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Citizenship: United Kingdom & United States

### EDUCATION

University of California, Berkeley, California:

Ph.D. in Electrical Engineering, January 2006

*A Jump Linear Framework for Estimation with Markovian Source and Channel Dynamics*

Committee - EECS: Kannan Ramchandran (chair), Venkat Anantharam

Mathematics: Alexandre J. Chorin

M.A. in Mathematics, May 2005

*Estimation via Sparse Approximation: Error Bounds and Random Frame Analysis*

Committee - Mathematics: F. Alberto Grünbaum (chair)

Statistics: David J. Aldous, Bin Yu

M.S. in Electrical Engineering, May 2002

*Denosing via Recursive Wavelet Thresholding*

Committee - EECS: Kannan Ramchandran (chair)

IEOR and EECS: Laurent El Ghaoui

University of Iowa, Iowa City, Iowa:

B.S. with honors in Mathematics

Minors: Physics, Chemistry, and Music

### POSTDOCTORAL TRAINING

Postdoctoral Researcher

Professor Martin Vetterli

Computer and Communication Sciences Department,

École Polytechnique Fédérale de Lausanne, and

Department of Electrical Engineering and Computer Sciences

University of California, Berkeley

University of California President's Postdoctoral Fellow

Wireless Foundations Center

University of California, Berkeley

### SELECTED ACADEMIC HONORS

University of California President's Postdoctoral Fellowship

University of California, Berkeley, EECS Eugene Lawler Award

Henry Luce Foundation – Clare Boothe Luce Fellowship

National Science Foundation Graduate Fellowship

Soroptimist Founder's Dissertation Year Fellowship

Sigma Xi, the Scientific Research Society

University of California EECS GAANN Graduate Fellowship

University of Iowa: Undergraduate Research Scholar Fellowship

University of Iowa: President's, Dean's, & Honor's Scholarships

University of Iowa Scholars Day Speaker

## PUBLICATIONS (reverse chronological)

### Highly-selective long conference papers

1. A. K. Fletcher, S. Rangan, L. R. Varshney and A. Bhargava, “Neural Reconstruction with Approximate Message Passing (NeuRAMP),” Proc. 25th Ann. Conf. Neural Information Processing Systems, NIPS 2011. [\*Acceptance rate: 305/1400 = 22%]
2. A. K. Fletcher and S. Rangan, “Orthogonal Matching Pursuit from Noisy Measurements: A New Analysis,” Proc. 23rd Ann. Conf. Neural Information Processing Systems, NIPS 2009. [\*Acceptance rate: 263/1105=24%, Spotlight: 87/1105, top 8%]
3. S. Rangan, A. K. Fletcher, and V. K. Goyal, “Asymptotic Analysis for MAP Estimation via the Replica Method and Compressed Sensing,” Proc. 23rd Ann. Conf. Neural Information Processing Systems, NIPS 2009. [\*Acceptance rate: 263/1105=24%, Spotlight: 87/1105, top 8%]
4. A. K. Fletcher, S. Rangan, and V. K. Goyal, “Resolution Limits of Sparse Coding in High Dimensions,” Proc. 22nd Ann. Conf. Neural Information Processing Systems, NIPS 2008. [\*Acceptance rate: 250/1022 = 24%]
5. A. K. Fletcher, S. Rangan, and V. K. Goyal, “Estimation from Lossy Sensor Data: Jump Linear Modeling and LMI Analysis,” Proc. ACM Information Processing in Sensor Networks 2004. pp. 251–258. [\*Acceptance rate: 25/145=17%]

### Journal papers and book chapters

- 1<sup>†</sup> S. Rangan, A. K. Fletcher, and P. Schniter, “Hybrid Approximate Message Passing with Applications to Structured Sparsity” submitted June 2011; arXiv as <http://arxiv.org/abs/1111.2581>.
  - 2<sup>†</sup> A. K. Fletcher, S. Rangan, and V. K. Goyal, “Ranked Sparse Signal Support Detection,” submitted May 2011.
  3. A. K. Fletcher, S. Rangan, and V. K. Goyal, “On–Off Random Access Channels: A Compressed Sensing Framework,” *IEEE Trans. Information Theory*, in revision; arXiv:0903.1022.
  4. A. K. Fletcher and S. Rangan, “Orthogonal Matching Pursuit: A Brownian Motion Analysis,” *IEEE Trans. Signal Processing*, vol. 60, no. 3, pp. 1010–1021, March 2012.
  5. S. Rangan, A. K. Fletcher, and V. K. Goyal, “Asymptotic Analysis of MAP Estimation via the Replica Method and Applications to Compressed Sensing,” *IEEE Trans. Information Theory*, vol. 58, no. 3, pp 1902–1923, March 2012.
  6. A. K. Fletcher, S. Rangan, and V. K. Goyal, “Necessary and Sufficient Conditions on Sparsity Pattern Recovery,” *IEEE Trans. Information Theory*, vol. 55, no. 12, pp. 5758–5772, Dec 2009.
  7. V. K. Goyal, A. K. Fletcher, and S. Rangan, “Distributed Coding of Sparse Signals,” chapter in *Distributed Source Coding: Theory, Algorithms, and Applications*, P. L. Dragotti and M. Gastpar eds., Academic Press, 2009, 18 pages.
  8. V. K. Goyal, A. K. Fletcher, and S. Rangan, “Compressive Sampling and Lossy Compression,” *IEEE Signal Processing Magazine*, vol. 25, no. 2, pp. 48–56, March 2008.
  9. A. K. Fletcher, S. Rangan, V. K. Goyal, and K. Ramchandran, “Robust Predictive Quantization: Analysis and Design via Convex Optimization,” *IEEE J. Selected Topics in Signal Processing*, vol. 1, no. 4, pp. 618–632, Dec 2007.
  10. A. K. Fletcher, S. Rangan, V. K. Goyal, and K. Ramchandran, “Denoising by Sparse Approximation: Error Bounds Based on Rate–Distortion Theory,” *EURASIP J. Applied Signal Processing*, Special Issue on Overcomplete Representations, vol. 2006, March 2006, 19 pages.
- \* A. K. Fletcher, S. Rangan, and J. Viventi, “Learning Dynamical Models of Epileptic Seizures from High-Density *in vivo* Recordings,” in preparation for *J. Neuroscience*.

- \* A. K. Fletcher and S. Rangan, “Bayesian Inference for Regularized Low-Rank Matrix Approximations and Sparse PCA”, in preparation for *Annals of Statistics*.
- \* A. K. Fletcher, S. Rangan, L. R. Varshney, and A. Bhargava, “Message Passing Techniques in Neural Estimation,” in preparation for *Neuron*.
- \* A. K. Fletcher, D. S. Weller, V. K. Goyal, E. Adalsteinsson, “Multi-Coil MRI Reconstruction via Bilinear Optimization,” in preparation for *IEEE Trans. Med. Imaging*.
- \* A. K. Fletcher and M. Vetterli, “On Multiple-Observation Denoising with Threshold Operators,” in preparation for *IEEE Signal Processing Letters*.

Other peer-reviewed conference papers

1. S. Rangan and A. K. Fletcher, “Iterative Estimation of Constrained Rank-One Matrices in Noise,” submitted February 2012.
2. S. Rangan, A. K. Fletcher, and P. Schniter, “Hybrid Generalized Approximate Message Passing with Applications to Structured Sparsity,” submitted February 2012.
3. S. Rangan, A. K. Fletcher, and V. K. Goyal, “Extensions of Replica Analysis to MAP Estimation with Applications to Compressed Sensing,” Proc. IEEE Int. Symp. Information Theory 2010 (Austin, TX, June 12–18), pp. 1543–1547.
4. A. K. Fletcher, S. Rangan, and V. K. Goyal, “A Sparsity Detection Framework for On–Off Random Access Channels,” Proc. Wavelets XIII, part of SPIE Int. Symp. Optical Sci. & Techn. 2009 (San Diego, CA, August 2–6), pp. 744607-[1–15].
5. S. Rangan, A. K. Fletcher, and V. K. Goyal, “A Sparsity Detection Framework for On–Off Random Access Channels,” IEEE Int. Symp. Information Theory 2009 (Seoul, South Korea, June 28–July 3), pp. 169–173.
6. A. K. Fletcher, S. Rangan, and V. K. Goyal, “On Subspace Structure in Source and Channel Coding,” Proc. IEEE Int. Symp. Information Theory 2008 (Toronto, Canada, July 6–11), pp. 1982–1986.
7. A. K. Fletcher, S. Rangan, and V. K. Goyal, “Rate-Distortion Bounds for Sparse Approximation,” Proc. IEEE Workshop on Statistical Signal Processing 2007 (Madison, WI, August 26–29), pp. 254–258.
8. A. K. Fletcher, S. Rangan, and V. K. Goyal, “On the Rate-Distortion Performance of Compressed Sensing,” Proc. IEEE Int. Conf. Acoustics, Speech, & Signal Processing 2007 (Honolulu, HI, April 15–20), vol. III, pp. 885–888.
9. A. K. Fletcher, S. Rangan, V. K. Goyal, and K. Ramchandran, “Causal and Strictly Causal Estimation for Jump Linear Systems: An LMI Analysis,” Proc. Conf. Information Sciences & Systems 2006 (Princeton, NJ, March 22–24), pp. 1302–1307.
10. A. K. Fletcher, S. Rangan, V. K. Goyal, and K. Ramchandran, “Analysis of Denoising by Sparse Approximation with Random Frame Asymptotics,” Proc. IEEE Int. Symp. on Information Theory 2005 (Adelaide, September 4–9), pp. 1706–1710.
11. A. K. Fletcher, S. Rangan, and V. K. Goyal, “Sparse Approximation, Denoising, and Large Random Frames,” Proc. Wavelets XI, part of SPIE Optics & Photonics 2005 (San Diego, CA, July 31–August 4), vol. 5914, pp. 172–181.
12. A. K. Fletcher, S. Rangan, V. K. Goyal, and K. Ramchandran, “Optimized Filtering and Reconstruction in Predictive Quantization with Losses,” Proc. IEEE Int. Conf. Image Processing 2004 (Singapore, October 24–27), vol. 5, pp. 3245–3248.

13. A. K. Fletcher, S. Rangan, V. K. Goyal, K. Ramchandran, "Robust Predictive Quantization: A New Design and Optimization Methodology," Proc. IEEE Int. Symp. Information Theory 2004 (Chicago, IL, June 27–July 2), p. 427.
14. A. K. Fletcher, V. K. Goyal, and K. Ramchandran, "On Multivariate Estimation by Thresholding," Proc. IEEE Int. Conf. Image Processing 2003 (Barcelona, Spain, September 14–17), vol. 1, pp. 61–64.
15. A. K. Fletcher and K. Ramchandran, "Estimation Error Bounds for Denoising by Sparse Approximation," Proc. IEEE Int. Conf. Image Processing 2003 (Barcelona, Spain, September 14–17), vol. 1, pp. 113–116.
16. A. K. Fletcher, V. K. Goyal, and K. Ramchandran, "Iterative Projective Wavelet Methods for Denoising," Proc. Wavelets X: Applications in Signal & Image Processing, part of SPIE Int. Symp. on Optical Science & Technology 2003 (San Diego, CA, August 3–8), vol. 5207, pp. 9–15.
17. A. K. Fletcher and K. Ramchandran, "Estimation Error Bounds for Frame Denoising," Proc. Wavelets X: Applications in Signal & Image Processing, part of SPIE Int. Symp. on Optical Science & Technology 2003 (San Diego, CA, August 3–8), vol. 5207, pp. 40–46.
18. A. K. Fletcher, K. Ramchandran, and V. K. Goyal, "Wavelet Denoising by Recursive Cycle Spinning," Proc. IEEE Int. Conf. Image Processing 2002 (Rochester, NY, September 22–25), vol. 2, pp. 873–876.

#### SELECTED INVITED PRESENTATIONS AND WORKSHOPS

1. "Neural Connectivity and Receptive Field Estimation via Hybrid Message Passing," Mathematical Biology Seminar, University of California, Davis, March 16, 2012.
2. "Neural Connectivity and Receptive Field Estimation via Hybrid Message Passing," Information Theory and Applications Workshop, University of California, San Diego, February 6, 2012.
3. "Sparsity: Algorithms and Applications in Neuroscience," Applied Mathematics and Mathematical Biology Seminar, Claremont Graduate University, January 25, 2012.
4. "Generalized Approximate Message Passing and Applications in Neural Receptive Field Estimation and Connectomics," Redwood Center for Theoretical Neuroscience, University of California, Berkeley, June 8, 2011.
5. "Compressed Sensing to the Limits: Bounds, Algorithms, and Wireless Applications," University of Michigan Electrical Engineering and Computer Science Seminar, March 31, 2009.
6. "Sparsity Recovery: Limits, Algorithms and Wireless Applications," DIMACS/DyDAn Working Group on Streaming, Coding, and Compressive Sensing: Unifying Theory and Common Applications to Sparse Signal/Data Analysis and Processing, New Brunswick, NJ, March 25–26, 2009. (By invitation only workshop speaker and participant.)
7. "Sparsity Pattern Recovery: Precisely Contrasting Thresholding, Lasso, and Maximum Likelihood," University of California at San Diego Information Theory and Applications Workshop, February 8–13, 2009.
8. "Random Access Channels and Sparsity Detection," University of California at San Diego Information Theory and Applications Workshop, February 8–13, 2009.
9. American Institute of Mathematics Workshop on Frames for the Finite World: Sampling, Coding, and Quantization, August 18–22, 2008 (invited participant).
10. Banff International Research Station Workshop on Mentoring for Engineering Academia II, July 22–27, 2007 (invited participant), Banff, Alberta, Canada.

11. “Compressed Sensing as a Source Coding Technique,” 2007 von Neumann Symposium on Sparse Representation and High-Dimensional Geometry, July 8–12, 2007, Snowbird, UT.
12. “On Encoding with a Codebook of Subspaces,” University of California at San Diego Information Theory and Applications Workshop, January 29, 2007.
13. “Rate-Distortion Performance of Sparse-Signal Coding with Random Measurements,” SIAM Conference on Imaging Science, May 15, 2006, Minneapolis, MN.
14. University of California at San Diego Workshop on Information Theory and Its Applications, February 6–10, 2006 (invited participant).
15. “Estimation and Robust Communication of Signals with Markovian Losses,” École Polytechnique Fédérale de Lausanne, Computer and Communication Sciences Department, July 14, 2005, Lausanne, Switzerland.
16. “Estimation with Markovian Dynamics and Sparseness,” University of California, Berkeley, Networking/Communication/DSP Seminar, April 20, 2005, Berkeley, CA.
17. UCLA Institute for Pure and Applied Mathematics (IPAM) Program on Multiscale Geometry and Analysis in High Dimensions, Fall 2004.
18. PAESMEM/Stanford School of Engineering Workshop on Mentoring in Engineering, June 21–22, 2004.
19. “Sparseness from Redundancy: Denoising Methods and Bounds,” University of Cambridge, Department of Engineering, Signal Processing Seminar, October 2, 2003, Cambridge, UK.
20. “Wavelet Denoising by Recursive Cycle Spinning,” DIMACS Workshop on Source Coding and Harmonic Analysis, May 9, 2002, New Brunswick, NJ.

## TEACHING AND MENTORING EXPERIENCE

**Graduate Student Instructor** – University of California, Berkeley, *Signals & Systems*, EE120

I was requested multiple times to be a TA for this intermediate undergraduate signal processing course. It is considered challenging due to its breadth and the mathematical level compared to previous courses in the curriculum. I received a highest HKN Departmental TA rating.

**Graduate Student Instructor** – University of California, Berkeley, *Intro to Electronics*, EE42/100  
 As a TA for this circuit analysis class—which is an introductory course for pre-computer science students—I led discussion and laboratory sessions, designed and graded homeworks and exams, and often guest lectured for the visiting instructor. I tied for the highest teaching rating that semester.

**Teaching Assistant** – University of Iowa, *Computers in Engineering*, 57:017

With the rare opportunity of being an undergraduate TA three times, I initially was responsible for laboratory and lecture sessions on computer architecture and machine language programming. My final summer, the professor and I redesigned the entire course to incorporate programming in C/C++, which entailed new experiments, syllabus, books, and the purchase of lab equipment.

**Learning Center Supervisor & Instructor** – University of Iowa Dept of Intercollegiate Athletics  
This job involved supervising and instructing small groups of student athletes, for four hours Monday through Thursday evenings, in any physics, chemistry, engineering, or mathematics course. It was a challenging job usually offered only to graduate students.

**Tutor for Iowa Department for the Blind**

For two years, I tutored a newly-blind Iranian student in rhetoric, literature, chemistry, and mathematics courses at the University of Iowa; I learned more about teaching from this than anything.

**University of Iowa Tutor Referral Service: Tutor**

I privately tutored approximately 80 students in mathematics, English, writing, statistics, and the physical sciences while an undergraduate.

**Girls E-Mentoring in Science, Engineering and Technology (GEM-SET) mentor**

During graduate school, I was an on-line mentor for a national program that connects middle school and high school girls with professional women in science, engineering and technology fields.

**WICSE Big-Sister Mentor**

Senior graduates mentor beginning students during their first few years at Berkeley—guiding them through the undergraduate–graduate transition and assisting them in selecting courses and advisors.

## PROFESSIONAL SERVICE

Girls E-Mentoring in Science, Engineering and Technology (GEM-SET) mentor

Women in Computer Science & Electrical Engineering (WICSE) Officer

WICSE Big Sister

Reviewer for:

IEEE Int. Conference on Acoustics, Speech, & Signal Processing

Neural Information Processing Systems Conference

Artificial Intelligence and Statistics

Conference on Information Sciences and Systems

IEEE Int. Conference on Image Processing

IEEE International Symposium on Information Theory

IEEE American Control Conference,

IEEE Conference on Decision & Control,

ACM Int. Conference on Information Processing in Sensor Networks

European Signal Processing Conference

IEEE Trans. on Automatic Control

IEEE Trans. on Image Processing

IEEE Trans. on Information Theory

IEEE Trans. on Signal Processing

EURASIP Journal on Advances in Signal Processing

PHYCOM: Physical Communication Journal

## PROFESSIONAL AND HONORARY MEMBERSHIPS

Sigma Xi, The Scientific Research Society

Institute of Electrical and Electronics Engineers

Society of Women Engineers

Association for Women in Mathematics

Society for Industrial and Applied Mathematics

## REFERENCES

Martin Vetterli  
Dean and Professor  
School of Computer & Communication Sciences  
École Polytechnique Fédérale de Lausanne  
Room BC332, Station 14  
CH-1015 Lausanne Switzerland  
Martin.Vetterli@epfl.ch  
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Martin J. Wainwright  
Associate Professor  
Statistics & EECS  
University of California, Berkeley  
263 Cory Hall  
Berkeley, CA 94720-1770  
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Eero Simoncelli  
Professor & Howard Hughes Investigator  
Neural Science, Mathematics, & Psychology  
New York University  
4 Washington Place, Room 809  
New York, NY 10003-1056  
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Vivek K Goyal  
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Electrical Engineering & Computer Science  
Massachusetts Institute of Technology  
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Kannan Ramchandran  
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Electrical Engineering & Computer Sciences  
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Sundeep Rangan  
Associate Professor  
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