IGOR RIVIN

Mathematician & Universalist

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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://cci30.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
Univesity 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).
- – “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 [Z/p 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, 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 Sn 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.
- 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.

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

- 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 inequalites 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.

- Rivin, Igor. “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 Schlafli 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* $\mathrm{SL}_2(Z)/pZ$. 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.