

# Lakshmi Ramesh

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## Education

- Universität Bielefeld** - *Doctoral candidate* 2024 - 2027 (tentative)  
Supervised by Prof. Martin Wahl and Prof. Bernd Sturmfels
- RPTU Kaiserslautern** - *Master of Science* 2021 - 2024  
Mathematics with specialisation in Algebra, Geometry and Computer Algebra
- Indian Institute of Science Education and Research Mohali** - *BS-MS Dual degree* 2015 - 2020  
Major in Mathematics

## Research

- Exact volumes of semi-algebraic convex bodies (submitted)** January 2026  
Lakshmi Ramesh, Nicolas Weiss  
*arXiv* 2602.04707
- Points on rational curves and the ABCT variety** May 2025  
Daniele Agostini, Lakshmi Ramesh, Dawei Shen  
*Le Matematiche* vol. 80 (2025), 103-122
- Invariant Theory** January 2025  
Wolfram Decker, Lakshmi Ramesh, Johannes Schmidt  
Book chapter (Springer)

## Contributed talks

- Workshop Metric Algebraic Geometry: Starting Local (scheduled)** April 2026  
Max Planck Institute for Mathematics in the Sciences
- Nonlinear Algebra Seminar** February 2026  
Max Planck Institute for Mathematics in the Sciences
- KOLKOM 2025** November 2025  
Universität Bielefeld
- Oberseminar Probability Theory and Mathematical Statistics** October 2025  
Universität Bielefeld
- Cohomology Theories of Automorphic Forms** August 2025  
Mathematisches Forschungsinstitut Oberwolfach
- TRR 358 Bielefeld Graduate Seminar** July 2025  
Universität Bielefeld
- Oberseminar Applied Algebra and Discrete Mathematics** June 2025  
Universität Osnabrück
- Combinatorial Synergies East** March 2025  
Max Planck Institute for Mathematics in the Sciences
- Non-linear Algebra Seminar** June 2025  
Max Planck Institute for Mathematics in the Sciences

## Computer Algebra Projects

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### **Algorithms for Free Resolutions over the Exterior Algebra with Parallel Structures** 2023 - 2024

*Masters Thesis project supervised by Dr. Janko Boehm, RPTU Kaiserslautern*

Using the Bernstein-Gelfand-Gelfand correspondence and the Tate resolution, one can compute the cohomology numbers of a coherent sheaf over project space. This requires computing the minimal free resolution of a module over the exterior algebra. I adapted Schreyer's new syzygy algorithm to the non-commutative setting of the exterior algebra. I have implemented the algorithm in Singular, and this can be parallelised using the Singular- GPI Space interface.

### **Invariant Rings** 2023 - 2024

I use Harm Derksen's algorithm to compute fundamental invariants of linearly reductive groups and Cayley's Omega process for  $SL_n$ , and implemented invariant rings of reductive groups, as well as tori in OSCAR. This project was funded by the SFB-TRR 195 project under the supervision of Prof. Max Horn and Prof. Wolfram Decker.

### **Modules over Dedekind Domains** 2022 - 2023

I developed functionality for modules over Dedekind domains in Hecke (dependency of OSCAR), including modules with torsion, quotient modules, module homomorphisms and elemental functionality. I also implemented a corrected version of Henry Cohen's algorithm for the Smith Normal Form, giving a canonical representation to a module over a Dedekind Domain. This project was funded by the SFB-TRR 195 project under the supervision of Prof. Claus Fieker.

## Work Experience

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### **Organisation of Reading Groups** 2024- 2025

I organised two reading groups between the University of Bielefeld and the University of Osnabrück that met once a week to study "Metric Algebraic Geometry" by Paul Breiding, Kathlen Kohn, and Bernd Sturmfels, as well as "3254 and all that" by David Eisenbud and Joe Harris.

### **Research Assistant, RPTU Kaiserslautern** 2022 - 2024

This position is funded by the Deutsche Forschungsgemeinschaft (DFG, German Research Foundation) through the SFB-TRR 195 project for 'Symbolic Tools in Mathematics and their Application'. I study algorithms in computer algebra related to algebraic number theory and algebraic geometry, and implement them in 'Open Source Computer Algebra Research system', OSCAR.

### **Tutor** 2021

In this teaching role at *Tuition Wayanad Online*, I prepared course material in mathematics and physics. I taught lessons and handled tutorials for high school students from around India over video call (due to the pandemic). I gained skills in teaching and designing learning material.

## Scholarships

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### **INSPIRE Scholarship** 2015 - 2020

*Awarded by the Government of India*

The INSPIRE scholarship, awarded to the top percentile of school graduates who pursue pure sciences, is a scheme by the Ministry of Science and Technology of the Government of India.