

# Juan VIU SOS

- PH.D. IN MATHEMATICS -

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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."** in co-tutorship, *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*). Laboratoire de Mathématiques et de leurs Applications (Équipe Algèbre et Géométrie). Supervised by Jacky Cresson (Pau), Enrique Artal Bartolo (Zaragoza) and Vincent Florens (Pau). **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)

## Career and education

- Current position ○ **Post-doc in the Instituto de Ciências Matemáticas e de Computação (Universidade de São Paulo)**, São Carlos (Brasil).

**Research interests:** Line arrangements (combinatorics, topology and logarithmic vector fields), Number theory (effective periods), Singularity theory (topology and zeta functions), Knot theory and Computational algebra.

- 2016/2017 ○ **ATER (Teaching and research assistant position) in Intitut Fourier (Université Grenoble Alpes)** (France).
- 2015/2016 ○ **ATER in Université de Pau et des Pays de l'Adour** (France).
- 2016 ○ **Qualified as "Maître de conférences" in section 25 "Mathématiques"** (France).

## Previous education

- 2011/2012 ○ **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 ○ **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 Report in Knot Theory supervised by Vincent Florens: "Nœuds, entrelacs et coloriages".

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

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## Articles and preprints

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### Publications

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- 2018 ○ **Configurations of points and topology of real line arrangements**, [arXiv:1702.00922](#), 52 pags., with B. Guerville-Ballé (to appear in *Mathematische Annalen*).
- 2017 ○ **Fundamental groups of real arrangements and torsion in the lower central series quotients**, [arXiv:1704.04152](#), 12 pags., with E. Artal-Bartolo and B. Guerville-Ballé (to appear in *Experimental Mathematics*).

### Preprints

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- submitted ○ **A semi-canonical reduction for periods of Kontsevich-Zagier**, [arXiv:1509.01097](#), 26 pags..
- submitted ○ **Combinatorics of line arrangements and dynamics of polynomial vector fields**, [arXiv:1412.0137](#), 14 pags., with B. Guerville-Ballé.

### Proceedings

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- **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).

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## Complements on symbolic computation developed for Sage

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- 2014 ○ **Filtration and dynamics of logarithmic vector fields of line arrangements in the plane**, with B. Guerville-Ballé.
- 2012 ○ **Calculation of the Igusa and Topological zeta functions of a non-degenerated polynomial with respect to his Newton polyhedron**.

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## Research activities

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### Talks in national and international conferences

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- 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*, 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

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- 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).
- **Mini-cours (7h) "Line arrangements: combinatorics, geometry and topology"**, ICMC-USP (São Carlos, Brazil).
- **Arreglos de puntos y topología 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

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- 2015 ○ **Hokkaido University and Tokyo Gakugei University (3 weeks)** invited by M. Yoshinaga and A. Yasuhara (Japan).
- 2014 ○ **Hokkaido University (3 weeks)** 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

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- 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).

### Dissemination activities

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- 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.

### Awards

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- 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

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

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## Teaching

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### ATER: Université Grenoble Alpes (76,5 hours)

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- 2016/2017 ○ **MATH101-Langage mathématique, algèbre et géométrie**, *Lecture 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 et des Pays de l'Adour (192 hours)

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- 2015/2016 ○ **Initiation à la modélisation statistique**, *Lecture 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**, *Lecture, 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**, *Exercices*, 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**, *Exercices*, 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 et des Pays de l'Adour (128 hours)

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- 2014/2015 ○ **Arithmétique**, *Exercices*, L1 Mathématiques.

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

- **Algèbre Linéaire II**, *Exercices*, L1 MIASHS.

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

- **Équations différentielles I**, *Exercices*, 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.

- 2013/2014 ○ **Arithmétique**, *Exercices*, L1 Mathématiques.

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

- **Algèbre Linéaire II**, *Exercices*, L1 MASS.

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

- **Topologie et Calcul Différentiel**, *Exercices*, L2 Mathématiques.

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

## Private academy

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2009/2011 ○ **Teacher**, *Academia Enseñalia S.L.*, Zaragoza.

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

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## Schools and Conferences

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### Scientific schools

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- 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).

### Conference attendance

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- 2016 ○ **Conference “The 4th Franco-Japanese-Vietnamese Singularities”**, *Université de Savoie*, Chambéry (France).
- **Conference “Summer Conference on Hyperplane Arrangements (SCHA)”**, *Hokkaido University*, Sapporo (Japan).
- **Conference “XV Encuentro de Álgebra Computacional y Aplicaciones (EACA 2016)”**, *Universidad de Logroño*, Logroño (Espagne).
- 2015 ○ **Workshop “Real Analytic Geometry and Trajectory of Vector Fields”**, *Centre international de rencontres mathématiques*, Marseille (France).
- **Conference “Winter Braids V”**, *Université de Pau et des Pays de l’Adour*, Pau (France).
- 2014 ○ **The 2nd Franco-Japanese-Vietnamese Symposium on Singularities of the CNRS-JSPS-VAST**, *Hokkaido University*, Sapporo (Japan).
- **Conference “Winter Braids IV”**, *Institute de Mathématiques de Bourgogne*, Dijon (France).
- 2013 ○ **Conference “II Congreso de Jóvenes Investigadores de la Real Sociedad Matemática Española”**, *RSME – Universidad de Sevilla*, Sevilla (Spain).
- **Conference “Algebra and Geometry and Topology of Singularities: Conference on the occasion of the 60th birthday of I. Luengo”**, *Instituto de Ciencias Matemáticas*, La Cristalera, Miraflores de la Sierra (Spain).
- **III Workshop of Singularities in Zaragoza**, *IUMA, Universidad de Zaragoza*, Zaragoza (Spain).
- 2012 ○ **Conference “Winter Braids III”**, *Institut Fourier*, Grenoble (France).



- Conference “**XII International Conference Zaragoza-Pau on Applied Mathematics and Statistics 2012**”, *Universidad de Zaragoza – Université de Pau et des Pays de l’Adour, Jaca* (Spain).
- Conference “**Arrangements in Pyrénées**”, *Université de Pau et des Pays de l’Adour, Pau* (France).
- 2011 ○ **II Workshop of Singularities in Zaragoza**, *IUMA, Universidad de Zaragoza, Zaragoza* (Spain).
- **Wokshop “Atelier thématique d’Algebre et Géometrie Bilbao-Pau-Zaragoza**”, *Université de Pau et des Pays de l’Adour, Bayonne* (France).

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## Skills

### Languages

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| ○ <b>Spanish</b> – Native speaker.                   | ○ <b>English</b> – C1 Level ( <i>FCE, 2013</i> ). |
| ○ <b>French</b> – C2 Level ( <i>Dalf C1, 2014</i> ). | ○ <b>Portuguese</b> – A2 level.                   |

### Computer skills

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| ○ Sage, Maple, Mathematica. | ○ Python, C/C++, Java.         |
| ○ Fortran, Matlab, R.       | ○ $\LaTeX$ , TikZ/Pgf, Beamer. |

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## Interests

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| ○ Drawing.             | ○ Mountain sports (trekking, climbing). |
| ○ Organic agriculture. | ○ Dancing (lindy hop, rock).            |