

Jessica V. Zúñiga

Stanford University
Department of Mathematics
Building 380
Stanford, CA 94305

Office Phone: (650) 723-7824
Home Phone: (607) 592-7766
Email: jzuniga@math.stanford.edu
www.math.stanford.edu/~jzuniga

RESEARCH INTERESTS

Theoretical and applied probability
More specifically: Markov chains and quantitative analysis of stochastic processes

EMPLOYMENT

Stanford University, Department of Mathematics 2008 – present
NSF Postdoctoral Fellow

EDUCATION

Cornell University 2002 – 2008
Ph.D. in Mathematics, advisor: Laurent Saloff-Coste
Thesis title: Merging of some time homogeneous and inhomogeneous Markov chains.
Rice University 1998 – 2002
B.A. in Mathematics

AWARDS, HONORS AND FELLOWSHIPS

NSF Mathematical Sciences Postdoctoral Research Fellowship 2008 – 2011
Three year fellowship for a postdoctoral position at Stanford University.
Robert J. Battig Award 2007
Cornell Mathematics award for outstanding graduate research.
VIGRE Fellowship 2003 – 2005
Two year fellowship for graduate study, provided by Cornell University and funded through the National Science Foundation.
Cornell Sage Fellowship 2002 – 2003
One year fellowship for graduate study in the Department of Mathematics.
Mellon Mays Undergraduate Fellowship 2000 – 2002
Two year fellowship for undergraduate research in major field.

PUBLICATIONS

- (1) *Merging for inhomogeneous finite Markov chains, part II: Nash and log-Sobolev inequalities.* (with L. Saloff-Coste) To appear in **Annals of Probability**.
- (2) *Time inhomogeneous Markov chains with wave like behavior.* (with L. Saloff-Coste) **Annals of Applied Probability**. Vol. 20, Number 5 (2010), pages 1831-1853.
- (3) *Merging for time inhomogeneous finite Markov chains, Part I: singular values and stability.* (with L. Saloff-Coste) **Electronic Journal of Probability**. Vol. 14 (2009), Paper no. 49, pages 1456-1494.

- (4) *Refined estimates for some basic random walks on the symmetric and alternating groups.* (with L. Saloff-Coste) **Latin American Journal of Probability and Mathematical Statistics** (ALEA) 4, 359-392 (2008)
- (5) *Convergence of some time inhomogeneous Markov chains via spectral techniques.* (with L. Saloff-Coste) **Stochastic Processes and their Applications** 117 (2007) 961-979

Works in progress:

- (6) *On the spectral analysis of second-order Markov chains.* (with P. Diaconis and L. Miclo)
- (7) *Harnack inequalities and time inhomogeneous Markov chains.* (with L. Saloff-Coste)
- (8) *Merging for inhomogeneous Markov chains on general state spaces.* (with L. Saloff-Coste)

PRESENTATIONS

Invited talks at conferences or seminars

| | |
|--|---------------|
| Probability Seminar , University of California, Los Angeles | November 2010 |
| AMS Regional Meeting , Los Angeles, CA <i>Special Session on Recent Trends in Probability and Related Fields</i> | October 2010 |
| SACNAS National Conference , Dallas, TX <i>Special Session on Mathematics of a New Generation</i> | October 2009 |
| Department Colloquium , Oregon State University | April 2009 |
| Conference on Analysis and Probability in Nice II , Nice, France University of Nice-Sophia Antipolis | June 2009 |
| Probability Seminar , University of California, Berkeley | February 2009 |
| Probability Seminar , Stanford University | December 2008 |
| Probability Seminar , University of California, Davis | October 2008 |
| Conference on Analysis and Probability in Nice I , Nice, France University of Nice-Sophia Antipolis | June 2008 |
| Probability Seminar , Cornell University | November 2007 |
| Probability Seminar , Purdue University | April 2007 |
| Probability Seminar , University of Rochester | March 2007 |

Contributed and short talks

| | |
|--|-----------|
| Fifth Cornell Summer School in Probability , Ithaca, NY | July 2009 |
| 33rd Conference on Stochastic Processes and their Applications Berlin, Germany | July 2009 |

SEMINARS AND CONFERENCES

- AMS Regional Meeting, Los Angeles, CA October 2010
- Sixth Cornell Summer School July 2010
- Joint Mathematics Meeting, San Francisco, CA January 2010
- 33rd Conference on Stochastic Processes and their Applications July 2009
- Fifth Cornell Probability Summer School July 2009
- Mathematics Research Communities:
Modern Markov Chains and their Statistical Applications June 2009
- Conference on analysis and probability in Nice II June 2009
- Seminar on Stochastic Processes, Stanford University 2009
- Conference on analysis and probability in Nice I June 2008
- Workshop for Women in Probability, Cornell University October 2008
- Geometric Group Theory: Random Walks on Groups
at C.I.R.M., Marseilles, France February 2007
- Fifth Northeast Probability Seminar November 2006
- Fourth Northeast Probability Seminar November 2005
- First Cornell Summer School in Probability July 2005
- Second Conference on Analysis and Probability on Fractals May 2005
- Markov Chains in Algorithms and Statistical Physics
at the Mathematical Science Research Institute (MSRI) January 2005
- Tenth Seminar on Analysis of Algorithms June 2004
at the Mathematical Science Research Institute (MSRI)

TEACHING EXPERIENCE

Stanford University

- **Instructor: STAT 219 – Stochastic Processes**, Fall 2009 and Fall 2010

This course is a master's level course in stochastic processes. It is required for the Financial Mathematics degree at Stanford and is attended by students with various backgrounds from advanced undergraduates to PhD students. It provides an introduction to measure theoretic probability, including measurable, L_p and Hilbert spaces, uniform integrability, modes of convergence, stationarity and sample path continuity of stochastic processes. Examples such as Markov chains, branching, Gaussian and Poisson processes, martingales and properties of Brownian motion are studied. As the sole instructor for this course, I developed the course plan, held classes three times a week and created exams.

- **Instructor: MATH 41 – Calculus**, Fall 2009

This is a first course in single variable calculus. The main topics covered are: review of elementary functions including exponentials and logarithms, rates of change and derivatives. It also gives an introduction to definite integrals and integration. As one of three instructors for this course, I held classes three times a week and assisted in creating and proctoring exams.

- **Instructor: MATH 20 - Calculus**, Spring 2010

This is a slower paced version of MATH 41 described above. It is meant for students interested in taking Calculus but without a strong background in mathematics. It covers much of the same material as MATH 41.

Cornell University

- **Instructor: MATH 105 – Finite Mathematics**, Fall 2007
This is an introductory mathematics course for students with a limited mathematics background and offers a basic introduction to linear algebra and probability. The topics in this course are developed as tools for the study of different fields with class examples taken from biology and the social sciences. As one of three instructors for this course, I held classes three times a week, and assisted in creating exams and worksheets.
- **Teaching assistant: MATH 671 – Probability Theory I**, Fall 2006
Held weekly office hours for graduate probability class and graded student work.
- **Teaching assistant: MATH 192 – Multivariable Calculus for Engineers**, Spring 2005
Taught biweekly recitation sections, proctored exams, and graded student work.
- **Teaching assistant: MATH 311 – Introduction to Analysis**, Fall 2004
Held weekly office hours and graded student work.

Additional teaching

- **Math Explorer’s Club, Ithaca High School**, Fall 2005
Organized weekly workshops for advanced Ithaca High School students to introduce them to more advance topics in mathematics.
- **Analysis on Fractals REU**, Summer 2005
Research assistant. Helped students in research projects and computer programing.
- **Rice University**, 1998 – 2001
Grader for undergraduate courses in the Mathematics department (Calculus II and III).

PROFESSIONAL ACTIVITIES AND SERVICE

Co-organizer: Joint Mathematics Meeting AMS Special Session on Markov Chains and Their Statistical Applications, San Francisco, CA, January 13–16, 2010

Co-organizer: Stanford Probability Seminar, Spring 2008

Referee: *Annals of Applied Probability* and *Random Structures and Algorithms*

REFERENCES

Amir Dembo `amir@math.stanford.edu`
 Persi Diaconis `diaconis@math.stanford.edu`
 Richard Durrett `rtd1@cornell.edu`
 Laurent Saloff-Coste `lsc@math.cornell.edu`
 Maria Terrell (teaching) `maria@math.cornell.edu`