Curriculum Vitae for Joel Friedman, November 2000

Coordinates

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Biographic

Born: November 24, 1962, Evanston, Illinois. Citizenship: U.S.A.

Work Experience

- Associate Professor, Department of Mathmatics, University of British Columbia, January 1994 until present (on leave 1998–99).
- Quantitative Analyst, D.E. Shaw and Co., May 1998 until January 1999.
- Assistant Professor, Department of Computer Science, Princeton University, September 1987 until January 1994 (on leave at Hebrew University, Jerusalem, Spring 1990 and Spring 1991).
- Research Assistant at IBM San Jose (during B.A. and Ph.D. studies):
    Summer 1984 and January 1985-June 1987: with Nicholas Pippenger in the Foundations of Computer Science group.
    Summer 1983: with Brian Marcus in the Coding Theory group (working on Symbolic Dynamics and Coding Theory).

Graduate Education and Fellowships

- Doctoral student in Mathematics, from September 1984 until May 1987, at University of California, Berkeley. Ph.D. in Mathematics received May 1987. Thesis title: "On the Convergence of Newton's Method." Advisor: Stephen Smale.
- IBM Graduate fellowship, taken 1985-86 and 1986-87; The Berkeley Graduate Fellowship, taken 1984-85; NSF Graduate Fellowship (declined).

College Education and Honors

- Undergraduate student at Harvard University, from September 1980 until May 1984. B.A. received June 1984, magna cum laude with highest honors, in Mathematics. Thesis: "On Hearing the Shape of a Drum."
- Machtey Award for best student paper in *25th Symposium on Foundations of Computer Science*, 1984.
- Top ten individuals in W.L. Putnam Mathematical Competition, 1980-81, 1982-83, and 1983-84.*
- First prize in Robert Fletcher Rogers Prizes, for best talk given by an undergraduate to the Harvard Math Club, 1981-82 and 1983-84.
- Phi Beta Kappa.
- TA for math and CS courses, 1981–84 (includes 1 hour per week of teaching).

Grants and Fellowships

- 1998–2002, 1994–98 NSERC individual research grant.

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* 1980-81 refers to the academic year 1980-81, etc.

- 1988–93 NSF Presidential Young Investigator Award.
- 1990–93 DEC Equipment Grant.
- 1989 NSF Medium and Long Term Research at Foreign Centers of Excellence (used for Spring 1990 leave at Hebrew University).
- 1988–90 IBM Faculty Development Award.
- 1987 NSF Mathematical Sciences Postdoctoral Research Fellowship (declined).

Presentations

(since 1995)
- Georgia Tech. (seminar), April 1995.
- Ecole Normale Supérieure (seminar), December 1995.
- Paris-Sud (Orsay) (seminar), December 1995.
- University of Minnesota (colloquium), Minneapolis, April 1996.
- Symposium on the Theory of Computing, Philadelphia, May 1996.
- Workshop on Emerging Applications of Number Theory, Minneapolis, July 1996.
- AT&T Labs (seminar), New Jersey, March 1998.

Other Activities
- Organized DIMACS Workshop on Expanding Graphs at Princeton University, May 1992.
- Co-organizer of IMA Workshop on Emerging Applications of Number Theory, July 1996.

Teaching Experience

Courses Designed:
- Introduction to Mathematical Finance, grad course at UBC
- Introduction to Scientific Computing, undergrad course at Princeton
- Numerous graduate "topics courses" at Princeton and Hebrew University (see below).

At UBC, including Spring 2000 (all courses at all univerisities are one-semester courses):
- First year (undergraduate) courses: Calculus (two semesters), Linear Algebra (one semester)
- Second year courses: Linear Algebra (one semester), Honours Linear Algebra (two semesters).
- Third year courses: Applied Linear Algebra (a second course in linear algebra, taught five semesters), Linear Programming (two semesters), Number Theory (one semester).
- Fourth year courses: Optimization in Graphs and Networks (one semester).
- Graduate courses: Combinatorial Optimization (one semester), Mathematical Finance (one semester).

At Princeton:
- First year courses: Introduction to Pascal Programming (one semester).
- Third year courses: Introduction to Scientific Computing (four semesters).
- Fourth year courses: Theory of Algorithms (one semester).
- Graduate courses: Topics in Expanding Graphs (one semester), Topics in Error Correcting Codes (one semester), Topics in Parallel Computation (one semester), Applications of Algebraic Geometry to Theoretical Computer Science (two semesters, with different topics).

At Hebrew University:
- Graduate courses: Applications of Algebraic Geometry to Theoretical Computer Science (two semesters, with different topics).

Publications

In Journals:

J1. Joel Friedman, "A Note on State Splitting," in *Proc. Amer. Math. Soc.* **92** (1984), 206–208.

J2. Roy Adler, Joel Friedman, Bruce Kitchens, and Brian Marcus, "State Splitting for Variable Length Graphs," in *IEEE Transactions on Information Theory* **32** (1986), 108–115.

*J3. Joel Friedman, "Constructing $O(n \log n)$ Size Monotone Formulae for the k-th Threshold Function," in *SIAM Journal on Computing* **15** (1986), 641–654.

J4. Joel Friedman and Nicholas Pippenger, "Expanding Graphs Contain all Small Trees," in *Combinatorica* **7** (1987), 71–76.

*J5. Joel Friedman, "A Lower Bound for Strictly Non-Blocking Networks," in *Combinatorica* **8** (1988), 185–188.

*J6. Paul Feldman, Joel Friedman, and Nicholas Pippenger, "On Non-Blocking Networks," in *SIAM J. Disc. Math.* **1** (1988), 185–173.

J7. Avner Friedman, Joel Friedman, and Brice McLeod, "Concavity of Solutions of Nonlinear Ordinary Differential Equations," in *J. Math. Anal. Appl.* **131** (1988), 486–500.

*J8. Joel Friedman, "On the Convergence of Newton's Method," in *Journal of Complexity* **5** (1989), 12–33.

J9. Joel Friedman, "On the Road Map Coloring Problem," in *Proceedings of the AMS* **110** (1990), 1133–1135.

J10. Joel Friedman, "Random Polynomials and the Density of Approximate Zeros," in *SIAM Journal on Computing* **19** (1990), 1068–1099.

J11. Joel Friedman, "A Density Theorem for Purely Iterative Zero Finding Methods," in *SIAM Journal on Computing* **19** (1990), 124–132.

J12. Bernard Chazelle and Joel Friedman, "A Deterministic View of Random Sampling and its Use in Geometry," in *Combinatorica* **10** (1990), 229–249.

*J13. Joel Friedman, "On the Second Eigenvalue and Random Walks in Random d-Regular Graphs," in *Combinatorica* **11** (1991), 331–362.

J14. Joel Friedman and Avi Wigderson, "The Spectra of Infinite Hypertrees," in *SIAM Journal on Computing* **20** (1991), 951–961.

*J15. Joel Friedman, "A Note on Matrix Rigidity," in *Combinatorica* **13** (1993) 235–239.

J16. Joel Friedman, "A Note on Poset Geometries," in *SIAM Journal on Computing* **22** (1993), 72–78.

J17. Joel Friedman and Nathan Linial, "On Convex Body Chasing," in *Discrete and Computational Geometry* **9** (1993), 293–321.

*J18. Joel Friedman, "Some Geometric Aspects of Graphs and their Eigenfunctions," in *Duke Mathematical Journal* **69** (1993), 487–525.

J19. Bernard Chazelle and Joel Friedman, "Point Location among Hyperplanes and Unidirectional Ray-Shooting," in *Computational Geometry: Theory and Applications* **4** (1994), 53–62.

J20. Joel Friedman, "Some Graphs with Small Second Eigenvalue," in *Combinatorica* **15** (1995), 31–42.

J21. Joel Friedman and Avi Wigderson, "On the Second Eigenvalue of Hypergraphs," in *Combinatorica* **15** (1995), 43–65.

J22. Joel Friedman, "Minimum Higher Eigenvalues of Laplacians on Graphs," in *Duke Mathematical Journal* **83** (1996), 1–18.

J23. Joel Friedman, "Computing Betti Numbers via Combinatorial Laplacians," in *Algorithmica* **21** (1998), 331–346.

J24. Joel Friedman, "Error Bounds on the Power Method for Determining the Largest Eigenvalue," in *Linear Algebra and its Applications* **280** (1998), 199–216.

J25. Joel Friedman and Phil Hanlon, "On the Betti Numbers of Chessboard Complexes," in *Journal of Algebraic Combinatorics* **8** (1998), 193–203.

*J26. Joel Friedman, Antoine Joux, Yuval Roichman, Jacques Stern, and Jean-Pierre Tillich, "The action of a few permutations on r-tuples is quickly transitive," in *Random Structures and Algorithms* **12** (1998), 335–350.

J27. Joel Friedman, "On Cayley Graphs on the Symmetric Group Generated by Tranpositions," to appear in *Combinatorica* (accepted October 1998), 15 pages.

*J28. Joel Friedman and Jean-Pierre Tillich, "Laplacian Eigenvalues and Distances Between Subsets of a Manifold," to appear in *The Journal of Differential Geometry* (accepted October 2000), 14 pages.

In Conferences:

*C1. Joel Friedman, "Constructing $O(n \log n)$ Size Monotone Formulae for the k-th Threshold Function," winner of Machtey Award, for best student paper in *25th IEEE Symposium on Foundations of Computer Science*, 1984, 506–515.

C2. Benny Chor, Joel Friedman, Oded Goldreich, Johan Hastad, Steven Rudich, and Roman Smolensky, "The Bit Extraction Problem or t-Resilient Functions," with B. Chor, O. Goldreich, J. Hastad, S. Rudich, and R. Smolensky, in *26th IEEE Symposium on Foundations of Computer Science*, 1985, 396–407.

*C3. Joel Friedman, "On Newton's Method for Polynomials," in *IEEE 27th Symposium on Foundations of Computer Science*, 1986, 153–161.

C4. Paul Feldman, Joel Friedman, and Nick Pippenger, "On Non-Blocking Networks," in *ACM Symposium on the Theory of Computing*, 1986, 247–254.

C5. Bernard Chazelle and Joel Friedman, "A Deterministic View of Random Sampling and its Use in Geometry," in *IEEE 29th Symposium on Foundations of Computer Science*, 1988, 539–549.

*C6. Joel Friedman, Jeff Kahn, and Endre Szemeredi, "On the Second Eigenvalue in Random Regular Graphs," in *21st ACM Symposium on the Theory of Computing*, 1989, 587–598.

C7. Joel Friedman, Craig Gotsman, and Eli Shamir, "On the Second Eigenvalue of Noisy Boolean Networks," with *Coll. Math. Soc. Janos Bolyai 59: Sets, Graphs, and Numbers*, Budapest, 1992, 287–296.

*C8. Joel Friedman, "On the Bit Extraction Problem," in *33rd IEEE Symposium on Foundations of Computer Science*, 1992, 314–319.

*C9. Joel Friedman, Antoine Joux, Yuval Roichman, Jacques Stern, and Jean-Pierre Tillich, "The Action of a Few Random Permutations on r-tuples and an Application to Cryptography," in *13th Annual Symposium on Theoretical Aspects of Computer Science*, 1996, 375–386.

C10. Joel Friedman, "Computing Betti Numbers via Combinatorial Laplacians," *28th ACM Symposium on the Theory of Computing*, 1996, 386–391.

Submitted for Publications:

*S1. Joel Friedman, "On the Bit Extraction Problem," 32 pages, submitted for publication in April 1996, revised and resubmitted June 2000.

*S2. Joel Friedman and Jean-Pierre Tillich, "Calculus on Graphs," 63 pages, submitted for publication in May 2000.

*S3. Joel Friedman and Jean-Pierre Tillich, "Wave Equations for Graphs and The Edge-based Laplacian," 40 pages, submitted for publication in February 2000.

*S4. Joel Friedman, "Relative Expanders or Weakly Relatively Ramanujan Graphs," 29 pages, submitted for publication in July 2000.

Work Near Completion:

P1. Joel Friedman and Jean-Pierre Tillich, "The p-Laplacian on Graphs."

P2. Joel Friedman and Jean-Pierre Tillich, "Alon-Boppana Theorems and Error-Correcting Codes."

Books Edited:

B1. Joel Friedman, *Expanding Graphs*, 1993, American Mathematical Society, x+142 pages.

B2. Dennis A. Hejhal, Joel Friedman, Martin C. Gutzwiller, and Andrew M. Odlyzko, *Emerging Applications of Number Theory*, 1999, Springer-Verlag, xiv+689 pages.

Patents:

Pt1. Paul N. Feldman, Joel Friedman, and Nicholas Pippenger, "Non-Blocking Concentrators," U.S. Pat. No. 4,750,202, June 7, 1988.