Himanshu Shukla

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Research Interests

Computational Arithmetic Geometry and Number Theory. I have peripheral interests in real geometry and sparse polynomials.

Education

Universität Bayreuth

- Ph.D., Degree (expected graduation: 2023).
- Advisor: Prof. Dr. Michael Stoll (funded by Deutsche Forschungsgemeinschaft (DFG)).

Max Planck Institut für Informatik

- Doctoral Researcher (Jul' 2019–Dec' 2019).
- Advisor: Prof. Dr. Markus Bläser (funded by Max Planck Gesellschaft (MPG)).

Indian Institute of Technology (IIT) Kanpur

- B.Tech.-M.S., Dual-Degree, (Aug' 2018).
- B.Tech. part: Computer Science and Engineering (GPA: 8.6/10).
- M.S. part: Mathematics (GPA: 9.7/10).

Publications and Preprints

1. **The Cassels-Tate pairing on 2-Selmer groups of odd-degree hyperelliptic curves**. (in prep.).
2. **Rank bounds on curves of the form** $y^2 = x(x^2 - p^2)(x^2 - 4p^2)$ (joint with T. Evink). (in prep.).
3. **Towards a classification of isolated** j**-invariants** (joint with A. Bourdon, S. Hashimoto, T. Keller, Z. Klagsburn, D. Lowry-Duda, T. Morrison and F. Najman). (in prep.).
4. **The Cassels-Tate pairing on 2-Selmer groups of elliptic curves** (joint with M. Stoll). (submitted). (arxiv.org/abs/2302.01640).
5. **How many zeros of a random sparse polynomial are real?** (joint with G. Jindal, A. Pandey and C. Zissopuolos). In Proceedings of the 45th International Symposium on Symbolic and Algebraic Computation (ISSAC), 2020, ACM (New York), 273–280. (arxiv.org/abs/1911.02540).
6. **On definable functions of Atomless Boolean Algebras** (joint with A. Kuber). (in prep.).
7. **Definable combinatorics with dense linear orders** (joint with A. Kuber and A. Jain). Archive for Mathematical Logic 59 (2020), no. 5-6, Springer Verlag, 679–701. (arxiv.org/abs/1807.06097).

[1] Updated August 14, 2023

8. **On Resource-bounded versions of the van Lambalgen's theorem** (joint with D. Chakraborty and S. Nandakumar). In Gopal, T., Jäger , G., Steila, S. (eds) Theory and Applications of Models of Computation. TAMC 2017. Lecture Notes in Computer Science(), 10185 Springer, Cham, 129–143. (arxiv.org/abs/1704.01101).

Talks

1. *Cassels-Tate pairing on the curves of the form* $y^2 = x(x^2 - p^2)(x^2 - 4p^2)$. Universität Bielefeld, Early Number Theory Researchers (ENTR) Workshop, 2023.
2. *Cassels-Tate pairing on the curves of the form* $y^2 = x(x^2 - p^2)(x^2 - 4p^2)$. Universität Bayreuth, Oberseminar Arithmetische Geometrie, 2023.
3. *Computing Cassels-Tate pairing on superelliptic curves.* CISPA, St. Ingbert, Crypto Seminar, 2023.
4. *Computing Cassels-Tate pairing on the curves of the form* $y^2 = x^l + A$. Rijksuniversiteit Groningen, Algebra Seminar, 2022.
5. *Computing Cassels-Tate pairing on odd-degree hyperelliptic curves.* Schney, Rational Points, 2022.
6. *Cassels-Tate pairing on odd-degree hyperelliptic curves.* Universität Bayreuth, Oberseminar Arithmetische Geometrie, 2021.
7. *Playing dodgeball with Normality.* Universität Bayreuth, Oberseminar Arithmetische Geometrie, 2021.
8. *Computing Cassels-Tate pairing on 2-Selmer groups of elliptic curves.* Universität Bayreuth, Oberseminar Arithmetische Geometrie, 2020.
9. *Introduction to Heegner points I and II.* Universität Bayreuth, Oberseminar Arithmetische Geometrie, 2020.
10. *On expected number of zeros of random sparse polynomial.* Saarbrücken, Graduate School Seminar, MPI-Inf., 2019.
11. *On Grothendieck rings of some partial orders.* IIT Kanpur, Math-Stat Seminar, 2018.
12. *On resource bounded versions of van Lambalgen's theorem.* Universität Bern, 14th Annual conference on Theory and Models of Computation, 2017.

Teaching Experience

- Teaching Assistant, *Einführung in die Theorie die Modulformen und Modulkurven* (Winter Semester 2021-22), Universität Bayreuth.
- Teaching Assistant, *Introduction to Complexity theory* (Winter Semester 2019-20), Universität Saarland.
- Teaching Assistant, *Abstract algebra* (Winter Semester 2017-18), IIT Kanpur.

Organization

- Co-organizer of *Oberseminar Arithmetische Geometrie*, with Pip Goodman. Seminar website.

Workshops and summer schools

- *Summer school on arithmetic statistics.* Luminy, France, CIRM, 2023.
- *COmputations and their Uses in Number Theory (COUNT).* Luminy, France, CIRM, 2023.
- *Summer school on automorphic forms.* Budapest, Alfred Rényi Institute of Mathematics, 2022.
- *Summer school on elliptic curves.* Wales, Baskerville Hall, Hay on Wye, 2022.
- *Summer school on number theory as informed by computation.* Park City, Utah, PCMI, 2022.
- *Branching in number theory–p-adics in sciences (online).* Leipzig, MPI-MiS, 2021.
- *Elliptic curves and L-functions (online).* Bangalore, ICTS, 2021.
- *Theoretical and computational aspects of elliptic curves.* Bangalore, ICTS, 2017.

Awards and recognition

- Bhagwandas Sanghi Gold Medal for being the best dual-degree student in the Department of Mathematics and Statistics, IIT Kanpur (2018).
- Yogendra Nath and Sushma Gupta Scholarship for academic performance in Computer Science and Engineering department (2016).
- Academic Excellence Award by IIT Kanpur for achieving 10.0/10.0 GPA in first two semesters at IIT Kanpur (2014).
- All India Rank of 659 (99.95 percentile) in IIT-JEE (Advanced) (2013).
- Among top 1% nationwide in NSEC (National Standard Examination in Chemistry) and NSEA (National Standard Examination in Astronomy) and top 1% statewide in NSEP (National Standard Examination in Physics) (2012).