IGOR RIVIN

Mathematician & Universalist

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in https://www.linkedin.com/in/igor-rivin-b95257249/

EXPERIENCE

Consultant
Turing AI

📅 July 2025-present   📍 Princeton, NJ

Design LLM feedback in Mathematics.

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.

LIFE PHILOSOPHY

"Fluctuat nec Mergitur."

STRENGTHS

Problem Solver · Curious · Generalist

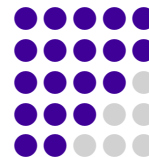Geometry · Number Theory · Probability · Computation · Statistics · Mathematica · Data Science · Quantitative Finance

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 📍

Regius Professor of Mathematics
Univesity of St Andrews

📅 May 2015 – May 2017   📍 St Andrews, Scotland

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 alpha-Criterion". In: *arXiv preprint arXiv:2507.22251* (2025).
- – "Counting Matrices in SL3 (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).
- – "(More) Robust Variance Estimation". In: *Available at SSRN 4767015* (2024).
- 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.
- 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`.
- 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`.
- 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`.
- – "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`.
- 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`.

- Rivin, Igor. "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).

- 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, 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.