Krishna Hanumanthu

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Personal Information

Date of birth: March 23, 1981
Nationality: Indian

Education

- Ph.D in Mathematics, University of Missouri, Columbia, USA - May 2008.
  Advisor: Dale Cutkosky.
  Thesis: Toroidalization of locally toroidal morphisms.
- M.Sc in Mathematics, Chennai Mathematical Institute, Chennai, India - 2003.
- B.Sc in Mathematical Sciences, Chennai Mathematical Institute, Chennai, India - 2001.

Employment

- July, 2023 – , Professor, Chennai Mathematical Institute, Chennai, India.
- November, 2016 – June, 2023, Associate Professor, Chennai Mathematical Institute, Chennai, India.
- July, 2011 – October, 2016, Assistant Professor, Chennai Mathematical Institute, Chennai, India.
- August – December, 2015, Visiting Professor, University of Nebraska, Lincoln, USA.
- 2008 – 2011, Visiting Assistant Professor, University of Kansas, Lawrence, USA.
- 2004 – 2008, Graduate Teaching Assistant, University of Missouri, Columbia, USA.

Research Interests

Algebraic Geometry and Commutative Algebra.

Publications and Preprints

1. *Seshadri constants of curve configurations on surfaces*, preprint, arXiv:2309.16981 (with Praveen Kumar Roy and Aditya Subramaniam).
2. *Seshadri constants on some flag bundles*, preprint, arXiv:2303.16477 (with Jagadish Pine).

3. *Some results on Seshadri constants of vector bundles*, to appear in Forum Mathematicum (with Indranil Biswas and Snehajit Misra).

4. *Seshadri constants of parabolic vector bundles*, to appear in Documenta Mathematica (with Indranil Biswas, Snehajit Misra and Nabanita Ray).

5. *On the Seshadri constants of equivariant bundles over Bott-Samelson varieties and wonderful compactifications*, to appear in Manuscripta Math. (with Indranil Biswas and S. Senthamarai Kannan).

6. *Seshadri constants on Bott towers*, J. Algebra 601 (2022), 178–197 (with Indranil Biswas, Jyoti Dasgupta, and Bivas Khan).

7. *Seshadri constants on some Quot schemes*, Forum Math. 33 (2021), no. 6, 1591–1603 (with Chandranandan Gangopadhyay and Ronnie Sebastian).

8. *Real and complex supersolvable line arrangements in the projective plane*, Journal of Algebraic Combinatorics 54 (2021), 767–785 (with Brian Harbourne).

9. *Bounded negativity and Harbourne constants on ruled surfaces*, Manuscripta Math. 164, 431–454 (2021) (with Aditya Subramaniam).

10. *Weyl and Zariski chambers on projective surfaces*, Forum Math. 32 (2020), no. 4, 1027-1037 (with Nabanita Ray).

11. *Positivity of vector bundles on homogeneous varieties*, International Journal of Mathematics, Vol. 31, No. 12, 2050097 (2020), (with Indranil Biswas and D. S. Nagaraj).

12. *Rationality of Seshadri constants on general blow ups of $\mathbb{P}^2$*, J. Pure Appl. Algebra 224 (2020), no. 8, 106345 (with Łucja Farnik, Jack Huizenga, David Schmitz, and Tomasz Szemberg).

13. *Seshadri constants and Grassmann bundles over curves*, Annales de l'Institut Fourier, 70(4):1477–1496, 2020 (with Indranil Biswas, D. S. Nagaraj, and Peter E. Newstead).

14. *Negative curves on special rational surfaces*, Analytic and Algebraic Geometry 3, 83-94, Łódź University Press, Łódź, 2019 (with Marcin Dumnicki, Łucja Farnik, Grzegorz Malara, Tomasz Szemberg, Justyna Szpond, and Halszka Tutaj-Gasińska).

15. *Seshadri constants on hyperelliptic surfaces*, Proc. Amer. Math. Soc. 146 (2018), no. 10, 4175-4187 (with Praveen Kumar Roy).

16. *Single point Seshadri constants on rational surfaces*, J. Algebra 499 (2018), 37-42 (with Brian Harbourne).

17. *Multi-point Seshadri constants on ruled surfaces*, Proc. Amer. Math. Soc. 145 (2017), no. 12, 5145-5155 (with Alapan Mukhopadhyay).

18. *Positivity of line bundles on special blow ups of $\mathbb{P}^2$*, J. Pure Appl. Algebra 221 (2017), no. 9, 2372-2382.

19. *Seshadri constants on surfaces with Picard number 1*, Manuscripta Math. 153 (2017), no. 3-4, 535-543.

20. *Positivity of line bundles on general blow ups of $\mathbb{P}^2$*, J. Algebra 461 (2016), 65-86.

21. *Syzygies of some GIT quotients*, J. Ramanujan Math. Soc. 31 (2016), no. 4, 419-430 (with S. Senthamarai Kannan).

22. *Syzygies of surfaces of general type*, Geom. Dedicata 167 (2013), 123-149 (with P. Bangere).

23. *Bounding the first Hilbert coefficient*, Proc. Amer. Math. Soc. 140 (2012), no. 1, 109-117 (with C. Huneke).

24. *Some Koszul Rings from Geometry*, J. Algebra, 323 (2010), no. 2, 526-539.

25. *Toroidalization of locally toroidal morphisms from N-folds to surfaces*, J. Pure Appl. Algebra, 213 (2009), no. 3, 349-359.

Students

1. Cyril J Jacob (current Ph.D).
2. Saketh Heramb Narayanan (Masters, 2023).
3. Pratik Roy (Masters, 2023).
4. Mukta Vikas Bendke (Masters, 2023).
5. Aditya N. K. Subramaniam (Ph.D, 2021)
6. Anant Singh (Masters, 2020)
7. Madhuparna Pal (Masters, 2020)
8. Abhijit A. J. (Masters, 2019)
9. Praveen Kumar Roy (Ph.D, 2019).
10. Alapan Mukhopadhyay (Masters, 2017).

Post-doctoral Fellows mentored

1. Bivas Khan
2. Suhas B N
3. Amit Kumar Singh
4. Snehajit Misra
5. Nabanita Ray
6. Rupam Karmakar
7. Suratno Basu
8. Krishanu Dan

Organization

1. Advanced Instructional School on Birational Geometry (NCM programme), May 22 – June 03, 2023, Chennai Mathematical Institute.
2. Instructional School for Teachers in Algebra (NCM programme), December 5-17, 2022, Chennai Mathematical Institute.
3. Annual Foundational School – I (NCM programme), May 30 – June 25 , 2022, Pondicherry University, Pondicherry.
4. ATM workshop on Seshadri constants (NCM programme), December 16-21, 2019, NISER Bhubaneswar.
5. Mini-Workshop on Seshadri constants, November 10-16, 2019, MFO Oberwolfach, Germany.

6. Workshop on Seshadri Constants, January 30 - February 10, 2017, Chennai Mathematical Institute, Chennai.

Invited Talks

1. Gave a talk on "Bounded negativity and Harbourne constants" in Bundles 2023 conference, TIFR Mumbai, March 28, 2023.

2. Gave a talk on "Some results on Seshadri constants" in Vector Bundles in Chennai conference, IIT Madras, February 6, 2023.

3. Gave a talk on "Rationality of Seshadri constants" in Algebraic Geometry Symposium, 27th Annual Ramanujan Mathematical Society Conference, Shiv Nadar University, Chennai, December 7, 2022.

4. Gave a talk on "Seshadri constants" at Conference on Algebraic Geometry and Commutative Algebra at SRM University, Amaravati, Andhra Pradesh, July 18-21, 2022.

5. Gave a talk on "Seshadri constants" at Tata Institute of Fundamental Research, Mumbai on March 29, 2022.

6. Gave a talk on "Nagata Conjecture" at Ramanujan Institute for Advanced Study in Mathematics, University of Madras on March 23, 2022.

7. Gave a talk on "Seshadri constants" at IIT Bombay Virtual Commutative Algebra Seminar on Oct 8, 2021 (online).

8. Gave a talk on "Some results on Seshadri constants" at TIFR Algebraic Geometry Seminar on Sep 9, 2021 (online).

9. Gave a virtual talk on "Seshadri constants" at SRM University, Amaravati on July 30, 2021 (online).

10. Gave a virtual talk on "Introduction to the Nagata Conjecture on plane curves" at IIT Palakkad on Jul 26, 2021 (online).

11. Gave a talk on "Rationality questions on Seshadri constants" at Zoom Algebraic Geometry (ZAG) seminar on June 22, 2021 (online).

12. Lectured on "Bounded negativity and Harbourne constants" in Indo-Japan Web Workshop on Vector Bundles and Related Topics, February 24, 2021 (online).

13. Lectured on "Some results on Seshadri constants" in Algebra and Number Theory Seminar, University of Maryland, September 21, 2020 (online).

14. Lectured on "Seshadri constants and rationality questions" in Algebraic Geometry Seminar, IIT Bombay, June 22, 2020 (online).

15. Lectured on "Rationality of Seshadri constants" at a workshop on "Seshadri constants", Mathematisches Forschungsinstitut Oberwolfach (MFO), Germany, November 10-16, 2019.

16. Lectured on "Bounded negativity problem" at at Commutative Algebra and Algebraic Geometry (CAAG 2019) conference, IISER Bhopal, July 2019.

17. Lectured on "Seshadri constants on rational surfaces" at a conference on Complex Geometry at Kerala School of Mathematics (KSOM) in Kozhikode, March 18-22, 2019.

18. Lectured on "Some results on Seshadri constants" at Pedagogical University of Cracow, Poland, October 10, 2018.

19. Lectured on "Rationality of Seshadri constants on rational surfaces" at a workshop on "Asymptotic Invariants of Homogeneous Ideals", Mathematisches Forschungsinstitut Oberwolfach (MFO), Germany, September 30 - October 6, 2018.

20. Gave 3 lectures on "Nagata conjecture and Seshadri constants" at IIT-Madras, August 21, 28, September 4, 2018.

21. Lectured on "Some results on Seshadri constants" at "Nagarajfest", a conference in honor of Professor D.S. Nagaraj's 60th birthday, IMSc, Jul 10-12, 2018.

22. Lectured on "Seshadri constants on projective varieties" at Analytic and Algebraic Geometry conference, International Center for Theoretical Sciences, Bangalore, Mar 19-24, 2018.

23. Seshadri constants and SHGH Conjecture, at Algebraic Geometry and Number Theory conference, ISI Bangalore, December, 2017.

24. Seshadri constants, at Commutative Algebra and Algebraic Geometry (CAAG 2016) conference, IISER Pune, December, 2017.

25. Positivity of line bundles on general blow ups of $\mathbb{P}^2$, at Commutative Algebra and Algebraic Geometry (CAAG 2016) conference, IISER Mohali, October 2016.

26. Positivity of line bundles on general blow ups of $\mathbb{P}^2$, University of Kansas, Lawrence, November, 2015.

27. Positivity of line bundles on general blow ups of $\mathbb{P}^2$, University of Missouri, Columbia, October, 2015.

28. Syzygies on GIT Quotients, at University of Nebraska, Lincoln, September, 2015.

29. Bounding Hilbert Coefficients, at the Annual Meeting of Ramanujan Mathematical Society, Shiv Nadar University, New Delhi, October, 2013.

30. Syzygies and geometry, at Commutative Algebra and Algebraic Geometry (CAAG 2012) conference, Pondicherry University, March 2012.

31. Syzygies and geometry, at Indian Statistical Institute, Bangalore, October, 2011.

32. Syzygies and geometry, at IIT Madras, October 2012.

33. Bounding Hilbert Coefficients, at University of Missouri, Columbia, April 2011.

34. Geometry and syzygies of line bundles on algebraic surface, at Chennai Mathematical Institute, Chennai, India, July 2010.

35. Geometry and syzygies of line bundles on algebraic surface, at Show-Me algebraic geometry symposium, University of Missouri, St Louis, May 2010.

36. Koszul rings in geometry, at University of Nebraska, Lincoln, April 2010.

37. Koszul rings in geometry, at University of Missouri, Columbia, October 2009.

38. Toroidalization of Locally Toroidal Morphisms, at Eighth Colloquiumfest, CUNY Graduate Center, New York, March 2009.

39. Toroidalization Conjecture, at Chennai Mathematical Institute, Chennai, India, January 2009.

40. Toroidalization of Locally Toroidal Morphisms, at KUMUNU 2008, Lincoln, Nebraska, September 2008.

41. Toroidalization of Locally Toroidal Morphisms, at the AMS Spring Central Section Meeting, Bloomington, Indiana, April 2008.

Workshops and programmes where I lectured

1. Lectures on Linear Algebra at Mathematics Training and Talent Search (MTTS) Overture programme, October 6-7, 2023, Ramakrishna Mission Vivekananda College, Chennai.

2. Lectured on Structure Theorem for Finitely Generated Modules over Euclidean Domains at Mathematics Training and Talent Search (MTTS) programme, June 2023, IIT Madras.

3. Lectured on Straight Lines, Conic Sections and 3-Dimensional Geometry at Workshop on Mathematics for Teachers of 11th and 12th standards, Delhi Public Schools on May 29, 2023 at Human Resource Development Centre, Delhi Public School, Greater Noida.

4. Lectured on Curves and Surfaces at Advanced Instructional School on Birational Geometry (NCM programme), May 22 – June 03, 2023, Chennai Mathematical Institute.

5. Lectured on Linear Algebra (online) at Vellore Institute of Technology, April 12, 2023.

6. Lectured at Instructional School for Teachers in Algebra (NCM programme), December 5-17, 2022, Chennai Mathematical Institute.

7. Lectured on Algebra and Topology at Annual Foundational School – I (NCM programme), May 30 – June 25 , 2022, Pondicherry University, Pondicherry.

8. Lectured in UGC Refresher Course on linear algebra, University of Hyderabad, September, 2022 (online)

9. Lectured in UGC Refresher Course on Galois theory, Pondicherry University, July 11, 2022 (online)

10. Gave two virtual talks on "Basics of algebraic geometry" during the workshop on Geometric Complexity Theory at CMI on Aug 27 and Sep 7, 2021 (online).

11. Gave a course on group theory during Mathematics Training and Talent Search (MTTS) programme, June 2021 (online).

12. Lectured on "Seshadri constants" at the NCM workshop on Seshadri constants, NISER Bhubaneswar, December 2019.

13. Lectured in the NCM workshop "Commutative algebra and algebraic geometry in positive characteristics" at IIT-Bombay, Dec 10-22, 2018.

14. Lectured on group theory at UGC Refresher Course in Mathematics at Bharathidasan University, Trichy, Jul 25-26, 2018.

15. Lectured on algebra at AFS-III, at Kerala School of Mathematics, Kozhikode, July 16-21, 2018.

16. Lectured on algebra at AFS-2 workshop, Kerala School of Mathematics, Kozhikode, May 2017.

17. Lectured in Instructional School for Teachers in Commutative Algebra, at St Joseph's College, Irinjalakuda, Kerala, May 2017.

18. Lectured in Workshop on Seshadri Constants, Chennai Mathematical Institute, Chennai, January 30 - February 10, 2017.

19. Lectured on sheaves and cohomology at Local Cohomology workshop at St Joseph's College, Irinjalakuda, Kerala, June 2016.

20. Lectured on linear algebra at MTTS, IIT Madras, May 2016.

21. Lectured on linear series in algebraic geometry at Geometry Seminar for Research Students, Indian Statistical Institute, Bangalore, February 2015.

22. Lectured on Schemes and Cohomology at AIS, Kerala School of Mathematics, Kozhikode, December 2014.

23. Lectured on algebra at AFS-1 workshop, IIT Madras, December 2014.

24. Lectured on differential topology at AFS-2 workshop, Kerala School of Mathematics, Kozhikode, May 2014.

25. Lectured on algebra at AFS-1 workshop, CMI, December 2012.

26. Lectured on algebraic geometry at AIS workshop on Syzygies and Free Resolutions, CMI, December 2012.

27. Lectured on combinatorial commutative algebra at AIS workshop on Commutative Algebra, IIT Madras, May 2012.

28. Lectured on local cohomology at ATM Workshop in Commutative Algebra, IIT Bombay, July 2011.

Awards and Grants

- Simons Visiting Professorship, Uniwersytet Pedagogiczny, Krakow, Poland, October, 2018.
- DST SERB MATRICS grant MTR/2017/000243, 2018-2021.
- G Baley Price Award for Outstanding Teaching of Graduate Mathematics, University of Kansas, 2011.
- Distinguished Teaching Award, University of Missouri, 2008

Teaching

- **Chennai Mathematical Institue, 2011-**:
  Algebra I (Linear algebra and group theory)
  Topology
  Analysis I
  Commutative Algebra
  Algebra IV (Fields and Galois theory)
  Algebra II (Group theory)
  Introduction to Algebraic Geometry
  Introduction to Algebraic Groups
  Introduction to Algebraic Curves.
  Algebra 3 (Rings, fields, introduction to commutative algebra).
  Complex Algebraic Surfaces I and II.
  Graduate Analysis I.

Algebraic Geometry II.

- **NPTEL (National Programme on Technology Enhanced Learning)**:
  Introduction to Abstract Group Theory.
  Introduction To Rings And Fields.
  Introduction to Galois Theory.

- **University Nebraska, August-December 2015**:
  Math 208 - Calculus 3
  Math 314 - Linear Algebra.

- **University of Kansas, 2008-2011**:
  Math 116 - Calculus 2
  Math 290 - Linear Algebra
  Math 526 - Applied Statistics
  Math 790 - Advanced Linear Algebra.

- **University of Missouri, 2004-2008**:
  Math 1100 - College Algebra
  Math 1500 - Calculus 1
  Math 1700 - Calculus 2
  Math 4100 - Differential Equations
  Math 4720 - Abstract Algebra.