Brett Geiger

Curriculum Vitae

5400 Braesvalley Drive, Apt. N33
Houston, TX 77096
☎ *1-985-856-0543*
✉ *geiger12@math.uh.edu*

Education

2012–2017 **Ph.D. in Mathematics**. *University of Houston*. Houston, TX. *4.0*.

2009–2010 **Master's Degree in Community and Technical College Mathematics**. *Nicholls State University*. Thibodaux, LA. *3.909*.

2004–2008 **Bachelor's Degree in Mathematics**. *Nicholls State University*. Thibodaux, LA. *3.368*.

Doctoral Thesis (In Preparation)

title   *Large Deviations for Dynamical Systems with Small Noise*

supervisors   R. Azencott, W. Ott, and I. Timofeyev

description   Dynamical processes are often influenced by small random fluctuations acting on a variety of spatiotemporal scales. Small noise can dramatically affect the underlying deterministic system by giving positive probability to rare events of high interest such as excursions away from nominally stable states, transitions between metastable states, or fixation of genotypes that are not the fittest in a population of bacteria. In this dissertation, we first use large deviations theory for Gaussian processes to develop a fully explicit large deviations framework for (necessarily Gaussian) processes X_t driven by linear delay stochastic differential equations with small diffusion coefficients, which enables fast computation of the action functional controlling rare events for X_t and of most likely transition paths from $X_0 = p$ to $X_T = q$. Second, we develop a rigorous large deviations principle for an evolutionary model describing the genetic evolution of E. Coli populations assuming small mutation rates. Finally, we use this large deviations principle to explicitly calculate most likely population histogram trajectories linking an initial population histogram H to a desired terminal histogram G and develop efficient numerical algorithms to generate these trajectories.

Research Papers

R. Azencott, B. Geiger, and W. Ott. *Large Deviations for Gaussian Diffusions with Delay*. Submitted to J. Stat. Phys. (2016).

R. Azencott, B. Geiger, and I. Timofeyev. *Application of Large Deviations to Genetic Evolution of Bacterial Populations*. In preparation.

B.Geiger and W.Ott. *Nonstationary Open Dynamical Systems*. In preparation.

Experience

2015–Present **Research Assistant**. *University of Houston*. Houston, TX.
Research related to applications of large deviations to bacterial evolutionary populations under the guidance of various multidisciplinary professors. Weekly or bi-weekly meetings to discuss progress as well as computational and conceptual issues.

2014–2015	**Instructor**. *University of Houston.* Houston, TX.
	Taught Introduction to Statistics (Math 2311) and Calculus (Math 1431) face-to-face and Introduction to Statistics (Math 2311) online with all class sizes ranging from 70 to 100 students. Managed assigned teaching assistants along with coursework on CASA.
2012–2014	**Teaching Assistant**. *University of Houston.* Houston, TX.
	Assisted students with homework/quiz problems in weekly lab recitations. Tutored students in the math tutoring lab (CASA) in various subjects ranging from algebra to real analysis. Assisted professors in grading homeworks, tests, and quizzes.
2009–2012	**Teacher**. *Science and Math Academy.* Vacherie, LA.
	Taught dual enrollment college algebra and trigonometry classes in addition to high-school level algebra, trigonometry, and calculus. For the dual enrollment classes, managed coursework as well as administered tests, quizzes, and homeworks via MyMathLab. Wrote weekly lesson plans, attended workshops to improve teaching skills and course material, and helped new teachers use MyMathLab.
2009–2010	**Teaching Assistant**. *Nicholls State University.* Thibodaux, LA.
	Assisted and tutored students in MEW (Mathematics Enrichment Workshop) in algebra and trigonometry using MyMathLab. Lead test review sessions. Observed and managed students during testing.
2002–2010	**Independent Tutor**. *Self-employed.* Thibodaux/Houma, LA.
	Tutored high school and college students in subjects including (but not limited to) business math, algebra, geometry, statistics, calculus, trigonometry, discrete mathematics, foundations of mathematics (proof-based course), physics, and chemistry. When applicable, discussed studying and test-taking techniques with students and parents to improve performance.

Departmental Talks, Class Presentations, and Informal Lectures

Aug. 2016	**Welcome Talk to New Graduate Students**. *University of Houston.* Houston, TX.
Apr. 2016	**Large Deviations and Applications**. *University of Houston.* Houston, TX.
Sep. 2015	**Large Deviations of Gaussian Diffusions with Delay**. *University of Houston.* Houston, TX.
Feb. 2015	**Introduction to Dynamical Systems**. *University of Houston.* Houston, TX.
Dec. 2013	**Brief Overview of Strong Shift Equivalence and Shift Equivalence**. *University of Houston.* Houston, TX.

Organizational Leadership

2016–2017	**President of the American Mathematical Society**. *University of Houston.*
2015–2017	**Vice President of the Society for Industrial and Applied Mathematics**. *University of Houston.*
Spring 2015	**Organizer of the Graduate Student Seminar**. *University of Houston.*
2014–2015	**Secretary of the Society for Industrial and Applied Mathematics**. *University of Houston.*

Conference Travel Awards

Jul. 2016	**Society for Industrial and Applied Mathematics Annual Meeting**. Boston, MA.
May 2015	**Classification of C^* Algebras, Flow Equivalence on Shift Spaces, and Graph and Leavitt Path Algebras**. *University of Louisiana-Lafayette.* Lafayette, LA.

Apr. 2015	**Statistical Properties of Dynamical Systems**. *Loughborough University*. Loughborough, United Kingdom.
Jul. 2014	**Modern Applications of Representation Theory**. *University of Chicago*. Chicago, IL.
May 2014	**Summer School in Dynamics**. *University of Houston*. Houston, TX.
Mar 2014	**Topology and Geometry Conference**. *Texas Tech University*. Lubbock, TX.

Honors and Awards

Apr. 2016	**Best Research Presentation**. *University of Houston Chapters of the Society for Industrial and Applied Mathematics and the American Mathematical Society*.
Aug. 2015	**Research Grant**. *Dr. Azencott and Dr. Timofeyev*.
Aug. 2012	**Graduate Teaching Assistantship**. *University of Houston*.

Departmental and Community Service

Volunteer	Will be assisting the Texas-Louisiana division of the Society for Industrial and Applied Mathematics with the Data Analytics Workshop to be held at the University of Houston on December 9, 2016.
Panel Participant	Invited to serve on a panel of graduate students sponsored by Pi Mu Epsilon in 2016. This panel answered various questions from undergraduate students about graduate student life and opportunities, study habits for graduate courses, useful skills to develop before graduate school, choosing research directions, and many others.
Mentor	Mentored a senior student from Klein High School during the 2015-2016 academic year. Helped student choose presentation topics in mathematics, computer science, and statistics. Gave guidance on college life and studies as well as information related to majoring in mathematics and computer science at various universities.
Volunteer	Volunteer at University of Houston High School Math Competition in 2013. Helped monitor students during testing. Organized and graded tests.
Sponsor	Sponsored and accompanied a team of high school students to participate in the MACH 5 Math Competition at Nicholls State University in 2011.
Server	Served food to elderly and homeless in New Orleans on Thanksgiving day in 2010.
Volunteer	Cut and served oranges and bananas to participants at the Crescent City Classic in New Orleans twice.
Chaperone	Chaperone for a field trip for high school students to Nicholls State University for GIS Day in 2010.
Volunteer	Helped organize and operate Math Club table for Family Day in 2008. Gave information to parents regarding the mathematics department and interacted with students of varying ages.

Skills

Matlab, LaTeX, Probability and Statistics, Numerical Simulation, Stochastic Processes, Dynamical Systems, Public Speaking, MyMathLab, CourseCompass, MathZone, ActivInspire, PowerPoint, Microsoft Word, Microsoft Excel