

Boulos El Hilany

Curriculum Vitae

Institut für Analysis und Algebra,
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Employment and Education

- Since May 2021 **Walter Benjamin Programme fellow in the Algebra Research Group**, *Institut für Analysis und Algebra, TU Braunschweig*, Berlin, Germany.
Mentor: Time de Wolff
- May 2020 – April 2021 **Postdoctoral Researcher in the Symbolic Computations Group**, *Johann Radon Institute for Computational and Applied Mathematics*, Linz, Austria.
Mentor: Niels Lubbes
- Dec. 2018 – April 2020 **Postdoctoral Researcher in the Algebraic Geometry Group**, *Institute for Mathematics in the Polish Academy of Sciences*, Warsaw, Poland.
Mentor: Zbigniew Jelonek
- Dec. 2017 – Nov. 2018 **Visiting Researcher**, *Max Planck Institute for Mathematics*, Bonn, Germany.
Mentor: Gaetan Borot
- May 2016 – Nov. 2017 **Postdoctoral Researcher in the Geometry Group**, *University of Tübingen*, Tübingen, Germany.
Mentor: Johannes Rau
- Oct. 2013 – Sept. 2016 **PhD Student in Mathematics Laboratory (LAMA)**, *University of Savoy Mont Blanc*, Chambéry, France.
Advisor: Frédéric Bihan

Awards and Scholarships

- 2021 – 2023 **DFG Walter Benjamin Programme**, *Project title: "Classifying polynomial maps by means of polyhedral geometry"*, €187 400.
Single PI

Research Topics

- Topology of polynomial maps,
- Real algebraic geometry
- Geometry of sparse polynomial systems
- Tropical geometry
- Convex geometry
- Polyhedral geometry
- Real Hurwitz numbers

Publications

1. **Counting isolated points outside the image of a polynomial map**
To appear in *Advances of Geometry*, (2021),
[ArXiv 1909.08339](#)
2. **A note on generic polynomial maps having a fiber of maximal dimension**
Colloquium Mathematicum - IMPAN Journals, (2021),
[doi.org/10.4064/cm8162-8-2020](#), [ArXiv 1910.01333](#)
3. **Signed counts of real simple rational functions**
with Johannes Rau, *Journal of Algebraic Combinatorics*, (2019),
[doi.org/10.1007/s10801-019-00906-6](#), [ArXiv 1712.05639](#)
4. **Constructing polynomial systems with many positive solutions using tropical geometry**
Revista Matemática Complutense Volume 31, Issue 2, pp. 525—544, (2018),
[doi.org/10.1007/s13163-017-0254-1](#) [ArXiv 1703.02272](#)
5. **Characterization of circuits supporting polynomial systems with the maximal number of positive solutions**
Journal of Discrete & Computational Geometry, Vol. **58**, No. **2**, pp. 355–370, (2017),
[doi.org/10.1007/s00454-017-9897-4](#) [ArXiv 1603.01813](#)
6. **A sharp bound on the number of real intersection points of a sparse plane curve with a line**
with Frédéric Bihan, *Journal of Symbolic Computations* (2017), Vol. **81**, pp. 88–96, (2017),
[doi.org/10.1016/j.jsc.2016.12.003](#) , [ArXiv 1506.03309](#)

Preprints

- **Computing efficiently the non-properness set of polynomial maps on the plane**
with Elias Tsigaridas, see [ArXiv 2101.05245](#)
- **Describing the Jelonek set of polynomial maps via Newton polytopes**
see [ArXiv 1909.07016](#)
- **Counting positive intersection points of a trinomial and a t -nomial curves via Grothendieck's dessins d'enfant**
see [ArXiv 1512.05688](#)

Theses

1. **Tropical Geometry and Polynomial Systems**
Doctorate, 2016
2. **Tropical Curves and Amoebas**
Masters, 2013

Talks

- July 2021 **MEGA 2021**, *UiT – The Arctic University of Norway*.
Computing efficiently the non-properness set of polynomial maps on the plane
- July 2021 **Geometric Structures Seminar**, *SISSA, Italy*.
Computing efficiently the non-properness set of polynomial maps on the plane
- May 2021 **Ouragan Seminar**, *Inria Paris, France*.
Computing efficiently the non-properness set of polynomial maps on the plane
- March 2021 **Singularity Theory Seminar**, *Universidade Federal do Ceará, Brazil*.
Computing efficiently the non-properness set of polynomial maps on the plane

- Oct. 2020 **Geometry team seminar**, *LAMA, Université Savoie Mont Blanc, Chambéry.*
Counting isolated points outside the image of a polynomial map
- Sep. 2020 **Applied Algebra and Analysis online seminar**, *TU Braunschweig.*
Counting isolated points outside the image of a polynomial map
- July 2020 **Discrete Mathematics Research Seminar**, *RICAM, Linz.*
Counting isolated points outside the image of a polynomial map
- June 2020 **Seminar in Real and Complex Geometry**, *TAU University.*
Counting isolated points outside the image of a polynomial map
- Feb. – 2020 **Young Researchers Colloquium**, *IMPAN, Warsaw.*
On polynomial maps having fibers of maximal dimension
- Dec. – 2019 **Gdańsk-Kraków-Łódź-Warszawa Seminar in Singularity Theory**, *Jagellonian University, Kraków.*
Describing the Jelonek set of polynomial maps via Newton polytopes
- Oct. 2019 **Algebraic Geometry Seminar**, *MIMUW, Warsaw.*
Describing the Jelonek set of polynomial maps via Newton polytopes
- Sep. 2019 **Einstein workshop on Real Applied Algebraic Geometry**, *TU Berlin.*
Describing the Jelonek set of polynomial maps via Newton polytopes
- July 2019 **SIAM conference on Applied Algebraic Geometry**, *Bern University.*
Characterizing circuits supporting polynomial systems having maximal number of positive solutions
- June 2019 **Algebra group seminar**, *University of Tübingen.*
Describing the Jelonek set of polynomial maps via Newton polytopes
- 2019 **Geometry and Singularity Theory seminar**, *IMPAN, Warsaw.*
On polynomial maps having fibers of maximal dimension
- 2019 **Geometry and Singularity Theory seminar**, *IMPAN, Warsaw.*
Counting isolated points outside the image of a polynomial map
- 2019 **Geometry and Singularity Theory seminar**, *IMPAN, Warsaw.*
Constructing polynomial systems with many positive solutions using tropical geometry
- Feb. 2018 **IMPANGA Seminar**, *IMPAN, Warsaw.*
Signed counts of real simple rational functions
- June 2018 **6th Workshop on Combinatorics of Moduli Spaces, Cluster Algebras, and Topological Recursion**, *Steklov Mathematical Institute, Moscow..*
Signed counts of real simple rational functions
- May. 2018 **Düsseldorf Research Seminar in Pure Mathematics**, *Heinrich Heine University.*
Constructing polynomial systems with many positive solutions using tropical geometry
- Oct. 2018 **ASGARD: Real algebraic geometry and tropical mathematics**, *Oslo University, Norway.*
Signed counts of real simple rational functions
- Oct. 2018 **Working group on Grothendieck-Teichmüller groups**, *MPIM, Bonn, Germany.*
Belyii Theorem via dessins d'enfants

- Sept 2018 **Image Processing and Computer Vision conference**, *Tübingen University, Germany.*
The equations for the moduli space of n points on the line
- June 2017 **Reading Group on Real Algebraic Geometry**, *Max Plank Institute MIS, Leipzig.*
Topology of real K3 surfaces
- Feb. 2017 **Workshop on Tropical algebra and applications**, *Mittag Leffler Institute, Sweden.*
Constructing polynomial systems with many positive solutions using tropical geometry
- Dec. 2017 **Algorithmic algebra group weekly seminar**, *TU Berlin, Germany.*
Signed counts of real simple rational functions
- Aug. 2017 **Nonarchimedean and Tropical Geometry conference**, *Universität Regensburg, Germany.*
Constructing polynomial systems with many positive solutions using tropical geometry
- July 2017 **Geometry group seminar**, *Tübingen University, Germany.*
Real Hurwitz numbers and simple rational functions
- June 2017 **Geometry team seminar**, *LAMA, Université Savoie Mont Blanc, Chambéry.*
Nombres de Hurwitz réels et fonctions rationnelles simples
- March 2016 **Geometry group seminar**, *Universität des Saarlandes, Saarbrücken, Germany.*
Constructing polynomial systems with many positive solutions using tropical geometry
- [Job Talks](#)
- March 2020 **Colloquium**, *Innsbrück University, Austria.*
Discrete geometry and topological structures from polynomial equations.

Further Conferences and Workshops

- August 2021 **SIAM AG 2021**, Texas A& M, USA.
- April 2021 **(Polytop)ics: Recent advances on polytopes**, MPI MIS, Leipzig, Germany.
- July 2021 **Tropical Moduli Spaces School**, Mittag Leffler Institute, Sweden.
- Sep. 2019 **Curves and Surfaces, A History of Shapes**, Hotel Bellavista - Levico Terme, Italy.
- June 2019 **Gdańsk-Kraków-Łódź-Warszawa Seminar in Singularity Theory**, IMPAN, Warsaw, Poland.
- June 2019 **New Perspectives in Gromov-Witten Theory**, Institut de mathématiques de Jussieux, France.
- July 2018 **Tropical Geometry in Europe**, Institut de mathématiques de Toulouse, France.
- June 2018 **Random matrices, maps, and gauge theories**, ENS de Lyon, France.
- Nov. 2017 **Young Researchers in String Mathematics**, MPI Für Mathematik, Bonn, Germany.
- Sep. 2017 **Perspectives in Real Geometry**, CIRM, Marseilles, France.
- May 2017 **Geometric aspects of singularities**, Université de Lille, France.
- March 2017 **Tropical curve counts, Motivic integration and Nonarchimedean Geometry**, Universität Tübingen, Germany.

- March 2017 **Workshop on Enumerative Geometry**, IHP, Paris, France.
Jan. 2016 **Singularity Workshop Meeting**, CIRM, Marseilles, France.
Jan. 2015 **Singularities and Tropical Geometry**, IMJ-PRG, Paris, France.
June 2015 **Algebraic Complexity Meeting**, ENS de Lyon, France.
June 2015 **MEGA 2015**, Povo center, Trento, Italy.
Feb. 2015 **Jeunes Chercheurs en Singularité**, CIRM, Marseilles, France.
Jan. 2014 **Tropical Geometry in its Complex and Symplectic Aspects**, Bernoulli Center, EPFL, Switzerland.

Organized Conferences and Workshops

- July 2021 **Workshop on Real Algebraic and Convex Geometry**, TU Braunschweig.
joint with Khazhgali Kozhasov and Timo de Wolff
- July 2017 **Image Processing and Computer Vision**, Universität Tübingen, Germany.
joint with Domenico Monaco and Jonas Ziefle
- July 2015 **Colloque Inter'Actions**, Université Grenoble Alpes, France.
joint with Clément Charpentier, Benjamin Druart, Burak Ekici, Guillaume Idelon-Riton, Julien Korinman, Teddy Mignot, Pedro Montero, Charlotte Perrin, Federico Zertuche

Other Professional Activities

Refereeing

Full reports for:

1. Journal of Algebraic Combinatorics
2. Journal of Applied Algebra
3. International Journal of Differential Equations

Paper reviews for Mathrev

Reviewed in total: **9** articles.

Teaching

- Sep. 2017 **Teaching assistant for refugees**, 15 hrs, Universität Tübingen, Germany.
[Université Savoie Mont Blanc, France](#)
- 2015 – 2016 **Reinforcement math courses**, 20 hrs.
- 2015 – 2016 **Fourrier Series**, 25 hrs.
- 2015 – 2016 **Linear Algebra I**, 15 hrs.
- 2015 – 2016 **Calculus I**, 55 hrs.
- 2014 – 2015 **Inferential Statistics**, 30 hrs.
- 2014 – 2015 **Statistics and Probability**, 12 hrs.

Languages

- Arabic **Mothertongue**
Russian **Mothertongue**

French **Expert**
English **Expert**
German **Advanced**
Ukrainian **Advanced**
Polish **Basic**