Juan Viu-Sos

PhD in Mathematics
– Geometry, Topology and Singularities –

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Introduction

Post-doctoral researcher at *IMPA - Instituto de Matemática Pura e Aplicada*, Rio de Janeiro (Brazil), supported by a *CAPES/PNPD* grant.

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

Articles and preprints

Publications

- **Motivic zeta functions on $\mathbb{Q}$-Gorenstein varieties** ↗ , `arXiv:1911.03354`, with E. León-Cardenal, J. Martín-Morales and W. Veys, *accepted for publication in Advances in Mathematics*.

- **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.*.

- **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

- submitted **On the equality of periods of Kontsevich-Zagier** ↗ , `arXiv:1912.01751`, with J. Cresson.

- preprint **An introduction to p-adic and motivic integration, zeta functions and invariants of singularities** ↗ , Lecture notes (2018).

- submitted **A semi-canonical reduction for periods of Kontsevich-Zagier** ↗ , `arXiv:1509.01097`.

- submitted **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

Current position

2019/2021 o **Post-doc à l'IMPA (Instituto de Matemática Pura e Aplicada), financé par une bourse CAPES/PNPD**, Rio de Janeiro (Brésil).

Preceding position

2017/2019 o **Post-doctoral fellow atICMC/Universidade de São Paulo with a FAPESP grant** (São Carlos, Brazil).

2016/2017 o **ATER (Teaching and research assistant position) at Institut Fourier (Université Grenoble Alpes)** (France).

2015/2016 o **ATER at Université de Pau et des Pays de l'Adour** (France).

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

Previous education

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

> Master degree in Mathematical Research. Master's thesis in *Singularity Theory* and *Computacional Algebra* supervised by Enrique Artal: "Funciones Zeta y poliédro de Newton: Aspectos teóricos y computacionales".

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

> Double Diploma with the Universidad de Zaragoza. Master's Thesis in Knot Theory supervised by Vincent Florens: "Nœuds, entrelacs et coloriages".

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

Research activities

Lectures in seminars and mini-courses

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

2018 o **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 o **Mini-course (7h) "Line arrangements: combinatorics, geometry and topology"**, *Mini-cours pour doctorants*, ICMC-USP (São Carlos, Brazil).

Talks in national and international conferences

2019 o **Configurations of points and new Zariski pairs of line arrangements**, *Workshop on Topological and Analytical Methods in Singularity Theory*, CIMAT - Guanajuato (Mexico).

o **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).

o **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 o **Motivic zeta functions on $\mathbb{Q}$-Gorenstein varieties and $\mathbb{Q}$-resolution of singularities**, *Lipschitz Geometry of Singularities*, Oaxaca (Mexico).

o **Motivic zeta functions, orbifold motivic measures and Q-resolutions of singularities (Short Communication)**, *International Congress of Mathematicians 2018*, Rio de Janeiro (Brazil).

o **Motivic zeta functions, orbifold motivic measures and Q-resolutions of singularities**, *15th International Workshop on Real and Complex Singularities*, ICMC-USP (Brazil).

2017 o **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*, 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).

Talks in seminars

2018 ○ **Motivic zeta functions, orbifold motivic measures and Q-resolutions of singularities**, *Singularity Theory Seminar*, ICMC-USP (São Carlos, Brazil).

2017 ○ **Configurations of points and topology of real line arrangements**, *Singularity Theory Seminar*, ICMC-USP (São Carlos, Brazil).

- **Configurations of points and topology of real line arrangements**, *Seminário de Topologia*, Universidade Federal de São Carlos (Brazil).

- **Arreglos de puntos y topologia de configuraciones de rectas reales**, *Seminario de Geometría Algebraica*, Universidad Complutense de Madrid (Spain).

- **Configurations de points et topologie des arrangements de droites réelles**, *Séminaire Géométrie des systèmes Dynamiques*, Institut de Mathématiques de Bourgogne, Université de Bourgogne (France).

- **Configurations de points et topologie des arrangements de droites réelles**, *Séminaire Géométrie des espaces singuliers*, Laboratoire Paul Painlevé, Université de Lille 1 (France).

- **Une approche en géométrie réelle pour périodes de Kontsevich-Zagier**, *Séminaire Théorie des Nombres*, Institut de Mathématiques de Bordeaux, Université de Bordeaux (France).

- **Configurations de points et topologie des arrangements de droites réelles**, *Séminaire Géométrie*, Institut de Mathématiques de Bordeaux, Université de Bordeaux (France).

- **Configurations de points et topologie des arrangements de droites réelles**, *Séminaire du LMAP*, Université de Pau et des Pays de l'Adour (France).

2016 ○ **Arreglos de puntos y topología de configuraciones de rectas reales**, *Seminario de Geometría y Topología*, Universidad de Zaragoza (Spain).

- **Configurations de points et topologie des arrangements de droites réelles**, *Séminaire de Algèbre et Géométrie*, Institut Fourier, Université de Grenoble Alpes (France).

- **Configurations de points et topologie des arrangements de droites réelles**, *Séminaire de Géométrie et Topologie*, Institut Fourier, Université de Grenoble Alpes (France).

- **Configurations de points et topologie des arrangements de droites réelles**, *Séminaire de Géométrie, Groupes et Dynamiques*, École Normale Supérieure de Lyon (France).

- **Some contributions on periods of Kontsevich-Zagier and on logarithmic vector fields of line arrangements**, *Seminario de Geometría y Topología*, Universidad de Zaragoza (Spain).

2015	A semi-canonical reduction for periods of Kontsevich-Zagier, *Seminar of Department of Mathematics*, Tokyo Gakugei University (Japan).
	Some contributions on periods of Kontsevich-Zagier and on logarithmic vector fields of line arrangements, *Seminar of Department of Mathematics*, Hokkaido University (Japan).
	Géométrie des arrangements de droites, dynamique des champs de vecteurs polynomiaux et conjecture de Terao, *Séminaire Topologie*, Institut Fourier, Université de Grenoble I (France).
	Géométrie des arrangements de droites, dynamique des champs de vecteurs polynomiaux et conjecture de Terao, *Séminaire Analyse*, Institut de recherche mathématique avancée, Université de Strasbourg (France).
2014	Combinatoria de configuraciones de rectas y campos vectoriales polinómicos, *Seminario de Geometría y Topología*, Universidad de Zaragoza (Spain).
	Forma semi-canónica para periodos de Kontsevich-Zagier, *Seminario de Geometría y Topología*, Universidad de Zaragoza (Spain).
2013	On generalized colorings of knots and the Alexander polynomial, *Séminaire de doctorants du LMAP*, Université de Pau et des Pays de l'Adour.
	Introduction aux périodes, *Séminaire de Géométrie*, Université de Pau et des Pays de l'Adour.
2012	Fonctions zêta d'une singularité, *Séminaire de Géométrie*, Université de Pau et des Pays de l'Adour.

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).

Posters

2018	Combinatorics and topology of line arrangements via configuration of points, *International school on Singularities and Lipschitz Geometry*, Universidad Nacional Autónoma de México (Cuernavaca, Mexico).
2014	Algebraic Hilbert's 16th problem and line arrangements, *The 2nd Franco-Japanese-Vietnamese Symposium on Singularities of the CNRS-JSPS-VAST*, Hokkaido University (Japan).
	Periods of Kontsevich-Zagier: conjectures and reduction, *Journées de l'École Doctoral*, Université de Pau et des Pays de l'Adour (France).
2013	Periods as volumes and the Kontsevich-Zagier conjecture, *II Congreso de Jóvenes Investigadores de la RSME*, Universidad de Sevilla (Spain).

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).

Dissemination activities

2014	Mini-course "Présentation du package TikZ", with B. Guerville-Ballé, *Laboratoire de Mathématiques et de leurs Applications*, Université de Pau et des Pays de l'Adour (France).
2012	Mini-course (3h) "Introduction à la Théorie de Nœuds", *Seminar for Master degree students*, Université de Pau et des Pays de l'Adour (France).
2011	Monitor-guide of the RSME-Imaginary's Exhibition (35h), *Real Sociedad Matemática Española - Instituto Universitario de Matemáticas y Aplicaciones*, Universidad de Zaragoza.

Responsibility positions and others

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

Teaching experience

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

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

> Logic, sets, functions, methods of proofs, real and complex algebraic calculus, geometry of the euclidean plane.

ATER: Université de Pau (192h, France)

2015/2016   **Initiation à la modélisation statistique**, *Lectures and exercises*, L1 MIASHS.

> Probabilised spaces. Conditional probability. Bernoulli's schema. Binomial and Normal distributions. Moivre-Laplace Theorem and applications: estimation and testing of statistical models.

  Statistiques Descriptives, *Lectures, exercises and lab works*, L1 MIASHS-Math-SDT.

> Univariate analysis: definitions, numerical characterizations and graphics. Bivariate analysis: contingency tables and independence, linear regression and correlation coefficients of Bravais-Pearson and Spearman. Lab works over spreadsheet.

  Fonctions et intégrales, *Exercises*, L1 Mathématiques.

> Trigonometric functions. Superior and inferior bounds in $\mathbb{R}$. Anti-derivatives. Riemann integral of a piecewise continuous function. Taylor's formulas and series, Landau notations, local study of functions.

  Équations différentielles I, *Exercises*, L2 Mathématiques.

> First and second order ODEs. Analytic methods: undetermined coefficients and variation of parameters. Separation of variables. Series solutions of ODEs. Matrix exponentials. Linear differential systems. Euler's approximation method.

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

2014/2015   **Arithmétique**, *Exercises*, L1 Mathématiques.

> Logic and sets. Functions and applications. Binary relations. Groups and subgroups. Arithmetic for integers.

  Algèbre Linéaire II, *Exercises*, L1 MIASHS.

> Matrix calculus. Gauss's method and inverse. Determinants and comatrices. Matrix's rank. Linear applications and change of basis.

  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.

> Normed vector spaces. Limits and continuity. Complete and compact spaces. Continuous linear applications. Differential calculus. PDEs. Maximums and minimums.

Private academy

2009/2011   **Teacher**, *Academia Enseñalia S.L.*, Zaragoza (Spain).

> Supplementary exercises and individual tutorials for school, high school and undergraduate students in scientific subjects, specially in mathematics and statistics.

Attended scientific schools

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).

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.

Interests
- Drawing.
- Organic agriculture.
- Mountain sports (trekking, climbing).
- Dancing (lindy hop, rock).