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## Employment

2017 –	Assistant Professor	Department of Mathematics, Johns Hopkins, USA
2014 –2017	Postdoctoral Fellow	Department of Mathematics, UC Berkeley, USA
2013 – 2014	Postdoctoral Fellow	Lawrence Berkeley National Laboratory, USA
2009 – 2012	Graudate Teaching Assistant	Department of Mathematics, University of Kansas, USA
2008 – 2009	Graduate Research Assistant	Department of Mathematics, University of Kansas, USA
2004 – 2007	Graduate Research Assistant	Wuhan Institute of Physics and Mathematics, China

## Education

2013	Ph. D. Mathematics, University of Kansas, USA
2007	M.S. Applied Mathematics, Wuhan Institute of Physics and Mathematics, China
2004	B.S. Information Science and Computing, Huazhong University of Science and Technology, China

## Research Interests

My research interests are in probability, statistics, scientific computing and mathematics of data science. My current research focuses on learning dynamics from data, in particular, data-driven stochastic model reduction and data assimilation. I am interested in the following topics:

- Stochastic model reduction for complex dynamical systems
- Data assimilation, uncertainty quantification and inverse problems
- Statistical inference for time series and diffusion processes
- Malliavin calculus, Stein’s method and stochastic PDEs
- Variational methods and critical point theory

## Grants and Awards

NSF Research Grant Award DMS 1913243. (Co-PI: Mauro Maggioni). *Learning Dynamics from Data: Discovering Governing Interaction Laws of Particle Systems*. 2019/8-2022/7.

NSF Research Grant Award DMS1821211. *Data-Driven Stochastic Model Reduction and Its Applications in Data Assimilation*. 2018/7-2021/6.

## Journal Publications

1. F. Lu, M. Zhong, S. Tang, M. Maggioni. *Nonparametric inference of interaction laws in systems of agents from trajectory data*. Proc. Natl. Acad. Sci. USA, 116.29 (2019): 14424–14433.
2. F. Lu, N. Weitzel, A. Monahan. *Joint parameter and state estimation for nonlinear stochastic energy balance models from sparse noisy data*. Nonlin. Processes Geophys., 26 (2019), no.3, 227–250.
3. F. Lu, X. Tu and A. Chorin. *Accounting for Model Error from Unresolved Scales in Ensemble Kalman Filters by Stochastic Parameterization*. Mon. Wea. Rev., 145(2017), no. 9, 3709–3723.
4. F. Lu, K. K. Lin and A. J. Chorin. *Data-based stochastic model reduction for the Kuramoto–Sivashinsky equation*. Physica D, 340 (2017), 46–57.
5. F. Lu, K. K. Lin and A. J. Chorin. *Comparison of continuous and discrete-time data-based modeling for hypoelliptic systems*. Comm. App. Math. Com. Sc., 11 (2016), no. 2 187–216.

6. A. J. Chorin, F. Lu, R. N. Miller, M. Morzfeld and X. Tu. *Sampling, feasibility, and priors in data assimilation*. Discrete Contin. Dyn. Syst. Ser. A, 36 (2016), no. 8, 4227–4246.
7. A. J. Chorin and F. Lu. *Discrete approach to stochastic parametrization and dimension reduction in nonlinear dynamics*. Proc. Natl. Acad. Sci. USA, 112 (2015), no. 32, 9804–9809.
8. F. Lu, M. Morzfeld, X. Tu and A. J. Chorin. *Limitations of polynomial chaos expansions in the Bayesian solution of inverse problems*. J. Comput. Phys. 282 (2015), 138–147.
9. Y. Hu, F. Lu and D. Nualart. *Convergence of Densities of some functionals of Gaussian Processes*. J. Funct. Anal. 266 (2014), no. 2, 814–875.
10. Y. Hu, F. Lu and D. Nualart. *Non-degeneracy of Sobolev Pseudo-norms of fractional Brownian motion*. Electron. Commun. Probab. 18 (2013), no. 84, 1–8.
11. Y. Hu, F. Lu and D. Nualart. *Hölder continuity of the solution for a class of nonlinear SPDEs arising from one-dimensional superprocesses*. Probab. Theory Relat. Fields 156 (2013), no. 1-2, 27–49.
12. Y. Hu, F. Lu and D. Nualart. *Feynmann-Kac formula for a stochastic heat equation driven by fractional noise*. Ann. Probab. 40 (2012), no. 3, 1041–1068.
13. F. Lu. *Branching points for a class of variational equations involving potential with parameter*. Adv. Nonlinear Stud., 8 (2008), no. 2, 251–269.

### Conference papers and other publications

1. F. Lu, K. K. Lin, and A. J. Chorin. *Data-driven stochastic model reduction*. Paper for Advancing X-cutting Ideas for Computational Climate Science, 2016.
2. F. Lu, *Malliavin Calculus and its applications to SPDEs*. PhD thesis, University of Kansas, 2013.

### Submitted and preprints

1. K. K. Lin and F. Lu. *Data-driven model reduction, Wiener projections, and the Mori-Zwanzig formalism*. arXiv:1908.07725.
2. F. Lu, M. Maggioni and S. Tang. *Learning interaction kernels in heterogeneous systems of agents from multiple trajectories*. arXiv:1910.04832
3. Zhongyang Li, F. Lu, Mauro Maggioni, Sui Tang and Cheng Zhang: *On the identifiability of interaction functions in systems of interacting particles*. arXiv:1912.11965.
4. F. Lu. *Data-driven model reduction for stochastic Burgers equations*.
5. F. Lu, M. Maggioni, and S. Tang. *Learning interaction laws of stochastic agent systems*.
6. Zehong Zhang and F. Lu. *Cluster prediction for opinion dynamics with partial observations*. (Zehong is a graduate student)

### Graduate students

Qingci An	2017-current	
Zehong Zhang	2017-current	
Quanjun Lang	2017-current	co-supervising with Yannick Sire

## Teaching

### Johns Hopkins

Math 110.415 Honor Analysis (3 credits, 18 undergraduate)	Fall 2019
Math 110.417 Partial Differential Equations (3 credits, 17 undergrad)	Spring 2019
Math 110.757 Stochastic dynamical systems (3 credits, 9 graduate)	Spring 2019
Math 110.637 Functional Analysis (3 credits, 11 graduate)	Fall 2018
Math 110.302 Differential Equations (3 credits, 182 undergraduate)	Spring 2018

### UC Berkeley

Math 128A: Numerical analysis (46 undergraduate students)	Summer 2015
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### University of Kansas

Math 122: Engineering Calculus II	Fall 2012
Math 116: Business Calculus II	Spring 2012
Math 122: Engineering Calculus II	Fall 2011
Math 122: Engineering Calculus II	Spring 2011
Math 121: Engineering Calculus I	Fall 2010
Math 121: Engineering Calculus I	Spring 2010
Math 115: Business Calculus I	Fall 2009

## Conference Presentations

Talk: AMS Fall central sectional meeting, Special Session on Classical and Geophysical Fluid Dynamics: Modeling, Reduction and Simulation. Madison, Wisconsin, 9/2019

Talk: AMS Fall central sectional meeting, Special Session on Uncertainty Quantification Strategies for Physics Applications. Madison, Wisconsin, 9/2019

Talk: US National Congress on Computational Mechanics (USNCCM), Austin, 7/2019

Talk: IMS-China International Conference on Statistics and Probability, Dalian, 7/2019

Four Talks: SIAM Conference on Applications of Dynamical Systems (DS19), Snowbird, Utah, 5/2019

Talk: Inference based model reduction for stochastic Burgers equation. KI-Net conference on "Dimension reduction in physical and data sciences", Duke, 4/2019

Poster: Stochastic PDE model identification from sparse noisy data, 1st Workshop on Leveraging Artificial Intelligence (AI) in the Exploitation of Satellite Earth Observations and Numerical Weather Prediction (NWP). NOAA Center for Weather and Climate Prediction. College Park, MD. 4/2019

Talk: Joint State and Parameter Estimation for Non-Linear Stochastic Energy Balance Models from sparse noisy data, Baltimore, JMM, 1/2019

Poster: Joint State and Parameter Estimation for Non-Linear Stochastic Energy Balance Models, Washington DC, AGU, 12/2018

Talk: Data-driven stochastic modeling and SPDEs. International Conference on Stochastic Partial Differential Equations, U of Alberta, 9/2018

Poster: Stochastic model reduction in data assimilation. SAMSI, MUMS opening workshop, 8/2018

Talk: Data-driven non-Markov model reduction. SIAM Annual Meeting, Portland, Oregon, 7/2018

Talk: Particle filter for hidden non-Markov models. SIAM Annual Meeting, Portland, Oregon, 7/2018

Talk: Bayesian approach to paleoclimate modeling with stochastic energy balance model. CLIM Transition Workshop (of the Program on Mathematical and Statistical Methods for Climate and the Earth System), SAMSI, 5/2018

Talk: Data-driven stochastic model reduction. SIAM UQ18, Grove Garden, CA, 4/2018

Talk: Data-driven stochastic model reduction. The 42nd SIAM Southeastern Atlantic Sectional Conference (SIAM-SEAS 2018), UNC Chapel Hill, 3/2018

Poster: Data assimilation with non-Markovian forward models. QMC Program: Trends and Advances in Monte Carlo Sampling Algorithms Workshop, SAMSI, Duke, 12/2017

Talk: Data-driven stochastic model reduction and its application in data assimilation. Workshop on Nonlinear and Stochastic Problems in Atmospheric and Oceanic Prediction, Banff International Research Station for Mathematical Innovation and Discovery (BIRS), Canada, 11/2017

Talk: Data-driven stochastic model reduction. Conference on Classical and Geophysical Fluid Dynamics: Modeling, Reduction and Simulation. Virginia Tech, 6/2017

SIAM Conference on Applications of Dynamical Systems (DS17). Snowbird, Utah, 5/2017

Minisymposium on Numerical Methods for Uncertainty Quantification, Surrogate Models, and Bayesian Inference. SIAM Conference on Computational Science and Engineering, Atlanta, 2/27-3/3, 2017

American Geophysical Union Fall meeting, San Francisco, 12/2016

Minisymposium on Computation and Dynamics in Climate Models. SIAM Conference on Mathematics of Planet Earth (MPE), 10/2016

Advancing X-cutting Ideas for Computational Climate Science (AXICCS). Rockville, MD, 9/2016

Workshop on Stochastic numerical algorithms, multiscale modeling and high-dimensional data analytics, ICERM, 7/2016

The 115th Statistical Mechanics Conference, Rutgers, 5/2016

American Geophysical Union Fall meeting, San Francisco, 12/2015

Bay Area Scientific Computing Day, LBNL, 12/2015

Midwest Mathematics and Climate Conference, University of Kansas, 4/2015

American Geophysical Union Fall meeting, San Francisco, 12/2014

American Mathematical Society Fall Western Sectional Meeting, San Francisco State University, 10/2014

American Mathematical Society Central Section Meeting, University of Kansas, 3/2012

International Conference on Malliavin Calculus and Stochastic Analysis, University of Kansas, 3/2011

The 4th Graduate Student Probability conference, Duke University, 4/2010

## Invited Seminar/Colloquium Talks

Applied Math. and Comput. Science Colloquium, University of Pennsylvania, 11/2019

Colloquium, Dept. Mathematics and Statistics, University of Nevada, Reno, 10/2019

Institute of Computational Mathematics and Scientific/Engineering Computing (ICMSEC), Chinese Academy of Sciences, 7/2019

Applied Math seminar, Mathematics Center, Huazhong University of Science and Technology, 6/2019

Applied Math seminar, Mathematics Department, U.S. Naval Academy, 3/2019

CSCAMM Seminar, University of Maryland, 2/2019

Analysis and Probability Seminar, University of Connecticut, 2/2019

Applied and computational math seminar, Department of Mathematics, Georgia Tech, 12/2018

Applied Math seminar, Department of Mathematics, University of Wisconsin, Madison, 10/2018

Applied mathematics and PDE seminar, Department of Mathematics, University of Maryland, 11/2017

ACM seminar, Department of Mathematics, University of South Carolina, 11/2017

Applied mathematics seminar, Department of Mathematics, Duke University, 9/2017

Research seminar, Naval Research Laboratory, Marine Meteorology Division, Monterey, CA, 3/2017

Seminar, Department of Mathematical sciences, Stevens Institute of Technology, 2/2017

Data seminar, Department of Mathematics, Johns Hopkins, 2/2017

Colloquium, Department of Mathematics, Lehigh University, 1/2017

Stochastics Seminar, Department of Mathematics and Statistics, Boston University, 1/2017

Modeling and Computation Seminar, Department of Mathematics, University of Arizona, 12/2016

PDE and Applied Math Seminar, UC Davis, 11/2016

Applied Mathematics and Statistics Seminar, UC Santa Cruz, 4/2016

Colloquium, Department of Mathematics, Penn State University, 2/2016

Collaboratory on Mathematics for Mesoscopic Modeling of Materials (CM4) Webinar, Pacific Northwest National Laboratory, 11/2015

Applied Mathematics Seminar, UC Berkeley, 10/2015

Uncertainty quantification seminar, Sandia National Laboratory, Livermore, 1/2015

Applied Mathematics Seminar, UC Berkeley, 5/2012

## Service

### Seminars/ meetings organization

Co-organizer (with Mauro Maggioni). Data Science Seminar, Johns Hopkins University, 8/2017– current

Co-organizer (with Ming Zhong and Mauro Maggioni). Sessions on Data-driven methods for complex systems, SIAM Conference on Mathematics of Data Science, Cincinnati, Ohio, May 5-7, 2020

Organizer. Session on Stochastic processes in stochastic modeling and computation. IMS-China International Conference on Statistics and Probability, Dalian, 7/2019

Co-organizer (with Kevin Lin). Session in Model reduction and dynamical systems. SIAM Conference on Dynamical Systems, Snowbird, Utah, 5/2019

Co-organizer (with Matthias Morzfeld). Mini-symposium on Model reduction and fast sampling methods for Bayesian inference, SIAM Conference on Uncertainty Quantification, Orange County, CA, 4/2018

Co-organizer (with Kevin Carlberg and Matthias Morzfeld). Mini-symposium on Numerical methods for uncertainty quantification, surrogate models and Bayesian inference, SIAM Conference on Computational Science and Engineering, 2/2017

Co-convener (with Cécile Penland, Juan M. Restrepo and Paul D. Williams). Session on Stochastic Modeling in Atmosphere, Ocean, and Climate Dynamics, American Geophysical Union Fall meeting in the Nonlinear Geophysics section. 12/2016

Co-organizer (with Lin Lin and Per-Olof Persson). Applied math seminar, UC Berkeley and Lawrence Berkeley National Laboratory, 8/2015 –5/2017

Co-organizer. Graduate student seminar, University of Kansas, 2010 – 2012

### Journal Referee

Geoscientific Model Development

Physica D  
Journal of Mathematical Physics  
Communications in Nonlinear Science and Numerical Simulation.  
SIAM Journal of Uncertainty Quantification  
Comm. App. Math. Com. Sc.  
SIAM Journal on Applied Mathematics  
Atmosphere  
Stochastic Dynamics  
Statistics and Probability Letters  
The IEEE Transactions on Signal Processing  
Stochastics: An International Journal of Probability and Stochastic Processes  
Acta Mathematica Scientia  
Abstract and Applied Analysis  
Journal of Inequalities and Applications;  
Mathematics.  
PNAS  
Journal of Computational Physics

**PhD student DBO committees served**

Raymond Lei Feng, Physics and Astronomy, JHU, 1/2018  
Harry Lang, Computer Science, JHU, 5/2018  
Fangzheng Xie, Department of Applied Mathematics and Statistics, JHU, 11/14, 2018

**Undergraduate student advisees**

Sally Tingting Bao, Applied Mathematics and Statistics + Mathematics, JHU, 2017-2020  
Nicolas Amogero, Molecular & Cellular Biology + Mathematics, JHU, 2018- 2020  
Samuel Price, Mat Sci & Eng + Mathematics, JHU, 2018-2020  
Eduardo Sandoval, neuroscience/biophysics/math, JHU, 2017-2019