Subrahmanya (Raju) Krishnamoorthy, Ph.D.

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Employment History

2024.07 – 2024.12 **Cryptographer,** Irreducible.

2022.10 – 2024.06 **Wissenschaftlicher Mitarbeiter,** Humboldt Universität Berlin.

2020.10 – 2022.10 **Wissenschaftlicher Mitarbeiter,** Bergische Universität Wuppertal

2018.08 – 2020.08 **Limited Term Assistant Professor** University of Georgia, Athens

2016.08 – 2018.08 **NSF Postdoctoral Fellow,** Freie Universität Berlin
Supervisor: Hélène Esnault

Education

2010 – 2016 **Ph.D., Columbia University** Mathematics.
Thesis title: *Dynamics, Graph Theory, and Barsotti-Tate Groups: Variations on a Theme of Mochizuki.* Supervisor: Johan de Jong

2005 – 2008 **B.S., MIT** Mathematics with Computer Science

Skills

Programming Python, Rust, SageMath, Circom, Halo2 (through halo2-lib).

Cryptography Experienced with zero-knowledge proofs, succinct verfiable computation, and their synthesis: zk-SNARKS.

Mathematics Expert in algebraic geometry over arithmetic fields, in particular elliptic curves and higher dimensional abelian varieties over finite fields.

Other Experience

Programming

Spring 2023 Participated in the first Axiom Open Source program. Wrote a native Rust implementation of a batch IPA prover and a halo2 "circuit" (using halo2-lib) to verify batch IPA proofs: code and detailed explanation.

2021 – 2024 Have implemented a variety of cryptographic algorithms and verifiable computation algorithms (including GKR) in Python and in Rust

Teaching

2008 – 2024 Have taught a variety of undergraduate classes (in English and German) and have run many graduate/research level seminars. More details may be found here.

2009 – 2010 Co-started a creative math class for kids through sprout (in Somerville, MA) with Shaunalynn Duffy.

Talks

2009 – 2024 Have given numerous invited seminar and conference talks on my research in Canada, China, France, Germany, the Netherlands, Poland, and the United States.

Research Publications and Preprints

Journal Articles

1. R. Krishnamoorthy and M. Sheng, "Periodicity of Hitchin's uniformizing Higgs bundles," *Int. Math. Res. Not.*, vol. 2024, no. 11, pp. 9440–9468, Mar. 2024, ISSN: 1073-7928. DOI: 10.1093/imrn/rnae042.
2. R. Krishnamoorthy, J. Yang, and K. Zuo, "Constructing abelian varieties from rank 2 Galois representations," *Compos. Math.*, vol. 160, no. 4, pp. 709–731, 2024. DOI: 10.1112/S0010437X23007728.
3. R. Krishnamoorthy, "Rank 2 local systems, Barsotti-Tate groups, and Shimura curves," *Algebra Number Theory*, vol. 16, no. 2, pp. 231–259, 2022, ISSN: 1937-0652. DOI: 10.2140/ant.2022.16.231.
4. R. Krishnamoorthy and A. Pál, "Rank 2 local systems and abelian varieties. II," *Compos. Math.*, vol. 158, no. 4, pp. 868–892, 2022, ISSN: 0010-437X. DOI: 10.1112/S0010437X22007333.
5. R. Krishnamoorthy and A. Pál, "Rank 2 local systems and abelian varieties," *Sel. Math., New Ser.*, vol. 27, no. 4, p. 40, 2021, Id/No 51, ISSN: 1022-1824. DOI: 10.1007/s00029-021-00669-8.
6. R. Krishnamoorthy, "Correspondences without a core," *Algebra Number Theory*, vol. 12, no. 5, pp. 1173–1214, 2018, ISSN: 1937-0652. DOI: 10.2140/ant.2018.12.1173.
7. R. C. Daileda, R. Krishnamoorthy, and A. Malyshev, "Maximal class numbers of CM number fields," *J. Number Theory*, vol. 130, no. 4, pp. 936–943, 2010, ISSN: 0022-314X. DOI: 10.1016/j.jnt.2009.09.013.

Preprints

1. R. Krishnamoorthy and Y. H. J. Lam, *Constructing abelian varieties from rank 3 galois representations with real trace field*, 2024. arXiv: 2403.18138 [math.AG].
2. R. Krishnamoorthy and Y. H. J. Lam, *Frobenius trace fields of cohomologically rigid local systems*, 2023. arXiv: 2308.10642 [math.AG].
3. P. Engel, R. Krishnamoorthy, and D. Litt, *The Manin-Mumford conjecture in genus 2 and rational curves on K3 surfaces*, 2022. arXiv: 2208.08729 [math.AG].
4. R. Krishnamoorthy and M. Sheng, *Periodic de Rham bundles over curves*, 2022. arXiv: 2011.03268 [math.AG].
5. R. Krishnamoorthy, J. Yang, and K. Zuo, *A Lefschetz theorem for crystalline representations*, 2021. arXiv: 2003.08906 [math.AG].
6. R. Krishnamoorthy, J. Yang, and K. Zuo, *Deformation theory of periodic Higgs-de Rham flows*, 2020. arXiv: 2005.00579 [math.AG].
7. R. Krishnamoorthy, J. Yang, and K. Zuo, *Finiteness of logarithmic crystalline representations*, 2020. arXiv: 2005.13472 [math.AG].
8. R. Krishnamoorthy, J. Yang, and K. Zuo, *Finiteness of logarithmic crystalline representations II*, 2020. arXiv: 2009.00074 [math.AG].