

# Juan VIU-Sos

PHD IN MATHEMATICS  
– GEOMETRY, TOPOLOGY AND SINGULARITIES –

Dpto. de Matemáticas e Informática, 276A  
ETSI Caminos, Canales y Puertos  
Universidad Politécnica de Madrid  
C/ Prof. Aranguren, 3  
28040 Madrid (SPAIN)  
☎ +34 91 06 74402  
✉ [jviusos@math.cnrs.fr](mailto:jviusos@math.cnrs.fr)  
🌐 [jviusos.github.io](https://jviusos.github.io)



## 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.*
- **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 Matemáticas 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** [↗](#).

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## 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)

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## 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 poliedro 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 coloriage".
- 2005/2011 ◦ B.S. in Mathematics (Licenciado en Matemáticas), *Universidad de Zaragoza*, Zaragoza, Spain.

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## 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, *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  $\mathbb{Q}$ -resolutions of singularities (Short Communication)**, *International Congress of Mathematicians 2018*, Rio de Janeiro, Brazil.
- **Motivic zeta functions, orbifold motivic measures and  $\mathbb{Q}$ -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

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- 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

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- 2014 ◦ **1st prize awareness poster "Periods of Kontsevich-Zagier: conjectures and reduction"**, *Journées de l'École Doctorale*, 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

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- 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 webinar "Iberoamerican Webinar of Young Researchers in Singularity Theory and related topics"**, URL: [iberosing.github.io](https://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.

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## Teaching experience

### Assistant Professor: Universidad Politécnica de Madrid (Spain)

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- 2023/2024 ◦ **Topología**, *Lectures and lab works*, S3 Grado en Matemáticas.
- **Informática**, *Lectures and lab works*, S1 Ingeniería Civil.
- 2022/2023 ◦ **Topología**, *Lectures and lab works*, 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)

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

### ATER: Université de Pau (192h, France)

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- 2015/2016 ◦ **Initiation à la modélisation statistique**, *Lectures and exercises*, L1 MIAHS.
- **Statistiques Descriptives**, *Lectures, exercises and lab works*, L1 MIAHS-Math-SDT.
- **Fonctions et intégrales**, *Exercises*, L1 Mathématiques.

- **Équations différentielles I**, *Exercises*, L2 Mathématiques.

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

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- 2014/2015
- **Arithmétique**, *Exercises*, L1 Mathématiques.
  - **Algèbre Linéaire II**, *Exercises*, L1 MASHS.
  - **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.

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## Attended scientific schools

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- 2019
- **School “XX School of Mathematics Lluís Santaló 2019: p-Adic Analysis, Arithmetic and Singularities”**, *Universidad Internacional Menéndez 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.

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## Skills

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### Languages

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|------------------------------------------------------|---------------------------------------------------|
| ◦ <b>Spanish</b> – Native speaker.                   | ◦ <b>English</b> – C1 Level ( <i>FCE</i> , 2013). |
| ◦ <b>French</b> – C2 Level ( <i>DalF C1</i> , 2014). | ◦ <b>Portuguese</b> – B2 level.                   |

### Computer skills

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|-----------------------------|---------------------------------------|
| ◦ Sage, Maple, Mathematica. | ◦ Python, C/C++, Java.                |
| ◦ Fortran, Matlab, R.       | ◦ $\text{\LaTeX}$ , TikZ/Pgf, Beamer. |