

IGOR RIVIN

Mathematician & Universalist

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github.com/igorrivin



EXPERIENCE

Senior Advisor

Wolfram Inc

May 2023-present

Princeton, NJ

Organized the 2023 ChainScience Conferences (the in-person and the virtual conferences).

Research Scientist

Edgestream LP

January 2020 – April 2023

Princeton, NJ

Working on understanding market data and developing quantitative strategies. Have worked on:

- Portfolio-based strategies.
- Optimal hedging strategies
- Machine learning based strategies
- Signal processing based strategies
- Software architecture
- Alternative data
- Extracting data from derivatives

Professor of Mathematics

Temple University

June 1999 – ongoing

Philadelphia, PA

Director

The Cryptos Fund

October 2017 – October 2019

Zug, Switzerland

- Developed the CCI30 cryptocurrency index - see <https://cc130.com>

Chief Strategy Officer

Accern, Inc

Jan 2017 – Jan 2018

New York, NY

- Developed trading strategies based on Accern's sentiment data.
- Developed the Natural Language parser.

Research Director

Ticklr, Inc

May 2017 – May 2019

London, England

- Developed Blockchain technologies for Social Media.

Regius Professor of Mathematics

University of St Andrews

May 2015 – May 2017

St Andrews, Scotland

LIFE PHILOSOPHY

"Fluctuat nec Mergitur."

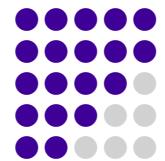
STRENGTHS

Problem Solver Curious Generalist

Geometry Number Theory
Probability Computation Statistics
Mathematica Data Science
Quantitative Finance

LANGUAGES

English
Russian
French
Spanish
Portuguese



EDUCATION

Ph.D. in Mathematics

Princeton University

Sept 1981 – June 1986

- Advised by William P. Thurston
- Dissertation: "Geometry of convex polyhedra in hyperbolic 3-space."

B.Sc. (Hon) in Mathematics

University of Toronto

Sept 1977 – Sept 1981

ADVISORY BOARDS

Advisory board member

iVate.com

May 2019-present

Technical Advisory Board member

Accern.com

January 2015-present

Principal

Meteque Holdings

📅 2006-2016

📍 Princeton, New Jersey

- Built a hedge fund (Samsara Investment Partners) which outperformed the market by wide margin for eight years, despite being a one man operation.

Member, School of Mathematics

Institute for Advanced Study

📅 September 2010-July 2011

📍 Princeton, New Jersey

Berlin Mathematics Graduate School Professor

September 2011-Dec 2011

📅 Berlin, Germany

📍

Visiting Professor

Stanford University

📅 2007

📍 Stanford, California

ICERM professor of Mathematics

Brown University

📅 2013-2014

📍 Providence, Rhode Island

Lady Davis Professor

Hebrew University

📅 2006

📍 Jerusalem, Israel

Consultant

Susquehanna International Group

📅 2005-2006

📍 Bala Cynwyd, Pennsylvania

- Worked in the statistical arbitrage group; developed a number of successful medium-hold-time trading strategies.

Consultant

Equities Trading Laboratory, Morgan Stanley

📅 2004

📍 New York, New York

- Developed a new market impact model.
- Developed a new options trading strategy.

EPSRC Advanced Fellow (with rank of Reader)

University of Manchester

📅 1999-2002

📍 Manchester, UK

Warwick Research Fellow

University of Warwick

 1995-1998

 Coventry, UK

Olga Tausski-John Todd Instructor

Caltech

 1995-1998

 Pasadena, California

Research Fellow

University of Melbourne

 1994-1995

 Melbourne, Australia

Member, School of Mathematics

Institute for Advanced Study

 1993-1994

 Princeton, New Jersey

Consultant

NEC Research Institute

 1991-1993

 Princeton, New Jersey

- Jointly with Mike Treacy developed the subject of *hypothetical zeolites*
- Jointly with Srimat Chakradhar developed new methodology for VLSI testing.
- Made breakthroughs in computational and discrete geometry.
- Made significant contributions to Machine Learning (jointly with Yuh-Dauh Lyuuu.)

Director of Advanced Development

Wolfram Research Inc

 Jan 1989-March 1991

 Champaign, Illinois

- Developed large parts of the *Mathematica* kernel, including 3-D graphics, linear algebra, power series, limits, big number multiplication, solution of algebraic equations, and others.
- Supervised a group of six developers (all around the world).

Director of Applications Development, the QLISP project

Stanford University Computer Science Department

 Jan 1987-Dec 1988

 Stanford, California

- worked on the QLISP system for parallel symbolic computation (with John McCarthy).
- Developed algorithms for symbolic computation and task scheduling.
- Developed new methods for constraint propagation (with Ramin Zabih).

Visiting Professor

Institut des Hautes Études Scientifiques

 1985-1986

 Paris, France

PUBLICATIONS

Journal Articles

- Kolpakov, Alexander and Igor Rivin. "DiRe-JAX: A JAX based Dimensionality Reduction Algorithm for Large-scale Data". In: *arXiv preprint arXiv:2503.03156* (2025).
- – "Fast Geometric Embedding for Node Influence Maximization". In: *arXiv preprint arXiv:2506.07435* (2025).
- – "Graphem-JAX: Node Influence Maximization via Geometric Embeddings". In: *Journal of Open Source Software* 10.113 (2025), p. 8855.
- Rivin, Igor. "Computational Resolution of Hadamard Product Factorization for 4\times 4 Matrices". In: *arXiv preprint arXiv:2508.14901* (2025).
- – "Computing Periodic Billiard Orbits in L_p Balls via Newton's Method and Smale's
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alpha -Criterion". In: *arXiv preprint arXiv:2507.22251* (2025).
- – "Counting Matrices in $SL_3(\mathbb{Z})$ with Fixed Completely Split Character Polynomial: Preliminary Upper Bounds". In: *arXiv preprint arXiv:2507.15129* (2025).
- – "From Euler to Today: Universal Mathematical Fallibility A Large-Scale Computational Analysis of Errors in ArXiv Papers". In: *arXiv preprint arXiv:2511.10543* (2025).
- Kolpakov, Alexander and Igor Rivin. "Discovering temporal and personality aspects in meager and highly variable text samples". In: *Proceedings of the 2024 8th International Conference on Natural Language Processing and Information Retrieval*. 2024, pp. 75–81.
- Rivin, Igor. "(More) Robust Variance Estimation". In: Available at SSRN 4767015 (2024).
- Curto, Carina, Joshua Paik, and Igor Rivin. "Betti curves of rank one symmetric matrices". In: *International Conference on Geometric Science of Information*. Springer. 2021, pp. 645–655.
- Bassino, Frédérique et al. "Complexity and Randomness in Group Theory: GAGTA BOOK 1". In: *Complexity and Randomness in Group Theory*. De Gruyter, 2020.
- Rivin, Igor and Naser T Sardari. "Quantum Chaos on Random Cayley Graphs of $SL_2(\mathbb{Z}/p\mathbb{Z})$ ". In: *Experimental Mathematics* 28.3 (2019), pp. 328–341.
- – "Quantum Chaos on Random Cayley Graphs of". In: *Experimental Mathematics* (2017), pp. 1–14.
- Fuchs, Elena and Igor Rivin. "Generic thinness in finitely generated subgroups of $SL(n, \mathbb{Z})$ ". In: *arXiv preprint arXiv:1506.01735* (2016), rnw136.
- Rivin, Igor. "How to pick a random integer matrix?(and other questions)". In: *Mathematics of Computation* 85.298 (2016), pp. 783–797. arXiv: 1312.4607.
- – "Spectral experiments+". In: *Experimental Mathematics* 25.4 (2016), pp. 379–388. arXiv: 1410.6771.
- Pemantle, Robin, Yuval Peres, and Igor Rivin. "Four random permutations conjugated by an adversary generate S_n with high probability". In: *Random Structures & Algorithms* (2015). arXiv: 1412.3781.
- Malestein, Justin, Igor Rivin, and Louis Theran. "Topological Designs". In: *Geometriae Dedicata* 168.1 (2014), pp. 221–233. DOI: 10.1007/s10711-012-9827-9. arXiv: 1008.3710.

HONORS AND AWARDS

Top Five by Reputation

MathOverflow

2016–ongoing Worldwide

Fellow

American Mathematical Society

2015 USA

ICERM Professor

Brown University

2013–2014 Providence, RI

BMS Professor

Berlin Mathematical School

2011 Berlin, Germany

Lady Davis Fellow

Hebrew University

2006 Jerusalem, Israel

Advanced Research Fellow

EPSRC

1999 UK

Whitehead Prize

London Mathematical Society

1998 UK

Plenary Address

Nordic Mathematics Congress

1991 Sweden

First Prize

Canadian Mathematical Olympiad

1977 Canada

EDITORIAL BOARDS

International Mathematics Research Notices

2015–present

Geometriae Dedicata

2004–2018

New York Journal of Mathematics

2016–2018

Experimental Mathematics

- Rivin, Igor. "Generic phenomena in groups: some answers and many questions". In: *Thin groups and superstrong approximation* 61 (2014), pp. 299–323. arXiv: 1211.6509.
- – "Some Thoughts on the Teaching of Mathematics—Ten Years Later". In: *Notices of the American Mathematical Society* 61.6 (2014), pp. 597–602. arXiv: 1401.0828.
- Treacy, MMJ et al. "Flexibility mechanisms in ideal zeolite frameworks". In: *Philosophical Transactions of the Royal Society of London A: Mathematical, Physical and Engineering Sciences* 372.2008 (2014), p. 20120036.
- Pemantle, Robin and Igor Rivin. "The distribution of zeros of the derivative of a random polynomial". In: *Advances in Combinatorics*. Springer, 2013, pp. 259–273. arXiv: 1109.5975.
- Rivin, Igor. "The moment zeta function and applications". In: *From Fourier Analysis and Number Theory to Radon Transforms and Geometry*. Springer, 2013, pp. 455–474. arXiv: math/0201109.
- Alam, Ashraful, Igor Rivin, and Ileana Streinu. "Outerplanar graphs and Delaunay triangulations". In: *Computation, Physics and Beyond*. Springer, 2012, pp. 320–329.
- Rivin, Igor. "Geodesics with one self-intersection, and other stories". In: *Advances in Mathematics* 231.5 (2012), pp. 2391–2412. arXiv: 0901.2543.
- Kapko, V et al. "Density of mechanisms within the flexibility window of zeolites". In: *Physical review letters* 107.16 (2011), p. 164304.
- Droste, Manfred and Igor Rivin. "On extension of coverings". In: *Bulletin of the London Mathematical Society* (2010), bdq068. DOI: 10.1112/blms/bdq068. arXiv: 0901.3594.
- Mohar, Bojan and Igor Rivin. "Simplices and spectra of graphs". In: *Discrete & Computational Geometry* 43.3 (2010), pp. 516–521. arXiv: 0901.3284.
- Rivin, Igor. "Walks on Free Groups and other Stories – twelve years later". In: *Illinois Journal of Mathematics* 54 (2010), pp. 327–370. arXiv: 1106.5947.
- – "Zariski density and genericity". In: *International Mathematics Research Notices* (2010), rnq043.
- – "Asymptotics of convex sets in Euclidean and hyperbolic spaces". In: *Advances in Mathematics* 220.4 (2009), pp. 1297–1315. arXiv: 0801.0077.
- – "Walks on graphs and lattices—effective bounds and applications". In: *Forum Mathematicum*. Vol. 21. 4. 2009, pp. 673–685. arXiv: math/0703533.
- Kapovich, Ilya and Igor Rivin. "On the absence of McShane-type identities for the outer space". In: *Journal of Algebra* 320.10 (2008), pp. 3659–3670.
- Rivin, Igor. "Volumes of degenerating polyhedra—on a conjecture of J. W. Milnor". In: *Geometriae Dedicata* 131.1 (2008), pp. 73–85. arXiv: math/0512065.
- Rivin, Igor et al. "Walks on groups, counting reducible matrices, polynomials, and surface and free group automorphisms". In: *Duke Mathematical Journal* 142.2 (2008), pp. 353–379. arXiv: math/0703532.
- Rivin, Igor. "Surface area and other measures of ellipsoids". In: *Advances in Applied Mathematics* 39.4 (2007), pp. 409–427. arXiv: math/0403375.
- Treacy, MMJ, MD Foster, and I Rivin. "Towards a Catalogue of Designer Zeolites". In: *Turning Points in Solid-State, Materials and Surface Science*. 2007, pp. 208–220.
- Foster, MD et al. "A geometric solution to the largest-free-sphere problem in zeolite frameworks". In: *Microporous and mesoporous materials*

90.1 (2006), pp. 32–38.

- Rivin, Igor. "Geometric simulations: a lesson from virtual zeolites". In: *Nature materials* 5.12 (2006), pp. 931–932.
- Foster, MD et al. "A systematic topological search for the framework of ZSM-10". In: *Journal of applied crystallography* 38.6 (2005), pp. 1028–1030.
- Kapovich, Ilya et al. "Asymptotic density in free groups and Z k, visible points and test elements". In: *arXiv preprint math.GR/0507573* (2005).
- Rivin, Igor. "A simpler proof of Mirzakhani's simple curve asymptotics". In: (2005). DOI: 10.1007/s10711-005-7153. arXiv: [math/0512066](#).
- – "On some mean matrix inequalities of dynamical interest". In: *Communications in mathematical physics* 254.3 (2005), pp. 651–658. arXiv: [math/0312048](#).
- – "Symmetrized chebyshev polynomials". In: *Proceedings of the American Mathematical Society* 133.5 (2005), pp. 1299–1305. arXiv: [math/0301241](#).
- – "A Remark on 'Counting Primitive Elements in Free Groups' (By J. Burillo and E. Ventura)". In: *Geometriae Dedicata* 107.1 (2004), pp. 99–100. arXiv: [math/0302083](#).
- – "Some properties of the conjugacy class growth function". In: *Group theory, statistics, and cryptography*. 2004, pp. 113–117.
- Treacy, MMJ et al. "Enumeration of periodic tetrahedral frameworks. II. Polynodal graphs". In: *Microporous and Mesoporous Materials* 74.1 (2004), pp. 121–132.
- Komarova, Natalia L. and Igor Rivin. "Harmonic mean, random polynomials and stochastic matrices". In: 31.2 (2003), pp. 501–526.
- Rivin, Igor. "Combinatorial optimization in geometry". In: *Advances in Applied Mathematics* 31.1 (2003), pp. 242–271.
- – "Some observations on the simplex". In: *Non-Euclidean Geometries: Janos Bolyai Memorial Volume* (2003). arXiv: [math/0308239](#).
- – "Counting cycles and finite dimensional L^p norms". In: 29.4 (2002), pp. 647–662. arXiv: [math/0111106](#).
- – "Simple curves on surfaces". In: *Geometriae Dedicata* 87.1-3 (2001), pp. 345–360.
- Jakobson, Dmitry and Igor Rivin. "Extremal metrics on graphs I". in: *arXiv preprint math/0001169* (2000).
- McShane, Greg and Igor Rivin. "Simple curves on hyperbolic tori". In: *arXiv preprint math/0005220* (2000).
- Rivin, Igor and Jean-Marc Schlenker. "On the Schläfli differential formula". In: *arXiv preprint math/0001176* (2000).
- Jakobson, Dmitry and Igor Rivin. "On some extremal problems in graph theory". In: *arXiv preprint math/9907050* (1999).
- Jakobson, Dmitry et al. "Eigenvalue spacings for regular graphs". In: *Emerging Applications of Number Theory*. Springer, 1999, pp. 317–327. arXiv: [hep-th/0310002](#).
- Rivin, Igor. "Growth in free groups (and other stories)". In: *arXiv preprint math/9911076* (1999).
- Rivin, Igor and Jean-Marc Schlenker. "The Schläfli formula in Einstein manifolds with boundary". In: *Electronic Research Announcements of the American Mathematical Society* 5.3 (1999), pp. 18–23.
- Almgren Jr, Frederic J and Igor Rivin. "The mean curvature integral is invariant under bending". In: *Geometry and Topology Monographs* 1 (1998), pp. 1–21.
- Rivin, Igor and John H Lindsey. "A similarity criterion: 10462". In: *The American Mathematical Monthly* 105.7 (1998), pp. 671–671.

- Cooper, Daryl and Igor Rivin. "Combinatorial scalar curvature and rigidity of ball packings". In: *Mathematical Research Letters* 3 (1996), pp. 51–60.
- Rivin, Igor. "A characterization of ideal polyhedra in hyperbolic 3-space". In: *Annals of mathematics* 143.1 (1996), pp. 51–70.
- Beckwith, David et al. "Problems: 10459-10465". In: *The American Mathematical Monthly* 102.6 (1995), pp. 553–554.
- McShane, Greg and Igor Rivin. "Geometry of geodesics and a norm on homology". In: *International Mathematics Research Notices* 2 (1995), pp. 61–69.
- Rivin, Igor. "Euclidean structures on simplicial surfaces and hyperbolic volume". In: *Annals of Mathematics* 139.3 (1994), pp. 553–580.
- – "Intrinsic geometry of convex ideal polyhedra in hyperbolic 3-space". In: *LECTURE NOTES IN PURE AND APPLIED MATHEMATICS* (1994), pp. 275–275.
- Rivin, Igor and Srimat T Chakradhar. "Discrete test generation by continuous methods". In: *VLSI Test Symposium, 1994. Proceedings., 12th IEEE*. IEEE. 1994, pp. 100–105.
- Rivin, Igor, Ilan Vardi, and Paul Zimmerman. "The n-queens problem". In: *The American Mathematical Monthly* 101.7 (1994), pp. 629–639.
- Rivin, Igor. "On geometry of convex ideal polyhedra in hyperbolic 3-space". In: *Topology* 32.1 (1993), pp. 87–92.
- Rivin, Igor and Craig D Hodgson. "A characterization of compact convex polyhedra in hyperbolic 3-space". In: *Inventiones mathematicae* 111.1 (1993), pp. 77–111.
- Hodgson, Craig D, Igor Rivin, and Warren D Smith. "A characterization of convex hyperbolic polyhedra and of convex polyhedra inscribed in the sphere". In: *Bulletin of the American Mathematical Society* 27.2 (1992), pp. 246–251.
- Lyuu, Yuh-Dauh and Igor Rivin. "Tight bounds on transition to perfect generalization in perceptrons". In: *Neural Computation* 4.6 (1992), pp. 854–862.
- Rivin, Igor and Ramin Zabih. "A dynamic programming solution to the N-queens problem". In: *Information Processing Letters* 41.5 (1992), pp. 253–256.
- Treacy, MMJ, S Rao, and I Rivin. "A combinatorial method for generating new zeolite frameworks". In: *R. von Ballmoos, JB Higgins, MMJ Treacy (Eds.)* (1992), pp. 381–388.
- Grinberg, Eric L and Igor Rivin. "Infinitesimal aspects of the Busemann-Petty problem". In: *Bulletin of the London Mathematical Society* 22.5 (1990), pp. 478–484.
- Rivin, Igor and Ramin Zabih. "An Algebraic Approach to Constraint Satisfaction Problems." In: 89 (1989), pp. 1989–284.

Preprints

- Rivin, Igor and Carlo Scevola. *An Investable Cryptocurrency Index*. eprint: 3154706.
- Kolpakov, Alexander and Igor Rivin. *A ripple in time: a discontinuity in American history*. 2023. arXiv: 2312.01185 [cs.CL].
- Rivin, Igor. *A Currency Addendum to The Volatility Smile Quantified, and Other Stories'*. 2023. SSRN: 4519663.
- – *The Volatility Smile Quantified and Other Stories*. 2023. SSRN: 4519663.
- Curto, Carina, Joshua David Paik, and Igor Rivin. *Betti Curves of Rank One Symmetric Matrices*. 2021. arXiv: 2103.00761.

- Rivin, Igor. *A Bayesian addendum to the Bibliometric Analysis of Senior US Mathematics Faculty*. 2021.
- Paik, Joshua and Igor Rivin. *Bibliometric Analysis of Senior US Mathematics Faculty*. 2020.
 - *Data Analysis of the Responses to Professor Abigail Thompson's Statement on Mandatory Diversity Statements*. 2020.
- Rivin, Igor. *Adventures in Financial Time Series*. 2019. SSRN: 3344910.
- – *Experiments with the census*. 2019. arXiv: 1903.09532.
- – *Random Graphs from Random Matrices*. 2019.
- – *Fear Universality and Doubt in Asset price movements*. 2018. arXiv: 1803.07138.
- – *The end of the West - a Prologue*. 2018. SSRN: 3185162.
- – *What is the Sharpe Ratio, and how can everyone get it wrong?* 2018. arXiv: 1802.04413.
- Rivin, Igor and Andrew Seaton. *An analysis of a war*. 2018. SSRN: 3150129.
- Rivin, Igor and Naser T. Sardari. *Quantum Chaos on random Cayley graphs of $\mathrm{SL}_2(\mathbb{Z})/p\mathbb{Z}$* . 2017. arXiv: 1705.02993.
- Rivin, Igor. *Random space and plane curves*. 2016. arXiv: 1607.05239.
 - *Galois Groups of Generic Polynomials*. 2015. arXiv: 1511.06446.
 - *Some experiments on Bateman-Horn*. 2015. arXiv: 1508.07821.
 - *On Basmajian's identities, and other stories*. 2014. arXiv: 1404.1583.
 - *Statistics of Random 3-Manifolds occasionally fibering over the circle*. 2014. arXiv: 1401.5736.
 - *Large Galois groups with applications to Zariski density*. 2013. arXiv: 1312.3009.
 - *Rigidity of Fibering*. 2011. arXiv: 1106.4595.
 - *Golden-Thompson from Davis*. 2010. arXiv: 1010.2193.
 - *Extra-large metrics*. 2005. arXiv: math/0509320.
 - *Triangulations into Groups*. 2005. arXiv: math/0510613.
 - *Estimates and identities for the average distortion of a linear transformation*. 2004. arXiv: math/0412260.
- Cejtin, Henry and Igor Rivin. *A property of alternating groups*. 2003. arXiv: math/0303036.
- Grabovsky, Yury, Omar Hijab, and Igor Rivin. *Differentiability of functions of matrices*. 2003. arXiv: math/0310086.
- Rivin, Igor. *An extended correction to "Combinatorial Scalar Curvature and Rigidity of Ball Packings," (by D. Cooper and I. Rivin)*. 2003. arXiv: math/0302069.
 - *An inequality on Chebyshev polynomials*. 2003. arXiv: math/0301210.
 - *Simple estimates for ellipsoid measures*. 2003. arXiv: math/0306085.
 - *Spheres and Minima*. 2003. arXiv: math/0305252.
 - *Surface Area of Ellipsoids*. 2003. arXiv: math/0306387.
 - *A multidimensional Law of Sines*. 2002. arXiv: math/0211261.
 - *Another Simple Proof of a Theorem of Chandler Davis*. 2002. arXiv: math/0208223.
 - *The amplitude modulation transform*. 2002. arXiv: math/0212199.
 - *The performance of the batch learner algorithm*. 2002. arXiv: cs/0201009.
- Komarova, Natalia and Igor Rivin. *Harmonic mean, random polynomials and stochastic matrices*. 2001. arXiv: math/0105236.
- – *Mathematics of learning*. 2001. arXiv: math/0105235.

- Rivin, Igor. *Yet another zeta function and learning*. 2001. arXiv:
cs/0107033.

Patents

- Rivin, Igor and Srimat Chakradhar. "Testing VLSI circuits for defects".
1994.