

Lorenzo Baldi

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Research interests

Algebraic Geometry and its Applications, in particular:

- Sums of Squares and Real Algebraic Geometry
- Polynomial Optimization
- Tensor Decomposition
- Moments
- Effective Algebraic Geometry

Current position

2022– **Postdoctoral researcher**, *Sorbonne University*, Polsys team.
Mentors: Jérémy Berthomieu and Pierre Lairez

Education

- 2019–2022 **Ph. D. in Mathematics**, *Inria Sophia Antipolis – Université Côte d’Azur*, ESR9 of POEMA network. Title: Effective Representations in Real Algebraic Geometry and Polynomial Optimization.
Advisor: B. Mourrain.
- 2017–2019 **Master Degree in Mathematics**, *Università degli studi di Trento, 110H/110*, Percorso di Eccellenza Laurea Magistrale in Matematica (Path of Excellence for the Master Degree in Mathematics). Title: Real Tensors and Algebraic Geometry.
Supervisor: E. Ballico.
- 2014–2017 **Bachelor Degree in Mathematics**, *Università degli studi di Firenze, 110H/110*, Title: Introduzione ai gruppi di movimenti rigidi.
Supervisor: C. Casolo.

Grants

- 2019–2022 **European Union’s Horizon 2020 research and innovation programme**, *Marie Skłodowska-Curie Actions*, grant agreement 813211, POEMA.

Journal Articles

- [3] Lorenzo Baldi and Bernard Mourrain. “On the effective Putinar’s Positivstellensatz and moment approximation”. In: *Mathematical Programming*

(Sept. 6, 2022). ISSN: 1436-4646. DOI: 10.1007/s10107-022-01877-6.
URL: <https://doi.org/10.1007/s10107-022-01877-6>.

Conference papers

- [1] Lorenzo Baldi and Bernard Mourrain. “Computing Real Radicals by Moment Optimization”. In: *Proceedings of the 2021 on International Symposium on Symbolic and Algebraic Computation. ISSAC '21. Virtual Event, Russian Federation: Association for Computing Machinery, 2021, 43–50. ISBN: 9781450383820. DOI: 10.1145/3452143.3465541. URL: <https://doi.org/10.1145/3452143.3465541>.*

Preprints

- [2] Lorenzo Baldi and Bernard Mourrain. “Exact Moment Representation in Polynomial Optimization”. preprint. Dec. 2020. URL: <https://hal.archives-ouvertes.fr/hal-03082531>.

Organization

Feb 11 2022 **POEMA ESR Day**, *Part of POEMA Workshop 4*, online.

Research Visits and Industrial Secondments

- Jun 8–10 2022 University of Konstanz, Research Group in Real Algebraic Geometry
- May 30–Jun 3 2022 Max Plank Institute Leipzig, Nonlinear Algebra group
- Jan–May 2022 ARTELYS, Paris. Supervisor: M. Gabay
- Jul–Oct 2022 University of Birmingham, online. Supervisor: M. Kočvara

Meetings and conferences

2022, Talks

- Sep 6 General Convergence Rates in Polynomial Optimization. POEMA Final Workshop, Paris
- Jul 25 **On Putinar’s Positivstellensatz and Convergence Rates in Polynomial Optimization**, *ICCOPT*, Invited minisymposium speaker, Lehigh University.
- Jun 24 **On Łojasiewicz Inequalities and the Effective Positivstellensatz**, *MEGA 2022*, Contributed, Krakow.
- Jun 10 **Convergence Rates and Flat Truncation in Lasserre’s Hierarchies**, *seminar Reelle Geometrie und Algebra*, Invited, University of Konstanz.

- Jun 1 **Flat Truncation in Polynomial Optimization: a Geometric and Algebraic Perspective**, *Seminar on Nonlinear Algebra*, Invited, MPI Leipzig.
- Apr 4 **Effective Putinar's Positivstellensatz: a general Polynomial Bound**, *Reading Group on Polynomial Optimization*, Invited, CWI, online.
- Mar 4 **On the Effective Putinar's Positivstellensatz and Convergence Rates in Polynomial Optimization**, *Journées nationales de calcul formel*, Contributed, CIRM, Luminy.
- Feb 3 **On Finite Convergence and Convergence Rates in Polynomial Optimization**, *Joint PolSys-SpecFun Seminar*, Invited, online.
- 2021, Talks**
- Dec 16 **On Moment Approximation and the Effective Putinar's Positivstellensatz**, *POEMA Industrial Workshop*, Invited, INRIA.
- Aug 20 **Exact Moment Representation in Polynomial Optimization**, *SIAM Conference on Applied Algebraic Geometry*, Invited minisymposium speaker, online.
- Jul 20 **Computing real radicals by moment optimization**, *ISSAC*, Contributed, online.
- Jul 8 **The approximation of measures by positive moment sequences**, *EUROPT*, Contributed, online.
- Jun 24 **Some Geometric Properties of Lasserre's Truncated Moments**, *GO60*, Poster, online.
- Jun 16 Computing real radicals by moment optimization. AROMATH seminar, INRIA - online
- Jun 10 **Exact Moment Representation in Polynomial Optimization**, *MEGA*, Contributed, online.
- Mar 3 **Geometry of Lasserre's Truncated Moments**, *Journées nationales de calcul formel*, Contributed, online.
- Feb 17 Exact Moment Representation in Polynomial Optimization. POEMA 3rd Workshop, online
- 2021, Conferences and Schools attended**
- Sep 13 – 17 POEMA Learning Week 2, Toulouse
- Jul 05 – 16 Minicourse in Convex Geometry, MPI – online
- Jan – Feb POEMA 3rd Workshop, online
- 2020, Talks**
- Nov 27 Exact Moment Representation in Polynomial Optimization. POEMA 2nd Workshop, online

Mar 2–6 **Polynomial Optimization and Moments**, *Journées nationales de calcul formel*, Contributed, CIRM, Luminy.

2020, Conferences and Schools attended

Oct – Dec POEMA 2nd Workshop, online

Jun 29 Recent Advances in the Method of Moments, SIAM Conference on Mathematics of Data Science, online

May – Sep POEMA online Learning Weeks, online

Jan 20 Journée Moments. Inria Saclay, Paris

Jan 15–17 POEMA 1st Workshop. Department of Mathematics and Computer Science, Florence

2020 – 2021, Seminars attended

Research Seminar Real Geometry and Algebra, online (Konstanz University); Applied Algebraic Geometry, online (UNIFI); AROMATH Seminar, online (INRIA Sophia Antipolis); NASO, online (MPI); PolSys SpecFun Seminar, online (Sorbonne-LIP6); Séminaire Français d’Optimisation, online.

2019, Conferences and Schools attended

Jan 7–11 A Journey through Projective and Birational Geometry. Together with Marco Andreatta. Polo Ferrari, University of Trento

2019, Other presentations

Jun 17 Un teorema di Chevalley per schemi noetheriani e suoi usi in Algebra Commutativa. Department of Mathematics, Trento

May 30 Real Nullstellensatz. Department of Mathematics, Trento

Teaching activity

2019 *Informatica*, tutorial exercises (teaching professor: R. Zunino), Department of Mathematics, Trento

2018 *Geometria e algebra lineare*, tutorial exercises (teaching professors: A. Bernardi and S. Siboni), Department of Civil, Environmental and Mechanical Engineering, Trento

Programming skills

Programming languages Julia, C, Singular, Magma, Maple, Git, \LaTeX

Packages MomentTools.jl, PMO.jl, MultivariateSeries.jl developed