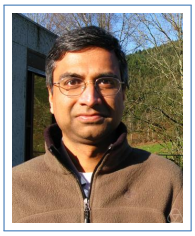

# Saugata Basu

*Curriculum Vitae*

## Education

1991–1996 **Phd**, Courant Institute, New York University, New York.

1987–1991 **B. Tech**, *Computer Science and Engineering*, Indian Institute of Technology, Kharagpur.

## Phd thesis

title *Algorithms in Semi-algebraic Geometry*

supervisor Professor Richard Pollack

## Experience

2008–current **Professor**, *Department of Mathematics and Department of Computer Science, Purdue University*, West Lafayette, (Math 90%, Computer Science 10%).

2008–2010 **Professor**, *School of Mathematics and College of Computing, Georgia Institute of Technology*, Atlanta, (Math 75%, Computer Science 25%).
(On leave)

2004–2008 **Associate Professor**, *School of Mathematics and College of Computing, Georgia Institute of Technology*, Atlanta, tenured (Math 75%, Computer Science 25%).

2000–2004 **Assistant Professor**, *School of Mathematics and College of Computing, Georgia Institute of Technology*, Atlanta, tenure-track (Math 75%, Computer Science 25%).

1998–2000 **Assistant Professor**, *Department of Mathematics, University of Michigan*, Ann Arbor, (non-tenure-track).

1997–1998 **Post-doctoral Fellow (currently called Goldstine Fellowship)**, *Mathematical Sciences Department, IBM T.J. Watson Research Center*, Yorktown Heights.

1996–1997 **Post-doctoral Fellow**, *Mathematical Sciences Research Institute*, Berkeley.

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## Visiting positions and short visits

Mar 19-23, 2018 **Visiting Professor**, *Indian Statistical Institute, Stat-Math Unit*, Kolkata, India.

Jan-Feb, 2018 **Visiting Professor**, *Institute Henri Poincaré*, Paris, France, Trimester on Model theory, combinatorics and valued fields.

Aug-Dec, 2014 **Visiting Scientist**, *Simon's Institute for the Theory of Computing, University of California*, Berkeley, Program on Algorithms and Complexity in Algebraic Geometry.

Mar-Jun, 2014 **Visiting Scientist**, *Institute of Pure and Applied Mathematics, UCLA*, Los Angeles, Program on Algebraic Techniques for Combinatorial and Computational Geometry.

May, 2013 **Visiting Professor**, *Université de Rennes I*, Rennes, France.

June, 2011 **Visiting Professor**, *Université de Rennes I*, Rennes, France.

May 14-28, 2011 **Research in Pairs Program**, *Mathematisches Forschungsinstitut*, Oberwolfach.

July, 2010 **Visiting Professor**, *Université de Rennes I*, Rennes, France.

June, 2009 **Visiting Professor**, *Université de Rennes I*, Rennes, France.

May, 2008 **Visiting Professor**, *Universíte de Rennes I*, Rennes, France.

April - June, 2007 **Visiting Professor**, *Institute for Mathematics and its Applications*, Minneapolis.

February, 2007 **Visiting Professor**, *Université de Rennes I*, Rennes, France.

November, 2005 **Visiting Professor**, *Institute Henri Poincaré*, Paris, France, Trimester on real algebraic geometry.

## Current Research Interests

Real Algebraic and O-minimal Geometry

Model Theory and Incidence Combinatorics

Computational Algebraic Geometry

Computational Complexity Theory

Applied Topology

## Honors and Awards

- Fellow of the American Mathematical Society, Class of 2019. "For contributions to algorithmic and quantitative real algebraic geometry, computational complexity, and o-minimal structures."
- University Faculty Scholar, Purdue University, 2010-15
- Alfred P. Sloan Foundation Fellowship in Mathematics, 2003-05
- Recipient of US National Science Foundation Career Award, 2002-2007
- Rackham Graduate School Faculty Fellowship for Research, University of Michigan, Ann Arbor, December, 1998
- The IBM Mathematical Sciences Post-doctoral Fellowship for the year 1997-98 (one or two fellowships granted every year to outstanding scientists).

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- The Janet Fabri Memorial Prize for an outstanding dissertation, Courant Institute, May, 1997
- Post-doctoral Fellowship at the Mathematical Sciences Research Institute, Berkeley, 1996-97
- Dean's Dissertation Award, New York University, 1995-96
- The Harold Grad Memorial Prize, awarded for outstanding performance and promise as a graduate student in Mathematics or Computer Science, Courant Institute, April, 1994
- Ranked All India First in the Indian School Certificate Examination, 1987
- Jagadis Bose National Science Talent Search Scholarship, 1987
- National Talent Search Scholarship, awarded by the National Council of Education, Research and Training, Government of India, 1985

## Research Grants

1998 Computing the topology of semi-algebraic sets, Rackham Graduate School Faculty Fellowship for Research, University of Michigan ($10,000).

1999-2002 PI, Design and Implementation of Algorithms in Semi-algebraic Geometry, National Science Foundation, Grant Number CCR-9901947 ($77,084).

2002-2007 PI, CAREER: Algorithmic Semi-Algebraic Geometry and Its Applications, National Science Foundation, Grant Number CCR-0133597 ($333,025).

2003-2005 Alfred P. Sloan Foundation Fellowship in Mathematics ($40,000).

2006-2009 PI, Algorithmic Problems in Semi-algebraic Geometry and Topology, National Science Foundation, Grant Number CCF-0634907 ($229359).

2009-2012 PI, Algorithmic and Quantitative Problems in Semi-algebraic and O-minimal Geometry, National Science Foundation, Grant Number CCF-0915954 ($300,000).

2012-2015 Co-PI (PI A. Gabrielov), Semi-monotone sets and triangulation of definable families, National Science Foundation, Grant Number DMS-1161629 ($300,000).

2013-2016 PI, Algorithmic and Quantitative Semi-Algebraic Geometry and Applications, National Science Foundation, Grant Number CCF-1319080 ($368,000).

2016-2019 PI, AF: Small: Quantitative and Algorithmic Aspects of Semi-algebraic Sets and Partitions, National Science Foundation, Grant Number CCF-1618981 ($399,640).

2016-2019 PI, Logic, Topology and Genomics, National Science Foundation, Grant Number DMS-1620271 ($200,000).

2019-2022 PI, AF: Small: Symmetry, Randomness and Computations in Real Algebraic Geometry, National Science Foundation, Grant Number CCF-1910441 ($400,000).

2021-2024 Co-PI: (PI: Ali Mohammad Nezhad, Golomb Assistant Professor at Purdue) Collaborative Research: AF: Small: On the Complexity of Semidefinite and Polynomial Optimization through the Lens of Real Algebraic Geometry, National Science Foundation, Grant Number CCF-2128702 ($247,647).

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## Author profiles

- zbMATH
- Mathscinet

## Publications

### Papers (submitted)

Saugata Basu and Ali Mohammad-Nezhad. Improved effective Łojasiewicz inequality and applications, 2022.

Saugata Basu, Negin Karisani, and Laxmi Parida. Sequents, barcodes, and homology, 2022.

Saugata Basu and Negin Karisani. Computing the homology functor on semi-algebraic maps and diagrams, 2022.

Saugata Basu and Negin Karisani. Persistent homology of semi-algebraic sets, 2022.

Saugata Basu and Daniel Perrucci. Topology of real multi-affine hypersurfaces and a homological stability property, 2022.

Saugata Basu and Sarah Percival. Efficient computation of a semi-algebraic basis of the first homology group of a semi-algebraic set, 2021. 30 pages.

Saugata Basu, Shaoming Guo, Ruixiang Zhang, and Pavel Zorin-Kranich. A stationary set method for estimating oscillatory integrals, 2021. 23 pages.

Saugata Basu and Negin Karisani. Efficient simplicial replacement of semi-algebraic sets, 2020. 62 pages.

### Papers (published)

Saugata Basu, Hamidreza Amini Khorasgani, Hemanta K. Maji, and Hai H. Nguyen. Geometry of secure two-party computation. In *2022 IEEE 62nd Annual Symposium on Foundations of Computer Science—FOCS 2022*. IEEE Computer Soc., Los Alamitos, CA, [2022] ©2022.

Saugata Basu and Antonio Lerario. Hausdorff approximations and volume of tubes of singular algebraic sets. *Mathematische Annalen*, 2022.

Saugata Basu, Antonio Lerario, and Abhiram Natarajan. Betti numbers of random hypersurface arrangements. *Journal of the London Mathematical Society*.

Saugata Basu and Cordian Riener. Vandermonde Varieties, Mirrored Spaces, and the Cohomology of Symmetric Semi-algebraic Sets. *Found. Comput. Math.*, 22(5):1395–1462, 2022.

Saugata Basu, Nathanael Cox, and Sarah Percival. On the Reeb spaces of definable maps. *Discrete Comput. Geom.*, 68(2):372–405, 2022.

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Saugata Basu and Ali Mohammad-Nezhad. On the central path of semidefinite optimization: degree and worst-case convergence rate. *SIAM J. Appl. Algebra Geom.*, 6(2):299–318, 2022.

Saugata Basu and Nathanael Cox. Harmonic persistent homology (extended abstract). In *2021 IEEE 62nd Annual Symposium on Foundations of Computer Science—FOCS 2021*, pages 1112–1123. IEEE Computer Soc., Los Alamitos, CA, [2022] ©2022.

Saugata Basu and Marie-Françoise Roy. Quantitative curve selection lemma. *Mathematische Zeitschrift*, 2021.

Saugata Basu and Cordian Riener. Vandermonde varieties, mirrored spaces, and the cohomology of symmetric semi-algebraic sets. *Foundations of Computational Mathematics*, 2021.

Saugata Basu and Deepam Patel. VC density of definable families over valued fields. *J. Eur. Math. Soc. (JEMS)*, 23(7):2361–2403, 2021.

Saugata Basu and Deepam Patel. Connectivity of joins, cohomological quantifier elimination, and an algebraic Toda's theorem. *Selecta Math. (N.S.)*, 26(5):71, 2020.

Saugata Basu and Umut Isik. Categorical complexity. *Forum Math. Sigma*, 8:Paper No. e34, 63 pages, 2020.

Saugata Basu and Cordian Riener. On the Isotypic Decomposition of Cohomology Modules of Symmetric Semi-algebraic Sets: Polynomial Bounds on Multiplicities. *Int. Math. Res. Not. IMRN*, (7):2054–2113, 2020.

Saugata Basu, Antonio Lerario, and Abhiram Natarajan. Zeroes of polynomials on definable hypersurfaces: pathologies exist, but they are rare. *Q. J. Math.*, 70(4):1397–1409, 2019.

Saugata Basu, Antonio Lerario, Erik Lundberg, and Chris Peterson. Random fields and the enumerative geometry of lines on real and complex hypersurfaces. *Math. Ann.*, 374(3-4):1773–1810, 2019.

Saugata Basu and Orit E. Raz. An o-minimal Szemerédi-Trotter theorem. *Q. J. Math.*, 69(1):223–239, 2018.

Saugata Basu and Cordian Riener. On the equivariant Betti numbers of symmetric definable sets: vanishing, bounds and algorithms. *Selecta Math. (N.S.)*, 24(4):3241–3281, 2018.

Saugata Basu and Anthony Rizzie. Multi-degree bounds on the betti numbers of real varieties and semi-algebraic sets and applications. *Discrete & Computational Geometry*, 59(3):553–620, Apr 2018.

Saugata Basu. Algorithms in real algebraic geometry: a survey. In *Real algebraic geometry*, volume 51 of *Panor. Synthèses*, pages 107–153. Soc. Math. France, Paris, 2017.

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Saugata Basu and Cordian Riener. Efficient algorithms for computing the Euler-Poincaré characteristic of symmetric semi-algebraic sets. In *Ordered Algebraic Structures and Related Topics*, volume 697 of *Contemp. Math.*, pages 51–79. Amer. Math. Soc., Providence, RI, 2017.

S. Basu and C. Riener. Bounding the equivariant Betti numbers of symmetric semi-algebraic sets. *Advances in Mathematics*, 305:803–855, January 2017.

Saugata Basu and Laxmi Parida. Spectral sequences, exact couples and persistent homology of filtrations. *Expositiones Mathematicae*, 35(1):119 – 132, 2017.

Sal Barone and Saugata Basu. On a real analog of Bezout inequality and the number of connected components of sign conditions. *Proc. Lond. Math. Soc. (3)*, 112(1):115–145, 2016.

Saugata Basu and Martín Sombra. Polynomial Partitioning on Varieties of Codimension Two and Point-Hypersurface Incidences in Four Dimensions. *Discrete Comput. Geom.*, 55(1):158–184, 2016.

Saugata Basu, Andrei Gabrielov, and Nicolai Vorobjov. Triangulations of monotone families i: two-dimensional families. *Proceedings of the London Mathematical Society*, 111(5):1013–1051, 2015.

Saugata Basu. A complexity theory of constructible functions and sheaves. *Found. Comput. Math.*, 15(1):199–279, 2015.

S. Basu, M.-F. Roy, M. Safey El Din, and É. Schost. A baby step–giant step roadmap algorithm for general algebraic sets. *Found. Comput. Math.*, 14(6):1117–1172, 2014.

Sal Barone and Saugata Basu. On homotopy types of limits of semi-algebraic sets and additive complexity of polynomials. *J. Eur. Math. Soc. (JEMS)*, 16(8):1527–1554, 2014.

Saugata Basu and Marie-Françoise Roy. Divide and conquer roadmap for algebraic sets. *Discrete Comput. Geom.*, 52(2):278–343, 2014.

Saugata Basu, Andrei Gabrielov, and Nicolai Vorobjov. A Helly-type theorem for semi-monotone sets and monotone maps. *Discrete Comput. Geom.*, 50(4):857–864, 2013.

Saugata Basu, Andrei Gabrielov, and Nicolai Vorobjov. Monotone functions and maps. *Rev. R. Acad. Cienc. Exactas Fís. Nat. Ser. A Math. RACSAM*, 107(1):5–33, 2013.

Saugata Basu, Andrei Gabrielov, and Nicolai Vorobjov. Semi-monotone sets. *J. Eur. Math. Soc. (JEMS)*, 15(2):635–657, 2013.

Saugata Basu. A complex analogue of Toda's theorem. *Found. Comput. Math.*, 12(3):327–362, 2012.

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Sal Barone and Saugata Basu. Refined bounds on the number of connected components of sign conditions on a variety. *Discrete Comput. Geom.*, 47(3):577–597, 2012.

Saugata Basu and Marie-Françoise Roy. Bounding the radii of balls meeting every connected component of semi-algebraic sets. *J. Symbolic Comput.*, 45(12):1270–1279, 2010.

Saugata Basu and Thierry Zell. Polynomial hierarchy, Betti numbers, and a real analogue of Toda's theorem. *Found. Comput. Math.*, 10(4):429–454, 2010.

Saugata Basu, Dmitrii V. Pasechnik, and Marie-Françoise Roy. Bounding the Betti numbers and computing the Euler-Poincaré characteristic of semi-algebraic sets defined by partly quadratic systems of polynomials. *J. Eur. Math. Soc. (JEMS)*, 12(2):529–553, 2010.

Saugata Basu. Combinatorial complexity in o-minimal geometry. *Proc. Lond. Math. Soc. (3)*, 100(2):405–428, 2010.

Saugata Basu, Richard Pollack, and Marie-Françoise Roy. An asymptotically tight bound on the number of semi-algebraically connected components of realizable sign conditions. *Combinatorica*, 29(5):523–546, 2009.

Saugata Basu, Dmitrii V. Pasechnik, and Marie-Françoise Roy. Computing the Betti numbers of semi-algebraic sets defined by partly quadratic sytems of polynomials. *J. Algebra*, 321(8):2206–2229, 2009.

Saugata Basu and Michael Kettner. Bounding the number of stable homotopy types of a parametrized family of semi-algebraic sets defined by quadratic inequalities. *Proc. Lond. Math. Soc. (3)*, 98(2):298–324, 2009.

Saugata Basu. On the number of topological types occurring in a parameterized family of arrangements. *Discrete Comput. Geom.*, 40(4):481–503, 2008.

Saugata Basu, Nayantara Bhatnagar, Parikshit Gopalan, and Richard J. Lipton. Polynomials that sign represent parity and Descartes' rule of signs. *Comput. Complexity*, 17(3):377–406, 2008.

Saugata Basu and Michael Kettner. A sharper estimate on the Betti numbers of sets defined by quadratic inequalities. *Discrete Comput. Geom.*, 39(4):734–746, 2008.

Saugata Basu, Richard Pollack, and Marie-Françoise Roy. Computing the first Betti number of a semi-algebraic set. *Found. Comput. Math.*, 8(1):97–136, 2008.

Saugata Basu. Computing the top Betti numbers of semialgebraic sets defined by quadratic inequalities in polynomial time. *Found. Comput. Math.*, 8(1):45–80, 2008.

Saugata Basu and Thierry Zell. On projections of semi-algebraic sets defined by few quadratic inequalities. *Discrete Comput. Geom.*, 39(1-3):100–122, 2008.

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Saugata Basu and Nicolai Vorobjov. On the number of homotopy types of fibres of a definable map. *J. Lond. Math. Soc. (2)*, 76(3):757–776, 2007.

Saugata Basu. Efficient algorithm for computing the Euler-Poincaré characteristic of a semi-algebraic set defined by few quadratic inequalities. *Comput. Complexity*, 15(3):236–251, 2006.

Saugata Basu. Computing the first few Betti numbers of semi-algebraic sets in single exponential time. *J. Symbolic Comput.*, 41(10):1125–1154, 2006.

Saugata Basu, Jacob E. Goodman, Andreas Holmsen, and Richard Pollack. The Hadwiger transversal theorem for pseudolines. In *Combinatorial and computational geometry*, volume 52 of *Math. Sci. Res. Inst. Publ.*, pages 79–85. Cambridge Univ. Press, Cambridge, 2005.

Saugata Basu, Richard Pollack, and Marie-Françoise Roy. Computing the Euler-Poincaré characteristics of sign conditions. *Comput. Complexity*, 14(1):53–71, 2005.

Saugata Basu, Richard Pollack, and Marie-Françoise Roy. On the Betti numbers of sign conditions. *Proc. Amer. Math. Soc.*, 133(4):965–974 (electronic), 2005.

S. Basu, R. Pollack, and M.-F. Roy. Computing the dimension of a semi-algebraic set. *Zap. Nauchn. Sem. S.-Peterburg. Otdel. Mat. Inst. Steklov. (POMI)*, 316(Teor. Slozhn. Vychisl. 9):42–54, 225, 2004.

Saugata Basu. Computing the Betti numbers of arrangements via spectral sequences. *J. Comput. System Sci.*, 67(2):244–262, 2003. Special issue on STOC2002 (Montreal, QC).

Saugata Basu. Different bounds on the different Betti numbers of semi-algebraic sets. *Discrete Comput. Geom.*, 30(1):65–85, 2003. ACM Symposium on Computational Geometry (Medford, MA, 2001).

Saugata Basu. The combinatorial and topological complexity of a single cell. *Discrete Comput. Geom.*, 29(1):41–59, 2003.

Saugata Basu, Richard Pollack, and Marie-Françoise Roy. Computing roadmaps of semi-algebraic sets on a variety. *J. Amer. Math. Soc.*, 13(1):55–82, 2000.

Saugata Basu. New results on quantifier elimination over real closed fields and applications to constraint databases. *J. ACM*, 46(4):537–555, 1999.

S. Basu. On bounding the Betti numbers and computing the Euler characteristic of semi-algebraic sets. *Discrete Comput. Geom.*, 22(1):1–18, 1999.

Saugata Basu, Richard Pollack, and Marie-Françoise Roy. A new algorithm to find a point in every cell defined by a family of polynomials. In *Quantifier elimination and cylindrical algebraic decomposition (Linz, 1993)*, Texts Monogr. Symbol. Comput., pages 341–350. Springer, Vienna, 1998.

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Saugata Basu, Richard Pollack, and Marie-Françoise Roy. On computing a set of points meeting every cell defined by a family of polynomials on a variety. *J. Complexity*, 13(1):28–37, 1997.

Saugata Basu, Richard Pollack, and Marie-Françoise Roy. On the combinatorial and algebraic complexity of quantifier elimination. *J. ACM*, 43(6):1002–1045, 1996.

Saugata Basu, Richard Pollack, and Marie-Françoise Roy. On the number of cells defined by a family of polynomials on a variety. *Mathematika*, 43(1):120–126, 1996.

Dipanwita Roy Chowdhury, Saugata Basu, Indranil Sengupta, and Parimal Pal Chaudhuri. Design of CAECC—cellular automata based error correcting code. *IEEE Trans. Comput.*, 43(6):759–764, 1994.

### Survey articles

Saugata Basu and Bhubaneswar Mishra. Computational and quantitative real algebraic geometry. In *Handbook of discrete and computational geometry, 3rd Edition*, CRC Press Ser. Discrete Math. Appl. CRC, Boca Raton, FL, 2017.

Saugata Basu. Algorithmic semi-algebraic geometry and topology—recent progress and open problems. In *Surveys on discrete and computational geometry*, volume 453 of *Contemp. Math.*, pages 139–212. Amer. Math. Soc., Providence, RI, 2008.

Saugata Basu, Richard Pollack, and Marie-Françoise Roy. Betti number bounds, applications and algorithms. In *Combinatorial and computational geometry*, volume 52 of *Math. Sci. Res. Inst. Publ.*, pages 87–96. Cambridge Univ. Press, Cambridge, 2005.

### Books

S. Basu, R. Pollack, and M.-F. Roy. *Algorithms in real algebraic geometry*, volume 10 of *Algorithms and Computation in Mathematics*. Springer-Verlag, Berlin, 2003.

S. Basu, R. Pollack, and M.-F. Roy. *Algorithms in real algebraic geometry*, volume 10 of *Algorithms and Computation in Mathematics*. Springer-Verlag, Berlin, 2006 (second edition).

### Edited Volumes

Saugata Basu and Cordian Riener and Marie-Francoise Roy (editors). *Selected papers connected to the Arctic Applied Algebra Conference held in Tromso, April 1-5, 2019*, Journal of Pure and Applied Algebra, Volume 225, Issue 7, July 2021.

Saugata Basu and Laureano González-Vega (editors). *Algorithmic and Quantitative Real Algebraic Geometry: DIMACS Workshop, Algorithmic and Quantitative Aspects of Real Algebraic, Geometry in Mathematics and Computer Science, March 12-16, 2001, DIMACS Center*, volume 60. oy American Mathematical Soc., 2003.

B. Aronov, S. Basu, J. Pach, and M. Sharir (editors). *Discrete and computational geometry: the Goodman-Pollack Festschrift*, volume 25. Springer Science & Business Media, 2003.

### Refereed Conference Proceedings

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Laxmi Parida, Filippo Utro, Deniz Yörükoglu, Anna Paola Carrieri, David Kuhn, and Saugata Basu. Topological signatures for population admixture. In *Research in Computational Molecular Biology - 19th Annual International Conference, RECOMB 2015, Warsaw, Poland, April 12-15, 2015, Proceedings*, pages 261–275, 2015.

Saugata Basu and Thierry Zell. Polynomial hierarchy, Betti numbers and a real analogue of Toda's theorem. In *2009 50th Annual IEEE Symposium on Foundations of Computer Science (FOCS 2009)*, pages 73–82. IEEE Computer Soc., Los Alamitos, CA, 2009.

Saugata Basu. Combinatorial complexity in o-minimal geometry [extended abstract]. In *STOC'07—Proceedings of the 39th Annual ACM Symposium on Theory of Computing*, pages 47–56. ACM, New York, 2007.

Saugata Basu and Michael Kettner. Computing the Betti numbers of arrangements in practice. In *Computer algebra in scientific computing*, volume 3718 of *Lecture Notes in Comput. Sci.*, pages 13–31. Springer, Berlin, 2005.

Saugata Basu. Polynomial time algorithm for computing the top Betti numbers of semi-algebraic sets defined by quadratic inequalities. In *STOC'05: Proceedings of the 37th Annual ACM Symposium on Theory of Computing*, pages 313–322. ACM, New York, 2005.

Saugata Basu, Richard Pollack, and Marie-Francoise Roy. Computing the first Betti number and the connected components of semi-algebraic sets. In *STOC'05: Proceedings of the 37th Annual ACM Symposium on Theory of Computing*, pages 304–312. ACM, New York, 2005.

Saugata Basu. Computing the Betti numbers of arrangements. In *Proceedings of the Thirty-Fourth Annual ACM Symposium on Theory of Computing*, pages 712–720 (electronic). ACM, New York, 2002.

Saugata Basu, Richard Pollack, and Marie-Françoise Roy. Complexity of computing semi-algebraic descriptions of the connected components of a semi-algebraic set. In *Proceedings of the 1998 International Symposium on Symbolic and Algebraic Computation (Rostock)*, pages 25–29 (electronic). ACM, New York, 1998.

Saugata Basu. Uniform quantifier elimination and constraint query processing. In *Proceedings of the 1997 International Symposium on Symbolic and Algebraic Computation (Kihei, HI)*, pages 21–27 (electronic). ACM, New York, 1997.

Saugata Basu. On bounding the Betti numbers and computing the Euler characteristic of semi-algebraic sets. In *Proceedings of the Twenty-eighth Annual ACM Symposium on the Theory of Computing (Philadelphia, PA, 1996)*, pages 408–417. ACM, New York, 1996.

S. Basu, R. Pollack, and M.-F. Roy. Computing roadmaps of semi-algebraic sets (extended abstract). In *Proceedings of the Twenty-eighth Annual ACM Symposium*

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*on the Theory of Computing (Philadelphia, PA, 1996)*, pages 168–173. ACM, New York, 1996.

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S. Basu, R. Pollack, and M.-F. Roy. On the combinatorial and algebraic complexity of quantifier elimination. In *35th Annual Symposium on Foundations of Computer Science (Santa Fe, NM, 1994)*, pages 632–641. IEEE Comput. Soc. Press, Los Alamitos, CA, 1994.

## Talks (reverse chronological order)

- Seminar talk at the Stat-Math Unit, Indian Statistical Institute, Kolkata, Dec 13. 2022.
- Géometrie algébrique réelle (mini-course), CIRM, Luminy, 24 - 28 October 2022.
- Real algebraic geometry and singularities, Conference in honor of Wojciech Kucharz's 70th birthday Krakow, 12-17 Sep, 2022.
- ATMCS (Algebraic Topology: Methods, Computation, and Science) Oxford University, June 20-24, 2022.
- Conference "On the Crossroad of Topology and Enumerative Geometry" , Leonhard Euler International Mathematical Institute in Saint Petersburg, 13-17 June, 2022.
- Mathematics Colloquium, Department of Mathematics, University at Albany, Dec 3, 2021.
- Workshop on Model Theory and Combinatorics, November 29 - December 3, 2021, The Fields Institute.
- Computational Persistence Workshop (virtual), Nov 1-5, 2021, Purdue University.
- Talk at MFO-RIMS Tandem Workshop: Symmetries on Polynomial Ideals and Varieties (hybrid meeting), Oberwolfach, Sep 9, 2021 (given remotely).
- Seminar talk at TU Berlin (via Zoom) May 19, 2021.
- ATMCS (Algebraic Topology: Methods, Computation, and Science) Ohio State University, June 8–12, 2020. Cancelled due to COVID-19
- Real Geometry Seminar, SISSA, Trieste, May 12, 2020 (online seminar talk).
- Geometrie Algebrique Reelle CIRM, Luminy, 20 - 24 April, 2020. Short course. Cancelled due to COVID-19
- MPS Conference on Discrete & Computational Geometry: Quo Vadis (Dedicated to the memory of Ricky Pollack), Flatiron Institute New York, March 30 - April 3, 2020. Postponed due to COVID-19
- Algebraic Methods in Discrete and Computational Geometry, CG Week, Portland, Oregon, June 18 - 21, 2019.
- Geometry of Real Polynomials, Convexity and Optimization, Banff International Research Station, May 26 - 31, 2019.
- Arctic Applied Algebra Conference, UiT – The Arctic University of Norway, April 1- 5, 2019.

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- Association for Symbolic Logic 2018 North American Annual Meeting, Special Session on Model Theory, Western Illinois University Macomb, Illinois, May 16 -19, 2018.
- Topology, Geometry and Data Seminar, Ohio State University, May 1, 2018.
- Algebraic Geometry Seminar, Purdue University, April 18, 2018.
- Geometry Seminar, Courant Institute, New York, April 3, 2018.
- Seminar talks at the Stat-Math Unit, Indian Statistical Institute, Kolkata, Mar 19, Mar 21, 2018.
- Workshop - Numerical methods for algebraic curves, Universite de Rennes 1, Rennes Feb 19 -Feb 23, 2018.
- Workshop on Model theory and Combinatorics, Institut Henri Poincaré, Paris Jan 29 -Feb 02, 2018.
- Computatbility in Europe, Special Session on Computability in analysis, algebra, and geometry, organized by Julia Knight (Notre Dame, USA) and Andrey Morozov (Novosibirsk, Russia), Turku, Finland, Jun 12-16, 2017.
- Oberwolfach Workshop on O-Minimality and its Applications to Number Theory and Analysis, April 30- May 6, 2017.
- Workshop on Topology: Identifying Order in Complex Systems, Rutgers University and IAS, April 1, 2017.
- Conference on Real Algebraic Geometry, Nagoya University, Mar 13-19, 2017.
- Shanks Workshop on Real Algebraic Geometry, Vanderbilt University, Mar 10-11, 2017.
- Logic Seminar, Department of Mathematics, University of Notre Dame, Feb 14, 2017.
- Combinatorial and Computational Geometry Reunion Conference II, IPAM, Lake Arrowhead, UCLA, December 11 - 16, 2016.
- Algebra Seminar, School of Mathematics, Georgia Institute of Technology, Sep 16, 2016.
- Colloquium, School of Mathematics, Georgia Institute of Technology, Sep 15, 2016.
- One hour talk at Conference on Statistical Topology of Random Manifolds: Theory and Applications, The Abdus Salam International Centre for Theoretical Physics (ICTP), Trieste July 18-23, 2016.
- One hour talk at Workshop on Algebra, Geometry and Proofs in Symbolic Computation, Fields Institute, Dec 7- 16, 2015.
- Seminar talk Symbolic-Numeric Computing Seminar, CUNY Graduate Center, Nov 20, 2015.
- Invited plenary lecture at seminar on Ordered Algebraic Structures and Related Topics, October 12 -16, 2015, CIRM, Luminy.
- Invited one-hour talk at Complexity of Symbolic and Numerical Problems, June 7-12, 2015, Dagstuhl Seminar 15242.
- Invited one-hour talk at Computability, Analysis, and Geometry, BIRS, Mar 8-13, 2015.

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- Invited plenary lecture at the workshop Solving Polynomial Equations, 13-17 October 2014, at the Simons Institute for the Theory of Computing's semester-long programme on Algorithms and Complexity in Algebraic Geometry.
- Invited one hour talk at the culminating workshop for the program on *Algebraic Techniques for Combinatorial and Computational Geometry Workshop*, Lake Arrowhead, UCLA, Jun 9, 2014.
- Invited talk at the Algebraic Geometry Seminar, University of Chicago, April 23, 2014.
- Invited one hour talk at the workshop on Algebraic Techniques for Combinatorial and Computational Geometry Workshop II: Tools from Algebraic Geometry, IPAM, UCLA, April 7 - 11, 2014.
- Invited one hour talk at the workshop on Algebraic Techniques for Combinatorial and Computational Geometry Workshop I: Combinatorial Geometry Problems at the Algebraic Interface, IPAM, UCLA, March 24 - 28, 2014.
- Three invited tutorial lectures at Algebraic Techniques for Combinatorial and Computational Geometry Combinatorial and Computational Geometry: Tutorials, IPAM, UCLA, March 11 - 14, 2014.
- Invited one hour talk at the conference Applications of Real Algebraic Geometry, Helsinki, Finland, Feb 27-Mar 2, 2014.
- Talk at the *Geometry Seminar*, Courant Institute, Feb 11, 2014.
- Seminar talk at the Theoretical Statistics and Mathematics Department, Indian Statistical Institute, Kolkata, Feb 7, 2014.
- Seminar talk at the Department of Mathematics, RKMV University, Kolkata, Feb 5, 2014.
- Invited one hour talk at the conference Polyhedra, Lattices, Algebra, and Moments , Inverse Moment Problems: the Crossroads of Analysis, Algebra, Discrete Geometry and Combinatorics, IMS, Singapore Jan 6-17, 2014.
- *Geometry Seminar*, Courant Institute, April 16, 2013.
- *Logic Seminar*, University of Maryland, College Park, Feb 5, 2013.
- *Colloquium*, McMaster University, Jan 18, 2013.
- *Model theory Seminar*, McMaster University, Jan 18, 2013.
- *Logic Seminar*, Ohio State University, Oct 19, 2012.
- *Real Algebraic Geometry Seminar*, Universite de Rennes 1 , May 24, 2012.
- Invited plenary talk at the conference From Dynamics to Complexity: A conference celebrating the work of Mike Shub, Fields Institute, May 07-11, 2012.
- *Geometry Seminar*, Courant Institute, Feb 28, 2012.
- Invited talk (30 min) in Workshop on "Progress and Open Problems in Motion Planning in Robotics" at International Conference on Intelligent Systems and Robots (IROS), San Francisco, Sept 30, 2011.
- One hour lecture at workshop on Mathematical aspects of the P vs NP problem and its variants, ICERM, Brown University, Aug 1-5, 2011.
- Invited talk (45 min) *Foundations of Computational Mathematics Conference, Workshop on Computational Algebraic Geometry*, Budapest, July 8-10, 2011.

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- Invited talk (45 min) *Foundations of Computational Mathematics Conference, Workshop on Real Number Complexity*, Budapest, July 4-6, 2011.
- *Seminaire de Calcul formel et Complexite*, Institut de Recherche Mathematique de Rennes, Jul 1, 2011.
- Invited one-hour plenary talk at the Real Algebraic Geometry Conference, Rennes, Jun 20-24, 2011.
- Colloquium talk at the Indian Statistical Institute, Kolkata, Stat-Math unit, Feb 7, 2011.
- *Real Algebraic Geometry Seminar*, Rennes, June 23, 2010.
- *Geometry Seminar*, Courant Institute, April 13, 2010.
- Invited lecture at Workshop on Convex Algebraic Geometry, Banff International Research Station, Canada, Feb 14 - 19, 2010.
- *Geometry Seminar*, Texas A& M University, College Station, Texas, Feb 5, 2010.
- Four one-hour lectures at Oberwolfach Seminar on "New Trends in Algorithms for Real Algebraic Geometry", Nov 22-28, 2009.
- Invited one-hour talk at *Workshop on Complexity of Numerical Computation, Thematic Program on the Foundations of Computational Mathematics,* Oct 20 - 24, 2009.
- ACO Seminar, Georgia Tech, April 10, 2009.
- Invited talk at the *AMS Special Session on Concrete Aspects of Real Positive Polynomials*, Urbana-Champaign, Mar 27-29, 2009.
- Geometry Seminar, Courant Institute, Feb 24, 2009.
- Colloquium talk at the Indian Institute of Technology, Kharagpur, Jan 13, 2009.
- *Algebra, Geometry and Combinatorics Seminar*, Department of Mathematics, University of Illinois, Urbana-Champaign, Oct 29, 2008.
- Invited talk at the *AMS Special Session on Applicable Algebraic Geometry*, Vancouver, Oct 4-5, 2008.
- Invited talk at the Conference (honoring Andrei Gabrielov) on Effective Real Analytic Geometry, ICMS, Edinburgh May 5-9, 2008.
- Invited talk at the Workshop on Enumeration and Bounds in Real Algebraic Geometry, Bernoulli Center, EPFL, Lausanne, April 19-25, 2008.
- *Geometry Seminar*, Courant Institute, Mar 18, 2008.
- *Working Algebraic Geometry Seminar*, Purdue University, Spetember 19, 2007.
- *Mathematics Colloquium*, Purdue University, September 18, 2007.
- One hour plenary talk at Workshop on Complexity, Coding, and Communications, IMA Special year on Applicable Algebraic Geometry, Minneapolis, April 16-20, 2007.
- *IMA Algebraic Geometry Seminar*, Minneapolis, April 11, 2007.
- One hour Seminar talk in *Seminaire Geometrie Algebrique Reele*, Universite de Rennes I, Feb 16, 2007.
- Talk at *Oberwolfach Workshop on Geometric and Topological Combinatorics*, Jan 28 - Feb 3, 2007.

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- Invited one hour speaker at the 2006 AMS-IMS-SIAM Summer Research Conference on *Discrete and Computational Geometry – Twenty Years Later*, Snowbird, Utah, June 18-23, 2006.
- Mathematics Colloquium, University of Paderborn, Germany, Nov 22, 2005.
- *Mini-course on Efficient Algorithms for Computing Betti Numbers of Semi-Algebraic Sets* (4 lectures), Trimester on Real Geometry at Institute Henri Poincaré, Paris, Nov 1-30, 2005.
- *Mini-course on Algorithms in Real Algebraic Geometry* (5/15 lectures) (co-taught with Marie-Francoise Roy and Fabrice Rouillier), Trimester on Real Geometry, at Institute Henri Poincaré, Paris, Nov 1-30, 2005.
- Invited one hour lecture at workshop on *Real Algebra, Quadratic Forms and Model Theory; Algorithms and Applications* Paris, November 2-9, 2005.
- *DIMACS Theoretical Computer Science Seminar*, Rutgers University, Oct 11, 2005.
- *Fourth Annual Network Meeting - Real Algebraic and Analytic Geometry* (RAAG-2005), Universitat Passau, Germany, September 5 - 9, 2005 (one hour invited lecture).
- *Foundations of Computational Mathematics* (FOCM, 2005) Workshop on Real Number Complexity, Santander, Spain, July 7-9, 2005.
- *Workshop on Algorithms in Real Algebraic Geometry and Applications*, (three one-hour lectures), Ouessant, France, June 24-28, 2005.
- *Effective Methods in Algebraic Geometry* (MEGA), Alghero, Sardinia, May 25-June 2, 2005.
- *Geometry Seminar*, Texas A& M University, College Station, Texas, April 11, 2005.
- *AMS Sectional Meeting, Special Session on Real Algebraic Geometry,* Lubbock, Texas, April 9, 2005.
- *Seminaire de Calcul formel et Complexite*, Institut de Recherche Mathématique de Rennes, Nov 5, 2004.
- *Computational Geometry Seminar* at the Department of Computer Science, University of Illinois, Urbana-Champaign, Sept 17, 2004.
- Colloquium talk at the Department of Mathematics, University of Illinois, Urbana-Champaign, Sept 16, 2004.
- Seminar at the Department of Computer Science and Engineering, Indian Institute of Technology, Kharagpur, Aug 26, 2004.
- Invited one-hour talk at the Conference on *Algebraic Topological Methods in Computer Science II,* University of Western Ontario, Canada, July 15-21, 2004.
- *Special Session on Quantitative Results in Real Algebra and Geometry, First Joint Meeting between the RSME and the AMS,* Seville, Spain, June 18-21, 2003.
- *Foundations of Computational Mathematics Conference, Workshop on Complexity Theory*, Minneapolis, Aug 12-14, 2002.
- *Seminaire de Calcul formel et Complexite*, Institut de Recherche Mathématique de Rennes, June 21, 2002.

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- *Workshop on Computations in Real Algebraic Geometry and Applications*, Facultad de Ciencias, Universidad de Cantabria, Santander, Spain, June 13-15, 2002.
- Research Seminar at the Research Institute for Symbolic Computation, Linz, Austria, June 4, 2002.
- Invited lecture at the *CBMS Conference on Solving Polynomial Systems*, College Station, Texas, May 21-24, 2002.
- *Special Session on Computational Topology*, American Mathematical Society annual meeting in San Diego, Jan 8, 2002.
- *Applied Mathematics Colloquium*, University of Maryland, Baltimore County, Nov 16, 2001.
- *Geometry and Topology Seminar*, University of Georgia, Athens, Nov 12, 2001.
- *Conference on Real Algebraic and Analytic Geometry*, Rennes, France, June 11 - 15, 2001.
- Invited one hour lecture at the *DIMACS Workshop on Quantitative Aspects of Real Algebraic Geometry*, DIMACS, News Brunswick, March 12 - 16, 2001.
- *Geometry Seminar*, Courant Institute, March 6, 2001.
- Mini-course on algebraic curves and codes at the *Workshop on Theoretical Computer Science, Indian Institute of Science, Bangalore,* June 13-21, 2000.
- *Foundations of Computational Mathematics Conference in Oxford, Workshop on Complexity Theory, Real Machines and Homotopy* July 18-27, 1999.
- Invited one hour lecture at the *International Conference on Discrete and Computational Geometry*, Ascona, Switzerland, June 27 - Jul 2, 1999.
- *Computer Algebra Seminar*, Universite de Rennes, May 14, 1999.
- *Geometry Seminar*, Courant Institute, Feb 16, 1999.
- *Combinatorics Seminar*, University of Michigan, Ann Arbor, Oct 20, 1998.
- *Dagstuhl Seminar on Real Computation and Complexity*, Germany, June 15-19, 1998.
- *Real Algebraic Geometry Seminar*, Universite de Rennes, March 27, 1998.
- *Special Session on Concrete Aspects of Real Polynomials,* at the AMS meeting held at Atlanta, Georgia, Oct 17-19, 1997.
- *IBM Mathematical Sciences Seminar*, Sept 15, 1997.
- *Special Session on Algorithms in Real Algebraic Geometry*, at the AMS meeting held at College Park, Maryland, April 12-14, 1997.
- *Discrete Mathematics Seminar,* Department of Mathematics, University of California, Berkeley, Oct 28, 1996.
- *Special Session on Discrete and Combinatorial Geometry,* Fall Eastern Sectional Meeting of the AMS, Lawrenceville, NJ , October 5-6, 1996.
- *AMS-IMS-SIAM Joint Summer Research Conference on Discrete and Computational Geometry,* Mount Holyoke College, July 13-19, 1996.
- *Special Session on Real Algebraic Geometry and Ordered Algebraic Structures,* at the AMS meeting held at Baton Rouge, Louisiana, April 17-21, 1996.
- *Geometry Seminar* at the Courant Institute, March 26, 1996.

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- *Dagstuhl Seminar on Real Computation and Complexity*, Germany, Nov 6-10, 1995.
- *AMS-SIAM Summer Seminar on Mathematics of numerical analysis: Real number Algorithms,* Park City, Utah, July 6 - 11, 1995.
- *PoSSo Open Workshop on Applications of PoSSo and Real Solving,* Iraklio, Greece, June 7-10, 1995.

## Editorial Board

- Member of the Editorial Board, Discrete and Computational Geometry

## Professional Activities

- Co-organizer of Michigan Interdisciplinary Mathematics Meeting II on Algorithms, Optimization and Control, Ann Arbor, MI, May 6-8,1999.
- Co-editor (with Laureano Gonzalez-Vega) of the book Algorithmic and Quantitative Real Algebraic Geometry, American Mathematical Society, DIMACS, Series in Discrete Mathematics and Theoretical Computer Science, ISSN: 1052-1798, Volume: 60.
- Co-editor (with J. Pach, M. Sharir, B. Aronov) of Festschrift volume honoring Eli Goodman and Ricky Pollack, 2003.
- Co-organizer of AMS Special Session on Algorithmic Algebraic and Analytic Geometry, AMS-MAA Joint Mathematics Meeting, Atlanta, GA, Jan 5-8, 2005.
- Co-organizer of AMS-ASL Special Session on Logical Methods in Computational Mathematics, AMS-MAA Joint Mathematics Meeting, New Orleans, LA, Jan 5-8, 2007.
- Co-organizer of Special Quarter on Non-linear Computational Geometry, Institute for Mathematics and its Applications, Minneapolis, May 13 - June 22, 2007.
- Co-organizer (with Marie-Francoise Roy, Frank Sottile, Monique Laurent) of Oberwolfach Seminar on "New Trends in Algorithms for Real Algebraic Geometry", Nov 22-28, 2009.
- Co-organizer (with J.M. Landsberg, M. Rojas) "Mathematical aspects of the P vs NP problem and its variants", ICERM, Brown University, Aug 1-5, 2011.
- Member of the Program Committee, International Symposium on Symbolic and Algebraic Computation, 2012.
- Chair of the organizing committee (with I. Dolgachev, J. Ellenberg, J. Landsberg and M.-F. Roy) for IPAM workshop on "Tools from algebraic geometry" (April 7-11, 2014), as part of the special semester on "Algebraic Techniques for Combinatorial and Computational Geometry", Spring 2014.
- Organizer (with F. Cucker and C. Beltran) of workshop on "Real number complexity" in Foundations of Computational Mathematics, Montevideo, Dec 2014.
- Invited long-term participant for a one-semester program "Algorithms and Complexity in Algebraic Geometry" Simons Institute for the Theory of Computing in Berkeley, CA, Fall 2014.
- Invited core participant for the IPAM the special semester on "Algebraic Techniques for Combinatorial and Computational Geometry", Spring 2014.

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- Organizer (with M. Braverman and C. Beltran) of workshop on "Real number complexity" in Foundations of Computational Mathematics, Barcelona, July 2017.
- Organizer (with M. Thomas and P. Hieronymi) Special Session on Model Theory and its Applications , Spring Central Sectional Meeting Purdue University, West Lafayette, IN April 4-5, 2020. Cancelled due to COVID-19
- Organizer (with M. Braverman and C. Beltran) of workshop on "Real number complexity" in Foundations of Computational Mathematics, Vancouver, July 2020. Cancelled due to COVID-19
- Organizer (with A. Lerario, C. Riener, A. Raymond) Symmetry, Randomness, and Computations in Real Algebraic Geometry, Aug 24 - 28, 2020, ICERM, Providence, RI.
- Organizer (with Ali Mohammad Nezhad) AMS Special Session on Optimization and Algebraic Geometry, Joint Mathematics Meeting, J an 6-7, 2021.
- Organizer (with Ali Mohammad Nezhad) Special Session on Optimization and Real Algebraic Geometry, AMS Spring Southeastern Sectional Meeting, Mar 13-14, 2021.
- Organizer (with C. Beltran and P. Koiran) of workshop on "Real number complexity" in Foundations of Computational Mathematics, Paris, France, June 2023.
- Organizer (with M. Thomas and P. Hieronymi) Special Session on Model Theory and its Applications , Spring Central Sectional Meeting Purdue University, West Lafayette, IN, Mar 26-27, 2022.
- Organizer (with Ali Mohammad Nezhad) Special Session on Optimization, Complexity, and Real Algebraic Geometry, Spring Central Sectional Meeting Purdue University, West Lafayette, IN, Mar 26-27, 2022.
- Organizer (with M. Kummer, T. Netzer, C. Vinzant) of Oberwolfach workshop "New Directions in Real Algebraic Geometry", on Week: 3/19/2023 - 3/25/2023.

## Phd students supervised

- Michael Kettner, School of Mathematics, Georgia Tech. Defended his thesis titled *Algorithmic and Topological Aspects of Semi-algebraic Sets Defined by Quadratic Inequalities*, Fall 2007.
- Sal Barone, Department of Mathematics, Purdue University. Defended his thesis titled *Some Quantitative Results in Real Algebraic Geometry* , Summer 2013 (first position: post-doctoral fellow in the School of Mathematics, Georgia Institute of Technology).
- Anthony Rizzie, Department of Mathematics, Purdue University. Defended his thesis titled *Multi-degree bounds on the Betti numbers of semi-algebraic sets and applications*, Summer 2015 (first position: Visiting Assistant Professor in the Department of Mathematics, University of Connecticut).
- Akash Kumar, Department of Computer Science, Purdue University. Defended his thesis titled *Spectral approach to modern algorithm design*, Spring 2020. Currently postdoc at EPFL, Lausanne.

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- Abhiram Natarajan, Department of Computer Science, Purdue University. Defended his thesis titled *Betti numbers of deterministic and random sets in semi-algebraic and o-minimal geometry,* Spring 2020. Currently, EPSRC postdoctoral fellow at the Mathematical Institute, University of Warwick.
- Nathanael Cox, Department of Mathematics, Purdue University. Defended his thesis titled *Two problems in applied topology,* Spring 2021.
- Sarah Percival, Department of Mathematics, Purdue University. Defended her thesis titled *Efficient computation of Reeb spaces and first homology groups,* Summer 2021. Currently postdoc at Michigan State University, East Lansing.

## Current Phd students

- Alison Rosenblum (Math), Warren Katz (Math), Negin Karisani (CS), Haoyu Song (CS).

## Post-doctoral Fellows supervised

- Thierry Zell (2004-6). Subsequent position: Assistant Professor, Department of Mathematics, Lenoir-Rhyne University.
- Peter Scheiblechner. Subsequent position: postdoc in Hausdorff Center, Bonn University.
- Anotonio Lerario, Department of Mathematics. Subsequent position: postdoc at Institut Camille Jordan Universite Claude Bernard Lyon 1, France.
- Ali Mohammad Nezhad, Golomb Assistant Professor, Department of Mathematics, Pudue University (current).

## Teaching

Representation theory of Lie Algebra (Math 598), Spring 2022, 8 students.
Linear Algebra (Math 554), Spring 2022, 18 students.
Linear Algebra (Math 554), Fall 2021, 6 students.
Real Algebraic Geometry (Math 598), Spring 2021, 8 students.
Linear Algebra (Math 554), Spring 2021, 14 students.
Linear Algebra for Engineers (Math 511), Fall 2020, 29 students.
Linear Algebra (Math 265), Spring 2020, 42 students.
Graduate Linear Algebra (Math 554), Fall 2019 (11 students).
Topics in Algebra (Lie Algebras and Representations), Math 690, FAll 2019 (6 students).
Model Theory (Math 598), Spring 2019 (8 students).
Abstract Algebra I (Math 453), Spring 2019 (40 students).
Topics in Algebra (Lie Algebras and Representations), Math 690, Fall 2018 (10 students).
Abstract Algebra I (Math 453), Fall 2018 (40 students).
Graduate Linear Algebra (Math 554), Fall 2017 (18 students).
Abstract Algebra (Math 453), Fall 2017 (35 students).
Topics in Algebra (Lie Algebras and Representations), Math 690, Spring 2017 (8 students).
Linear Algebra (Math 265), Fall 2016, 2 sections, 40+40 students.
Abstract Algebra I (Math 453), Spring 2016, (40+40 students).
Topics in Algebra (Real Algebraic Geometry), Math 690, Fall 2015, (7 students).
Linear Algebra (Math 265), Fall 2015, (40 students).

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Linear Algebra (Math 265), Fall 2013, (3 sections, 40 students each).
Graduate Algebra (Math 553), Spring 2013 (15 tudents).
Undergraduate Abstract Algebra (Math 453), Fall 2012 (25 students).
Undergraduate Abstract Algebra (Math 453), Spring 2012 (25 students).
Graduate Linear Algebra, Purdue University, Fall 2010 (14 students).
Graduate Special Topics course on Real Algebraic Geometry, Purdue University, Spring 2010 (10 students).
Undergraduate Linear Algebra, Spring 2010 (40 students).
Undergraduate Linear Algebra, Purdue University, Fall 2009 (40 students).
Graduate Commutative Algebra, Purdue University, Fall 2008 (10 students).
Undergraduate Linear Algebra, Purdue University, Fall 2008 (40 students).
Graduate Algebra II, Georgia Tech, Spring 2008 (6 students).
Graduate Algebra I, Georgia Tech, Fall 2007 (24 students).
Undergraduate Abstract Algebra I, Georgia Tech, Fall 2007 (15 students).
Graduate Algebraic Geometry, Georgia Tech, Fall 2006 (5 students).
CS Undergraduate Design and Analysis of Algorithms, Georgia Tech, Fall 2006 (35 students).
Calculus II, Georgia Tech, Spring 2006 (45 students).
Graduate Complex Analysis, Georgia Tech, Spring 2004 (10 students).
Graduate Computability and Algorithms, Georgia Tech, Spring 2004 (35 students).
Graduate Algebra I, Georgia Tech, Fall 2003 (28 students).
Graduate Algebraic Topology II, Georgia Tech, Spring 2003 (5 students).
Algorithms in Real Algebraic Geometry (Special Topics), Spring 2003 (5 students).
Graduate Algebra II, Georgia Tech, Spring 2002 (6 students).
Graduate Algebra I, Georgia Tech, Fall 2001 (24 students).
CS Introduction to Proofs (58 students), Georgia Tech, Fall, 2001.
Graduate Algebra I (12 students) and II (8 students), Georgia Tech, 2000-2001.
Calculus I and II, 1998 and 1999, University of Michigan.

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