

Emin Martinian

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Professional Interests:

I am interested in data prediction, estimation, and analysis as applied to capital markets.

I continue to be affiliated with the Systems, Information, and Algorithms group at MIT where I occasionally collaborate on problems in information theory, machine learning, and statistical inference.

Education

Massachusetts Institute of Technology GPA 5.0/5.0

Ph.D. in Electrical Engineering/Computer Science, September 2004

M.S. in Electrical Engineering/Computer Science, June 2000

- Ph.D. thesis, *Dynamic Information and Constraints in Source and Channel Coding*, introduced concept of distortion side information and applications to data compression in distributed systems (one patent filed), applied Bayesian belief propagation techniques originally developed for statistical inference to achieve low complexity, optimal data compression, and developed low delay methods for handling channel uncertainty and errors.
- M.S. thesis, *Authenticating Multimedia in the Presence of Noise*, used information theory, error correcting codes, and signal processing methods to develop techniques for multimedia authentication which detect malicious tampering but are robust to statistically benign modifications.

University of California at Berkeley GPA 4.0/4.0

B.S. with highest honors in Electrical Engineering/Computer Science, minor in Physics, May 1997

Awards and Honors

Runner-up for best computer science Ph.D. thesis at MIT

Capocelli Award for best paper at 2004 Data Compression Conference

National Science Foundation Fellowship 1998-2002

University of California Regents Scholarship 1993-1997

Phi Beta Kappa 1997

Software Skills

C/C++: *Used since 1994, 6 years full-time, largest projects: 100K lines (team of 3), 20K lines (solo)*
Example software available at http://alum.mit.edu/www/emin/source_code/pycodes

Python: *Used since 2000, 6 years full-time, largest projects: 170K lines (team of 3), 10K lines (solo)*
Example software available at <http://dibs.sourceforge.net>

SQL: *Used since 2006, 3 years full-time experience, largest database: 10+ GB real-time financial data*

MATLAB/Simulink: *Used since 1997, 2 years full-time experience, largest project 3K lines (solo)*

Tcl/Tk: *Used since 1997, 3 years full-time experience, largest project 20K lines (team of 3)*

Working knowledge of UNIX shell scripts (bash, csh), Makefiles, M4, LISP, Excel, HTML and \LaTeX .

Publications

Published over 30 articles in conferences/journals (see <http://alum.mit.edu/www/emin/research/>).

Presentations

Gave invited seminars at UC Berkeley, Caltech, MIT, Stanford, Notre Dame, and UC San Diego.

Patents

Inventor of over 10 granted or pending patents.

Professional Experience

- Bain Capital** *Boston, MA*
Absolute Return Capital Partners *August 2006-Present*
- Research and develop systematic trading models for commodities, currencies, stocks, bonds, futures, options, swaps, and other derivatives.
 - Lead development of all database, trading, research, and monitoring software.
 - Supervise two other full time research analysts and various summer interns on research and development projects.
 - Research, propose, and conduct discretionary trades based on macro-economic data.
- Mitsubishi Electric Research Labs** *Cambridge, MA*
Research Scientist *July 2004-August 2006*
- Lead project on secure biometrics including development of probabilistic factor graph models for fingerprint/iris data, and design of Bayesian belief propagation algorithms for statistical inference.
 - Lead research and standardization activities in multi-camera video compression by implementing algorithms in C/C++, MATLAB, and Beowulf parallel computing clusters.
 - Developed models for synthetic aperture radar imagery and designed statistical signal processing algorithms to recover ground elevation from radar data.
 - Supervised five interns on various projects.
- Analog Devices** *Wilmington, MA*
Engineer *May 2001-August 2001*
- Doubled performance by optimizing error correcting algorithms in C and assembly for DSP chip.
- PinPoint Corporation** *Bedford, MA*
Consultant *May 1999-January 2001*
- Developed neural network and Bayesian classifiers to determine location of electronic beacon from radio measurements to provide GPS-like functionality indoors (one patent granted).
 - Developed and evaluated MATLAB models for phase-locked loops for signal demodulation.
- OPC Technologies** *San Jose, CA*
Engineer *May 1997-September 1998*
- Developed statistical signal processing algorithms, C/C++ software, and regression testing infrastructure for Optical Proximity Correction (OPC) of semiconductor designs to improve chip yields.
 - Implemented Chazelle-Edelsbrunner computational geometry algorithm for line segment intersection and doubled speed of Boolean set operations.
 - Created programming language to specify procedures for OPC (one patent granted).

Teaching Experience

Massachusetts Institute of Technology Cambridge, MA
Teaching Assistant Spring 2001

Designed, supervised and graded term project for graduate Digital Signal Processing class. The project required students to design and analyze various Digital Subscriber Line (DSL) architectures using MATLAB. Led discussion sections, held office hours, designed and graded homework and exams.

Massachusetts Institute of Technology Cambridge, MA
Student Organizer Fall 2000, Spring 2001, Fall 2002

Co-founded student-led seminar on communications, signal processing, optimization, and control in Fall 2000 (see <http://web.mit.edu/6.454/www> for details). Co-organized seminar in Spring 2001 and Fall 2002.

UC Berkeley Berkeley, CA
Lab Instructor February 1994-May 1995

Developed and taught lectures and labs on Microsoft Windows, Word, and Excel.

Internships

Lucent Technologies' Bell Labs Murray Hill, NJ
Intern May 2000-August 2000

- Designed optimal low delay, burst error correcting codes for voice over IP (two patents granted).

Video and Image Processing Lab at UC Berkeley Berkeley, CA
Intern May 1996-May 1997

- Optimized algorithms and C software for video compression using overcomplete frame expansions.

Lawrence Berkeley National Laboratories Berkeley, CA
Intern May 1995-October 1995

- Analyzed statistics of leakage current of silicon detectors designed for particle accelerators.

Center for Extreme UV Astronomy Berkeley, CA
Intern May 1994-September 1994

- Applied artificial intelligence tools to monitoring the Extreme UV Explorer satellite.

Service

Reviewer for IEEE Transactions on Information Theory, IEEE Transactions on Signal Processing, IEEE Transactions on Communications, IEEE Journal on Selected Areas in Communication, IEEE Transactions on Wireless Communication, IEEE Transactions on Circuits and Systems for Video Technology, IEEE Transactions on Circuits and Systems II, EURASIP Journal on Applied Signal Processing, European Transactions on Telecommunications, Data Compression Conference, International Symposium on Information Theory, International Conference on Image Processing, International Conference on Communications, IEEE Wireless Communications and Networking Conference, Review Committee Member for International Symposium on Circuits and Systems.

Dissertations

1. Emin Martinian, “Dynamic Information and Constraints in Source and Channel Coding”, Ph.D. Thesis, Massachusetts Institute of Technology, (Cambridge, MA), September 2004 available from http://csua.berkeley.edu/~emin/research/phd_thesis.pdf
2. Emin Martinian, “Authenticating Multimedia in the Presence of Noise”, M.S. Thesis, Massachusetts Institute of Technology, (Cambridge, MA), May 2000 available from <http://csua.berkeley.edu/~emin/research/mthesis.pdf>

Dissertations Cosupervised

1. Venkat Chandar, “Iterative Algorithms For Lossy Source Coding”, M. Eng. Thesis, Massachusetts Institute of Technology, (Cambridge, MA), May 2006

Journal Articles

1. Emin Martinian, Ram Zamir, and Gregory W. Wornell, “Source Coding With Encoder Side Information”, *accepted for publication in IEEE Transactions on Information Theory*
2. J. Nicholas Laneman, Emin Martinian, Gregory W. Wornell, and John G. Apostolopoulos, “Source-Channel Diversity Approaches for Multimedia Communication”, *IEEE Transactions on Information Theory* October 2005
3. Emin Martinian and Carl-Erik Sundberg, “Burst Erasure Correction Codes with Low Decoding Delay”, *IEEE Transactions on Information Theory*, October 2004
4. Aaron S. Cohen, Stark C. Draper, Emin Martinian, and Gregory W. Wornell, “Stealing Bits from a Quantized Source”, *accepted for publication in IEEE Transactions on Information Theory*
5. Emin Martinian and Carl-Erik Sundberg, “Decreasing Distortion Using Low Delay Codes for Bursty Packet Loss Channels”, *IEEE Transactions on Multimedia*, September 2003
6. Emin Martinian, Gregory W. Wornell, and Brian Chen, “Authentication with Distortion Criteria”, *IEEE Transactions on Information Theory* July 2005

Patents

Patents pending with Mitsubishi Electric Research Labs regarding compression and coding of multi-camera video.

Patents pending with Mitsubishi Electric Research Labs regarding secure biometric storage.

Patents pending with the Massachusetts Institute of Technology regarding quantizing signals with distortion side information.

Emin Martinian, Jonathan S. Yedidia “Quantizing signals using sparse generator factor graph codes”, U.S. Patent no. 6,771,197 issued August 3, 2004 (filed September 26, 2003).

Jay Werb, Emin Martinian, Melanie Swiderek, Samuel Levy, and Peter Stein, “Method and Apparatus for Locating Mobile Tags”, U.S. Patent no. 6456239 issued September 24, 2002 (filed August 24, 2000).

Emin Martinian, Carl-Erik W. Sundberg “Low delay channel codes for correcting bursts of lost packets”, U.S. Patent no. 6,694,478 issued February 17, 2004 (filed November 7, 2000).

Emin Martinian, Carl-Erik W. Sundberg “Apparatus and method for adaptive, multimode decoding” U.S. Patent no. 7,003,712 issued February 21, 2006 (filed November 29, 2001)

Nicolas Bailey Cobb, Emin Martinian “Method and apparatus for submicron IC design”, U.S. Patent no. 6,467,076 issued October 15, 2002 (filed April 30, 1999). Due to an error Emin Martinian’s name did not appear in the continuation of the original patent, but a correction was filed with the U.S. patent office on March 28, 2005.

Conference Proceedings

1. Emin Martinian and Martin Wainwright, “Low-density constructions can achieve the Wyner-Ziv and Gelfand-Pinsker bounds”, *International Symposium on Information Theory*, (Seattle, Washington) July 2006
2. Venkat Chandar, Emin Martinian, and Gregory W. Wornell, “Information Embedding Using Codes on Graphs and Iterative Coding”, *International Symposium on Information Theory*, (Seattle, Washington) July 2006
3. Todd Coleman, Erik Ordentlich, and Emin Martinian, “”, Joint Decoding Achieves the Min-cut/Max-flow for Correlated Sources over Broadcast Networks *International Symposium on Information Theory*, (Seattle, Washington) July 2006
4. Ashish Khisti, Emin Martinian, and Gregory W. Wornell, “”, Information Embedding with Distortion Side Information *International Symposium on Information Theory*, (Seattle, Washington) July 2006
5. Emin Martinian, Alexander Behrens, Jun Xin, Anthony Vetro, “View Synthesis for Multiview Video Compression”, *Picture Coding Symposium*, (Beijing, China) April 2006
6. Emin Martinian, Anthony Vetro, Jonathan S. Yedidia, João Ascenso, Ashish Khisti, and Dmitry Malioutov, “Hybrid Distributed Video Coding Using SCA Codes”, *submitted to the 2006 Multimedia Signal Processing Workshop*
7. Emin Martinian and Martin Wainwright, “Low density codes achieve the rate-distortion bound”, *Data Compression Conference*, (Snowbird, Utah) March 2006
8. Emin Martinian, Sergey Yekhanin, and Jonathan S. Yedidia, “Secure Biometrics Via Syndromes”, *43rd Annual Allerton Conference on Communications, Control, and Computing*, (Monticello, IL) October 2005
9. Todd P. Coleman, Michelle Effros, Emin Martinian, and Muriel Médard, “Rate-splitting for the deterministic broadcast channel”, *International Symposium on Information Theory*, (Adelaide, Australia) September 2005
10. Todd P. Coleman, Emin Martinian, Michelle Effros, and Muriel Médard, “Interference management via capacity-achieving codes for the deterministic broadcast channel”, *International Symposium on Information Theory*, (Adelaide, Australia) September 2005
11. Emin Martinian and Gregory W. Wornell, “Source Coding with Fixed Lag Side Information”, *42nd Annual Allerton Conference on Communications, Control, and Computing*, (Monticello, IL) October 2004
12. Emin Martinian, Gregory W. Wornell, and Ram Zamir, “Encoder Side Information Is Useful in Source Coding”, *International Symposium on Information Theory*, (Chicago, IL) July 2004
13. J. Nicholas Laneman, Emin Martinian, Gregory W. Wornell, “Source-Channel Diversity Approaches for Multimedia Communication”, *International Symposium on Information Theory*, (Chicago, IL) July 2004
14. Emin Martinian, Gregory W. Wornell, and Ram Zamir, “Source Coding With Distortion Side Information At The Encoder”, *Data Compression Conference*, (Snowbird, UT) March 2004, **(received the Capocelli Award for best paper)**
15. Emin Martinian and Jonathan Yedidia, “Iterative Quantization Using Codes on Graphs”, *41st Annual Allerton Conference on Communications, Control, and Computing*, (Monticello, IL) October 2003

**Conference
Proceedings
(Continued)**

16. Emin Martinian and Gregory W. Wornell, "Universal Codes For Minimizing Per-User Delay on Streaming Broadcast Channels", *41st Annual Allerton Conference on Communications, Control, and Computing*, (Monticello, IL) October 2003
17. J. Nicholas Laneman, Emin Martinian, Gregory W. Wornell, John G. Apostolopoulos, Susie J. Wee, "Comparing Application and Physical Layer Approaches to Diversity on Wireless Channels", *International Conference on Communications*, (Anchorage, AL) May 2003
18. Emin Martinian and Gregory W. Wornell, "Multimedia Content Authentication: Fundamental Limits", *International Conference on Image Processing*, (Rochester, NY) September 2002
19. Aaron S. Cohen, Stark C. Draper, Emin Martinian, Gregory W. Wornell, "Stealing Bits From a Quantized Source", *International Symposium on Information Theory*, (Lausanne, Switzerland) July 2002
20. Emin Martinian and Carl-Erik Sundberg, "Low Delay Burst Erasure Correction Codes for Packet Transmission", *International Symposium on Information Theory*, (Lausanne, Switzerland) July 2002
21. Emin Martinian and Carl-Erik Sundberg, "Low Delay Burst Erasure Correction Codes", *International Conference on Communications*, (New York, NY) May 2002
22. Aaron S. Cohen, Stark C. Draper, Emin Martinian, and Gregory W. Wornell, "Source Requantization: Successive Degradation and Bit Stealing", *Data Compression Conference*, (Snowbird, UT) April 2002
23. Emin Martinian, Brian Chen, and Gregory W. Wornell, "On Authentication with Distortion Constraints", *International Symposium on Information Theory*, (Washington D.C.) May 2001
24. Emin Martinian, Brian Chen, and Gregory W. Wornell, "An Information Theoretic Approach to the Authentication of Multimedia", *SPIE Conference on Electronic Imaging*, (San Jose, CA) January 2001