

CURRICULUM VITAE

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👤 TobiasMetzlaff

PERSONAL INFORMATION

Name Tobias Christopher Metzläff
Birthday 8 April 1996 in Aachen, DE
Nationality German

EDUCATION

Dec 2019 – Dec 2022 **Mathematics PhD** awarded by Université Côte d'Azur in Nice, FR
Thesis *Groupes Cristallographiques et Polynômes de Chebyshev en Optimisation Globale*
(Crystallographic Groups and Chebyshev Polynomials in Global Optimization)
directed by E. Hubert at SFA Doctoral School PhD Thesis (2022COAZ4094) [↗](#)

Apr 2018 – Oct 2019 **Mathematics MSc** awarded by RWTH Aachen University in Aachen, DE
Thesis *Computational Improvements for Non-Commutative Gröbner Bases over $\mathbb{Z}/m\mathbb{Z}$*
directed by V. Levandovskyy at Chair D for Mathematics MSc Thesis [↗](#)

Oct 2014 – Mar 2018 **Mathematics BSc** awarded by RWTH Aachen University in Aachen, DE
Thesis *Periodische lineare diskrete Systeme und ihre Normalform*
(Periodic Linear Discrete Systems and their Canonical Form)
directed by E. Zerz at Chair D for Mathematics BSc Thesis [↗](#)

Sep 2006 – Jun 2014 Municipal High School in Würselen, DE
Sep 2002 – May 2006 Catholic Elementary School in Broichweiden, DE

CAREER

Jan 2023 – Dec 2024 **Postdoctoral Researcher** at University of Kaiserslautern-Landau, Department of Mathematics with U. Thiel in Kaiserslautern, DE
Funding *Symbolic Tools in Mathematics and their Application*
granted by German Research Foundation's transregional collaborative research centre and Rheinland-Pfalz' research initiative SFB-TRR 195 [↗](#) SymbTools [↗](#)

Oct 2021 – Dec 2021 **Secondee** at Numerical Algorithm Group with S. Bai in Oxford, GB

Dec 2020 – Feb 2021 **Secondee** at UiT The Arctic University of Norway, Department of Mathematics and Statistics with C. Riener in Tromsø, NO

Dec 2019 – Dec 2022 **Doctoral Researcher** at Centre Inria d'Université Côte d'Azur, Team AROMATH with E. Hubert and B. Mourrain in Sophia Antipolis, FR
Funding *Polynomial Optimization Efficiency through Moments and Algebra*
granted by European Union's Horizon 2020 research and innovation programme under the Marie Skłodowska-Curie Actions Poema [↗](#)

Oct 2018 – Sep 2019 **Student Assistant** at RWTH Aachen University, Chair II for Mathematics in Aachen, DE

Oct 2016 – Mar 2018 **Student Assistant** at RWTH Aachen University, Chair C for Mathematics in Aachen, DE

RESEARCH OUTPUT

ARTICLES IN JOURNALS

- [Met25] **On symmetry adapted bases in trigonometric optimization** in *Journal of Symbolic Computation*, Vol. 127, Art. Num. 102369, 2025 [arXiv 2310.05519](#) [hal 04236200](#)
- [HMMR24] **Optimization of trigonometric polynomials with crystallographic symmetry and spectral bounds for set avoiding graphs** with E. Hubert, P. Moustrou and C. Riener to appear in *Mathematical Programming*, 2024 [arXiv 2303.09487](#) [hal 03768067](#)
- [HMR24] **Orbit Spaces of Weyl Groups Acting on Compact Tori: A Unified and Explicit Polynomial Description** with E. Hubert and C. Riener in *SIAM Journal on Applied Algebra and Geometry*, Vol. 8, Iss. 3, pp. 612–649, 2024 [arXiv 2203.13152](#) [hal 03590007](#)
- [LMZ23] **Computing free non-commutative Gröbner Bases over \mathbb{Z} with SINGULAR:LETTERPLACE** with V. Levandovskyy and K. Abou Zeid in *Journal of Symbolic Computation*, Vol. 115, pp. 201–222, 2023 [arXiv 2111.08518](#) [hal 03085431](#)

ARTICLES IN PROCEEDINGS AND COMMUNICATIONS

- [Met23] **Symmetry Adapted Bases for Trigonometric Optimization** in *ACM Communications in Computer Algebra*, Vol. 57, Iss. 3, pp. 137–140, 2023
- [HMMR22] **T-orbit spaces of multiplicative actions and applications** with E. Hubert, P. Moustrou and C. Riener in *ACM Communications in Computer Algebra*, Vol. 56, Iss. 2, pp. 72–75, 2022
- [LMZ20] **Computation of free non-commutative Gröbner bases over \mathbb{Z} with SINGULAR:LETTERPLACE** with V. Levandovskyy and K. Abou Zeid in *Proceedings of the 45th International Symposium on Symbolic and Algebraic Computation*, Vol. 127, pp. 312–319, 2020

SOFTWARE DEVELOPMENT

- [GenCheby] **GENERALIZEDCHEBYSHEV** a Maple package for irreducible reduced root systems and the associated generalized Chebyshev polynomials [GeneralizedChebyshev](#)
- [Oscar] **OSCAR** a comprehensive Open Source Computer Algebra Research system for computations in algebra, geometry, and number theory [Oscar](#)
- [SingLet] **SINGULAR:LETTERPLACE** a Singular extension for finitely presented modules over finitely presented associative non-commutative algebras [Letterplace](#)

SKILLS

Languages	German native, English fluent, French fluent
Programming	C++, Latex, Julia, Python, Html
Mathematical Software	Gap, Singular, Maple, Oscar

SCIENTIFIC EVENTS

ORGANIZATION

- 2023/24 *Darstellungstheorie und darüber hinaus* (Representation theory and beyond) in Kaiserslautern, DE
- 2020 *POEMA ESR Day* in Amsterdam, NL

SCIENTIFIC EVENTS (CONTINUED)

TALKS AND POSTERS

- 2024 **Spectral bounds for set avoiding graphs via polynomial optimization** at *33rd European Conference on Operational Research* in Copenhagen, DK
Chebyshev Moments at *Moments and Polynomials: Applications and Theory* in Konstanz, DE
Singularités symplectiques et invariants diagonaux (Symplectic singularities and diagonal invariants) at *19ème Journées Nationales de Calcul Formel (19th JNCF)* in Marseille, FR
Spektrale Schranken für Cayley Graphen (Spectral Bounds for Cayley Graphs) at *Algorithmische und Diskrete Mathematik (Algorithmic and Discrete Mathematics)* in Chemnitz, DE
- 2023 **Symmetry in Trigonometric Optimization** at *Symmetry, stability and interactions with computations* in Marseille, FR
Fundamental invariants of improper symplectic reflection groups at *SFB-TRR 195 Annual Meeting* in Saarbrücken, DE
Symmetry Adapted Bases for Trigonometric Optimization at *48th International Symposium on Symbolic and Algebraic Computation* in Tromsø, NO
Crystallographic Symmetries in Trigonometric Optimization at *SIAM Conference on Applied Algebraic Geometry* in Eindhoven, NL
Optimisation Trigonométrique avec Symétrie (Trigonometric Optimization with Symmetry) at *18ème Journées Nationales de Calcul Formel (18th JNCF)* in Marseille, FR
- 2022 **T-Orbit Spaces of Multiplicative Actions and Applications** at *47th International Symposium on Symbolic and Algebraic Computation* in Lille, FR
Polynomial description for the T-Orbit Spaces of Multiplicative Actions at *17ème Journées Nationales de Calcul Formel (17th JNCF)* in Marseille, FR
- 2021 **Orbit Spaces for exponential Weyl Group Actions and the Chromatic Number of \mathbb{R}^n** at *POEMA Industrial Workshop* in Sophia Antipolis, FR
Regions of orthogonality of generalized Chebyshev polynomials as semi-algebraic set at *Modern Analysis Related to Root Systems with Applications* in Marseille, FR
- 2020 **Gröbner bases over \mathbb{K} and \mathbb{Z} in theory and practice** at *7th International Congress on Mathematical Software* in Braunschweig, DE
Computation of free non-commutative Gröbner Bases over \mathbb{Z} with Singular:Letterplace at *45th International Symposium on Symbolic and Algebraic Computation* in Kalamata, GR

FURTHER ATTENDANCE

- 2023 *Singularities and Algorithms* in Kaiserslautern, DE
Higher Structures in Algebra Geometry in Nordfjordeid, NO
Processes and Heat Kernels with Symmetries in Angers, FR
- 2022 *Computational Algebraic Geometry* in Kaiserslautern, DE
Topics in Real and Tropical Algebraic Geometry in Nordfjordeid, NO
4th POEMA Workshop in Tilburg, NL
- 2021 *POEMA Learning Week* in Toulouse, FR
Algebraic Combinatorics of the Symmetric Groups and Coxeter Groups in Cetraro, IT
16ème Journées Nationales de Calcul Formel (16th JNCF) in Marseille, FR
3rd POEMA Workshop in Sophia Antipolis, FR
- 2020 *15ème Journées Nationales de Calcul Formel (15th JNCF)* in Marseille, FR
1st POEMA Workshop in Florence, IT

MISCELLANEOUS EXPERIENCE

LEADERSHIP

2020 – 2022 **ESR Representative** for the POEMA network

TEACHING

2024 **Character Theory** assistant of U. Thiel at University of Kaiserslautern-Landau
2023/24 **Representation Theory** assistant of G. Malle at University of Kaiserslautern-Landau
2023 **Quadratic Number Fields** assistant of U. Thiel at University of Kaiserslautern-Landau
2019 **Mathematik II** assistant of E. Triesch at RWTH Aachen University
2018/19 **Mathematik III** assistant of Y. Guo at RWTH Aachen University
2017/18 **Mathematik III** assistant of S. Dirksen at RWTH Aachen University
2017 **Mathematik II** assistant of S. Dirksen at RWTH Aachen University
2016/17 **Mathematik I** assistant of S. Dirksen at RWTH Aachen University

CERTIFICATES

2021 **Marketing your research experience & Identifying your skills and demonstrating them by storytelling** awarded by Association Bernard Gregory
2013 **Diplôme d'Études en Langue Française (DELF)** awarded by French Ministry of Education

DISSEMINATION

2024 **Arctic MSCA Symposium** at UiT The Arctic University of Norway in Tromsø, NO
2021 **Researchers Night** at Université Côte d'Azur in Nice, FR

Tobias Metzloff, September 2024