

Sunder Sethuraman

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Education

1995 Ph.D. Courant Institute, New York University, New York, NY.

1990 B.S. Stanford University, Stanford, CA.

1986 Diploma Florida High School, Tallahassee, FL.

Professional Experience

| | | |
|-------------|------------------------------|--|
| 2008 – | Professor | Department of Mathematics, Iowa State University. |
| 2006 – 2007 | Visiting Associate Professor | Mathematical Sciences, University of Cincinnati. |
| 2002 – 2008 | Associate Professor | Department of Mathematics, Iowa State University. |
| 1998 – 2002 | Assistant Professor | Department of Mathematics, Iowa State University. |
| 1996 – 1998 | Visiting Assistant Professor | School of Mathematics, University of Minnesota. |
| 1995 – 1996 | Post-Doctoral Fellow | FIM, ETH-Zentrum Zürich, Switzerland. |
| 1990 – 1995 | Teaching Assistant | Courant Institute, New York University. |
| Summer 1991 | Research Assistant | Manufacturing Research Division, IBM, Yorktown Heights, NY. |

Research Areas of Interest

Probability. Stochastic analysis of interacting particles systems and other statistical physics models. Random walks, graphs and other random media. Markov chains.

Professional Societies

American Mathematical Society (AMS), Institute of Mathematical Statistics (IMS), Mathematical Association of America (MAA).

Research Grants

1997 – 2001 NSF-DMS-9703811 (Probability), “Fluctuations in Asymmetric Processes with Static and Dynamic Random Environments.”

2000 – 2004 NSF-DMS-0071504 (Probability), “Second-Order Calculations in Particle and Trapping Systems.”

2005 – 2007 NSA, “Asymptotic Studies in Nonhomogeneous and Interacting Systems.”

2005 – 2008 NSF-DMS-0504193 (Probability), “Studies in Nonequilibrium Behaviors of Tagged Particles.”

2009 – 2011 NSA, “Connections between tagged particles and hydrodynamics in some interacting particle systems.”

2009 – 2012 NSF-DMS-0906713 (Probability), “Connections between tagged particles and hydrodynamics in some interacting systems.”

Awards

July 2008 Prix de l’Institut Henri Poincare for the best paper (cf. [18]) in *Annales IHP Prob. Stat.* in the year 2007.

April 2009 Lambert Award, Dept of Mathematics, Iowa State University

Students Supervised

Jayadev S. Athreya. Senior undergraduate thesis, “On the asymptotic limits of discrete maximal order statistics,” May 2000. Next: Graduate student, Mathematics, University of Chicago.

Zach Dietz. PhD, “Large deviations for a class of non-homogeneous Markov chains,” December 2002. Next: NSF-VIGRE post-doc at Tulane University.

John Njue. MS (co-major with Paul Sacks), October 2003.

Eric Blabac. MS, “Some results in the determination of the basis of a convergent nonhomogeneous Markov chain,” July 2005. Next: Employed at SAP software company.

Maximilian Wimmer. MS “A law of large numbers and central limit theorem for the leaves in a random graph model” July 2006. Next: PhD student in Finance at University of Regensburg.

Reza Rastegar. PhD, Currently working on PhD project.

Publications

A. Refereed Articles

1. S. Hamaguchi, M. Dalvie, R.T. Farouki, and S. Sethuraman, A shock-tracking algorithm for surface evolution under reactive-ion etching. *J. Appl. Phys.* **74** (1992), 5172-5184.
2. S. Sethuraman, and L. Xu, A central limit theorem for reversible exclusion and zero-range particle systems. *Ann. Probab.* **24** (1996), 1871-1902.
3. C. Landim, S. Sethuraman, and S.R.S. Varadhan, Spectral gap for zero-range dynamics. *Ann. Probab.* **24** (1996), 1842-1870.
4. S. Sethuraman, and L. Xu, Spin depolarization decay rates in α -symmetric stable fields on cubic lattices. *Commun. Pure and Appl. Math.* **49** (1997), 1281-1298.
5. S. Sethuraman, Central limit theorems for additive functionals of exclusion processes. *Ann. Probab.* **28** (2000), 277-302; Correction **34**(2006), 427-428.
6. S. Sethuraman, S.R.S. Varadhan, and H.T. Yau, Diffusive limit of a tagged particle in asymmetric simple exclusion processes. *Commun. Pure and Appl. Math.* **53** (2000), 972-1006.
7. S. Sethuraman, On extremal measures for conservative particle systems. *Ann. Inst. Henri Poincaré Prob. et Statistiques* **37** (2001), 139-154.
8. J.S. Athreya, and S. Sethuraman, On the asymptotics of discrete order statistics. *Stat. and Prob. Letters* (2001), **54** 243-249.
9. S. Sethuraman, An equivalence of H_{-1} norms for the simple exclusion process. *Ann. Probab.* **31** (2003), 35-62.
10. T. Seppäläinen and S. Sethuraman, Transience of second-class particles and diffusive variance bounds for additive functionals of one dimensional asymmetric exclusion processes. *Ann. Probab.* **31** (2003), 148-169.
11. S. Sethuraman, Conditional survival distributions of Brownian trajectories in a one dimensional Poissonian environment. *Stoch. Proc. and Appl.* **102** (2003), 169-209.

12. S. Sethuraman, A clustering law for some discrete order statistics. *J. Appl. Probability* **40** (2003), 226-241.
13. J. Sethuraman and S. Sethuraman, On counts Bernoulli strings and connections to rank orders and random permutations. *Inst. of Math. Statistics* **45** "A Festschrift for Herman Rubin," Ed. A. DasGupta. (2004), 140-152.
14. Z. Dietz and S. Sethuraman, Large deviations for a class of non-homogeneous Markov chains. *Ann. Appl. Probab.* **15** (2005), 421-486.
15. S. Sethuraman and S.R.S. Varadhan, A martingale proof of Dobrushin's CLT for non-homogeneous Markov chains. *EJP*. **10**; #36 (2005), 1221-1235.
16. S. Sethuraman, Super-diffusivity of occupation-time variance in 2-dimensional asymmetric exclusion processes with density $\rho = 1/2$. *J. Stat. Phys.* **123** (2006), 787-802.
17. S. Sethuraman, Diffusive variance for a tagged particle in $d \leq 2$ asymmetric simple exclusion. *ALEA Lat. Am. J. Prob. Stat.* **1** (2006), 305-332.
18. S. Sethuraman, On diffusivity of a tagged particle in asymmetric zero-range dynamics. *Ann. I.H.P. Probab. et. Statistique* **43** (2007), 215-232.
19. Z. Dietz and S. Sethuraman, Occupation laws for some time-nonhomogenous Markov chains. *EJP* **12**; #23 (2007), 661-683.
20. M. Balasz, F. Rassoul-Agha, T. Seppäläinen, S. Sethuraman, Existence of the zero range process and a deposition model with superlinear growth rates. *Ann. Probab.* **35** (2007), 1201-1249.
21. K.B. Athreya, Arka Ghosh, and Sunder Sethuraman, Growth of preferential attachment random graphs via continuous-time branching processes. *Proceedings of Indian Academy; Mathematical Sciences* **118**; #3 (2008), 473-494.
22. M. Peligrad, S. Sethuraman, On fractional Brownian motion limits in one dimensional nearest-neighbor symmetric simple exclusion. *ALEA Lat. Am. J. Prob. Stat.* **4** (2008) 245-255.
23. F. Huffer, J. Sethuraman, and S. Sethuraman, A study of counts of Bernoulli strings via conditional Poisson processes. *Proc. Amer. Math. Soc.* **137** (2009) 2125-2134.

24. W. Bryc, S. Sethuraman, A remark on the maximal eigenvalue for circulant matrices. To appear IMS volume High Dimensional Probability Luminy Conference Proceedings.
25. M. Jara, C. Landim, and S. Sethuraman, Nonequilibrium fluctuations for a tagged particle in mean-zero one dimensional zero-range processes. *Probab. Theory Related Fields* **145** (2009) 565-590.
26. W. Bryc, D. Minda, S. Sethuraman, Large deviations for the leaves in some random trees. To appear *Adv. Appl. Probab.*
27. J. Sethuraman, S. Sethuraman, Connections between Bernoulli strings and random permutations. To appear *Alladi Ramakrishnan Memorial Volume, Springer-Verlag.*

B. Preprints

1. S. Sethuraman, SRS Varadhan, Large deviations of a tagged particle in one-dimensional nearest-neighbor symmetric simple exclusion. Available at <http://www.math.iastate.edu/sethuram/preprints/>
2. C. Bergman and S. Sethuraman, Biased coin-tossing and cryptanalysis. Submitted.

C. Works In Progress

Projects on particle systems, random graphs and other media are being considered.

1. M. Jara, C. Landim, S. Sethuraman, Nonequilibrium fluctuations for a tagged particle in mean-zero one dimensional zero-range processes II. *work-in-progress.*
2. S. Athreya, S. Sethuraman, B. Toth, On the range and double points of a random walk before exit from a set. *work-in-progress.*
3. S. Liu, T. Matzavinos, S. Sethuraman, Random walk distances in data clustering and applications. *work-in-progress.*
4. Large deviations of the current in symmetric simple exclusion. *work-in-progress*

D. Other Articles

1. S. Sethuraman, On Professor S.R.S. Varadhan's contributions to hydrodynamic limits. *Current Science* **78** (2000) 103-104.
2. S. Sethuraman, Diffusive limit for a tagged particle in zero-range. *Oberwolfach Reports* **1** #4 "Large Scale Stochastic Dynamics" Aug. 29 - Sep. 4 (2004) in 2229-2310.
3. S. Sethuraman, Nonequilibrium fluctuations for a tagged particle in one dimensional mean-zero zero-range processes. *Oberwolfach Reports* **4** #3 "Large Scale Stochastic Dynamics" Aug. 26 - Sep. 1 (2007) in 2443-2530.
4. Z. Dietz and S. Sethuraman, Large deviations for a class of non-homogeneous Markov chains: K-word level results. (2004)
Available at <http://www.math.iastate.edu/sethuram/>

Teaching

The following lists the courses taught at Iowa State University. The scale for the student evaluation is 5(best)–1(worst).

| Year | Semester | Courses | Enrollment | Evaluation |
|-------------------------|----------|--|------------|------------|
| 1998 | Fall | Math 165 Calculus I | 39 | 3.92 |
| | | Math 165 Calculus I | 41 | 3.73 |
| 1999 | Spring | Math 554 Stochastic Processes | 10 | 5.00 |
| | Fall | Math 166H Honors Calculus II | 29 | 3.08 |
| | | Math 555 Stochastic Differential Equations | 9 | 4.08 |
| 2000 | Spring | Math 554 Stochastic Processes | 10 | 4.13 |
| | | Math 491 Undergraduate Thesis (Athreya) | | |
| | Fall | Math 265 Calculus III | 42 | 3.40 |
| | | Math 514 Measure Theory | 14 | 3.90 |
| | | Math 699 Probability Research (Dietz) | | |
| 2001 | Spring | Math 554 Stochastic Processes | 10 | 4.56 |
| | | Math 699 Probability Research (Dietz) | | |
| | Summer | Math 699 Probability Research (Dietz) | | |
| | Fall | Math 514 Measure Theory | 19 | 4.5 |
| Math 307 Matrix Algebra | | 38 | 3.42 | |

| Year | Semester | Courses | Enrollment | Evaluation |
|---------------------------------------|----------|---|------------------------------|------------|
| 2002 | Spring | Math 266 ODE | 35 | 3.78 |
| | Fall | Math 501X Analysis | 15 | 4.15 |
| | | Math 166 Calculus II Math 699 Probability Research (Dietz) | 130 | 3.66 |
| 2003 | Spring | Stat 642 Advanced Probability | 12 | 4.0 |
| | | Math 307 Linear Algebra | 38 | 3.88 |
| | | Math 699 Probability Research (Dietz) | | |
| | Fall | Math 555 BM and Diffusions | 3 | 4.0 |
| | | Math 307 Linear Algebra | 39 | 3.91 |
| | | Math 490 Markov Chains (Sony Sung) | | |
| 2004 | Spring | Math 554 Stochastic Processes | 14 | 4.5 |
| | Fall | Math 166 Calculus II | 37 | 4.15 |
| | | Math 166H Calculus II | 21 | 4.06 |
| 2005 | Spring | Math 307 Matrix Algebra | 38 | 3.96 |
| | | Math 307 Matrix Algebra | 23 | 4.5 |
| | | Math 599 Probability Research (Blabac) | | |
| | Summer I | Math 414 (with E. Weber) | 25 | |
| | | Math 267 (with E. Weber) | 38 | |
| 2006 | Spring | Math 414 Intro to Analysis | 23 | 4.47 |
| | | Math 554 Stochastic Processes | 18 | 4.71 |
| | | Math 599 Probability Research (Wimmer) | | |
| | Summer I | Math 490 Undergraduate Study (Newton) | | |
| | 2007 | Fall | Math265H Honors Calculus III | 25 |
| Math 265 Calculus III | | | 38 | 4.07 |
| Math 266 ODE | | | 38 | 3.75 |
| Math 590 Probability Reading (Kaymaz) | | | | |
| Spring | | Math 699 (Kaymaz) | | |
| 2008 | Fall | Math 644X Advanced Probability | 5 | 4.75 |
| 2009 | Fall | Math 265H Honors Calculus III | 28 | |
| | | Math 266 ODE | 39 | |
| | | Math 690 Large Deviations(Choi, Rastegar) | | |
| 2010 | Spring | Math 690 Mixing and Random Graphs | | |

Course Development.

With KB Athreya, developed in 2007 a first course in graduate probability, 644X, which has run in Fall 2007, 2008.

Professional Service

Regularly serve on committees: MS, PhD exams (34 students), P&T, search, and other committees.

A. Department

Colloquium Committee 1998 – 1999

Undergraduate Curriculum Committee 1999 – 2001

Department Search Committee

2001-2002, 2002-2003, 2003-2004, 2007-2008

Graduate Committee 2002-2005 (chair 2003-2004, admissions 2003)

Analysis Exam committee

2003-2004, 2008-2009, (chair) 2009-2010

Promotion and Tenure Subcommittee

2003-2004, 2005-2006, 2007-2008, 2008-2009

Awards Committee 2007-2008, 2008-2009, 2009-2010

Adhoc Strategic Planning committee 2009-2010

B. College of Arts and Science

Department Chair Review Committee 2000

Department Chair Search Committee 2000-2001

C. University

LAS Dean Search Committee 2003-2004

D. Editorial Work and Refereeing

Associate Editor of *Statistics and Probability Letters*, 11/02 –

Associate Editor of *Electronic Journal of Probability/Electronic Communications in Probability*, 1/09 –

Regular referee for journals in probability, statistical physics, etc.

E. Meetings Organized

Ames Weekend Workshop on Particle Systems 2001. Ten lecturers visited Iowa State University on April 28-29, 2001. Organized by T. Seppäläinen and S. Sethuraman.

Ames Symposium on Probability and Statistics, a conference in honor of Krishna B. Athreya's 70th Birthday on Sep. 18-19, 2009. Organized by A. Ghosh, A. Roitershtein, S. Sethuraman, A. Weerasinghe.

F. Scientific Committees

Midwestern Probability Colloquium 2002. Yearly probability meeting for the last 30 years in Chicago, Oct. 19-20, 2002. Member of scientific committee: C. Mueller, E. Kosygina, and S. Sethuraman.

Cincinnati Symposium on Probability Theory and Applications. Mar. 20-23, 2009. Scientific advisory committee: R. Bradley, Q-M. Shao, and S. Sethuraman.

G. Other Service

Chair of Wald II session (SRS Varadhan) at Joint Statistical Meetings, Aug. 10, 2005, Minneapolis

NSF-DMS program in probability review panelist, January 10-13 2007, Washington, DC.

Lectures in Conferences

CLT for reversible exclusion and zero-range systems. AMS Meeting, Charlottesville, November 1994.

Central limit theorems for tagged particles in the simple exclusion process. Special session on probability, AMS Meeting, Chicago, IL, September 1998.

Path measure limit for surviving Brownian motion in an obstacle setting. Special session on probability, AMS Meeting, Gainesville, FL, March 1999.

Single particle dynamics in an infinite particle system. Brazilian Colloquium, IMPA, Rio de Janeiro, August 1999.

Central limit theorems for additive functionals of simple exclusion. Brazilian Probability School, IMPA-USPE, Angra dos Reis, August 1999.

On the martingale CLT, and applications. Summer Intern Program in Probability, University of Wisconsin at Madison, July 2002.

Tagged particle problems for simple exclusion and zero-range models. Summer Intern Program in Probability, University of Wisconsin at Madison, July 2002.

A Martingale Proof of Dobrushin's Theorem. Special session on probability, AMS Meeting, Madison, WI, October 2002.

On the numbers of $100 \cdots 01$ strings in certain Bernoulli sequences and random permutations. MAA Meeting, Cedar Falls, IA, April 2003.

Large deviations for a class of nonhomogeneous Markov chains. Stochastic Processes and Applications and 6th Brazilian School of Probability, Angra dos Reis, Brazil, August 2003.

Large deviations for a class of nonhomogeneous Markov chains. AMS-India Meeting, Bangalore, India, December 2003.

A Martingale Proof of Dobrushin's Theorem. Indian International Statistical Association Meeting, Athens, GA, May 2004.

Diffusive limit of a tagged particle in asymmetric zero-range. Oberwolfach Meeting, “Large Scale Stochastic Dynamics,” Aug. 29 – Sep. 4 2004.

On tracer particles in certain interacting particle systems. Session on “Stochastic Dynamical Systems” in conference “Differential and difference equations and applications” Florida Institute of Technology, Melbourne, FL, Aug 1-5, 2005.

Variance estimates of occupation times and a tagged particle in 2D asymmetric simple exclusion. Large scale behavior of interacting particle systems: Fluctuations and hydrodynamics, Budapest, Hungary, Aug. 22-26, 2005.

Diffusivity of a tagged particle in zero-range dynamics. “Martingales and Stochastic Analysis” conference at University of Florida, Gainesville, Nov. 10-12, 2005.

Occupation limits for some Markov time-reinforcement schemes. SAMSI Workshop on Random Matrices. Poster presentation, Sept. 17-20, 2006

Occupation limits for some Markov time-reinforcement schemes. AMS Meeting, Cincinnati, OH Oct. 21, 2006

Occupation limits for some Markov time-reinforcement schemes. IISA Conference on Probability and Statistics, Cochin, India, Jan. 2-5, 2007.

Nonequilibrium fluctuations for a tagged particle in a zero-range particle system. Frontier Probability Days, Colorado Springs, CO, May 21, 2007.

Nonequilibrium fluctuations for a tagged particle in mean-zero one dimensional zero-range processes. Oberwolfach meeting: Large scale stochastic dynamics, Aug. 26 - Sep. 1, 2007.

Tagged particle asymptotics in certain zero-range and simple exclusion systems. IHP meeting: Interacting particle systems and percolation, Paris Oct 27-31, 2008.

Large deviations of a tagged particle in 1D symmetric simple exclusion. Cincinnati Symposium on Probability Theory and Applications, Cincinnati, Mar. 20-23, 2009.

Large deviations of a tagged particle in 1D symmetric simple exclusion. CRM meeting: Interacting stochastic particle systems, Montreal May 18-23, 2009.

(upcoming) Nonequilibrium behavior of a tagged particle in interacting systems. Midwestern Probability Colloquium, Chicago, IL, Oct. 15-17, 2009

Seminars

Central limit theorems for simple exclusion and zero-range dynamics. Cornell University, February 1995.

Introduction to conservative particle systems. AT&T Bell Labs, Murray Hills, NJ, June 1995.

Central limit theorems for simple exclusion and zero-range processes. Indian Statistical Institute, Bangalore, August, 1995.

Some central limits theorems for conservative particle systems. ETH-Zentrum, Zürich, October, 1995.

Two talks on central limit theorems and spectral gap for particle systems. University of Minnesota, October and November 1996.

Central limit theorems for asymmetric exclusion. University of Wisconsin, March 1997.

Some Brownian motion trapping problems. University of Minnesota, May 1998.

Tagged particle problems and CLT's for the exclusion system. ETH-Zentrum, Zürich, June, 1998.

Central limit theorems for tagged particles in simple exclusion. University of Minnesota, January 1999.

Conditional Survival Distributions for Brownian Motion in a Poissonian Environment. Indian Statistical Institute, Bangalore, December 1999.

Extremal measures for zero-range processes. University of Minnesota, September 2000.

Introduction to Simulated Annealing, and A Short Proof of Dobrushin's CLT for non-homogeneous Markov chains. Indian Statistical Institute, Bangalore, August, 2001.

On extremal measures for zero-range processes. University of California at San Diego, November 2001.

On H_{-1} norms and the resolvent technique to prove CLT's. University of Wisconsin, November 2001.

On diffusive limits of a tagged particle in asymmetric simple exclusion. IMPA, Rio de Janeiro, Brazil, June 2004

On diffusive estimates for a tagged particle in asymmetric zero-range dynamics. University of Minnesota, November 2004

On diffusive estimates for a tagged particle in asymmetric zero-range dynamics. University of Wisconsin, November 2004.

On diffusive estimates for a tagged particle in asymmetric zero-range dynamics. Cornell University, November 2004.

On diffusive estimates for tagged particles in particle systems. Northwestern University, January 2005.

Diffusive estimate for a tagged particle in 2D asymmetric exclusion. University of Wisconsin, October 2005.

A stochastic "locker problem." University of Cincinnati, February 2008.

Nonequilibrium behavior of a tagged particle in one dimensional mean-zero zero-range. University of Massachusetts, March 2008.

Large deviations of a tagged particle in one dimensional symmetric simple exclusion. University of Utah, March 2009

(to be given) Some asymptotics in preferential attachment random graphs. University of Minnesota, Nov. 6, 2009

(to be given) Some asymptotics in preferential attachment random graphs. Carnegie Mellon, Nov. 9, 2009

Colloquia

Central limit theorems for exclusion and zero-range processes. Iowa State University, February 1995.

On fluctuations in conservative particle systems. Given at University of Illinois at Chicago, February 1997, University of Colorado, February 1997, Purdue University, February 1997, Iowa State University, February 1997, University of Arizona, February 1997.

On Proofs of tagged particle fluctuations for simple exclusion. Université de Rouen, France, May 2000.

A martingale proof of Dobrushin's theorem for nonhomogeneous Markov chains. USPE, Sao Paulo, Brazil, August 2003.

Diffusive limits of a tagged particle in asymmetric simple exclusion. USPE, Sao Paulo, Brazil, June 2004.

Diffusivity of a tagged particle in a "zero-range" particle system. University of Cincinnati, April 20, 2006.

Occupation laws for some Markov time-reinforcement schemes. Wright State University, Dayton, OH, Oct. 6, 2006.

On two problems—Ergodicity of some nonhomogenous Markov chains, and diffusive limit in a stochastic interacting particle system. Indian Statistical Institute, Bangalore, India, December 22, 2006.

On nonequilibrium fluctuations of a tagged particle in a zero-range particle system. Michigan State University, April 24, 2007.

On fractional Brownian motion limits for a tagged particle in simple exclusion interacting particle systems. University of Cincinnati, May 1, 2007.

Scaling limit for a tagged particle in some zero-range interacting systems. Indian Statistical Institute, Bangalore, India, June 22, 2007; Indian Institute of Science, Bangalore, India, June 30, 2007.

Scaling limit for a tagged particle in some zero-range interacting particle systems. University of Southern California, April 22, 2008; UCLA, April 23, 2008.

Large deviations in 1D simple exclusion. Indian Statistical Institute, Bangalore, India, June 2009; Indian Institute of Science, Bangalore, India, July 2009.