Thibaut Verron

Post-doctoral researcher, Johannes Kepler University

Date of birth: 21 March 1991
Citizenship: French
Address:
Johannes Kepler University
Altenbergerstraße 69,
4040 Linz, Austria
E-mail: thibaut.verron@jku.at
Webpage: https://thibautverron.github.io

Research interests

- Computer algebra, algorithms for commutative algebra and algebraic geometry
- Polynomial system solving, Gröbner bases, signature-based algorithms
- Algorithmic and algebraic structures of polynomial systems
- Tropical Gröbner bases, Gröbner bases for Tate series, Gröbner bases over rings
- Algorithms for real algebraic geometry
- D-finite functions and sequences

Employment

2017 – 2020 **Post-doctoral researcher at JKU (Linz, Austria)**
Supervisor: Manuel Kauers (Institute for Algebra)
Keywords: computer algebra, algorithmic combinatorics, D-finite functions

2016 – 2017 **Post-doctoral researcher at INP-ENSEEIHT (Toulouse, France)**
Supervisors: Joseph Gergaud, Olivier Cots
(Team *Parallel algorithms and optimization*)
Keywords: optimal control

Education

2012 – 2016 **Ph.D thesis, University Pierre et Marie Curie (Paris, France)**
Computer science

2011 – 2012 **Masters degree, University Paris-Sud 11 (Orsay, France)**
Pure and Applied Mathematics, specialty Algebra, Analysis and Geometry

2009 – 2013 **École Normale Supérieure de Paris (France)**
Diploma of the ENS, Major in Mathematics, minor in Computer Science

Ph.D. thesis

Dates September 2012 – September 2016 (defense: 26 September 2016)

Location PolSys team, LIP6, Université Pierre et Marie Curie (Paris, France)

Supervisors Jean-Charles Faugère, Mohab Safey El Din

Title Regularization of Gröbner basis computations for weighted and determinantal systems, and an application to medical imagery

Keywords polynomial systems; Gröbner bases; structured systems; weighted-homogeneous systems; determinantal systems; real algebraic geometry

Committee

Director	Jean-Charles Faugère	Research director, Inria
Advisor	Mohab Safey El Din	Professor, UPMC
Reviewer	Laurent Busé	Researcher, Inria, HdR
Reviewer	Bruno Salvy	Research director, Inria
Examiner	Bernard Bonnard	Professor, Université de Bourgogne
Examiner	Stef Graillat	Professor, UPMC

Publications

Journal papers

1. Tristan Vaccon, Thibaut Verron, and Kazuhiro Yokoyama. "On affine tropical F5 algorithms". In: *Journal of Symbolic Computation* (to appear). Extended version of an article presented at ISSAC 2018. ISSN: 0747-7171. DOI: https://doi.org/10.1016/j.jsc.2019.10.012. URL: http://www.sciencedirect.com/science/article/pii/S0747717119301208

2. Bernard Bonnard, Olivier Cots, Jérémy Rouot, and Thibaut Verron. "Time minimal saturation of a pair of spins and application in Magnetic Resonance Imaging". In: *Mathematical Control & Related Fields* 10.1 (2020), pp. 47–88. ISSN: 2156-8499. DOI: 10.3934/mcrf.2019029. URL: http://dx.doi.org/10.3934/mcrf.2019029

3. Jean-Charles Faugère, Mohab Safey El Din, and Thibaut Verron. "On the complexity of computing Gröbner bases for weighted homogeneous systems". In: *Journal of Symbolic Computation* 76 (2016), pp. 107–141. ISSN: 0747-7171. DOI: http://dx.doi.org/10.1016/j.jsc.2015.12.001. URL: https://hal.archives-ouvertes.fr/hal-01097316v2

Conference papers

4. Xavier Caruso, Tristan Vaccon, and Thibaut Verron. "Gröbner bases over Tate algebras". In: *Proceedings of the 2019 International Symposium on Symbolic and Algebraic Computation*. ISSAC '19. Beijing, China, 2018. arXiv: 1901.09574 [math.AG]. URL: https://arxiv.org/abs/1901.09574

5. Maria Francis and Thibaut Verron. "A Signature-Based Algorithm for Computing Gröbner Bases over Principal Ideal Domains". In: *Mathematics in Computer Science, special issue on the ACA 2018 conference* (2019). To appear. arXiv: 1802.01388 [cs.SC]

6. Tristan Vaccon, Thibaut Verron, and Kazuhiro Yokoyama. "On affine tropical F5 algorithms". In: *Proceedings of the 2018 International Symposium on Symbolic and Algebraic Computation*. ISSAC '18. New York, USA, 2018. URL: https://arxiv.org/abs/1805.06183

7. Bernard Bonnard, Jean-Charles Faugère, Alain Jacquemard, Mohab Safey El Din, and Thibaut Verron. "Determinantal set, singularities and application to optimal control in medical imagery". In: *Proceedings of the 2016 International Symposium on Symbolic and Algebraic Computation*. ISSAC '16. Waterloo, Canada, 2016, pp. 103–110. URL: https://hal.archives-ouvertes.fr/hal-01307073v2

8. Jean-Charles Faugère, Mohab Safey El Din, and Thibaut Verron. "On the complexity of computing Gröbner bases for quasi-homogeneous systems". In: *Proceedings of the 2013 International Symposium on Symbolic and Algebraic Computation*. ISSAC '13. Boston, USA: ACM, 2013, pp. 189–196. URL: https://hal.archives-ouvertes.fr/hal-00780388v2

Note on the conferences:

- The *International Symposium on Symbolic and Algebraic Computations* (ISSAC) is the reference conference in computer algebra. Presentations are selected after peer-review, and articles are published in proceedings.

Other publications

9. Manuel Kauers and Thibaut Verron. "Why you should remove zeros from data before guessing". In: *ACM Communications in Computer Algebra* 53.3 (Dec. 2019). Extended abstract of a poster presented at ISSAC 2019, pp. 126–129. ISSN: 1932-2240. DOI: 10.1145/3377006.3377017. URL: http://dx.doi.org/10.1145/3377006.3377017

Preprints and submitted papers

10. Xavier Caruso, Tristan Vaccon, and Thibaut Verron. *Signature-based algorithms for Gröbner bases over Tate algebras*. Feb. 2020. URL: https://hal.archives-ouvertes.fr/hal-02473665

11. Shaoshi Chen, Lixin Du, Manuel Kauers, and Thibaut Verron. *Integral P-Recursive Sequences*. 2020. arXiv: 2002.02783 [cs.SC]

12. Maria Francis and Thibaut Verron. "Signature-based Möller's algorithm for strong Gröbner bases over PIDs". In: *ArXiv e-prints* (2019). arXiv: 1901.09586 [cs.SC]

13. Bernard Bonnard, Olivier Cots, Jean-Charles Faugère, Alain Jacquemard, Jérémy Rouot, Mohab Safey El Din, and Thibaut Verron. "Algebraic-geometric techniques for the feedback classification and robustness of the optimal control of a pair of Bloch equations with application to Magnetic Resonance Imaging". In: *HAL open archives* (2017). URL: https://hal.inria.fr/hal-01556806

Software

Tate Algebras

- SageMath package for working with Tate series over $\mathbb{Z}_p$ and $\mathbb{Q}_p$
- Implementation of algorithms presented at ISSAC 2019
- Distributed with SageMath since version 8.5 (22/12/2018)
- 5200 lines of code (Python, Cython)
- Joint development with X. Caruso and T. Vaccon
- Link: https://doc.sagemath.org/html/en/reference/power_series/sage/rings/tate_algebra.html

Signature Gröbner bases over PIDs

- Toy implementation in Magma of signature-enabled versions of Möller's algorithms for computing Gröbner bases over PIDs
- Implementation of algorithms presented at *Applications of Computer Algebra* 2018 and *SIAM conference on Applied Algebraic Geometry* 2019
- 1600 lines of code (Magma)
- Link: https://github.com/ThibautVerron/SignatureMoller

Real algebraic classification algorithms for determinantal varieties

- Implementation in Maple of algorithms computing a classification of the real singularities of determinantal varieties
- Implementation of algorithms presented at ISSAC 2016
- 450 lines of code (Maple)
- Example run on an application to optimal control in medical imagery
- Joint development with M. Safey El Din
- Link: http://mercurey.gforge.inria.fr

Communications

Conference talks

- *Gröbner bases and Tate algebras*. International Symposium on Symbolic and Algebraic Computation (ISSAC). Beihang University, Beijing, China, 2019
- *Signature-based Möller's algorithm for strong Gröbner bases over PIDs*. SIAM Conference on Applied Algebraic Geometry, Mini-symposium "Algebraic methods for polynomial system solving solving". University of Bern, Bern, Switzerland, 2019
- *Algorithme de Möller avec signatures pour le calcul de bases de Gröbner fortes à coefficients dans un anneau principal*. Journées Nationales de Calcul Formel 2019. CIRM, Luminy, France, 2019

- *Signature-based criteria for computing weak Gröbner bases over PIDs*. 24th Conference on Applications of Computer Algebra (ACA 2018), session "Algorithms for zero-dimensional ideals". University of Santiago de Compostela, Santiago de Compostella, Spain, 2018
- *Méthodes algébriques pour le contrôle optimal en Imagerie à Résonance Magnétique*. 8e Biennale Française des Mathématiques Appliquées et Industrielles (SMAI 2017), Mini-symposium "Contrôle et applications". La Tremblade, France, 2017
- *Determinantal set, singularities and application to optimal control in medical imagery*. International Symposium on Symbolic and Algebraic Computation (ISSAC). Wilfrid Laurier University, Waterloo, Canada, 2016
- *Algebraic classification related to contrast optimization for MRI*. Journées annuelles du GdR Mathématiques de l'Optimisation et Applications 2015. IMB, Université de Bourgogne, Dijon, France, 2015
- *Classification algébrique associée à l'optimisation de contraste pour l'IRM*. Journées Nationales de Calcul Formel 2015. ENSAM, Cluny, France, 2015
- *Complexité du calcul de bases de Gröbner pour les systèmes homogènes avec poids*. Journées Nationales de Calcul Formel 2014. CIRM, Luminy, France, 2014
- *Bases de Gröbner et systèmes structurés*. Rencontres doctorales Henri Lebesgue 2014. IRMAR, Rennes, France, 2014
- *On the complexity of computing Gröbner bases for quasi-homogeneous systems*. International Symposium on Symbolic and Algebraic Computation (ISSAC). Northeastern University, Boston, USA, 2013
- *Complexité du calcul de bases de Gröbner pour les systèmes quasi-homogènes*. Journées Nationales de Calcul Formel 2013. CIRM, Luminy, France, 2013

Posters

- Manuel Kauers and Thibaut Verron. *Why you should remove zeros from data before guessing*. International Symposium on Symbolic and Algebraic Computation (ISSAC). Beihang University, Beijing, China, 2019

Teaching and supervising experience

2018 – 2020	Guest lecturer / teaching assistant in Mathematics, JKU, Linz (Austria) Supervision of a bachelor thesis with M. Kauers
2016 – 2017	Teaching assistant in Applied Mathematics, INP Toulouse (France)
2013 – 2016	Teaching assistant in Computer Science, UPMC, Paris (France)

Service

- **Software presentation award committee** for the International Symposium on Symbolic and Algebraic Computation (ISSAC) 2019

- **Poster chair** for the 6th International Congress on Mathematical Software (ICMS), 2018
- **Reviewer** for SODA, JSC, FPSAC, MACIS

Other information

- **Languages**: French (native), English (fluent), German (advanced), Russian, Turkish (basic)
- **Programming languages**: Python, C, C++, OCaml, Haskell
- **Computer algebra**: Sage, Magma, Maple, Mathematica
- **Others**: Bash, Emacs Lisp

References

- **J.-C. Faugère**, research director, Inria Paris, France
  E-mail: jean-charles.faugere@inria.fr
- **M. Safey El Din**, professor, Sorbonne Universités, Paris, France
  E-mail: mohab.safey@lip6.fr
- **M. Kauers**, professor, Johannes Kepler University, Linz, Austria
  E-mail: manuel@kauers.de
- **J. Gergaud**, professor, INP-ENSEEIHT, Toulouse, France
  E-mail: gergaud@enseeiht.fr
- **B. Bonnard**, professor, Université de Bourgogne, Dijon, France
  E-mail: bernard.bonnard@u-bourgogne.fr
- **X. Caruso**, research director, CNRS, Université de Bordeaux, Bordeaux, France
  E-mail: xavier.caruso@normalesup.org