

Zsolt Pajor-Gyulai

Academic Curriculum Vitae

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Professional summary

Self-directed, quick learner with proven track record of academic research in the area of probability and stochastic processes with a focus on the analysis of small random perturbations of dynamical systems. Ten years of experience communicating and teaching mathematics, with excellent evaluations, to students at various levels of higher education.

Professional experience

- 2018-present **Member of the Research Staff, *The Voleon Group*.**
Applying state-of-the-art machine learning techniques to develop predictive models for real-world problems in finance. Developing and maintaining other components of automated trading systems ranging from data preparation to production software implementation.
- 2015-2018 **Courant Instructor/Assistant Professor in Mathematics, *New York University*.**
Studied the long time behavior of diffusions along a heteroclinic networks, which are collections of hyperbolic saddle points and heteroclinic orbits connecting them. Heteroclinic networks are common in different contexts ranging from population dynamics to the modeling of neural processes. Taught various courses in mathematics to undergraduate and graduate students.
- 2010–2015 **Brin Graduate Fellow, *University of Maryland, College Park*.**
Studied the the macroscopic transport properties of periodic, incompressible, planar, noisy cellular flows on intermediate time scales. Established a fractional kinetic effective process whose variance grows as the square root of the elapsed time. This growth turns smoothly into the homogenized linear one for time scales that grow faster than the inverse of the noise intensity. Served as teaching assistant to numerous undergraduate and graduate courses.

Education

- 2010–2015 **Ph.D. in Mathematics, *University of Maryland College Park*.**
Thesis title: Averaging and homogenization in cellular flows
Advisor: Dr. Leonid Korolov
- 2004–2010 **B.Sc. and M.Sc. in Physics, *Budapest University of Technology and Economics*,**
Diploma with highest honors.
Thesis title: Energy Transfer and Joint Diffusion
Advisor: Dr. Domokos Szász

Continuing education (focus on Data Science)

- 2018 **Audited courses (with full, graded completion:, *New York University*.**
Deep Learning (by Dr. Yann LeCun)
Machine Learning and Computational Statistics (by Dr. David Rosenberg)
Mathematics of Deep Learning (by Dr. Joan Bruna)
with Parallel Curriculum on Reinforcement Learning and Games (by Cinjon Resnick)
- Massive Open Online Courses, *Various universities*.**
Algorithms and Data Structures Specialization, Coursera, UC San Diego
Machine Learning, Coursera, Stanford University

- 2017 **Audited courses (with full, graded completion):**, *New York University*.
Introduction to Data Science (by Dr. Brian d'Alessandro)
CPAC I, Accelerated introduction to computer science with Java (by Dr. Evan Korth)

Programming skills

Python (Numpy, Pandas, some exposure to PyTorch), Java, Matlab

Projects

- 2018 **Ideology based on Audio.**
We examined whether speech variation and vocal patterns are predictive of political ideology in various setting.
- 2018 **Some AI algorithms for TicTacToe.**
Implemented four algorithms in Java to play the simple game TicTacToe: (1) Negamax tree search; (2) Negamax tree search with memoization; (3) Negamax tree search with AlphaBeta pruning; (4) UCT algorithm.
- 2017 **Population estimation based on satellite imagery.**
Group project to build models predicting population density based on satellite imagery. We achieved this by comparing spatially disaggregated census data on the continental United States to satellite images. Used approaches: (1) naive one versus all logistic regression on the vectorized satellite images; (2) convolutional neural network built from scratch; (3) pre-trained network developed for image recognition

GitHub: www.github.com/Moosquibe

Fellowships

- 2015-2017 AMS Simons Travel Grant
2014-2015 Graduate Deans Dissertation Fellowship
2010-2014 Michael Brin Graduate Student Endowed Fellowship
2009-2010 Scholarship of the Ministry of Education of Hungary
2009-2010 Honorable Student of the Faculty Scholarship (BUTE)

Prizes

- 2013 Mark E. Lachtman Graduate Student Award
First place at Spotlight on Graduate Research Conference (UMD)
- 2009 Second Prize, Student scientific conference (BUTE)
- 2009 Special prize for applied mathematics - Award of the Institute of Mathematics, Student scientific conference(BUTE)
- 2008 Third Prize, Student scientific conference(BUTE)

Peer review

I have been the reviewer for a total of four articles for the journal Stochastics and Dynamics, Stochastic Processes and Applications, and the SIAM Journal of Mathematical Analysis.

Mentorship

- 2017 Summer Supervisor of summer undergraduate research projects:
- Samarth Tiwari: Heavy traffic in finite state Markov chains with rare transitions
 - Zhijian Yang, Shiyu Zhang: Modeling bitcoin price
- 2015 Summer Mentor for Mathematics, Applied Mathematics, and Statistics Research Experience for Undergraduates (REU)
- 2013 Mentor in the Maryland directed reading program (DRP)

Spoken languages

- Fluent: Hungarian (native), English
- Familiar: German, Spanish

Talks

INVITED CONFERENCE TALKS

- 2017 **Fractional kinetic process describing the intermediate time behavior of cellular flows**, *Minisymposium on Random Walks and Anomalous Transport, SIAM Conference on Applications of Dynamical Systems*, Snowbird, Utah.
- 2016 **Stochastic approach to anomalous diffusion in incompressible two dimensional cellular flows**, *Hyperbolic Dynamics and Statistical Physics*, Erwin Schroedinger International Institute for Mathematics and Physics, Vienna.
- 2015 **On dynamical systems perturbed by a diffusion driven by a null recurrent fast motion**, *1107th AMS Meeting*, Georgetown University, Washington DC.

CONTRIBUTED CONFERENCE TALKS

- 2013 **Transition from Averaging to Homogenization**, *36th Conference on Stochastic Processes and their Application*, University of Colorado Boulder.
- 2013 **Critical Behavior of Random Homopolymers**, *Seminar on Stochastic Processes*, Duke University.
- 2016 **Refinement of the Freidlin-Wentzell averaging principle close trajectories with saddles**, *Seminar on Stochastic Processes*, University of Maryland.
- 2017 **Rare transitions along heteroclinic networks**, *Seminar on Stochastic Processes*, University of Virginia.

INVITED SEMINAR TALKS

- 2018 Stochastic Analysis and Mathematical Finance Seminar, Rutgers University
- 2018 Applied Mathematics/Analysis Seminar, Yale University
- 2017 Probability Seminar, Courant Institute
- 2016 Probability Seminar, Duke University
- 2016 Probability and Financial Mathematics Seminar, Pennsylvania State University
- 2016 Probability Seminar, University of Pennsylvania, 2016
- 2016 Probability and Computational Finance Seminar, Carnegie Mellon University
- 2015 Probability and Computational Finance Seminar, Carnegie Mellon University

Publications

All of my publications are available at

https://arxiv.org/find/math/1/au:+Pajor_Gyulai_Z/0/1/0/all/0/1

IN PREPARATION

Y. Bakhtin, Zs. Pajor-Gyulai *Metastability and cycle structure in strictly attracting noisy heteroclinic networks*

Y. Bakhtin, Zs. Pajor-Gyulai *Rare transitions in planar heteroclinic networks*

Y. Bakhtin, Zs. Pajor-Gyulai *Rare events in a neighborhood of a planar hyperbolic saddle point*

PREPRINTS

Y. Bakhtin, Zs. Pajor-Gyulai *Tails of exit times from unstable equilibria on the line*, 2018

Zs. Pajor-Gyulai, D. Szász *Perturbation approach to scaled type Markov renewal processes with infinite mean*, 2010

JOURNAL PAPERS

Y. Bakhtin, Zs. Pajor-Gyulai *Malliavin calculus approach to long exit times from an unstable equilibrium on the line* Accepted for publication in *Annals of Applied Probability*, 2018

M. Hairer, G. Iyer, L. Koralov, A. Novikov, Zs. Pajor-Gyulai *A fractional kinetic process describing the intermediate time behaviour of cellular flows* *Annals of Probability* Vol. 46. No. 2, p897-955, 2018

Y. Bakhtin, Zs. Pajor-Gyulai *Scaling limit for escapes from unstable equilibria in the vanishing noise limit: nontrivial Jordan block case* Accepted for publication in *Stochastics and Dynamics*, 2017

Zs. Pajor-Gyulai, M. Salins *On dynamical systems perturbation by a null-recurrent fast motion: The general case* *Stochastic Processes and their Applications* Vol 127 No. 6, p1960-1997, 2017

M. Hairer, L. Koralov, Zs. Pajor-Gyulai *From averaging to homogenization in cellular flows - an exact description of the transition* *Annales de l'Institut Henri Poincaré, Probabilités et Statistiques* Vol. 52 No. 4, 2016

Zs. Pajor-Gyulai, M. Salins *On dynamical systems perturbation by a null-recurrent fast motion: The continuous coefficient case with independent driving noises* *Journal of Theoretical Probability*, p 1-17, 2015

L. Koralov, Zs. Pajor-Gyulai *On the Critical Behavior of Continuous Homopolymers* *Stochastics and Dynamics* Vol. 14 No. 1, 2014

Zs. Pajor-Gyulai, D.Szász *Weak convergence of Random Walk Conditioned to Stay Away from Small Sets* *Studia Scientiarum Mathematicarum Hungarica* 50 (1), p122-128, 2013

Zs. Pajor-Gyulai, D.Szász *Energy Transfer and Joint Diffusion* *Journal of Stathistical Physics* Vol. 146 No. 5, p1001-1025, 2012

CONFERENCE PROCEEDINGS

Zs. Pajor-Gyulai, D.Szász, I.P. Tóth *Billiard models and energy transfer* in XVIth International Congress on Mathematical Physics, 328–332, World Sci. Publ., Hackensack, NJ, 2010;