Manoj Kummini

Curriculum Vitæ

Chennai Mathematical Institute
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Education

- Ph. D., University of Kansas, Lawrence, KS. Advisor: C. Huneke. Aug 2008. Dissertation: *Homological Invariants of Monomial and Binomial Ideals*.
- M. A. (Mathematics), University of Kansas, Lawrence, KS. Aug 2005.
- M. E. (Telecommunication Engineering), Indian Institute of Science, Bangalore, India. Jan 2002.
- B. Tech. (Electronics and Communication Engineering), University of Calicut, India. Mar 1999.

Employment

- Professor, Chennai Mathematical Institute. Jan 2023 —
- Associate Dean, Chennai Mathematical Institute. May 2021 —
- Associate Professor, Chennai Mathematical Institute. Jul 2014 – Dec 2022.
- Post-doctoral Fellow, Mathematical Sciences Research Institute, Berkeley, CA, USA. Aug – Dec 2012.
- Assistant Professor, Chennai Mathematical Institute. Jun 2011 — Jun 2014.
- Research Assistant Professor, Purdue University, West Lafayette, IN, USA. Aug 2008 — May 2011.
- Graduate Teaching Assistant, University of Kansas, Lawrence, KS, USA. Aug 2003 – Aug 2008.
- Texas Instruments India, Bangalore, Karnataka, India. Senior Design Engineer, Jan – Jul 2003. Design Engineer, Feb 2002 – Jan 2003.
- Sasken Communication Technologies, Bangalore, Karnataka, India. Software Engineer, Apr 1999 – Jul 2000.

Publications

[1] Nirmal Kotal and Manoj Kummini. The non-F-rational locus of rees algebras, 2023. arXiv:2311.07074 [math.AC].
[2] Nirmal Kotal and Manoj Kummini. Blow-up rings and F-rationality, 2023. arXiv:2305.12383 [math.AC].
[3] Manoj Kummini and Mandira Mondal. On polynomial invariant rings in modular invariant theory, 2022. arXiv:2210.05945 [math.AC].
[4] Manoj Kummini and Dharm Veer. The Charney-Davis conjecture for simple thin polyominoes, 2022. arXiv:2203.03487 [math.AC].
[5] Manoj Kummini and Dharm Veer. The h-polynomial and the rook polynomial of some polyominoes, 2021. arXiv:2110.14905 [math.AC].
[6] Manoj Kummini and Mandira Mondal. On Hilbert ideals for a class of p-groups in characteristic p. *Proc. Amer. Math. Soc.*, 150(1):145–151, 2022. arXiv:2105.10527 [math.AC].
[7] Sabine El Khoury, Manoj Kummini, and Hema Srinivasan. An upper bound for the first Hilbert coefficient of Gorenstein algebras and modules. 773:195–206, 2021. arXiv:2012.13517 [math.AC].
[8] Mitra Koley and Manoj Kummini. F-rationality of Rees algebras. *J. Algebra*, 571:151–167, 2021. arXiv:1803.05382 [math.AC].
[9] Giulio Caviglia, Huy Tài Hà, Jürgen Herzog, Manoj Kummini, Naoki Terai, and Ngo Viet Trung. Depth and regularity modulo a principal ideal. *J. Algebraic Combin.*, 49(1):1–20, 2019. arXiv:1706.09675 [math.AC].
[10] Manoj Kummini and Shreedevi K. Masuti. On conjectures of Itoh and of Lipman on the cohomology of normalized blow-ups. *J. Commut. Algebra*, 13(4):505–522, 2021. arXiv:1507.03343 [math.AC].

[11] Manoj Kummini, Venkatramani Lakshmibai, Pramathanath Sastry, and Conjeerveram S. Seshadri. Free resolutions of some Schubert singularities. *Pacific J. Math.*, 279(1-2):299–328, 2015. arXiv:1504.04415v1 [math.AG].
[12] Manoj Kummini and Steven V Sam. The cone of Betti tables over a rational normal curve. In Eisenbud, Iyengar, Singh, Stafford, and Van den Bergh, editors, *Commutative Algebra and Noncommutative Algebraic Geometry*. Math. Sci. Res. Inst. Publ., Cambridge University Press, 2013. arXiv:1301.7005 [math.AC].
[13] Giulio Caviglia and Manoj Kummini. Betti tables of p-Borel-fixed ideals. *J. Algebraic Combin.*, 39(3):711–718, 2014. arXiv:1212.2201 [math.AC].
[14] Sabine El Khoury, Manoj Kummini, and Hema Srinivasan. Bounds for the multiplicity of Gorenstein algebras. *Proc. Amer. Math. Soc.*, 143(1):121–128, 2015. arXiv:1211.1316 [math.AC].
[15] Christine Berkesch, Daniel Erman, and Manoj Kummini. Three flavors of extremal Betti tables. In *Commutative algebra*, pages 99–121. Springer, New York, 2013. arXiv:1207.5707 [math.AC].
[16] Giulio Caviglia and Manoj Kummini. Poset embeddings of Hilbert functions and Betti numbers. *J. Algebra*, 410:244–257, 2014. arXiv:1210.5562 [math.AC].
[17] Christine Berkesch, Daniel Erman, Manoj Kummini, and Steven V Sam. Shapes of free resolutions over a local ring. *Math. Ann.*, 354(3):939–954, 2012. arXiv:1105.2244 [math.AC].
[18] Christine Berkesch, Daniel Erman, Manoj Kummini, and Steven Sam. Tensor complexes: multilinear free resolutions constructed from higher tensors. *J. Eur. Math. Soc. (JEMS)*, 15(6):2257–2295, 2013. arXiv:1011.4604 [math.AC].
[19] Christine Berkesch, Daniel Erman, Manoj Kummini, and Steven Sam. Poset structures in Boij-Söderberg theory. *Int. Math. Res. Not. IMRN*, (22):5132–5160, 2012. arXiv:1010.2663 [math.AC].
[20] Kia Dalili and Manoj Kummini. Dependence of Betti Numbers on Characteristic. *Comm. Algebra*, 42(2):563–570, 2014. arXiv:1009.4243 [math.AC].
[21] Giulio Caviglia and Manoj Kummini. Poset embeddings of Hilbert functions. *Math. Z.*, 274(3-4):805–819, 2013. arXiv:1009.4488 [math.AC].
[22] Manoj Kummini and Satoshi Murai. Regularity of canonical and deficiency modules for monomial ideals. *Pacific J. Math.*, 249(2):377–383, 2011. arXiv:1006.1444 [math.AC].
[23] Manu Basavaraju, L. Sunil Chandran, and Manoj Kummini. d-regular graphs of acyclic chromatic index at least $d + 2$. *J. Graph Theory*, 63(3):226–230, 2010. arXiv:0804.4681 [math.CO].
[24] Manoj Kummini. Regularity, depth and arithmetic rank of bipartite edge ideals. *J. Algebraic Combin.*, 30(4):429–445, 2009. arXiv:0902.0437 [math.AC].
[25] Giulio Caviglia and Manoj Kummini. Some ideals with large projective dimension. *Proc. Amer. Math. Soc.*, 136(2):505–509 (electronic), 2008. arXiv:math/0604436 [math.AC].
[26] Manoj Kummini. Alexander duality and Serre's property (S_i) for square-free monomial ideals, 2007. preprint.
[27] Manoj Kummini. Multiplicity bounds for quadratic monomial ideals, 2007. arXiv:0707.1311v2 [math.AC].
[28] Manoj Kummini and Ganesan Thiagarajan. The effect of sampling jitter in OFDM systems. In *Proc. IEEE Intern. Conf. Commun.*, pages 2061–2065, 2003.
[29] Manoj Kummini and B. Sundar Rajan. Full Rank Distance Codes and Optimal STBC for BPSK Modulation. In *Proc. IEEE Intern. Symp. on Inform. Theory*, page 276, 2002.

Research Talks

- *Polynomial invariant rings in modular invariant theory*, 19th Seminar on Commutative Algebra and Related Topics, IPM, Teheran, Iran. Jan 2024.
- *F-rationality of Rees algebras*, ICTP, Trieste, Italy. May 2023.
- *Charney-Davis conjecture for simple thin polyominoes*, Conference on Commutative Algebra and Algebraic Geometry, IIT Hyderabad, Telengana. February 2023.
- *Polynomial invariant rings in modular invariant theory*, SRM University AP, Amaravathi, Andhra Pradesh. July 2022.
- *Invariants of finite p-groups in characteristic p*, online talk at Hansraj College, Delhi. December 2021.
- *Invariants of finite p-groups in characteristic p*, online talk at IIT Hyderabad, Telengana. September 2021.

- *Prime-characteristic commutative algebra*, online talk at IISER Thiruvananthapuram, Kerala. March 2021.
- *Polynomial invariant rings*, Online Topological Groups Seminar, University of Hawaii, USA. March 2021.
- *Solving polynomial equations*, Colloquium, IIT Dharwad, Karnataka. October 2019.
- *Dependence of free resolutions of monomial ideals on the characteristic*, St. Berchmans College, Changanassery, Kerala. January 2019.
- IIT-Bombay, Maharashtra, June 2018.
- *Boij-Söderberg theory*, IIT Gandhinagar, Gujarat. April 2018.
- *Solving polynomial equations*, Colloquium, IISER Pune, Maharashtra. April 2018.
- *Castelnuovo-Mumford regularity*, Seminar, IIT Madras, Chennai, Tamilnadu. April 2018.
- *Solving polynomial equations*, Colloquium, Ramanujan Institute of Advanced Study in Mathematics, Madras University, Chennai, Tamilnadu. March 2018
- *F-rationality of Rees algebras*, Algebraic Geometry Seminar, Purdue University, West Lafayette, USA. March 2018
- *Singularities of conormal varieties*, Commutative Algebra Seminar, Purdue University, West Lafayette, USA. March 2018
- *F-rationality of Rees algebras*, Algebraic Geometry and Number Theory conference, Indian Statistical Institute, Bengaluru, Karnataka. Deceber 2017
- *F-rationality of Rees algebras*, National Conference on Commutative Algebra and Algebraic Geometry CAAG-2017, IISER Pune, Maharashtra. December 2017.
- *On the cohomology of normalized blow-ups*, University of Michigan, Ann Arbor, USA, July 2016.
- *Cohomology of normalized blow-ups*, Northeastern University, Boston, MA, USA. June 2016
- *On the cohomology of normalized blow-ups*, Indo-French Mathematics Meeting, Institute of Mathematical Sciences, Chennai, Tamilnadu. January 2016.
- *Generic initial ideals and their resolutions*, Tribhuvan University, Kathmandu, Nepal. April 2015.
- *A geometric technique of constructing interesting complexes*, Colloquium, Indian Statistical Institute, Bangalore, Karnataka. February 2015.
- *Free resolutions of some determinantal-line varieties*, CAAG 2015 Conference, IIT-Guwahati, Guwahati, Assam. February 2015.
- *Betti tables of p-Borel-fixed ideals*, Indian Statistical Institute, Kolkata, West Bengal. February 2015.
- *Betti tables of p-Borel-fixed ideals*, International Conference on Algebra and its Applications, Aligarh Muslim University, Aligarh, Uttar Pradesh. December 2014.
- *Free resolutions of some determinantal-line varieties*, University of Nebraska, Lincoln, NE. April 2014.
- *The cone of Betti tables over a rational normal curve*, Vietnam Institute for Advanced Study in Mathematics, Hanoi, Vietnam. December 2013.
- *From linear algebra to robotic arm design via Groebner bases*, Institute of Mathematical Sciences, Chennai. July 2013.
- *Hyperplane restriction theorems*, University of California, Berkeley, CA. November 2012
- *Poset embeddings of Hilbert functions*, City University of New York, New York, NY. October 2012.
- *Local Boij-Söderberg theory*, Northeastern University, Boston, MA. October 2012.
- *Hilbert functions and Betti numbers*, University of Missouri, Columbia, MO. September 2012.
- *Multilinear free resolutions from higher tensors*, Washington University, St. Louis, MO. September 2012.
- *Boij-Söderberg theory*, CAAG 2012 Conference, Pondicherry University, Puducheri. March 2012.

- *Vector bundles on projective spaces and modules over polynomial rings*, Colloquium, Indian Institute of Technology, Mumbai, Maharashtra. November 2011.
- *Boij–Söderberg Theory*, Indian Institute of Technology, Mumbai, Maharashtra. November 2011.
- *From linear algebra to robotic arm design: an expository talk on Gröbner bases*, Engineering College, Sreekrishnapuram, Kerala. September 2011.
- *Multilinear free resolutions from higher tensors*, AMS Spring Central Section meeting, Iowa City, IA. March 2011.
- *Multilinear free resolutions from higher tensors*, University of Illinois, Urbana, IL. March 2011.
- *On a conjecture of Lyubeznik on etale cohomological dimension*, University of Nebraska, Lincoln, NE. January 2011.
- *Bounds for arithmetic rank*, Joint Mathematics Meetings, New Orleans, LA. January 2011.
- *Poset structures in Boij–Söderberg theory: II - Supernatural sheaves*, AMS Fall Central Section meeting, South Bend, IN. November 2010.
- *Dependence of Betti numbers on characteristic*, University of Kentucky, Lexington, KY. October 2010.
- *Bounds for arithmetic rank of monomial ideals*, University of Notre Dame, South Bend, IN. October 2010.
- *Poset structures in Boij–Söderberg theory and homomorphisms of Cohen–Macaulay modules*, University of Missouri, Columbia, MO. September 2010.
- *Degree sequences and homomorphisms of Cohen–Macaulay modules*, University of Illinois, Urbana, IL. September 2010.
- *Poset Embeddings of Hilbert Functions*, Universitá degli Studi di Genova, Genova, Italy. June 2010.
- *Poset Embeddings of Hilbert Functions*, University of California, Berkeley, CA. May 2010
- *Poset Embeddings of Hilbert Functions*, AMS Spring Western Section meeting, Albuquerque, NM. April 2010.
- *Regularity of Ext Modules*, algebra seminar, Texas Tech University, Lubbock, TX. April 2010.
- *Arithmetic Rank of Ideals*, colloquium, Texas Tech University, Lubbock, TX. April 2010.
- *Regularity of Canonical and Deficiency modules for Monomial Ideals*, AMS Spring Southeastern Sectional meeting, Lexington, KY. March 2010.
- *Arithmetic Rank of Monomial Ideals*, AMS Fall Central Sectional meeting, Waco, TX. October 2009.
- *Arithmetic Rank of Monomial Ideals*. Purdue-UIUC Algebra, Geometry, Combinatorics Day, UIUC, Urbana, IL. September 2009.
- *Solving Polynomial Equations Using Gröbner Bases*, Undergraduate colloquium, Fairfield University, Fairfield, CT. November 2008.
- *Homological invariants of bipartite edge ideals*, commutative algebra seminar, City University of New York, New York, NY. November 2008.
- *Free resolutions of quadratic monomial ideals*, commutative algebra seminar, University of Nebraska, Lincoln, NE. March 2008.
- *Multiplicity Bounds for Quadratic Monomial Ideals*, Joint Mathematics Meetings, San Diego, CA. January 2008.
- *Multiplicity Conjectures*, seminar, Indian Institute of Science, Bangalore, Karnataka. July 2007.
- *Multiplicity Conjectures*. Graduate Student Research Conference On Algebra And Representation Theory, Kansas State University, Manhattan, KS. May 2006.
- *Some Ideals with Large Projective Dimension*, Cornell University, Ithaca, NY. May 2006.
- *Some Ideals with Large Projective Dimension*, Joint Mathematics Meetings, San Antonio, January 2006.

Other talks / instructional lectures

- *Solving systems of polynomial equations*, MGR Janaki College for Women, Chennai, Tamilnadu. October 2022.
- NCM Workshp *Maximal Cohen-Macaulay Modules*, CMI, Chennai, Tamilnadu. July 2022.
- AFS Level I, *Complex Analysis* and *Topology*, Pondicherry University, Puducheri. May 2022.
- *Rotations in dimension three*, VIT Chennai, Tamilnadu, Apr 2022.
- *Application of Linear Algebra to Coding Theory*, VIT Chennai, Tamilnadu, December 2021.
- Expository talk on *Group actions*, Maharajas College, Ernakulam, Kerala. December 2020.
- Expository talk on *Invariant theory*, SRM University, Chennai, Tamilnadu. August 2020.
- *Absolute integral closure*, Virtual commutative algebra seminar, IIT-Bombay, Mumbai, Maharashtra. June 2020.
- AIS School on *Advanced commutative algebra*, IIT Kharagpur, West Bengal. December 2019.
- Lectures on Hochschild-Kostant-Rosenberg theory, Workshop on Hochschild homology, CMI, Chennai, Tamilnadu. July 2019.
- Workshop on Galois theory, Bharathiyar University, Coimbatore, Tamilnadu. July 2019.
- Madhava Mathematics Competition Nurture Camp, *Invariant theory of finite groups*, CMI, Chennai, Tamilnadu. June 2019.
- NCM Workshop *Commutative algebra and algebraic geometry in positive characteristics*, IIT-Bombay, Mumbai, Maharashtra. Dec 2018.
- AFS Level III, *Galois theory*, Kerala School of Mathematics, Kozhikode, Kerala, July 2018.
- AIS School on *Gröbner basis: theory and applications*, Indraprastha Institute of Information Technology, New Delhi. December 2017.
- ATM Workshop on *Positive characteristic methods in commutative algebra*, IIT-Bombay, Mumbai, Maharashtra. June 2017.
- Instructional School for Teachers, *Commutative Algebra*, St. Joseph's College, Irinjalakuda, Kerala. April-May, 2017.
- *Field extensions and geometry*, Cochin University of Science and Technology, Kerala. March 2017.
- Lectures on Serre duality, Workshop on Seshadri Constants, CMI, Chennai, Tamilnadu, February 2017.
- ATM Workshop on *local cohomology*, St. Joseph's College, Irinjalakuda, Kerala. July 2016.
- Expository lecture on singular value decomposition, Stella Maris College, Chennai, Tamilandu. February 2016.
- Advanced Training School in Mathematics : Group theory and Ring theory, Madurai Kamaraj University, Madurai, Tamilnadu. January 2016.
- AIS School on *Commutative Algebra*, CMI, Chennai, Tamilnadu, December 2015.
- AFS Level I, IIT-Madras, Chennai, Tamilnadu. December 2014.
- AIS School on *Schemes and Cohomology*, Kerala School of Mathematics, Kozhikode, Kerala, December 2014.
- AIS School on *Algebraic Number Theory*, CMI, Chennai, Tamilnadu, July 2014.
- AFS Level II, *Differential Topology*, Kerala School of Mathematics, Kozhikode, Kerala, May 2014.
- UGC Refresher Programme for Lecturers, University of Mysore, Mysore, Karnataka. December 2013.
- ATM Workshop on *Singularity Categories in Algebraic Geometry and Commutative Algebra*, IIT-Madras, Chennai, Tamilnadu. January 2013.
- ATM School for Lecturers, Kumaon University, Almora, Uttarakhand. February 2012.

- ATM Workshop on *Computational Commutative Algebra and Algebraic Geometry* NIIT University, Neemrana, Haryana. January 2012.
- ATM Workshop on *local cohomology*, IIT-Bombay, Mumbai, Maharashtra. June 2011.

Research visits

- Centre Internationale Recontres Mathematiques, Luminy, France, January 2023.
- IIT Dharwad, Karnataka. October 2019.
- MFO, Oberwolfach, Germany, February 2019.
- University of Genoa, Italy, June 2018 and February 2019.
- Centre Internationale Recontres Mathematiques, Luminy, France, July 2017.
- University of Utah, Salt Lake City, UT, USA. July 2016
- Northeastern University, Boston, MA, USA. October 2012 and June 2016
- University of Nebraska, Lincoln, NE, USA. April 2014.
- Purdue University, West Lafayette, IN, USA. July 2012 and March 2018.
- American Institute of Mathematics, SQuaREs programme on *Ordinary Powers and Symbolic Powers*, Palo Alto, CA. April 2011, October 2012, April 2014.

Grants

- Science and Engineering Research Board, Department of Science and Technology, India - Core Research Grant, 2019–2022
- ICTP-INdAM collaborative research grant, University of Genoa, Italy, June 2018.
- Science and Engineering Research Board, Department of Science and Technology, India - MATRICS Grant, 2018–2021
- National Board of Higher Mathematics India Travel Grants: April 2014, June-July 2016.

Professional Activities

- Co-organizer, NCM Workshop on *Syzygies and Representation Theory*, CMI, Chennai, Tamilnadu. Dec 2023.
- Co-organizer, Sage Days 122, CMI, Chennai, Tamilnadu. Sept 2023.
- Co-organizer, IST *Algebra* CMI, Chennai, Tamilnadu. Dec 2022.
- Co-organizer, Sage Days 114, IMSc, Chennai, Tamilnadu. July 2022.
- Co-organizer, NCM Workshp on *Maximal Cohen-Macaulay modules*, CMI, Chennai, Tamilnadu. July 2022.
- Scientific Committee, Virtual Commutative Algebra Seminars, IIT Bombay, Maharashtra. 2021–22.
- Co-organizer, AIS School on *Advanced commutative algebra*, IIT Kharagpur, West Bengal. December 2019.
- Co-organizer, Workshop on Hochschild homology, CMI, Chennai, Tamilnadu. July 2019.
- Co-organizer, National Conference on Commutative Algebra and Algebraic Geometry, CAAG-2019, IISER Bhopal, Madhya Pradesh. July 2019.
- Co-organizer, ATM Workshop on *Positive characteristic methods in commutative algebra*, IIT-Bombay, Mumbai, Maharashtra. June 2017.
- Co-organizer, Instructional School for Teachers, *Commutative Algebra*, St. Joseph's College, Irinjalakuda, Kerala. April-May, 2017.
- Co-organizer, Workshop on Seshadri Constants, CMI, Chennai, Tamilnadu, February 2017.

- Co-organizer, National Conference on Commutative Algebra and Algebraic Geometry, CAAG-2016, IISER Mohali, Punjab. October 2016.
- Co-organizer, AIS School on *Commutative Algebra*, CMI, Chennai, Tamilnadu, December 2015.
- Co-organizer, India-UK Seminar on 'Recent Developments in Commutative Algebra and Applications to Classical Rings' funded by DST and Royal Society, January 2015.
- Co-Organizer: Mathematical Panorama Lecture series: 'Syzygies and Free Resolutions', CMI, Chennai, Tamilnadu, December 2012.
- Thesis supervision:
  - Abhiram Subramanian(PhD, CMI, ongoing)
  - Nirmal Kotal (PhD, CMI, ongoing)
  - Dharm Veer (PhD, CMI, 2023)
  - Mitra Koley (PhD, CMI, 2018).
  - Pratik Jadhav (MSc, CMI, 2022)
  - Abhiram Subramanian(MSc, CMI, 2022)
  - Neelarnab Raha (MSc, CMI, 2020)
  - Suprajo Das (MSc, CMI, 2014).
- Dissertation committees:
  - Meghna Bhat (PhD, IIT-Dharwad, ongoing. adv: S. Masuti)
  - Subhajit Chanda (PhD, IIT-Madras, 2021. adv: S. Sane)
  - Arvind Kumar (PhD, IIT-Madras, 2020. adv: A. V. Jayanthan)
  - Melissa Lindsey (PhD, Purdue, 2011. adv: G. Caviglia)
- Panelist, *What I wish I had known before I went to graduate school*, organized by the AMS Committee on the Profession, Chair: C. Huneke. AMS-MAA-SIAM Joint Mathematical Meetings, Washington, DC. January 2009.
- Student co-organizer, Math. Awareness Month activities, University of Kansas. 2005–07.
- Panelist, on a discussion on graduate school. Chair: T. Marley, AMS Fall Central Sectional meeting, Lincoln, NE. October 2005.