Resume of Chuntian Wang

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Research Interests

Nonlinear deterministic and stochastic partial differential equations and applications. I focused on:

1. The deterministic and stochastic Zakharov-Kuznetsov equation. Basic mathematical theories were established for the initial-boundary value problem.
2. Numerical analysis for stochastic geophysical fluid models. A time discrete approximation was constructed for the stochastic primitive equations of the atmosphere and oceans.

Stochastic modeling, computation, and applied analysis. I am currently working on:
Stochastic-statistical models of criminal behavior. Statistical agent-based models for residential burglary were improved and analyzed with the application of probability, partial differential equations and stochastic analysis.

Data Science. I am currently working on: Dynamic topic modeling with tensor decomposition.

Education

Indiana University Bloomington
Ph.D., Pure Mathematics, 2009–2015
Thesis Advisors: Roger Temam & Nathan Glatt-Holtz
Thesis Title: "Deterministic and Stochastic Nonlinear Partial Differential Equations: Theory and Approximation"

Sichuan University, China
M.S., Applied Mathematics, 2008–2009
B.S., Applied Mathematics and Actuary, 2004-2008
Thesis Advisor: Tian Ma
Thesis Title: "Bifurcation of the Euler-Bernoulli Pole

Appointments

The University of Alabama
Assistant Professor, 2018–present

University of California, Los Angele
Hedrick Assistant Professor, 2015–2018
Postdoctoral Advisor: Andrea Bertozzi

Mathematical Sciences Research Institute (MSRI) in Berkeley, CA
Postdoctoral Fellow, Aug. 2015–Dec. 2015
Postdoctoral Advisor: Andrea Montanari

Grants and Funding

1. Title: Fractional Diffusion in Human Activity Models and Machine Learning – Fractional Order Methods. Start/End Dates – 11/01/18 – 10/31/22 (4 years). I am the Subaward at the University of Alabama. Prime Awarding Agency: Department of Defense. Status: Pending.
2. Title: Applying Mathematics to Model and predict residential burglary crime.
   Start/End Dates – 01/01/ 2020 – 12/31/2021 (2 years). I am the PI. Prime Awarding Agency: The Office for Research and Economic Development at UA. Status: Declined.
3. Title: Applying Mathematics to Model and predict residential burglary crime.
   Start/End Dates – 01/01/2020 – 12/31/2022 (3 years). I am the PI. Prime Award Agency: Johnson & Johnson Scholars Award Program. Status: Declined.

4. Title: Collaborative research: Spatiotemporal dynamics of social systems with continuous time Markov processes and nonlocal behavior.
   Start/End Dates – 07/01/2020 – 07/01/2023 (3 years). I am the PI. Prime Award Agency: National Science Foundation. Status: Pending.

Awards and Honors

1. Postdoctoral Fellowship; New Challenges in PDE: Deterministic Dynamics and Randomness in High and Infinite Dimensional Systems, Mathematical Sciences Research Institute (Fall 2015).
2. Travel Award. Selected participation internationally to the Heidelberg Laureate Forum (HLF). All fares covered by the HLF foundation and Oak Ridge Associated Universities (2014).
3. NSF Graduate Student Fellowship, Sponsor: R. Temam (Fall 2014).
4. Joseph and Frances Morgan Swain Fellowship, Indiana University Bloomington (2014).
5. College of Arts and Sciences Travel Award, Indiana University Bloomington (2014).
6. Schober Travel Award, Indiana University Bloomington (2014).
7. NSF Graduate Student Fellowship, Sponsor: R. Temam (Fall 2013).
8. Schober Travel Award, Indiana University Bloomington (2013).
9. Excellent Undergraduate Dissertation Award (top 5% of seniors), Sichuan University (May 2008).

Article Published (UA Affiliated)

1. C. Wang, Y. Zhang, A. Bertozzi, and M. Short, *A Stochastic-Statistical Residential Burglary Model with Independent Poisson Clocks,* European Journal of Applied Mathematics, (108), 2020, 1-27.

Article Submitted (UA Affiliated)

1. M. Ahn, E. Balashova, N. Eikmeier, J. Haddock, K. Laram, K. Alona, K. Leonard, D. Needell, A. Wasala, and C. Wang, *On Large-Scale Dynamic Topic Modeling with Nonnegative CP Tensor Decomposition,* submitted to Proceedings of Women in Data Science and Mathematics 2019.

Articles in Preparation (UA Affiliated)

7. C. Wang and Y. Zhang, *Multi-scale stochastic-statistical crime models*. Invited to be submitted to Electronic Research Archive (in preparation)
6. M. Ahn, E. Balashova, N. Eikmeier, J. Haddock, K. Laram, K. Alona, K. Leonard, D. Needell, A. Wasala, and C. Wang, Image processing and classification with applications to CONVID-19 detection. (in preparation)
5. C. Wang, Y. Zhang, A. Bertozzi, and M. Short, *A two-space-dimensional statistical model of criminal behavior with truncated Lévy flights and independent Poisson clocks* (in preparation).
4. C. Wang, Y. Zhang, A. Bertozzi, and M. Short, *A one-space-dimensional statistical model of criminal behavior with truncated Lévy flights and independent Poisson clocks* (ready to submit).
3. C. Wang, Y. Zhang, A. Bertozzi, and M. Short, *A one-dimensional statistical model of criminal behavior with truncated Lévy flights and independent Poisson clocks* (in preparation).
2. C. Wang*, Local well-posedness of periodic Zakharov-Kuznetsov equation in three-dimensional space* (in preparation).
1. C. Wang, *Uniqueness of periodic Zakharov-Kuznetsov equation in H^3/2 in three-dimensional space* (in preparation).

Book Chapter (invited to submit) Published (Non-UA Affiliated)

1. C. Wang, Y. Zhang, A. Bertozzi, and M. Short*, A Stochastic-Statistical Residential Burglary Model with Finite Size Effects*, In: Bellomo N., Degond P., Tadmor E. (eds) Active Particles, Volume 2. Modeling and Simulation in Science, Engineering and Technology. Birkhäuser, Cham, 2019

Articles Published (Non-UA Affiliated)

6. C. Pan, B. Li, C. Wang, Y-Q. Zhang, N. Geldner, L. Wang, and A. Bertozzi, Crime modeling with truncated Lévy flights for residential burglary models, Math Models and Methods in Applied Sci., 28 (2018), no.9, 1857-1880. Among the Most-Read Articles in 2018 in Mathematical Models and Methods in Applied Sciences (https://www.worldscientific.com/worldscinet/m3as)

5. N. Glatt-Holtz, R. Temam and C. Wang, Time discrete approximation of weak solutions for stochastic equations of geophysical fluid dynamics and applications, Chin. Ann. Math. Ser. B 38 (2017), no.2, 425–472.
4. Glatt-Holtz, R. Temam and C. Wang, Martingale *and pathwise solutions to the stochastic Zakharov-Kuznetsov equation with multiplicative noise*, Discrete Contin. Dyn. Syst. Ser. B **19** (2014), no.4, 1047–1085.
3. C. Wang, *The existence of strong solutions to the 3D Zakharov-Kuznetsov equation in a bounded domain*, Discrete Contin. Dyn. Syst. Ser. A **34** (2014), no. 11, 4897–4910.
2. C. Wang, *Local existence of strong solutions to the 3D Zakharov-Kuznetsov equation in a bounded domain*, Appl. Math. Optim. **69** (2014), no.1, 1–19.
1. J.-C. Saut, R. Temam and C. Wang, *An initial and boundary-value problem for the Zakharov- Kuznetsov equation in a bounded domain*, J. Math. Phys. **53** (2012), no. 11, 29 pp.

Teaching Experience

1. Courses taught at the undergraduate level
   Math 457/557 Stochastic processes (for seniors), Spring 2019
   Math 355 Theory of Probability (for juniors), Spring 2019,
   --, Spring 2019
   M451/551 Mathematical Statistics with Applications (for seniors), Fall 2019
   --, Spring 2019
   --, Fall 2018
   M171 Stochastic Processes (for seniors), Spring 2018
   M170B Probability Theory (for juniors and seniors), Winter 2017
   M170A Probability Theory (for juniors and seniors), Winter 2017
   M170A Probability Theory (for juniors and seniors), Fall 2016
   M32B Multivariable Calculus (for freshmen and sophomores), Spring 2016
   M170A Probability Theory (for juniors and seniors), Winter 2015
   M025 Precalculus (for freshmen), Spring 2014
2. Courses taught at the graduate level
   Math 457/557 Stochastic processes, Spring 2019
   Math 451/551 Mathematical Statistics with Applications, Fall 2019
   M554 Statistical Mathematics I, Fall 2019
   M741 Selected Topics in Applied Mathematics, Fall 2013.The course is organized as a seminar with the topic "The 2D Stochastic Navier-Stokes Equations with a Multiplicative Noise".
3. Students Co-mentored
   Nathan Geldner, Bo Li, Chaohao Pan and Yuqi Zhang, "California Research Training Program in Computational and Applied Mathematics," University of California, Los Angeles, June-August 2015. Paper: C. Pan, B. Li, C. Wang, Y-Q. Zhang, N. Geldner, L. Wang, and A. Bertozzi, *A statistical model of criminal behavior with truncated Lévy flights*, published in Math Models and Methods in Applied Sci., 28 (2018), no.9, 1857-1880.

Dissertations, Theses and Non-Theses

2. Dissertation Committee, Student: Linda Katherine Ford. Dissertaion day plan: Summer 2020.
1. Dissertation Committee, Student: Siwen Wang. Dissertaion day plan: May 2020.

Conference Organization

3. Special Session "Stochastic Modeling in Biological, Physical and Social Sciences: Theory and Applications," AIMS Conference on Dynamical Systems, Differential Equations and Applications, Atlanta, to be held in June 2021

2. Special Session "Stochastic Modeling in Fluid Dynamics: Theory and Approximation," AIMS Conference on Dynamical Systems, Differential Equations and Applications, Orlando, July 2016
1. Mini-symposium "Deterministic and Stochastic Aspects of Fluid Dynamics," SIAM Conference on Analysis of PDEs, Arizona, Dec. 2015

Invited Research Visits

Georgia Institute of Technology, Aug. 2019. During the visit, I gave a talk in the Applied and Computational Mathematics Seminar "*Stochastic-Statistical Modeling of Criminal Behavior*".

University of California, Los Angeles, August 2019.

"Women in Data Science and Mathematics," ICERM, Brown University, Aug. 2019. Paper: M. Ahn, E. Balashova, N. Eikmeier, J. Haddock, K. Laram, K. Alona, K. Leonard, D. Needell, A. Wasala, and C. Wang, *On Large-Scale Dynamic Topic Modeling with Nonnegative CP Tensor Decomposition*, submitted to Proceedings of Women in Data Science and Mathematics 2019.

Indiana University Bloomington, June 2019. During the visit, I gave a talk in the Scientific Computing and Applied Math Institute Seminar, '*Hydrodynamic limit and stochastic fluctuation for interacting particle systems with applications in agent-based residential burglary modeling'.*

University of California, Los Angeles, March 2019. During the visit, I gave a talk in the Applied Math Colloquium "*Stochastic-Statistical Modeling of Criminal Behavior*".

California Institute of Technology, June 2017. During the visit, I gave a talk in Caltech/UCLA Joint Analysis Seminar "*A hyperbolic model from plasma physics: the deterministic and stochastic Zakharov- Kuznetsov equation*."

Claremont McKenna College, April 2017. During the visit, I gave a talk in Applied Math Seminar in

Claremont Center for the Mathematical Sciences, "*A hyperbolic model from plasma physics: the deterministic and stochastic Zakharov-Kuznetsov equation*."

University of Maryland, Baltimore County, Nov. 2016. During the visit, I gave a talk in the Applied Mathematics Colloquium "*A hyperbolic model from plasma physics: the deterministic and stochastic Zakharov-Kuznetsov equation*."

University of Virginia, Mar. 2015. During the visit, I gave a talk "*Numerical analysis of the stochastic Navier-Stokes equations*."

Virginia Polytechnic Institute and State University, Aug. 2013. I gave the talk "*A hyperbolic model from plasma physics: the Zakharov-Kuznetsov equation*."

—, Nov. 2014.

—, Mar. 2015. I gave the talk "*Numerical analysis of the stochastic Navier-Stokes equations*."

Invited Presentations at Conferences and Meetings

Stochastic-statistical modeling of criminal behavior, the AMS sectional meeting, University of Florida, Nov. 2019

Initial and boundary value problems for the deterministic and stochastic Zakharov-Kuznetsov equation in a bounded domain, the AMS sectional meeting, University of Florida, Nov. 2019

Stochastic-statistical modeling of criminal behavior, the AMS sectional meeting, Auburn University, March 2019

Initial and boundary value problems for the deterministic and stochastic Zakharov-Kuznetsov equation in a bounded domain, the AMS sectional meeting, Auburn University, March 2019

Stochastic-statistical modeling of criminal behavior, Young Researchers Workshop: Kinetic models in biology and social sciences, Arizona State University, Feb 2018

A partially hyperbolic model for plasma physics: Zakharov-Kuznetsov Equation, Southern California Applied Mathematics Symposium, University of California, Irvine, June 2017

Crime modeling with truncated Levy flights and effects of police patrol, MURI Review Meeting, University of Southern California, Institute for Creative Technologies, September 2016

Time discrete approximation of weak solutions for stochastic equations of geophysical fluid dynamics and applications, Southern California Applied Mathematics Symposium, Claremont Graduate University, June 2016

Time discrete approximation of weak solutions for stochastic equations of geophysical fluid dynamics and applications, the AMS sectional meeting, University of Utah, April 2016

Time discrete approximation of weak solutions for stochastic equations of geophysical fluid dynamics and applications, SIAM Conference on Analysis of PDEs, Arizona, Dec. 2015

Numerical analysis of the stochastic Navier-Stokes equations, the AMS sectional meeting, University of Nevada, April 2015

Numerical analysis of the stochastic Navier-Stokes equations, PDE/Applied Math Seminar, Indiana University Bloomington, Feb. 2015

Time discrete approximation of weak solutions for stochastic equations of geophysical fluid dynamics and applications, at IPAM Long Program: Mathematics of Turbulence, Institute for Pure and Applied Mathematics, Oct. 2014

Martingale and pathwise solutions to the stochastic Zakharov-Kuznetsov equation with multiplicative noise, at NSF-CBMS Regional Research Conference in the Mathematical Sciences, Oklahoma State University, July 2014

Martingale and pathwise solutions to the stochastic Zakharov-Kuznetsov equation with multiplicative noise, the AMS sectional meeting, University of New Mexico, Apr. 2014

Global existence of strong solutions to 3D Zakharov-Kuznetsov equation in a bounded domain, also invited to chair the Partial Differential Equations session at the Joint Mathematics Meetings, Baltimore, Jan. 2014

Some recent results of the 3D Zakharov-Kuznetsov equation in a bounded domain, PDE Workshop, the University of Maryland, Baltimore County, Jan. 2014,

Some recent results of the 3D Zakharov-Kuznetsov equation in a bounded domain, the AMS sectional meeting, University of California, Riverside, Nov. 2013

Some recent results of the 3D Zakharov-Kuznetsov equation in a bounded domain, the AMS sectional meeting, University of Louisville, Oct. 2013

An initial and boundary-value problem for the Zakharov-Kuznetsov equation in a bounded domain, the AMS sectional meeting, University of Arizona, Oct. 2012

Conferences and Workshops Attended

"Thirty-second Annual University of Alabama System Applied Mathematics Meeting", The University of Alabama Huntsville, Nov. 2019

"NSF-CBMS Conference: Mathematical Molecular Biosciences and Biophysics", The University of Alabama, May 2019

"Thirty-first Annual University of Alabama System Applied Mathematics Meeting", University of Alabama Huntsville, Nov. 2018

"IPAM Workshop: Turbulent Dissipation, Mixing and Predictability," Institute for Pure and Applied Mathematics, Jan. 2017

"Interdisciplinary Workshop on Multi-scale Modeling of Complex Systems in Development & Plant Biology," University of California, Riverside, Dec. 15, 2016

"Predictive Policing," ICERM, Brown University, Aug. 2016. I presented "*Comparing Commuting and Crime Networks*" as part of a group project

"Analysis & Computation in Kinetic Theory," Stanford University, Nov. 2015

"Shanks Workshop on Mathematical Aspects of Fluid Dynamics," Vanderbilt University, Feb. 2015

"Heidelberg Laureate Forum (HLF)," Heidelberg, Germany, Sept. 2014, total expense supported by the HLF foundation and ORAU (19 people for all of Math and Computer Science for all the US and 200 internationally)

"IPAM Workshop: Mathematical Analysis of Turbulence," Institute for Pure and Applied Mathematics, Oct. 2014

"MSRI Summer Graduate School: Stochastic Partial Differential Equations," Mathematical Sciences Research Institute, July 2014 (selected for participation nationally)

"IMA Workshop: Theory and Applications of Stochastic PDEs," Institute for Mathematics and its Applications, Jan. 2013

"AIM Workshop: Stochastic in Geophysical Fluid Dynamics," The American Institute of Mathematics, Feb. 2013

"The 9th AIMS Conference on Dynamical Systems, Differential Equations and Applications," Orlando, Florida, July 2012

"Interdisciplinary Session on Deterministic and Stochastic Partial Differential Equations," the AMS sectional meeting, University of Notre Dame, Nov. 2010

Other Scholar Activities

Invited to give seminar talk "Stochastic-statistical modeling of criminal behavior", UA Dept. of Information Systems, Statistics and Management Science, Feb. 2019

"Alabama Water Institute Fall 2019 Workshop", The University of Alabama, Oct. 2018

Invited to give Dept. of Criminology Colloquium "*A statistical model of criminal behavior with truncate Lévy flights"*, UA Department of Criminology & Criminal Justice, Sept. 2019

ORED and OSP Overview, The University of Alabama, Sept. 2019

NSF CAREER Webinar 2019, May 2019

"Alabama Water Institute Assistant Professor's Meeting", The University of Alabama, May 2019

NSF Research Grant Writing Workshop, UA Dept. of Mathematics, April 2019

NSF CAREER PATHs Seminar, Tuskegee University, April 13, 2019

"Alabama Water Institute Fall 2018 Workshop", The University of Alabama, Sept. 2018

Service (At University of Alabama)

Internal committee

2. Graduate Program Committee, Spring 2020 --

1. Textbook Committee for MATH355/451/451, Spring 2019

Other services

10. The 2020 MATHCOUNTS West Alabama Regional Competition, Feb 2019
    I volunteered to be the judge for the Countdown Round.

9. substituting for Math 355, Spring 2020

8. Presentation at Graduate Recruiting Expo 2020, Feb 2019

7. AWM Female Faculty Panel, Sept 2019

6. Applied Math course enrollment discussion, Sept 2019

5. Manuscript Review: Discrete and Continuous Dynamical Systems Series B. August 2019.

4. Recommendation letter: UA graduate School application for a UA undergraduate, May 2019

3. AWM Research Talk, March 2019

2. Presentation at Graduate Recruiting Expo 2019, March 2019

1. Presentation at Applied Mathematics Seminar, Aug. 2018

References

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