Personal Information

Anindya De
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Education

- **University of California, Berkeley**
  Ph.D. in Computer Science - 2008-2013
  Research advisor: Luca Trevisan
  Chair(s) of Dissertation Committee: Umesh V. Vazirani and Luca Trevisan

- **Indian Institute of Technology, Kanpur, India**
  B.Tech in Computer Science and Engineering - 2004-2008

Academic Positions held

- **Associate Professor (with tenure):** CIS, University of Pennsylvania, 2022-present

- **Assistant Professor:** CIS, University of Pennsylvania, 2019-2022

- **Adjunct Assistant Professor:** CS, Northwestern University, 2019-2021

- **Assistant Professor:** EECS, Northwestern University, 2015-2018.

- **Postdoctoral associate:** DIMACS, Rutgers (Mentor: Michael Saks), 2014-15.

- **Visitor:** School of Math, Institute for Advanced Study, 2014-15.

- **Member:** School of Math, Institute for Advanced Study (Mentor: Avi Wigderson), 2013-14.

- **Research fellow:** Simons Institute, UC Berkeley (Mentor: Luca Trevisan), Fall 2013.

- **Visiting researcher:** New York University (with Oded Regev), May-August 2013.

- **Visiting researcher:** Columbia University (with Rocco A. Servedio), May-August 2011, 2012.

Industrial Positions held

- **Summer Intern:** Microsoft Research, Silicon Valley (with Cynthia Dwork), May-August 2010.

Awards and Recognitions

- NSF Career Award 2021.

- IBM Pat Goldberg Memorial best paper award 2014 for "Nearly optimal solutions for the Chow Parameters Problem and low-weight approximation of halfspaces" (STOC 2012).

- Co-winner of the best student paper award at Theory of Cryptography Conference (TCC) 2012.

- Berkeley fellowship for Graduate Study 2008-2010.

- President of India Gold Medal for the best academic performance among all departments in graduating class of 2008 at Indian Institute of Technology, Kanpur.

Journal publications

1. **Quantitative correlation inequalities via extremal power series**
   (with S. Nadimpalli and R. Servedio), *Probability Theory and Related Fields, 2022.*

2. **Sharp bounds for population recovery**
   (with R. O'Donnell and R. Servedio), *Theory of Computing, 16(6), 2020, pp. 6:1–6:20.*

3. **Noise stability is computable and low-dimensional**
   (with E. Mossel and J. Neeman), *Theory of Computing, 15(6), 2019, pp. 6:1–6:47. Special issue for CCC 2017.*

4. **Optimal mean-based algorithms for trace reconstruction**
   (with R. O'Donnell and R. Servedio), *Annals of Applied Probability, 29(2), 2019, pp. 851–874.*

5. **A new central limit theorem and decomposition for Gaussian polynomials, with an application to deterministic approximate counting**
   (with R. Servedio), *Probability Theory and Related Fields, 171, 2017, pp. 981-1044.*

6. **The Inverse Shapley Value Problem**
   (with I. Diakonikolas and R. Servedio), *Games and Economic Behavior, 151, 2017, pp. 122-147.*

7. **A Robust Khintchine Inequality, and Algorithms for Computing Optimal Constants in Fourier Analysis and High-Dimensional Geometry**
   (with I. Diakonikolas and R. Servedio), *SIAM Journal on Discrete Math, 30(2), 2016, pp. 1058–1094.*

8. **Majority is Stablest: Discrete and SoS**
   (with E. Mossel and J. Neeman), *Theory of Computing, 12(4), 2016, pp. 4:1–4:50.*

9. **Nearly optimal solutions for the Chow parameters problem and low-weight approximations of halfspaces**
   (with I. Diakonikolas, V. Feldman and R. Servedio), *Journal of the ACM, 61(2), 2014, pp. 11:1–11:36.*

10. **Explicit optimal hardness via Gaussian stability results**
    (with E. Mossel), *ACM Transaction of Computation Theory, 5(4), 2013, pp. 14:1–14:26.*

11. **Fast Integer Multiplication using Modular Arithmetic**
    (with P. Kurur, C. Saha and R. Saptharishi), *SIAM Journal on Computing, 42(2), 2013, pp. 685-699.*

12. **Trevisan's extractor in the presence of quantum side information**
    (with C. Portmann, T. Vidick and R. Renner), *SIAM Journal on Computing, 41(4), 2012, pp. 915–940.*

13. **Extractors and lower bounds for locally samplable distributions**
    (with T. Watson), *ACM Transaction of Computation Theory, 4(1), 2012, pp. 3:1–3:21.*

Conference publications

1. **Near-Optimal Average-Case Approximate Trace Reconstruction from Few Traces**
   (with X. Chen, C. H. Lee, R. Servedio and S. Sinha), *SODA 2022, pp. 779–821.*

2. **Approximating Sumset Size**
   (with S. Nadimpalli and R. Servedio), *SODA 2022, pp. 2339–2357.*

3. **Convex Influences**
   (with S. Nadimpalli and R. Servedio), *ITCS 2022, pp. 53:1–53:21.*

4. **Algorithms for learning a mixture of linear classifiers**
   (with A. Chen and A. Vijayaraghavan), *ALT 2022, pp. 167:205–226.*

5. **Nearly Tight Bounds for Discrete Search under Outlier Noise**
   (with S. Khanna, H. Li and H. Nikpey), *SOSA 2022, pp. 161–173*

6. **Approximate optimization of convex functions with outlier noise**
   (with S. Khanna, H. Li and H. Nikpey), *NeurIPS 2021, pp. 8147–8157*

7. **Weak learning convex sets under normal distributions**
   (with R. Servedio), *COLT 2021, pp. 1399–1428.*

8. **Reconstructing weighted voting schemes from partial information about their power indices**
   (with H. Bennett, E. Vlatakis and R. Servedio), *COLT 2021, pp. 500-565.*

9. **Learning sparse mixtures of permutations from noisy information**
   (with R. O'Donnell and R. Servedio), *COLT 2021, pp. 1429–1466.*

10. **Robust testing of low-dimensional functions**
    (with E. Mossel and J. Neeman), *STOC 2021, pp. 584–597.*

11. **Quantitative correlation inequalities via semigroup interpolation**
    (with S. Nadimpalli and R. Servedio), *ITCS 2021, pp. 69:1–69:20.*
    Invited to GAFA seminar notes (declined).

12. **Learning a mixture of two subspaces over finite fields**
    (with A. Chen and A. Vijayaraghavan), *ALT 2021, pp. 481–504.*

13. **Polynomial-time trace reconstruction in the low deletion rate regime**
    (with X. Chen, C. H. Lee, R. Servedio and S. Sinha), *ITCS 2021, pp. 20:1–20:20.*

14. **Polynomial-time trace reconstruction in the smoothed complexity model**
    (with X. Chen, C. H. Lee, R. Servedio and S. Sinha), *SODA 2021, pp. 54–73.*
    Invited to TALG special issue for SODA 2021.

15. **Testing noisy linear functions for sparsity**
    (with X. Chen and R. Servedio), *STOC 2020, pp. 610–623.*

16. **An Efficient PTAS for Stochastic Load Balancing with Poisson Jobs**
    (with S. Khanna, H. Li and H. Nikpey), *ICALP 2020, pp. 37:1–37:20.*

17. **Reconstruction under outliers for Fourier sparse functions**
    (with X. Chen), *SODA 2020, pp. 2010-2029.*

18. **Learning from satisfying assignments under continuous distributions**
    (with C. Canonne and R. Servedio), *SODA 2020, pp. 82–101.*

19. **Junta correlation is testable**
    (with E. Mossel and J. Neeman), *FOCS 2019, pp. 1549-1563.*

20. **Simple and efficient pseudorandom generators from Gaussian Processes**
    (with E. Chattopadhyay and R. Servedio), *CCC 2019, pp. 4:1-4:33.*

21. **Is your function low dimensional?**
    (with E. Mossel and J. Neeman), *COLT 2019, pp. 979-993.*

22. **Density estimation for shift invariant multidimensional distributions**
    (with P. Long and R. Servedio), *ITCS 2019, pp. 28:1-28:20.*

23. **Learning sums of independent random variables with sparse collective support**
    (with P. Long and R. Servedio), *FOCS 2018, pp. 297-308.*

24. **Boolean function analysis meets stochastic optimization: An approximation scheme for stochastic knapsack**
    SODA 2018, pp. 1286-1305.

25. **Non-interactive simulation of correlated distributions is decidable**
    (with E. Mossel and J. Neeman), *SODA 2018, pp. 2728-2746.*

26. **Optimal mean-based algorithms for trace reconstruction**
    (with R. O'Donnell and R. Servedio), *STOC 2017, pp. 1047-1056.*

27. **Noise stability is computable and low-dimensional**
    (with E. Mossel and J. Neeman), *CCC 2017, pp. 10:1-10:11.*
    Invited to Theory of Computing special issue for CCC 2017

28. **Noisy population recovery in polynomial time**
    (with M. Saks and S. Tang), *FOCS 2016, pp. 675–684.*

29. **A size free CLT for poisson multinomials and its applications.**
    (with C. Daskalakis, G. Kamath and C. Tzamos), *STOC 2016, pp. 1074-1086.*

30. **Beyond the central limit theorem: asymptotic expansions and pseudorandomness for combinatorial sums**
    FOCS 2015, pp. 883–902.

31. **Boolean monotonicity testing requires (almost) $n^{1/2}$ non-adaptive queries**
    (with X. Chen, R. Servedio and L.-Y. Tan), *STOC 2015, pp. 519–528.*

32. **Learning distributions from satisfying assignments**
    (with I. Diakonikolas and R. Servedio), *SODA 2015, pp. 478–497.*

33. **Efficient deterministic approximate counting for low-degree PTFs**
    (with R. Servedio), *STOC 2014, pp. 832–841.*

34. **Deterministically counting satisfying assignments for juntas of degree-2 PTFs**
    (with I. Diakonikolas and R. Servedio), *CCC 2014, pp. 229–240.*

35. **A Polynomial time approximation scheme for fault-tolerant distributed storage**
    (with C. Daskalakis, I. Diakonikolas, A. Moitra and R. Servedio), *SODA 2014, pp. 628–644.*

36. **Majority is Stablest : Discrete and SoS**
    (with E. Mossel and J. Neeman), *STOC 2013, pp. 477–486.*

37. **A Robust Khintchine Inequality, and Algorithms for Computing Optimal Constants in Fourier Analysis and High-Dimensional Geometry**
    (with I. Diakonikolas and R. Servedio), *ICALP 2013, pp. 376–387.*

38. **Nearly optimal solutions for the Chow parameters problem and low-weight approximations of halfspaces**
    (with I. Diakonikolas, V. Feldman and R. Servedio), *STOC 2012, pp. 729–746.*
    Invited to Theory of Computing special issue on Analysis of Boolean functions (declined)

39. **The Inverse Shapley Value Problem**
    (with I. Diakonikolas and R. Servedio), *ICALP 2012, pp. 266–277.*

40. **Lower bounds in Differential Privacy**
    TCC 2012, pp. 321–338.

41. **Pseudorandomness for permutation and regular branching programs**
    CCC 2011, pp. 221–231.

42. **Extractors and lower bounds for locally samplable distributions**
    (with T. Watson), *RANDOM 2011, pp. 483–494.*

43. **Non-uniform attacks against one-way functions and PRGs**
    (with L. Trevisan and M. Tulsiani), *CRYPTO 2010, pp. 649–665.*

44. **Near optimal extractors against quantum storage**
    (with T. Vidick), *QIP 2010 , STOC 2010, pp. 504–517.*

45. **Improved pseudorandom generators against DNFs**
    (with O. Etesami, L. Trevisan and M. Tulsiani), *RANDOM 2010, pp. 504–517.*

46. **Extractors using hardness amplification**
    (with L. Trevisan), *RANDOM 2009, pp. 462–475.*

47. **Fast Integer Multiplication using Modular Arithmetic**
    (with P. Kurur, C. Saha and R. Saptharishi), *STOC 2008, pp. 499–506.*

Funding

- **NSF AF Small 2018-2022:** "Boolean function analysis meets stochastic design" (PI: Anindya De, co-PI: Rocco Servedio). Grant initially awarded at Northwestern and transferred to Penn. Total award amount (to PI): $333,497.

- **NSF AF Small 2019-2022:** "Threshold functions – Derandomization, Testing and Applications" (PI: Anindya De). Total award amount: $400,000.

- **NSF CAREER award 2021-2026:** "Learning and Property Testing – A complexity theoretic perspective" (PI: Anindya De). Total award amount: $420,983.

Invited talks

1. *Quantitative correlation inequalities via semigroup interpolation*,
   Online Asymptotic Geometric Analysis Seminar, April 2021
   Atlanta, GA.

2. *Quantitative correlation inequalities via semigroup interpolation*,
   CS Theory Seminar, Carnegie Mellon University, March 2021
   Pittsburgh, PA.

3. *Quantitative correlation inequalities via semigroup interpolation*,
   Dagstuhl seminar on Computational Complexity of Discrete Problems, February 2021
   Dagstuhl, Germany.

4. *Polynomial time trace reconstruction in the smoothed complexity model*,
   Simons Seminar on Probability, Geometry and Computation in High-Dimensions, September 2020
   Berkeley, CA.

5. *Testing noisy linear functions for sparsity*,
   CS Theory Seminar, University of Waterloo, June 2020
   Waterloo, ON.

6. *Testing noisy linear functions for sparsity*,
   Machine Learning Seminar, CU Boulder, February 2020
   Boulder, CO.

7. *Junta Correlation is Testable*,
   CS Theory Seminar, CU Boulder, February 2020
   Boulder, CO.

8. *Testing noisy linear functions for sparsity*,
   CS Theory Seminar, Cornell University, February 2020
   Ithaca, NY.

9. *Testing noisy linear functions for sparsity*,
   CS Theory Seminar, Tata Institute, January 2020
   Mumbai, India.

10. *Junta Correlation is Testable*,
    CS Theory Seminar, IIT Bombay, January 2020
    Mumbai, India.

11. *Testing noisy linear functions for sparsity*,
    CS Theory Seminar, Indian Statistical Institute, December 2019
    Kolkata, India.

12. *Central limit theorem: variants and applications*,
    Invited talk at FOCS 2019 workshop: "A TCS quiver", November 2019
    Baltimore, MD.

13. *Junta Correlation is Testable*,
    Theory of Computation Colloquium, MIT, October 2019
    Cambridge, MA.

14. *Junta Correlation is Testable*,
    CS Theory Seminar, Columbia University, October 2019
    New York, NY

15. *Testing noisy linear functions for sparsity*,
    Theory and ML Seminar, Yahoo Research, September 2019
    New York, NY.

16. *Learning sparse distributions from noisy samples*,
    Keynote talk at the Workshop on Algorithms for Learning and Economics, July 2019
    Rhodes, Greece.

17. *Learning sparse mixtures of rankings from noisy information*,
    Austin-Texas A&M Joint Probability day, March 2019
    Austin, TX.

18. *Identifying low-dimensional data in high-dimensional spaces*,
    Dagstuhl seminar on Computational Complexity of Discrete Problems, February 2019
    Dagstuhl, Germany.

19. *Identifying low-dimensional data in high-dimensional spaces*,
    STCS Seminar, Tata Institute, December 2018
    Mumbai, India.

20. *Optimal mean based algorithms for trace reconstruction*,
    Highlights of Algorithms, Vrije Universiteit Amsterdam, July 2018
    Amsterdam, The Netherlands.

21. *Optimal mean based algorithms for trace reconstruction*,
    CS Theory Seminar, UIUC, April 2018
    Champaign, IL.

22. *Learning sums of independent integer-valued random variables*,
    Algorithms and Optimization Workshop, ICTS Bengaluru, December 2017
    Bengaluru, India.

23. *Learning sums of independent integer-valued random variables*,
CS Theory Seminar, Caltech, November 2017
Pasadena, CA.

24. *Learning sums of independent integer-valued random variables*,
67th Midwest Theory Day at Indiana University, April 2017
Bloomington, IN.

25. *Optimal mean based algorithms for trace reconstruction*,
Dagstuhl seminar on Computational Complexity of Discrete Problems, February 2017
Dagstuhl, Germany.

26. *Learning sums of independent integer-valued random variables*,
Banff workshop on Computational Complexity, September 2016
Banff, AB.

27. *Learning from satisfying assignments*,
CS Theory Seminar, University of Pennsylvania, May 2016
Philadelphia, PA.

28. *Noisy population recovery in polynomial time*,
Simons workshop on Analysis of Boolean Functions, February 2016
Schloss Elmau, Germany.

29. *Asymptotic expansions of the central limit theorem and its applications*,
CSDM seminar, Institute for Advanced Study, November 2014
Princeton, NJ.

30. *Central limit theorem for Gaussian chaos and deterministic approximate counting for polynomial threshold functions*,
CS Theory seminar, Courant Institute, NYU, September 2014
New York, NY.

31. *Central limit theorem for Gaussian chaos and deterministic approximate counting for polynomial threshold functions*,
CSDM seminar, Institute for Advanced Study, May 2014
Princeton, NJ.

32. *Central limit theorem for Gaussian chaos and deterministic approximate counting for polynomial threshold functions*,
CS Theory seminar, University of Chicago, March 2014
Chicago, IL.

33. *Central limit theorem for Gaussian chaos and deterministic approximate counting for polynomial threshold functions*,
CS Theory seminar, Rutgers University, February 2014
Piscataway, NJ.

34. *Learning from satisfying assignments*,
CSDM seminar, Institute for Advanced Study, November 2013
Princeton, NJ.

35. *Deterministic Counting of Satisfying Assignments for Juntas of Degree-2 PTFs*,
Workshop on Real Analysis in Computer Science, Simons Institute, September 2013
Berkeley, CA.

36. *Boolean function analysis in Social Choice Theory*,
CS Theory seminar, The Ohio State University, April 2013
Columbus, OH.

37. *Reconstruction of halfspaces from their average satisfying assignment*,
    Microsoft Research / MIT CS Theory reading group, December 2012
    Cambridge, MA.

38. *Majority is Stablest: Discrete and SoS*,
    CS Theory seminar, Columbia University, December 2012
    New York, NY.

39. *The Inverse Shapley value problem*,
    CS Theory seminar, Columbia University, July 2012
    New York, NY.

40. *Nearly optimal solutions for the Chow Parameters Problem and low-weight approximation of halfspaces*,
    CS Theory seminar, IBM Almaden, April 2012
    San Jose, CA.

41. *Nearly optimal solutions for the Chow Parameters Problem and low-weight approximation of halfspaces*,
    CS Theory seminar, Stanford University, December 2011
    San Jose, CA.

42. *Extractors and lower bounds for locally samplable sources*,
    CS Theory seminar, Columbia University, July 2011
    New York, NY.

43. *Extractors and lower bounds for locally samplable sources*,
    Research I seminar, IIT Kanpur, January 2011
    Kanpur, India.

44. *Non-uniform attacks against one-way functions and PRGs*,
    China Theory week, Tsinghua University, September 2010
    Beijing, China.

45. *Non-uniform attacks against one-way functions and PRGs*,
    CS Theory seminar, Microsoft Research Silicon Valley, May 2010
    Mountain View, CA.

Teaching Experience

At Penn

- **CIS 262** – Automata, Computability and Complexity (Spring 2021, Fall 2021).

- **CIS 511** – Introduction to Theory of Computation (Spring 2019, Fall 2019).

- **CIS 700** – Sublinear time algorithms in Testing and Learning (Spring 2020).

- **CIS 700** – Mathematical methods in Theoretical Computer Science (Spring 2022).

At Northwestern

- **EECS 335** – Introduction to Theory of Computation (Winter 2016, Fall 2016, Winter 2017, Fall 2018).

- **EECS 395/495** – Introduction to Computational Learning Theory (Spring 2016, Spring 2017).

- **EECS 496** – Computational Complexity (Fall 2017).

- **EECS 396/496** – Randomized Algorithms (Spring 2018).

- **EECS 496** – Analytical methods in Theoretical Computer Science (Fall 2016).

At Rutgers

- **CS 452** – Formal languages and Automata theory (Fall 2014).

Mentoring experience

PhD students

- **Aidao Chen:** (at Northwestern, expected PhD 2022) co-advised with Aravindan Vijayaraghavan

- **Huan Li:** (at Penn, expected PhD 2024) co-advised with Sanjeev Khanna

- **Eshwar Ram Arunachaleswaram:** (at Penn, expected PhD 2024) co-advised with Sampath Kannan

Postdocs

- **Huxley Bennett:** (at Northwestern, 2017-2019) co-mentored with Aravindan Vijayaraghavan. Now tenure-track at Oregon State University.

- **Xue Chen:** (at Northwestern, 2018-2020) co-mentored with Konstantin Makarychev and Aravindan Vijayaraghavan. Now tenure-track at George Mason University.

Undergraduates

- **Mohammad Harris Khan:** (at Northwestern) Supervised Honors thesis (Math) and Masters thesis (CS) on "Expanders on groups".

- **Ashley Guo:** (at Northwestern) Supervised year long independent Study on "Property testing for distributions".

- **Caroline Okun:** (at Penn) Supervised Independent Study on "Predicting adversarial sequences".

- **Lyndsey Barrett:** (at Penn) Supervised REU project on "Testing low-degree sparse polynomials".

- **Fernando Negrete:** (at Penn) Supervised REU project on "Testing low-degree sparse polynomials".

Service to the community

- **Editorial Board**: Guest Editor-at-Large, Algorithmica.

- **Conference Program Committee**: RANDOM 2015, CCC 2016, FOCS 2017, COLT 2020 (senior PC), ITCS 2021, FOCS 2021, COLT 2021 (senior PC), ITCS 2022, ALT 2022, COLT 2022 (senior PC).

- **Conference Refereeing**: STOC, FOCS, CCC, RANDOM, TCC, PODS, SOFSEM, STACS, SODA, ICALP, ESA, FSTTCS, ITCS.

- **Journal Refereeing**: SIAM J. on Computing, SIAM J. on Discrete Math., Theory of Computing, Algorithmica, Journal of the ACM, Annals of Applied Probability.

- **Other service**: (a) Founding organizer of online seminar series TCS+. Nearly 150 talks so far with more than $100,000$ views on Youtube. (b) Local organizer for Computational Complexity Conference, 2022.