CONTACT INFORMATION	Prof. Dr. Afonso Bandeira Professur für Mathematik HG G 23.1 Ramistrasse 101 8092 Zürich Switzerland	*Phone:* +41 44 632 7954 `bandeira@math.ethz.ch`

WEB PAGE   https://people.math.ethz.ch/~abandeira/

PERSONAL DATA
Full Name: Afonso José Sousa Bandeira
Citizenship: Portugal

PRESENT OCCUPATION

ETH Zurich, Switzerland   *September 2019 to Present*
Full Professor, Department of Mathematics

Other affiliations:
- Director, Institute for Operations Research (IFOR)   2023 - present
- Member of the Max Planck ETH Center for Learning Systems
- Member of ETH Foundations of Data Science (ETH-FDS)
- Courtesy appointment at D-ITET — "assoziiert am D-ITET"
- Core Member of the AI Center, ETH Zürich

PAST OCCUPATIONS

Courant Institute, New York University   *March 2019 to August 2019*
Associate Professor of Mathematics and Data Science (with tenure)

Courant Institute, New York University   *July 2016 to March 2019*
Assistant Professor, Department of Mathematics, Courant Institute of Mathematical Sciences, and Center for Data Science, New York University

Massachusetts Institute of Technology   *July 2015 to June 2016*
Instructor of Applied Mathematics
- With half-time postdoctoral position sponsored by Philippe Rigollet
- Affiliated Member of the MIT Institute For Data, Systems, And Society (IDSS)

EDUCATION

Ph.D. awarded by Princeton University, NJ, USA   *September 2010 to June 2015*
- Ph.D. in Applied and Computational Mathematics
- Advised by Amit Singer
- Thesis: Convex Relaxations for Certain Inverse Problems on Graphs
- Research Assistantship (2011 – 2015)
- Also awarded M.A. in 2012.

M.S. in Mathematics awarded by University of Coimbra *September 2009 to July 2010*
- GPA: 19.3/20
- Thesis: Computation of Sparse Low Degree Interpolating Polynomials and their Application to DF Optimization. Was awarded the grade 20/20. Advised by Luis Nunes Vicente.

B.S. in Mathematics awarded by University of Coimbra *September 2006 to July 2009*
- GPA: 19.1/20

Fall 2023 VIS (Association of Computer Science Students at the ETH Zurich) teaching award for best [lecture] interaction.

My coauthors were awarded the 2023 ACHA Charles Chui Young Researcher Best Paper Award for our paper "Estimation under group actions: Recovering orbits from invariants".

The 2022 Prémio António Aniceto Monteiro from the Portuguese Mathematical Society.

The publication "Exact Recovery in the Stochastic Block Model" received the 2020 Information Theory Society Paper Award.

The 2020 Stephen Smale Prize from the FoCM society.

The 2019 ISAAC Award for Young Scientists, from the International Society for Analysis, its Applications and Computation (ISAAC), 2019.

Sloan Research Fellowship 2018.

Amelia Perry and Alexander Wein awarded 2018 Jonhson prize (MIT) for publication "Optimality and Sub-optimality of PCA I: Spiked Random Matrix Models"

NSF DMS Award 2017-2020: Collaborative Research: Statistical estimation with algebraic structure

NSF DMS Award 2017-2020: Collaborative Research: Tractable non-convex optimization

The publication "A Certifiably Correct Algorithm for Synchronization over the Special Euclidean Group" received the best paper award at the 12th International Workshop on the Algorithmics Foundations of Robotics, 2016.

Selected as a 2015 DARPA Riser.

US Junior Oberwolfach Fellow, April 2014 and August 2015.

Awarded the INFORMS Optimization Society student paper prize for the paper "Computation of sparse low degree interpolating polynomials and their application to derivative-free optimization", 2013.

The publication "The road to deterministic matrices with the restricted isometry property" received a best student paper award at the 36th Annual SIAM Southeastern Atlantic Section Conference, 2012.

Awarded two *Young Talents in Mathematics* fellowships: 2006/2007 and 2007/2008 by *Calouste Gulbenkian Foundation*.

Awarded an *Initiation to Research Fellowship* by *Portuguese Found. for Science and Tech.* for 2008/2009.

University of Coimbra

- Joao Farinha Prize for the student completing B. S. in Math. with the highest GPA, 2009
- Renato Pereira Coelho Prize for the student completing M. S. in Math. with the highest GPA, 2010
- Merit awards for student with the best GPA: on 2008 and 2009
- Prize for the 3% best students, 2007

Mathematical Olympiads

- Ibero-American Math Olympiads for Undergraduates, Silver Medal, 2008

- International Mathematical Olympiads, Bronze Medal, 2006
- Ibero-American Math Olympiads, Bronze Medal, 2006
- Portuguese Math Olympiads, Gold Medal, 2005 and 2006
- Sao Paulo Math Olympiads (Portugal and Brazil), Bronze Medal (2004) and Gold Medal (2005)
- Mayo Math Olympiads (Ibero-American), Bronze Medal, 2004

Tribute by the S. P. Sul Mayor for achievements on Math Olympiads, 2006

Bento de Jesus Caraca national prize in Mathematics for project developed while in high school, 2006

4th place nationally at the National Astronomy Olympiads, 2005.

MENTORING
AND ADVISING
EXPERIENCE

PhD Students advised

- Kevin Lucca (ETHZ, 2023-Present)
- Petar Nizic-Nikolac (ETHZ, 2022-Present)
- Anastasia Kireeva (ETHZ, 2022-Present)
- Daniil Dmitriev (ETHZ, 2021-Present)
- Konstantin Donhauser (ETHZ, 2021-Present; as secondary co-adviser)
- Pedro Abdalla Teixeira (ETHZ, 2020 - Present)
- Yunzi Ding (NYU, graduated: 2022) → Financial industry
- Anya Katsevich (NYU, student, graduated: 2022) → postdoc at MIT
- Dmitriy Kunisky (NYU, student, graduated: 2021) → postdoc at Yale
- Luca Venturi (NYU, student, graduated: 2021) → Facebook

Postdoctoral mentorship

- Gil Kur (ETHZ, 2023- current; as secondary co-mentor)
- Antoine Maillard (ETHZ, 2021 - current)
- March Boedihardjo (ETHZ, 2022-2023) → faculty at Michigan State
- Nikita Zhivotovskiy (ETHZ, 2021-2022) → faculty at UC Berkeley
- Alexander S. Wein (NYU, Fall 2018 - Summer 2021) → faculty at UC Davis
- Soledad Villar (NYU, Fall 2017 - Summer 2020) → faculty at John Hopkins
- Shuyang Ling (NYU, Fall 2017 - Summer 2019) → faculty at NYU Shanghai

- Second Adviser for several PhD students at ETH: Konstantin Donhauser (Present), Jongqiu Ding (Present), Tommaso D'Orsi (Present), Ivan Sergeev (Present), Federica Cecchetto (Present), Hongjin Wu (Present), Damagoj Bradac (Present), Baohua Ni (Present), Konstantinos Alexopoulos (Present).

- At ETH Zürich, I supervise, yearly, several Master Thesis, Bachelor Thesis, Semester papers, Reading courses, and Independent Research Projects (Fall 2019 - Present)

Other students advised at New York University: *Fall 2016 - Present*

- Ruitu Xu (Masters Student, 2017-2019) → PhD student in Yale
- Vladimir Kobzar (Masters student, 2016-2017) → PhD student in NYU

Students advised at Massachusetts Institute of Technology: *Spring 2016*

- Gergely Odor (Undergraduate Research Opportunities Program (UROP))

Students advised in Princeton (joint with Amit Singer):   *Fall 2012 to Spring 2015*

- Leor Klainerman (Summer Independent Research, Princeton University 2013 and Undergraduate Senior Thesis, Princeton University 2013-2014)
- Alexander Iriza (Summer Independent Research, Princeton University 2013)
- Andy Zhu (Undergraduate Senior Thesis, Princeton University 2012-2013)
- Christopher Kennedy (Undergraduate Senior Thesis, Princeton University 2012-2013)

TEACHING EXPERIENCE	*Classes taught* at ETH Zurich *Fall 2019 - Present*

- Fall 2023: Linear Algebra
- Fall 2023: Mathematics of Data Science
- Spring 2023: Student Seminar on Mathematics of Data Science: Random Matrices
- Spring 2023: Mathematics of Signal, Networks, and Learning
- Fall 2022: Mathematics of Data Science
- Fall 2022: Student Seminar on Mathematics of Data Science: Differential Privacy
- Spring 2022: Mathematics of Machine Learning
- Spring 2022: Student Seminar on Mathematics of Data Science: Discrepancy Theory
- Fall 2021: Mathematics of Data Science
- Fall 2021: Student Seminar on Mathematics of Data Science: Stochastic Optimization
- Spring 2021: Mathematics of Machine Learning
- Spring 2021: Student Seminar on Mathematics of Data Science: Optimal Transport
- Fall 2020: Complex Analysis
- Spring 2020: Student Seminar on Mathematics of Data Science: Optimization of Random Functions
- Spring 2020: Mathematics of Data Science

Classes taught at New York University   *Fall 2016 - August 2019*

- Fall 2018: Optimization and Computational Linear Algebra for Data Science (MS in Data Science)
- Fall 2018: Math and Data Working Group: Statistical to Computational Gaps and Statistical Estimation with Algebraic Structure (PhD level)
- Spring 2018: Special Topics in Data Science: Mathematics of Data Science: Graphs and Networks
- Fall 2016: Topics in Mathematics of Data Science (PhD class)
- Fall 2016: Optimization and Computational Linear Algebra for Data Science (MS in Data Science)

Classes taught at Massachusetts Institute of Technology: *Fall 2015*

- Topics in Mathematics of Data Science (Undergraduate special topics class)

Guest Lecturer at Princeton University   *Spring 2015*

- Mathematical Analysis of Massive Data Sets (Graduate Course)

Assistant in Instruction at Princeton University   *Spring 2013*

- Mathematical Analysis of Massive Data Sets (Graduate Course)

Assistant in Instruction at Princeton University   *Spring 2013 to Spring 2015*

- Program in Applied and Computational Mathematics Certificate Program

Teaching Assistant at U. Coimbra   *September 2009 to September 2010*

- Multidimensional Integral Calculus and Differential Equations
- Computational Statistics

SERVICE, OUTREACH, AND OTHER EXPERIENCES	Director of IFOR (Institute for Operations Research), ETH Zürich, 2023-present.

Head of the FIM Nachdiplom Committee, 2023-present.

Member of the Editorial Board of Annals of Probability, starting in 2024.

Member of the Editorial Board of Journal of AMS, starting in 2024.

Member of the Tucker Prize Committee 2023-present.

Member of the Smale Prize Committee 2023.

Member of the Editorial Board of Mathematical Statistics and Learning, 2023-present.

[Repeatedly] Member of several hiring, strategy, and restructuring advising committees, in Switzerland and abroad (details not public).

[Repeatedly] Panel member in grant reviewing process, and reviewer of proposals, for multiple grant-giving organizations, in Switzerland and abroad (details not public).

[Repeatedly] Evaluator and referee for several hiring and tenure committees, and referee for several journals and conferences in Mathematics, Science, Statistics, Computer Science, Electrical Engineering, among other fields (details not public).

[Repeatedly] Multiple media appearances and interviews.

Our work on Spontaneous Synchronisation in the Kuramoto Model featured in Quanta Magazine, July 2023.

Deputy Director of IFOR (Institute for Operations Research), ETH Zürich, 2021-2023.

Member of the Editorial Board of Portugaliae Mathematica, 2022-present.

Board member of the Zurich Graduate School of Mathematics, 2021-present.

Member of the Executive Commitee of the Foundations of Data Science Initiative, ETH Zürich.

Member of the Editorial Board of the SIAM Journal on Mathematics of Data Science, 2020-present.

Member of the Mathematics Colloquium Committee, 2021-present.

Member of the FIM Nachdiplom Committee, 2020-present.

Member of the D-MATH Outreach and Library Committees, 2020-present.

Member of the Herman-Weyl Selection Committee, 2020-2022.

Chair and/or co-examiner of several PhD defenses/examinations, both at ETH Zürich and other universities.

Lecturer at Summer School CUSO 2021, course on "Community Detection and the Stochastic Block Model", (Les Diablerets, Switzerland) September 2021.

Organizer of Simons Workshop on Rigorous Evidence for Information-Computation Trade-offs (Berkeley), including mirror event at EPFL (9/2021).

Member of the AI Center Selection Committee, 2021.

Creator and organizer of DACO seminar.

Maintains Youtube channel with seminars and lectures.

Organizer of two virtual seminars started during the COVID-19 pandemic: `MAD+` and `One World MINDS`.

Program Committee Member and Virtual Meeting Moderator of MSML 2020.

Organizer of "Research Seminar on Statistics", "ZuKoSt: Seminar on Applied Statistics", "Foundations of Data Science Seminar", "MAD+", and "Optimization Seminar" at ETH Zurich.

Maintained "Math and Data Plus" Youtube Channel 2020-2021.

Member of the Editorial Board of the Journal of the Society for the Foundations of Computational Mathematics (J. FoCM), 2020-present.

Member of the Editorial Board of the J. Four. Anal. Appl. (JFAA) 2019-present.

TPC member for Sampling Theory and Applications 2019

Head of the Math and Data Track for the Masters in Data Science at the CDS, NYU.

Member of the International Scientific Advisory Committee for the Centre de Recherches Mathématiques (CRM), Montreal, Canada.

Program Committee member of 31st Annual Conference on Learning Theory (COLT 2018), Stockholm, Sweden, 07/2018.

Organizer of Math and Data Working and Reading Group at NYU (Spring 2017 - Present)

Organizer of Workshop on Multi-reference Alginment at the Simons Collaboration on Algorithms & Geometry, Simons Foundation, New York, 11/2017

Participant on the theme semester "Bridging Continuous and Discrete Optimization" at the Simons Institute for the theory of computing at Berkeley, CA. Fall 2017.

Sampling Theory and Applications, 12th International Conference, Tallinn, Estonia 07/2017. (organized invited session)

Organizer of the "Math and Data", "Math, Information, and Computation", and "CDS Lectures" at the Center for Data Science, NYU.

Co-Founder and Core Member of the Math and Data Group at the Center for Data Science, NYU.

Member of the PhD admissions committee at the Center for Data Science, NYU.

Maintained the research blog: "Relax and Conquer" at http://afonsobandeira.wordpress.com/

Organizer of "Science outdoors" outreach activity with high school students from Sao Pedro do Sul, Portugal, June 2015.

"Delfos Oráculo" lecturer – lectures for high school students, as part of the Portuguese International Mathematical Olympiad training, Coimbra, Portugal, May 2015.

Oberwolfach Reporter, April 2014.

Advised undergraduate PACM certificate students on their final presentations (2012-2015).

Instructor of special introductory course on "Randomness, Matrices and High Dimensional Problems" in IMPA, Brazil. November 2014. (joint with Roberto I. Oliveira)

Reviewer for Mathematical Reviews/MathSciNet.

Organizer of the IDeAS seminar (Princeton, 2012–2015) and the PACM Graduate Student Seminar (Princeton, 2011–2012).

Teaching Assistant at Escola Diagonal 2009 (Summer School for Undergraduate Students) on a course on Combinatorics and Ergodic Theory by Vitaly Bergelson, in Porto, Portugal. September 2009.

Participant of the 69th, 70th and 73rd *European Study Group with Industry*, 2009 and 2010

Problem solver of several problems proposed by the *American Mathematical Monthly*. Solution published, in the June/July 2010 magazine, for problem 11374.

Member of the Scientific Committee of the Portuguese Math Olympiads (2008–2010)

Monitor at Projecto Delfos   *(2006 to 2010)*
  • Preparing the Portuguese team for the International Math Olympiads

Student representative, selected by election, for the administration organ of the Math. Dept. of the U. Coimbra (2006–2009)

Member of the Portuguese team for the International Programming competition, SWERC: *Southwest European Regional Contest* 2007.

JOURNAL
PUBLICATIONS

Matrix Concentration Inequalities and Free Probability. (A. S. Bandeira, M. T. Boedihardjo, R. van Handel). Inventiones Mathematicae, 234, pages 419–487 (2023).

Estimation under group actions: recovering orbits from invariants. (A. S. Bandeira, B. Blum-Smith, J. Kileel, A. Perry, J. Weed, A. S. Wein). Applied and Computational Harmonic Analysis, 66: 236–319 (2023).

Guarantees for spontaneous synchronization on Random Geometric Graphs. (P. Abdalla, A. S. Bandeira, C. Invernizzi). SIAM Journal on Applied Dynamical Systems, to appear. Preprint available online.

On free energy barriers in Gaussian priors and failure of cold start MCMC for high-dimensional unimodal distributions. (A. S. Bandeira, A. Maillard, R. Nickl, S. Wang). Philosophical Transactions of the Royal Society A, 381: 20220150, 2023.

Subexponential-Time Algorithms for Sparse PCA. (Y. Ding, D. Kunisky, A. S. Wein, A. S. Bandeira). Journal of the FoCM, 2023.

A remark on Kashin's discrepancy argument and partial coloring in the Komlós conjecture. (A. S. Bandeira, A. Maillard, N. Zhivotovskiy). Port. Math. 79 (2022), no. 3/4, pp. 311–316, 2022.

Dual bounds for the positive definite functions approach to mutually unbiased bases. (A. S. Bandeira, N. Doppelbauer, D. Kunisky). Sampling Theory, Signal Processing, and Data Analysis (SaSiDa) 20, 2022.

Community Detection with a Subsampled Semidefinite Program. (P. Abdalla, A. S. Bandeira). Sampling Theory, Signal Processing, and Data Analysis (SaSiDa) 20, 2022.

Computationally efficient sparse clustering. (M. Loffler, A. S. Wein, A. S. Bandeira). Information and Inference: A Journal of the IMA, Volume 11, Issue 4, Pages 1255–1286, 2022.

Likelihood Maximization and Moment Matching in Low SNR Gaussian Mixture Models. (A. Katsevich, A. S. Bandeira). Communications on Pure and Applied Mathematics, 2022.

The Average-Case Time Complexity of Certifying the Restricted Isometry Property. (Y. Ding, D. Kunisky, A. S. Wein, A. S. Bandeira). IEEE Transactions on Information Theory, volume 67, Issue 11, Pages 7355-7361, Nov 2021.

The Spectral Norm of Random Lifts of Matrices. (A. S. Bandeira, Y. Ding). Electron. Commun. Probab. 26: 1-10 (2021)

A Tight Degree 4 Sum-of-Squares Lower Bound for the Sherrington-Kirkpatrick Hamiltonian. (D. Kunisky, A. S. Bandeira). Mathematical Programming, 2020.

Non-unique games over compact groups and orientation estimation in cryo-EM. (A. S. Bandeira, Y. Chen, R. Lederman, and A. Singer). Inverse Problems, Volume 36, Number 6 Special Issue on Cryo-Electron Microscopy and Inverse Problems, 2020.

Optimal rates of estimation for multi-reference alignment. (A. S. Bandeira, P. Rigollet, J. Weed). Mathematical Statistics and Learning, Volume 2, Issue 1, 2019, pp. 25–75.

Statistical limits of spiked tensor models. (A. Perry, A. Wein, A. S. Bandeira). Annales de l'Institut Henri Poincaré - Probabilités et Statistiques, Vol. 56, No. 1, 230-264, 2020.

Deterministic guarantees for Burer-Monteiro factorizations of smooth semidefinite programs (N. Boumal, V. Voroninski, and A. S. Bandeira). Communications on Pure and Applied Mathematics, Volume 73, Issue 3, 2020.

Spurious Valleys in One-hidden-layer Neural Network Optimization Landscapes. (L. Venturi, A. S. Bandeira, J. Bruna). Journal of Machine Learning Research (JMLR), Volume: 20, Issue: 133, Pages: 1–34, 2019.

On the Landscape of Synchronization Networks: A Perspective from Nonconvex Optimization. (S. Ling, R. Xu, A. S. Bandeira). SIAM Journal on Optimization (SIOPT), 29(3), 1879–1907, 2019.

The sample complexity of multi-reference alignment. (A. Perry, J. Weed, A. Bandeira, P. Rigollet, A. Singer). SIAM Journal on Mathematics of Data Science (SIMODS), Vol. 1, No. 3, pp. 497–517, 2019.

SE-Synch: A Certifiably Correct Algorithm for Synchronization over the Special Euclidean Group (D. M. Rosen, L. Carlone, A. S. Bandeira, J. J. Leonard). International Journal of Robotics Research, International Journal of Robotics Research, Vol 38, Issue 2-3, 2019.

Notes on computational-to-statistical gaps: predictions using statistical physics (A. S. Bandeira, A. Perry, A. S. Wein). Portugaliae Mathematica, Vol 75, issue 2, pages 159-186, 2018.

Optimality and Sub-optimality of PCA I: Spiked Random Matrix Models (A. Perry, A. S. Wein, A. S. Bandeira, A. Moitra). Annals of Statistics, Volume 46, Number 5, pp. 2416–2451, 2018.

Message-passing algorithms for synchronization problems over compact groups. (A. Perry, A. S. Wein, A. S. Bandeira, A. Moitra). Communications on Pure and Applied Mathematics, Volume 71, Issue 11, Pages 2275-2322, 2018.

Discrete uncertainty principles and sparse signal processing. (A. S. Bandeira, M. E. Lewis, and D. G. Mixon). Journal of Fourier Analysis and Applications, volume 24, pages 935–956, 2018.

Random Laplacian matrices and convex relaxations. (A. S. Bandeira). Foundations of Computational Mathematics, 18, pages 345–379, 2018.

Resilience for the Littlewood-Offord Problem (A. S. Bandeira, A. Ferber, M. Kwan). Advances in Mathematics, volume 319, pp. 292-312, 2017.

Marcenko-Pastur Law for Kendall's Tau. (A. S. Bandeira, A. Lodhia, P. Rigollet). Electronic Communications in Probability, Vol. 22, paper no. 32, 1–7, 2017

Tightness of the maximum likelihood semidefinite relaxation for angular synchronization. (A. S. Bandeira, N. Boumal, and A. Singer). Mathematical Programming, volume 163, issue 1-2, pp. 145-167, 2017.

A conditional construction of restricted isometries. (A. S. Bandeira, D. G. Mixon, and J. Moreira). International Mathematics Research Notices, volume 2017, issue 2, pp. 372–381, 2017.

Approximating the little Grothendieck problem over the orthogonal and unitary Groups. (A. S. Bandeira, C. Kennedy, and A. Singer). Mathematical Programming, volume 160, issue 1-2, pp. 433-475, 2016.

Linear Boolean classification, coding and "the critical problem". (E. Abbe, N. Alon, and A. S. Bandeira, C. Sandon). IEEE Transactions on Information Theory, volume 62, issue 4, pp. 1667-1673, 2016.

A note on Probably Certifiably Correct algorithms. (A. S. Bandeira). Comptes Rendus Mathematique, volume 354, issue 3, pp. 329-333, 2016.

Derandomizing restricted isometries via the Legendre symbol. (A. S. Bandeira, M. Fickus, D. G. Mixon, and J. Moreira). Constructive Approximation, volume 43, issue 3, pp 409-424, 2016.

Sharp nonasymptotic bounds on the norm of random matrices with independent entries. (A. S. Bandeira and R. v. Handel). Annals of Probability, volume 44, number 4, 2479-2506, 2016.

Exact Recovery in the Stochastic Block Model. (E. Abbe, A. S. Bandeira, G. Hall). IEEE Transactions on Information Theory, vol.62, no.1, pp.471-487, Jan. 2016.

Decoding binary node labels from censored edge measurements: Phase transition and efficient recovery. (E. Abbe, A. S. Bandeira, A. Bracher, and A. Singer). IEEE Transactions on Network Science and Engineering, vol.1, no.1, pp.10-22, 2014.

Convergence of trust-region methods based on probabilistic models. (A. S. Bandeira, K. Scheinberg, and L. N. Vicente). SIAM J. Optim., 24(3), 1238–1264, 2014.

Phase retrieval from power spectra of masked signals. (A. S. Bandeira, Y. Chen, D. G. Mixon). Information and Inference: a Journal of the IMA, vol. 3, pp. 83-102, 2014.

Saving phase: Injectivity and stability for phase retrieval. (A. S. Bandeira, J. Cahill, D. G. Mixon, A. A. Nelson). Applied and Computational Harmonic Analysis (ACHA), vol. 37, pp. 106-125, 2014.

A Cheeger's inequality for the graph connection Laplacian. (A. S. Bandeira, A. Singer, and D. A. Spielman). SIAM Journal on Matrix Analysis and Applications (SIMAX), vol. 34, pp. 1611-1630, 2013.

Phase retrieval with polarization. (B. Alexeev, A. S. Bandeira, M. Fickus, D. G. Mixon). SIAM Journal on Imaging Sciences (SIIMS), vol. 7, pp. 35-66, 2013.

Certifying the restricted isometry property is hard. (A. S. Bandeira, E. Dobrian, D. G. Mixon, W. Sawin). IEEE Transactions on Information Theory, vol. 59, pp. 3448-3450, 2013.

The road to deterministic matrices with the restricted isometry property. (A. S. Bandeira, M. Fickus, D. G. Mixon, P. Wong). Journal of Fourier Analysis and Applications, vol. 19, pp. 1123-1149, 2013.

Computation of sparse low degree interpolating polynomials and their application to derivative-free optimization. (A. S. Bandeira, K. Scheinberg, and L. N. Vicente). Mathematical Programming, vol. 134, pp. 223-257, 2012.

Landau's necessary density conditions for the Hankel transform. (L. D. Abreu and A. S. Bandeira). Journal of Functional Analysis 262, 1845-1866, 2012.

CONFERENCE PUBLICATIONS

The Franz-Parisi Criterion and Computational Trade-offs in High Dimensional Statistics. (A. S. Bandeira, A. El Alaoui, S. B. Hopkins, T. Schramm, A. S. Wein, I. Zadik). NeurIPS 2022 (Oral Presentation).

Notes on Computational Hardness of Hypothesis Testing: Predictions using the Low-Degree Likelihood Ratio. (D. Kunisky, A. S. Wein, A. S. Bandeira). In: Cerejeiras, P., Reissig, M. (eds) Mathematical Analysis, its Applications and Computation. ISAAC 2019. Springer Proceedings in Mathematics & Statistics, vol 385, 2022.

Average-Case Integrality Gap for Non-Negative Principal Component Analysis. (D. Kunisky, A. S. Wein, A. S. Bandeira). Preprint, Mathematical and Scientific Machine Learning (MSML), 2021.

Spectral Planting and the Hardness of Refuting Cuts, Colorability, and Communities in Random Graphs. (A. S. Bandeira, J. Banks, D. Kunisky, C. Moore, A. S. Wein). Conference on Learning Theory (COLT), 2021.

Group Testing in the High Dilution Regime. (G. Arpino, N. Grometo, A. S. Bandeira). IEEE International Symposium on Information Theory (ISIT 2021).

Computational Hardness of Certifying Bounds on Constrained PCA Problems. (A. S. Bandeira, D. Kunisky, A. S. Wein). Innovations in Theoretical Computer Science (ITCS'20), 2020.

Experimental performance of graph neural networks on random instances of max-cut. (W. Yao, A. S. Bandeira, S. Villar). SPIE Wavelets and Sparsity, 2019.

Connections between sum-of-squares optimization and structured tight frames. (A. S. Bandeira, D. Kunisky). SPIE Wavelets and Sparsity, 2019.

A Revised note on Learning Algorithms for Quadratic Assignment with Graph Neural Networks. (A. Nowak, S. Villar, A. S. Bandeira, J. Bruna). IEEE DSW2018, Data Science Workshop, 2018.

Multisection in the stochastic block model using semidefinite programming. (N. Agarwal, A. S. Bandeira, K. Koiliaris, A. Kolla). Compressed Sensing and its Applications: MATHEON Workshop 2015 (Applied and Numerical Harmonic Analysis), 125-162, 2018.

Compressive classification and the rare eclipse problem. (A. S. Bandeira, D. G. Mixon, and B. Recht). Compressed Sensing and its Applications: MATHEON Workshop 2015 (Applied and Numerical Harmonic Analysis), 197-220, 2018.

Sum-of-Squares Optimization and the Sparsity Structure of Equiangular Tight Frames. (A. S. Bandeira, D. Kunisky). 13th International Conference on Sampling Theory and Applications (SampTA), 2017.

A Note on Learning Algorithms for Quadratic Assignment with Graph Neural Networks. (A. Nowak, S. Villar, A. S. Bandeira, J. Bruna). ICML 2017 Workshop on Principled Approaches to Deep Learning (PADL), 2017.

Community Detection in Hypergraphs, Spiked Tensor Models, and Sum-of-Squares. (C. Kim, A. S. Bandeira, M. X. Goemans). 12th International Conference on Sampling Theory and Applications (SampTA), 2017.

A Certifiably Correct Algorithm for Synchronization over the Special Euclidean Group (D. M. Rosen, L. Carlone, A. S. Bandeira, J. J. Leonard). 12th International Workshop on the Algorithmics Foundations of Robotics (WAFR 2016).

The non-convex Burer-Monteiro approach works on smooth semidefinite programs. (N. Boumal, V Voroninski, and A. S. Bandeira). Thirtieth Annual Conference on Neural Information Processing Systems (NIPS 2016).

On the low-rank approach for semidefinite programs arising in synchronization and community detection. (A. S. Bandeira, N. Boumal, and V Voroninski). Conference on Learning Theory (COLT 2016).

Relax, no need to round: integrality of clustering formulations. (P. Awasthi, A. S. Bandeira, M. Charikar, R. Krishnaswamy, S. Villar, and R. Ward). 6th Innovations in Theoretical Computer Science (ITCS 2015).

Open problem: Tightness of maximum likelihood semidefinite relaxations. (A. S. Bandeira, Y. Khoo, and A. Singer). COLT Open Problem, JMLR W&CP 35 : 1265–1267, 2014.

Linear inverse problems on Erdös-Rényi graphs: Information-theoretic limits and efficient recovery. (E. Abbe, A. S. Bandeira, A. Bracher, and A. Singer). IEEE International Symposium on Information Theory (ISIT 2014).

Linear Boolean classification, coding and "the critical problem". (E. Abbe, N. Alon, and A. S. Bandeira). IEEE International Symposium on Information Theory (ISIT 2014).

Multireference alignment using semidefinite programming. (A. S. Bandeira, M. Charikar, A. Singer, and A. Zhu). 5th Innovations in Theoretical Computer Science (ITCS 2014), 2014.

Near-optimal phase retrieval of sparse vectors. (A. S. Bandeira and D. G. Mixon). Wavelets and Sparsity XV, Proceedings of SPIE Optics+Photonics, 2013.

Fundamental limits of phase retrieval. (A. S. Bandeira, J. Cahill, D. G. Mixon, A. A. Nelson). 10th International Conference on Sampling Theory and Applications (SampTA), 2013.

In Press

Exact threshold for approximate ellipsoid fitting of random points. (A. Maillard, A. S. Bandeira). Submitted for publication, Preprint available online.

Fitting an ellipsoid to a quadratic number of random points. (A.S. Bandeira, A. Maillard, S. Mendelson, E. Paquette). Submitted for publication, Preprint available online.

Injectivity of ReLU networks: perspectives from statistical physics (A. Maillard, A. S. Bandeira, D. Belius, I. Dokmanic, S. Nakajima). Submitted for publication, Preprint available online.

On the concentration of Gaussian Cayley matrices. (A. S. Bandeira, D. Kunisky, D. G. Mixon, X. Zeng). Submitted for publication, Preprint available online.

Expander graphs are globally synchronising. (P. Abdalla, A. S. Bandeira, M. Kassabov, V. Souza, S. H. Strogatz, A. Townsend). Submitted for publication, Preprint available online.

OTHER
PUBLICATIONS

Linear Algebra part II (A. S. Bandeira), Lecture Notes, ETH 2023, available online.

Mathematics of Signals, Learning, and Networks (A. S. Bandeira, A. Maillard), Lecture Notes, ETH 2023, available online.

The spectral norm of Gaussian matrices with correlated entries (A. S. Bandeira, M. T. Boedihardjo), available online.

Mathematics of Machine Learning (A. S. Bandeira, N. Zhivotovskiy), Lecture Notes, ETH 2021, available online.

Mathematics of Data Science. (A. S. Bandeira, A. Singer, T. Strohmer), Book in preparation, 2023 draft available online.

The spectral norm of Gaussian matrices with correlated entries (A. S. Bandeira, M. T. Boedihardjo). 2021, Preprint available online.

A Gramian Description of the Degree 4 Generalized Elliptope. (A. S. Bandeira, D. Kunisky). 2018, Preprint available online.

Stochastic Block Model for Hypergraphs: Statistical limits and a semidefinite programming approach. (C. Kim, A. S. Bandeira, M. X. Goemans). 2018, Preprint, available online.

A polynomial-time relaxation of the Gromov-Hausdorff distance. (S. Villar, A. S. Bandeira, A. J. Blumberg, R. Ward). 2016, Preprint, available online.

Optimality and Sub-optimality of PCA for Spiked Random Matrices and Synchronisation (A. Perry, A. S. Wein, A. S. Bandeira, A. Moitra). 2016, Preprint, available online.

Neural Networks with Finite Intrinsic Dimension have no Spurious Valleys. (L. Venturi, A. S. Bandeira, J. Bruna). 2018, Preprint, available online.

Inference on Graphs via Semidefinite Programming. (A. S. Bandeira). Proceedings of the National Academy of Sciences (PNAS) Commentary, 2016.

Ten Lectures and Forty-Two Open Problems in the Mathematics of Data Science. (Afonso S. Bandeira). Lecture Notes, MIT, 2015.

Efficient Algorithm for Exact Recovery of Vertex Variables from Edge Measurements. (Afonso S. Bandeira). Spotlight on Transactions, IEEE Computer, 2015.

Non-unique games over compact groups (Extended Abstract). (Afonso S. Bandeira). Oberwolfach Report (38/2015), 2015.

Estimating group transformations via convex relaxation. (Afonso S. Bandeira). Oberwolfach Report (18/2014), Volume 11, Issue 2, 2014.

Sparse recovery in derivative-free optimization. (A. S. Bandeira). INFORMS OS Today, The Newsletter of the INFORMS Optimization Society, 2014.

On partially sparse recovery. (A. S. Bandeira, K. Scheinberg, and L. N. Vicente). Technical Report 11-13, Dept. of Mathematics, Univ. Coimbra, 2011.

Gerar Recorrencia recorrendo a Geradoras: uma aplicacao de Funcoes Geradoras. (A. S. Bandeira). Boletim da Sociedade Portuguesa de Matematica No 58 (Maio 2008)

SELECTED
COMMUNICA-
TIONS

MIT Applied Math Colloquium, Massachusetts, USA, 09/2023 (invited)

PACM Colloquium, Princeton University, USA, 09/2023 (invited)

DMV Plenary (annual meeting of the German Mathematical Society), Ilmenau, Germany, 09/2023 (plenary)

Hausdorff Colloquium, Bonn, Germany, 06/2023 (invited)

Probability Seminar, UC Davis (Virtual), 04/2023 (invited)

ENEMath, Porto, 04/2023. (invited)

German Probability and Statistics Days, plenary, Essen 03/2023. (plenary)

ASCAI Workshop, TU Munich, Germany, 02/2023. (invited)

Information Theory and Data Science Workshop, Singapore (Virtual), 01/2023. (invited)

NeurIPS 2022 - Deep dive session for Oral presentation paper (Virtual), 12/2022.

FAU Erlangen-Nurnberg, Germany (Virtual), 10/2022. (invited)

ICCHA Plenary talk, Ingolstadt, Germany, 09/2022 (plenary)

Meeting of the Portuguese Mathematical Society Plenary talk, Tomar, Portugal, 07/2022 (plenary)

SPA 2022, Wuhan, China (Virtual), 06/2022 (invited)

"Random graphs and applications". Rome, Italy, 05/2022 (invited)

Fields Institute, Toronto, Canada (Virtual), 05/2022 (invited)

Follow-Up-Workshop on "Mathematics of Data Science", HIM Bonn, 04/2022 (invited)

Probability & Statistics seminar joint to ENS Lyon and Université Lyon 1 (Virtual), 03/2022 (invited)

IRS 2022, Paris (Virtual), 01/2022 (invited)

BIRS (Banff) Workshop (Virtual), 12/2021. (invited)

Oberwolfach Workshop (Virtual), 12/2021. (invited)

Seminar on Stochastic Processes, ETH Zürich, 11/2021. (invited)

Probability Seminar, USC, Los Angeles (Virtual), 11/2021. (invited)

Probability Seminar, Basel, 11/2021. (invited)

One-World MINDS seminar (Virtual), 10/2021. (invited)

Simons Workshop on Rigorous Evidence for Information-Computation Trade-offs (at EPFL Mirror event), 9/2021. (intived)

ICCHA Plenary talk (Virtual), 9/2021. (invited)

SIMAI Congress (Virtual), 8/2021. (invited)

BIRS (Banff) Workshop (Virtual), 8/2021. (invited)

Faraway Fourier Talks (Virtual), 5/2021. (invited)

Statistics Colloquium, University of Chicago (Virtual), 4/2021. (invited)

YINS Seminar, Yale (Virtual), 3/2021. (invited)

Mathematics Colloquium, Warwick (Virtual), 2/2021. (invited)

Foundations of Computational Mathematics (FOCM) Plenary Speakers Virtual Colloquium (in occasion of Smale Prize), 1/2021. (invited)

Data Science Seminar, London School of Economics (Virtual), 11/2020. (invited)

Data Science Seminar, Mathematical Institute, University of Oxford (Virtual), 11/2020. (invited)

Statistics Colloquium (Virtual), Harvard University (Virtual), 11/2020. (invited)

ORIE Colloquium (Virtual), Cornell University, 10/2020. (invited)

ETH Inaugural lecture, 10/2020.

African Institute for Mathematical Sciences-AIMS (Virtual), 09/2020. (invited)

Simons Institute for the Theory of Computing (Virtual), Berkeley, 09/2020. (invited)

Analytics Club "From Academia to Industry", ETH (Virtual), 09/2020. (invited)

Inference Problems: Algorithms and Lower Bounds Workshop (Virtual), Frankfurt 08/2020. (invited)

CodeX seminar, Virtual Global Seminar, 07/2020. (invited)

Mathematical Colloquium, RWTH (Virtual), Germany, 07/2020. (invited)

MPML Seminar, IST Lisbon (Virtual), Portugal, 06/2020. (invited)

Gatsy Computational Neuroscience Seminar, London (Virtual), UK, 04/2020. (invited)

CIM Colloquium 2020, Coimbra (Virtual), Portugal, 03/2020. (invited)

Mathematics Colloquium, University of Fribourg, Switzerland, 11/2019. (invited)

Seminar on Stochastic Processes, ETHZ, Zurich, Switzerland, 11/2019. (invited)

Workshop on Science of Data Science, ICTP, Trieste, Italy, 10/2019. (invited)

12th ISAAC Congress, University of Aveiro, Portugal, 07/2019. (plenary)

Discrete Math seminar, Yale, New Haven, CT, 03/2019. (invited)

Combinatorics seminar, Rutgers, New Brunswick, NJ, 12/2018. (invited)

6th Princeton Day of Statistics, Princeton University, Princeton, NJ, 11/2018. (invited)

Random Matrix and Probability Theory seminar, Harvard, Cambridge, MA, 10/2018. (invited)

ETH Mathematics Dept, Zurich, Switzerland, 10/2018. (invited)

Mathematics of Data seminar, MPI Leipzig, Germany, 08/2018. (invited)

Statistical Physics and Machine Learning Back Together Workshop, Cargese, France, 08/2018. (invited)

Montreal Summer Workshop on Challenges in Probability and Mathematical Physics, CRM, Montreal, Canada, 07/2018. (invited)

SIAM Discrete Mathematics, Denver, CO, 06/2018. (invited)

Data Science Seminar (online), Rochester Institute of Technology, Rochester, NY, 04/2018. (invited)

MIT Stochastics and Statistics Seminar, Massachusetts Institute of Technology, Cambridge, MA, 03/2018. (invited)

Google Research Seminar, Google, New York, 02/2018. (invited)

February Fourier Talks 2018, University of Maryland, College Park, MD, 02/2018. (invited)

Simons Collaboration on Algorithms & Geometry Multi-reference Alignment Workshop, Simons Foundation, New York, 11/2017.

Fireside Chat, Simons institute for the theory of computing, Berkeley, CA, 11/2017.

Probability Seminar, UC Berkeley, CA, 10/2017. (invited)

Foundations of Computational Mathematics, Barcelona, Spain, 07/2017. (invited)

Global Portuguese Mathematicians, IST, Lisbon, Portugal, 07/2017. (invited)

Sampling Theory and Applications, 12th International Conference, Tallinn, Estonia, 07/2017. (invited)

IPG Seminar, Ecole polytechnique fédérale de Lausanne, Switzerland, 06/2017. (invited)

TTIC Colloquium, Toyota Technological Institute at Chicago, Chicago, 05/2017. (invited)

Simons Collaboration on Algorithms & Geometry Annual Meeting, Simons Foundation, New York, 05/2017. (invited)

IDeAS seminar, Princeton University, Princeton, 05/2017. (invited)

Statistics Department Seminar, Stanford University, Palo Alto, CA, 04/2017. (invited)

Optimization and Statistical Learning 2017, Les Houches, France, 04/2017. (invited)

Data Analysis Seminar, Johns Hopkins University, 04/2017. (invited)

Rutgers/DIMACS Theory Seminar, Rutgers University, New Brunswick, NJ, 03/2017. (invited)

Graduate Student/Postdoc Seminar, Courant Institute of Mathematical Sciences, NY, 03/2017. (invited)

Statistical physics, Learning, Inference and Networks, Les Houches, France, 02/2017. (invited)

Statistics and Probability Seminar Series, Boston University, Boston, 02/2017. (invited)

Analysis Seminar, Courant Institute of Mathematical Sciences, New York, 11/2016. (invited)

Machine Learning Seminar, Google NY, NY, 10/2016. (invited)

Workshop on Applied Harmonic Analysis, Massive Data Sets, Machine Learning, and Signal Processing, Casa Matematica Oaxaca, Mexico, 10/2016 (invited)

Probability Seminar, University of Minnesota, MN, 10/2016 (invited)

Pleanary talk at the National Meeting of the Portuguese Mathematical Society (EN-SPM16), Barreiro, Portugal, 07/2016. (invited)

National Meeting of the Portuguese Mathematical Society (ENSPM16), Barreiro, Portugal, 07/2016. (invited)

University of Southern California, Los Angeles, CA, 05/2016. (invited)

MIT Portugal, Cambridge, MA, 04/2016. (invited)

Workshop on Harmonic Analysis, Graphs, and Learning, Bonn, Germany, 03/2016. (invited)

Information Theory and Applications, San Diego, CA, 02/2016. (invited)

Mitsubishi Electric Research Laboratories, Cambridge, MA, 01/2016. (invited)

Short Communication, Inference on Networks: Algorithms, Phase Transitions, New Models and New Data, Santa Fe Institute, 12/2015.

Digital Signal Processing, MIT EECS, 11/2015. (invited)

Colloquium, Department of Mathematics, UCLA, 11/2015. (invited)

Information Theory, Coding and Combinatorics lunch seminar, MIT EECS, 09/2015. (invited)

Applied Harmonic Analysis and Sparse Approximation, Oberwolfach, 08/2015. (invited)

International Symposium on Mathematical Programming (ISMP 2015), Pittsburgh 07/2015. (invited)

PACM GSS, Princeton University, Princeton, 03/2015. (invited)

EECS Special Seminar, Massachusetts Institute of Technology, 03/2015. (invited)

Department of Industrial Engineering and Operations Research, Columbia, 02/2015. (invited)

Applied Math Seminar, Courant Institute of Mathematical Sciences, NYU, 02/2015. (invited)

EECS Department Colloquium Series , UC Berkeley, 02/2015. (invited)

Statistics Department, Wharton, University of Pennsylvania, 02/2015. (invited)

Department of Mathematics, University of Wisconsin-Madison, 02/2015. (invited)

Electrical Engineering Seminar Series, Harvard, 01/2015. (invited)

Statistics Colloquium, University of Chicago, 01/2015. (invited)

IDeAS seminar, Princeton University, Princeton, 01/2015. (invited)

Optimization and Statistical Learning 2015, Les Houches, France, 01/2015. (invited)

Meeting in Mathematical Statistics: New Procedures for New Data, CIRM Luminy, France 12/2014. (invited)

Semester Program on "High-dimensional Approximation", ICERM, Brown University, Providence, 11/2014. (invited)

Workshop: High dimensional phenomena in Probability, Statistics and Signal Processing, IMPA, Rio de Janeiro, 11/2014. (invited)

Computing + Mathematical Sciences seminar, California Institute of Technology, Pasadena, 10/2014. (invited)

Information Theory Forum, Stanford University, Palo Alto, 10/2014. (invited)

IDeAS seminar, Princeton University, Princeton, 10/2014. (invited)

International Congress of Mathematicians, Seoul, 08/2014.

SIAM conference on optimization, San Diego, 05/2014. (invited)

Ergodic Theory and Stastical Mechanics seminar, Princeton, 05/2014. (invited)

Austrian Academy of Sciences, Vienna, 04/2014. (invited)

Mini-Workshop: Mathematical Physics meets Sparse Recovery, Oberwolfach, 04/2014. (invited)

AMS Spring Central Sectional Meeting, Lubbock, 04/2014. (invited)

48th Annual Conference on Information Sciences and Systems (CISS 2014), Princeton, 03/2014. (invited)

PACM GSS, Princeton University, Princeton, 02/2014. (invited)

5th Innovations in Theoretical Computer Science (ITCS 2014), Princeton, 01/2014.

University of California at Berkeley, 12/2013. (invited)

Stanford University, 12/2013. (invited)

Center for Computational Intractability Meeting, Princeton University, Princeton, 12/2013. (invited)

Math GSS, Princeton University, Princeton, 11/2013. (invited)

PACM GSS, Princeton University, Princeton, 10/2013. (invited)

INFORMS Optimization Society student paper prize session, Minneapolis, 10/2013. (invited)

SPIE Optics+Photonics 2013, San Diego, 08/2013. (invited)

Theory Seminar, NYU, New York, 04/2013. (invited)

AT&T Labs, Florham Park, 02/2013. (invited)

OSL2013, Les Houches, 01/2013. (invited)

PACM GSS, Princeton University, Princeton, 12/2012. (invited)

Workshop on Phase Retrieval, Erwin Schroedinger Institute, Vienna, 10/2012. (invited)

TU Berlin, Berlin, 08/2012. (invited)

ICCOPT2013, Lisbon, 07/2013. (invited)

MOPTA2012, Bethlehem, 07/2012. (invited)

ISMP2012, Berlin, 08/2012. (invited)

NuHAG seminar, University of Vienna, Vienna, 05/2012. (invited)

University of Minnesota, Minneapolis, 06/2012. (invited)

Applied and Computational Math Colloquium, Princeton University, Princeton, 04/2012. (invited)

IDeAS seminar, Princeton University, Princeton, 04/2012. (invited)

PACM GSS, Princeton University, Princeton, 04/2012. (invited)

Theory Lunch, Princeton University, Princeton, 02/2012. (invited)

12th Annual Workshop on "Applications and Generalizations of Complex Analysis", Coimbra, 2010.

Seminario Diagonal, University of Coimbra, Coimbra, 05/2009. (invited)

London International Youth Science Forum, London, 07/2007. (invited)

Seminário Diagonal da Universidade de Coimbra 2007

Encontro Nacional do Programa dos Novos Talentos 2007.

Premio Bento de Jesus Caraca 2006; Encontro Nacional da Sociedade Portuguesa da Matematica 2006.