics of line arrangements and dynamics of polynomial vector fields**, `arXiv:1412.0137`, with B. Guerville-Ballé.

Packages developed for `Sagemath`

2012 - **Computing the Igusa and Topological zeta functions of a Newton non-degenerated polynomial**.

Ph.D Thesis

2012/2015 ○ **"Periods and line arrangements: contributions to the Kontsevich-Zagier periods conjecture and to the Terao conjecture."** , *Université de Pau et des Pays de l'Adour/Universidad de Zaragoza* , Pau/Zaragoza, France/Spain.

> Ph.D in Mathematics (*Number Theory, Algebraic Geometry and Vector Fields*) in LMAP (Équipe Algèbre et Géométrie). Supervised by Enrique Artal, Jacky Cresson and Vincent Florens. **Mention "Très honorable"/"Cum laude"**.

Jury and reviewers

- Pierre Cartier (IHES, Reviewer–President)
- David Mond (Univ. of Warwick)
- Jean Vallès (Univ. de Pau)
- Masahiko Yoshinaga (Hokkaido Univ., Reviewer)
- Michel Waldschmidt (Univ. Paris VI)
- Jacques-Arthur Weil (Univ. de Limoges)
- Michel Granger (Univ. d'Angers, Reviewer)

Previous career and education

Preceding position

2020/2024 ○ **Assistant Professor at *Universidad Politécnica de Madrid***, Spain.

2019/2020 ○ **Post-doctoral fellow at *IMPA* - *Instituto de Matemática Pura e Aplicada* supported by a CAPES/PNPD grant**, Rio de Janeiro, Brazil.

2017/2019 ○ **Post-doctoral fellow at *ICMC/Universidade de São Paulo* supported by a FAPESP grant**, São Carlos, Brazil.

2016/2017 ○ **ATER (Teaching assistant position) at *Institut Fourier /Université Grenoble Alpes***, France.

2015/2016 ○ **ATER at *Université de Pau et des Pays de l'Adour***, France.

2012/2015 ○ **Doctoral fellow in Pure Mathematics in co-tutorship**, *Université de Pau/Universidad de Zaragoza*, France/Spain.

Previous education

2011/2012 ○ **Master degree "Iniciación a la Investigación en Matemáticas"**, *Universidad de Zaragoza*, Bilbao-Zaragoza-Logroño, Spain.

> Master thesis supervised by Enrique Artal: "Funciones zeta y poliédro de Newton: aspectos teóricos y computacionales"

2010/2011 ○ **Master degree "Mathématiques, Modélisation et Simulation"**, *Université de Pau et des Pays de l'Adour*, France.

> Master Thesis supervised by Vincent Florens: "Nœuds, entrelacs et coloriages".

2005/2011 ○ **B.S. in Mathematics (Licenciado en Matemáticas)**, *Universidad de Zaragoza*, Zaragoza, Spain.

Research activities

Lectures in seminars and mini-courses

2020 ○ **Mini-course (4,5h) "An introduction to geometric motivic integration"**, *Thematic Program on Singularity Theory*, IMPA, Rio de Janeiro, Brazil.

2018 ○ **Mini-course (20h) "An introduction to p-adic and motivic integration, zeta functions and new stringy invariants of singularities"**, *Mini-cours pour doctorants*, ICMC-USP, São Carlos, Brazil.

2017 ○ **Mini-course (7h) "Line arrangements: combinatorics, geometry and topology"**, *Mini-cours pour doctorants*, ICMC-USP, São Carlos, Brazil.

Talks in national and international conferences

2024 ○ **A combinatorial approach to moduli spaces of line arrangements**, *18th International Workshop on Real and Complex Singularities*, Universidad de Valéncia, Spain.

- **A combinatorial approach to moduli spaces of line arrangements**, *XVIII EACA Conference 2024*, Universidad Complutense de Madrid, Spain.

2023
- **The geometric Kontsevich-Zagier conjecture**, *Workshop on "Periods"*, Universidade de Lisboa, Portugal.
- **Zeta functions, abelian orbifold resolutions of singularities and the geometry of curves in weighted projective planes**, *VI Congreso de Jóvenes Investigadores de la RSME (Sesión de singularidades)*, Universidad de León, Spain.

2022
- **Zeta functions, orbifold motivic measures and $\mathbb{Q}$-resolutions of singularities**, *Summer School on Motivic Integration*, Henrich Heine University, Düsseldorf, Germany.
- **On the geometry of curves in weighted projective planes and the Monodromy Conjecture for some surface singularities**, *17th International Workshop on Real and Complex Singularities*, Univ. São Paulo, São Carlos, Brazil.

2021
- **On zeta functions, weighted blow-ups and the Monodromy Conjecture for some surface singularities**, *Singularities in the Midwest (online edition)*, Univ. Wisconsin-Madison, USA.

2020
- **Generación de variantes aleatorias de exámenes**, *Workshop ENSEMAT 2020 "Usos y Avances en la Docencia de las Matemáticas en las Enseñanzas Universitarias"*, Universidad Politécnica de Madrid, Spain.
- **Sobre la conjetura de la monodromia para singularidades cuasihomogéneas de superficie**, *Seminario de Álgebra, Geometría y Topología*, Universidad Complutense de Madrid, Spain.
- **Embedded topology and combinatorics of line arrangements: some counter-examples using GeoGebra**, *14th Workshop of Young Researchers in Mathematics*, UCM-UAM-UC3M-IMI, Spain.

2019
- **Configurations of points and new Zariski pairs of line arrangements**, *Workshop on Topological and Analytical Methods in Singularity Theory*, CIMAT - Guanajuato, Mexico.
- **Classification of trihedral singularities $\mathbb{C}^3/G_{d,q}$ via arithmetic properties and motivic zeta functions**, *Workshop "Zeta functions, singularities and applications"*, CIMAT - Zacatecas, Mexico.
- **A new formula for the motivic and topological zeta functions from $\mathbb{Q}$-resolution of singularities**, *12th Mini Workshop on Singularities, Geometry and Differential Equations and 1st Meeting on Foliations and Singularities*, UFES, Vitoria, Brazil.

2018
- **Motivic zeta functions on $\mathbb{Q}$-Gorenstein varieties and $\mathbb{Q}$-resolution of singularities**, *Lipschitz Geometry of Singularities*, Oaxaca, Mexico.
- **Motivic zeta functions, orbifold motivic measures and Q-resolutions of singularities (Short Communication)**, *International Congress of Mathematicians 2018*, Rio de Janeiro, Brazil.
- **Motivic zeta functions, orbifold motivic measures and Q-resolutions of singularities**, *15th International Workshop on Real and Complex Singularities*, ICMC-USP, Brazil.

2017
- **Combinatorics and topology of line arrangements via configurations of points**, *XI Encontro Regional de Topologia*, USP-UNESP-UFSCar, Brazil.
- **A geometrical construction of Zariski pairs of real line arrangements**, *VIII Rencontre Pau-Zaragoza d'Algèbre et Géométrie*, Université de Pau, France.
- **A geometrical construction of Zariski pairs of real line arrangements**, *IV Congreso de Jóvenes Investigadores de la RSME (Sesión de singularidades)*, Universidad de Valencia, Spain.
- **Configurations of points and topology of real line arrangements**, *Congreso bienal de la Real Sociedad Matemática Española 2017*, Universidad de Zaragoza, Spain.

2016
- **A semi-canonical reduction for periods of Kontsevich-Zagier**, *Singularities and Topology*, Laboratoire J. A. Diudonné, Université de Nice, France.
- **A semi-canonical reduction for periods of Kontsevich-Zagier**, *Autour des Équations Différentielles*, Institut Fourier, Université de Grenoble Alpes, France.

2015
- **On the geometry of line arrangements and dynamics of polynomial vector fields**, *Geometry, topology and combinatorics of hyperplane arrangements and related problems*, Universidad de Zaragoza, Spain.

- **Una reducción semi-canónica para periodos de Kontsevich-Zagier**, *III Congreso de Jóvenes Investigadores de la RSME*, Universidad de Murcia, Spain.
- **On the geometry of line arrangements and polynomial vector fields**, *Functional Equations in LIMoges 2015*, XLIM, Université de Limoges, France.

2014
- **On periods of Kontsevich-Zagier**, *The 1st Workshop of JSPS-MAE Sakura Program "Geometry and Combinatorics of Hyperplane Arrangements and Related Problems"*, Hokkaido University, Japan.

Research scholarships

2015
- **Hokkaido University and Tokyo Gakugei University (3 semaines) invited by M. Yoshinaga and A. Yasuhara**, Japan.

2014
- **Hokkaido University (3 semaines) invited by M. Yoshinaga**, Japan.

2011
- **Laboratoire de Mathématiques et de leurs Applications (1 month) invited by V. Florens**, *Université de Pau et des Pays de l'Adour*, France.

Awards

2014
- **1st prize awareness poster "Periods of Kontsevich-Zagier: conjectures and reduction"**, *Journées de l'École Doctoral*, Université de Pau et des Pays de l'Adour.

2013
- **2nd prize awareness poster "Periods as volumes and the Kontsevich-Zagier conjecture"**, *II Congreso de Jóvenes Investigadores de la RSME*, Universidad de Sevilla, Spain.

Responsibility positions and others

2024
- **Organizer of the IberoSing International Workshop 2024: Low-dimensional Topology & Singularity Theory**, *URL:* `https://iberosing.github.io/IW24/`, Univ. Politécnica de Madrid, Madrid, Spain.

2023
- **Organizer of the IberoSing International Workshop 2023: Mirror symmetry & Hodge ideals**, *URL:* `https://iberosing.github.io/IW23/`, Univ. de Granada, Granada, Spain.

2022
- **Organizer of the IberoSing International Workshop 2022**, *URL:* `https://eventos.ucm.es/86046/detail/iberosing-international-workshop-2022.html`, Univ. Complutense de Madrid, Spain.

2020/···
- **Organizer of the international webimar "Iberoamerican Webminar of Young Researchers in Singularity Theory and related topics"**, *URL:* `iberosing.github.io`, Instituto de Matemática Interdisciplinar (IMI).

2013/2014
- **Organizer of the PhD math students seminar of LMAP**, Université de Pau et des Pays de l'Adour.

Teaching experience

Assistant Professor: Universidad Politécnica de Madrid (Spain)

2024/2025
- **Topología**, *Lectures and exercises*, S3 Grado en Matemáticas.
- **Informática**, *Lectures and lab works*, S1 Ingeniería Civil.

2023/2024
- **Topología**, *Lectures and exercises*, S3 Grado en Matemáticas.
- **Informática**, *Lectures and lab works*, S1 Ingeniería Civil.

2022/2023
- **Topología**, *Lectures and exercises*, S3 Grado en Matemáticas.
- **Informática**, *Lectures and lab works*, S1 Ingeniería Civil.

2021/2022
- **Informática**, *Lectures and lab works*, S1 Ingeniería Civil.
- **Cálculo I**, *Lectures and exercises*, S1 Ingeniería Naval.

2020/2021
- **Estadística y Optimización**, *Lectures and exercises*, S2 Ingeniería Civil.
- **Cálculo I**, *Lectures and exercises*, S1 Ingeniería Naval.

ATER: Université Grenoble Alpes (76,5h, France)

2016/2017
- **MATH101-Langage mathématique, algèbre et géométrie**, *Lectures and exercises*, L1 Math/Info.

ATER: Université de Pau (192h, France)

2015/2016
- **Initiation à la modélisation statistique**, *Lectures and exercises*, L1 MIASHS.
- **Statistiques Descriptives**, *Lectures, exercises and lab works*, L1 MIASHS-Math-SDT.
- **Fonctions et intégrales**, *Exercises*, L1 Mathématiques.
- **Équations différentielles I**, *Exercises*, L2 Mathématiques.

Teaching Assistant: Université de Pau (128h, France)

2014/2015
- **Arithmétique**, *Exercises*, L1 Mathématiques.
- **Algèbre Linéaire II**, *Exercises*, L1 MIASHS.
- **Équations différentielles I**, *Exercises*, L2 Mathématiques.

2013/2014
- **Arithmétique**, *Exercises*, L1 Mathématiques.
- **Algèbre Linéaire II**, *Exercises*, L1 MASS.
- **Topologie et Calcul Différentiel**, *Exercises*, L2 Mathématiques.

Attended scientific schools

2019
- **School "XX School of Mathematics Lluís Santaló 2019: p-Adic Analysis, Arithmetic and Singularities"**, *Universidad Internacional Menendez Pelayo*, Santander, Spain.

2018
- **Course "Post-quantum Cryptography"**, *BCAM&UPV/EHU*, Bilbao, Spain.
- **International school "Singularity Theory"**, *ICMC-USP*, São Carlos, Brazil.
- **International school "Singularities and Lipschitz Geometry"**, *Universidad Nacional Autónoma de México*, Cuernavaca, Mexico.

2017
- **Graduate school "Introduction To Geometric Analysis: The Atiyah-Singer Index Theorem"**, *BCAM-UPV/EHU*, Bilbao, Spain.

2016
- **School "III EACA International School on Computer Algebra and its Applications"**, *Universidad de Sevilla*, Sevilla, Spain.

2014
- **Clay Mathematics Institute Summer School 2014 "Periods and Motives: Feynman amplitudes in the 21st century"**, *Instituto de Ciencias Matemáticas*, Madrid, Spain.

2013
- **School "Multiple Zeta Values, Multiple Polylogarithms and Quantum Field Theory"**, *Instituto de Ciencias Matemáticas*, Madrid, Spain.
- **Graduate School "New aspects on Singularity Theory"**, *Instituto de Ciencias Matemáticas*, Madrid, Spain.

2012
- **Doc-Course "Singularities and Applications"**, *Universidad de Sevilla*, Sevilla, Spain.
- **Doc-Course "Cohomología de haces, dualidad de Verdier y cohomología de intersección"**, *Universidad Complutense de Madrid*, Madrid, Spain.

Skills

Languages

- **Spanish** – Native speaker.
- **French** – C2 Level (*Dalf C1, 2014*).
- **English** – C1 Level (*FCE, 2013*).
- **Portuguese** – B2 level.

Computer skills

- Sage, Maple, Mathematica.
- Fortran, Matlab, R.
- Python, C/C++, Java.
- LaTeX, TikZ/Pgf, Beamer.