

Bhargav Ram Karamched

CONTACT INFORMATION

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Department of Mathematics
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RESEARCH INTERESTS

Biomathematics, Stochastic Processes, Theoretical Biophysics, Complex Systems, Bioengineering

ACADEMIC APPOINTMENTS

Florida State University, Tallahassee, FL, USA

Assistant Professor of Biomathematics

August 2020 - present

The University of Houston, Houston, TX, USA

Lecturer

January 2018 - July 2020

The University of Houston, Houston, TX, USA

Postdoctoral Fellow

June 2017 - July 2020

- Advisor: Krešimir Josić

EDUCATION

The University of Utah, Salt Lake City, UT, USA

Ph. D., Mathematics, May 2017

Thesis Title: “Mathematical Models of Motor-Based Intracellular Transport”

- Advisor: Paul Bressloff

The University of Oklahoma, Norman, Oklahoma, USA

B.S., Mathematics, May 2012

- *GPA:* 4.0

The University of Oklahoma, Norman, Oklahoma, USA

B.S., Biochemistry, May 2012

- *GPA:* 4.0

PUBLICATIONS

1. **B. R. Karamched**, G. Hripcsak, D. J. Albers, and W. Ott. Delay-Induced Uncertainty in a Paradigmatic Glucose-Insulin Model. *Chaos*. **31** 023142 (2021).
2. **B. R. Karamched**, M. Stickler, B. Lindner, Z. P. Kilpatrick, W. Ott, and K. Josić. Heterogeneity Improves Speed and Accuracy in Social Networks. *Physical Review Letters* **125**, 218302 (2020)
 - Editors’ Suggestion for *Physical Review Letters*
 - Featured in *Physics Magazine*
 - Featured in *Physics Today*
 - Featured in Florida St. University and University of Colorado-Boulder Press Releases

- Featured in the Denver Local News
3. **B. R. Karamched**, S. Stolarczyk, Z. P. Kilpatrick, and K. Josić. Optimal Evidence Accumulation on Social Networks. *SIAM Journal on Applied Dynamical Systems* **19**(3) 1884-1919 (2020)
 4. R. N. Alnahhas, J. J. Winkle, A. J. Hirning, **B. R. Karamched**, W. Ott, K. Josić, and M. R. Bennett. Spatiotemporal Dynamics of Synthetic Microbial Consortia in Microfluidic Devices. *ACS Synthetic Biology* **8**: 2051-2058 (2019)
 5. **B. R. Karamched**, W. Ott, I. Timofeyev, R. N. Alnahhas, M. R. Bennett, and K. Josić. Moran Model of Spatial Alignment in Microbial Colonies. *Physica D: Nonlinear Phenomena*.(2019)
 6. P. C. Bressloff and **B. R. Karamched**. Doubly Stochastic Poisson Model of Flagellar Length Control. *SIAM Journal on Applied Mathematics* **78**(2), 719-741 (2018)
 7. P. C. Bressloff, **B. R. Karamched**, S. D. Lawley, and E. Levien. Diffusive Transport in the Presence of Stochastically Gated Absorption. *Physical Review E* **96** (2) (2017).
 8. **B. R. Karamched** and P. C. Bressloff. Effects of Cell Geometry on Reversible Vesicular Delivery. *Journal of Physics A: Mathematical and Theoretical* **50** 055601 (2017).
 - Highlight in Biological Modeling of *Journal of Physics A: Mathematical and Theoretical* for 2017
 9. P. C. Bressloff and **B. R. Karamched**. Model of reversible vesicular transport with exclusion. *Journal of Physics A: Mathematical and Theoretical* **49** 345602 (2016)
 10. P. C. Bressloff and **B. R. Karamched**. A Frequency-Dependent Decoding Mechanism for Axonal Length Sensing. *Frontiers in Cellular Neuroscience* **9**:281. (2015).
 11. **B. R. Karamched** and P. C. Bressloff. Delayed Feedback Model of Axonal Length Sensing. *Biophysical Journal* **108** 2408-2419 (2015).

GRANTS

Florida State University First-Year Assistant Professor Award, Summer 2021, \$20,000

HONORS AND AWARDS

SIAM TX-LA Sectional Meeting Travel Award, '18
 University of Utah Department of Mathematics Outstanding Graduate Student, '15-'16
 Phi Beta Kappa '12
 University of Oklahoma Henderson Scholar of the Year, '10 - '11
 University of Oklahoma Henderson Freshman Scholar of the Year, '08 - '09
 Oklahoma Regents Scholarship, University of Oklahoma, '08 - '12
 Union High School Valedictorian (Rank 1 of 898), Tulsa, OK, '08

TEACHING EXPERIENCE

Department of Mathematics, Florida State University

Assistant Professor of Mathematics

August 2020 - present

Teaching:

1. Calculus with Analytic Geometry III - Fall 2020 (online), Spring 2021 (hybrid)

Department of Mathematics, University of Houston

Postdoctoral Fellow

January 2018 - July 2020

Teaching:

1. Discrete Mathematics - Spring 2019
2. Transitions to Advanced Mathematics - Spring 2018, Spring 2020 (online)

Department of Mathematics, University of Utah

Teaching Assistant

August 2012 - May 2017

Duties at various times have included leading lab exercises and teaching.

- *Teaching:*
 - Engineering Calculus I - Fall 2016
 - Honors Engineering Calculus I - Fall 2015
 - Engineering Calculus II - Fall 2013, Spring 2015
 - Honors Engineering Calculus II - Spring 2017
 - Differential Equations and Linear Algebra - Fall 2014
 - Vector Calculus and Partial Differential Equations - Spring 2016
- *Labs:*
 - Engineering Calculus I - Fall 2012
 - Engineering Calculus II - Spring 2013
 - Vector Calculus and Partial Differential Equations - Spring 2014

MENTORING

Department of Mathematics, Florida State University

August 2020 - present

1. Ph. D. Students
 - Fan Bai - Project: Stochastic Models of Axon Length Sensing

Department of Mathematics, University of Houston

June 2018 - July 2020

1. Ph. D. Students
 - Megan Stickler - Project: Decision-Making Dynamics on Networks
 - Deepjyoti Ghosh - Project: Reliability Failure in Glucose-Insulin Dynamics: Theory and Clinical Studies
2. Undergraduate Students
 - Tammy Lam - Project: Reservoir Computing for Chaotic Glucose-Insulin Oscillations
3. High School Students
 - Aprameya Sudarshan - Generalizing the Two Brothers Problem

ORGANIZATION

1. **Minisymposium - Quantitative Modeling of Virus and Target Cell Dynamics: How Can Viruses Help Us?**
SMB Annual Meeting, June 13-17, 2021 (Virtual)
2. **Minisymposium - Mechanisms Underlying Dynamical Processes in Cellular and Systems Physiology**
SIAM Conference on Dynamical Systems, May 23-27, 2021 (Virtual)
Co-organizer: Gabriela Jaramillo
3. **Minisymposium - Biological Oscillations: From Genes to Populations**
SIAM TX-LA Sectional Meeting, October 17, 2020 (Virtual)
Hosted by Texas A&M University, College Station, TX, USA
Co-organizer: William Ott
4. **Minisymposium - Biological Signaling in Cellular Collectives**
SIAM Conference on the Applications of Dynamical Systems, May 23, 2019
Snowbird Ski and Summer Resort, Snowbird, UT, USA
Co-organizer: William Ott

5. **Minisymposium - Dynamical Models of Individual and Collective Decision-Making**
SIAM Conference on Life Sciences, August 8, 2018
Radisson BLU Minneapolis Downtown Hotel, Minneapolis, MN, USA
Co-organizers: Krešimir Josić, Zachary Kilpatrick
6. **Calculus Carnival**
University of Utah, November 21, 2013
Salt Lake City, UT, USA
Experimented with alternative forms of educational methods to teach key calculus concepts.

TALKS

1. **Spatial Model of Oncolytic Virotherapy**
SMB Annual Meeting, June 13-17, 2021 (Virtual)
University of California-Riverside, Riverside, CA, USA
2. **Delay-Induced Uncertainty in a Paradigmatic Glucose-Insulin Model**
SIAM Conference on Applications of Dynamical Systems, May 23-27, 2021 (Virtual)
Portland, OR, USA
3. **Optimal Decision-Making in Social Networks**
University of California-Riverside Applied Math and PDE Seminar, March 10, 2021 (Virtual)
University of California-Riverside, Riverside, CA, USA
4. **Optimal Decision-Making in Social Networks**
Florida State University Scientific Computing Colloquium, March 3, 2021 (Virtual)
Florida State University, Tallahassee, FL, USA
5. **Controlling Emergent Spatiotemporal Patterns in Synthetic Consortia: A Modeling Perspective**
Cleveland State University Mathematics Colloquium, February 26, 2021 (Virtual)
Cleveland State University, Cleveland, OH, USA
6. **Optimal Decision-Making in Social Networks**
University of New Mexico Mathematics Colloquium, February 22, 2021 (Virtual)
University of New Mexico, Albuquerque, NM, USA
7. **Controlling Emergent Spatiotemporal Patterns in Synthetic Consortia: A Modeling Perspective**
University of Pennsylvania Center for Mathematical Biology Seminar, February 16, 2021 (Virtual)
University of Pennsylvania, Philadelphia, PA, USA
8. **Bacterial Cell-Shape Modulation and Induced Population Dynamics of Synthetic Microbial Consortia**
SIAM TX-LA Sectional Meeting, October 17, 2020 (Virtual)
Texas A&M University, College Station, TX, USA
9. **Bacterial Cell-Shape Modulation and Induced Population Dynamics of Synthetic Microbial Consortia**
MBI Workshop on Mathematical and Computational Methods in Biology, May 5-7, 2020 (Virtual)
Mathematical Biosciences Institute, Columbus, OH, USA
10. **Binary Decisions of Large Cliques of Evidence Accumulators**
APS March Meeting, March 2-6, 2020 (Virtual)
Denver, CO, USA
11. **From Individuals to Populations: How features and interactions of individuals shape population dynamics**
Mathematics Colloquium, February, 3 2020
University of Maine, Orono, ME, USA

12. **From Individuals to Populations: How features and interactions of individuals shape population dynamics**
 Mathematics Colloquium, January 24, 2020
 Florida State University, Tallahassee, FL, USA
13. **Explaining and Controlling Spatiotemporal Patterns of Synthetic Microbial Consortia in Microfluidic Devices: A Model's Perspective**
 Structural Biology/Biochemistry Seminar, January 23, 2020
 Florida State University, Tallahassee, FL, USA
14. **From Individuals to Populations: How features and interactions of individuals shape population dynamics**
 Mathematics Colloquium, December 13, 2019
 Clarkson University, Potsdam, NY, USA
15. **Evidence Accumulation and Decision-Making on Social Networks**
 Networks Seminar, September 27, 2019
 University of Houston, Houston, TX, USA
16. **Evidence Accumulation and Decision-Making on Social Networks**
 Data Science Seminar, September 13, 2019
 University of Houston, Houston, TX, USA
17. **Moran Model of Spatial Alignment in Microbial Colonies**
 SIAM Conference on Applications of Dynamical Systems, May 19-24, 2019
 Snowbird Summer and Ski Resort, Snowbird, UT, USA
18. **Moran Model of Spatial Alignment in Microbial Colonies**
 SIAM TX-LA Sectional Meeting, October 5-7, 2018
 Louisiana State University, Baton Rouge, LA, USA
19. **Evidence Accumulation and Decision-Making on Networks**
 SIAM Conference on the Life Sciences, August 6-9, 2018
 Radisson BLU Minneapolis Downtown, Minneapolis, MN, USA
20. **Boundary-Driven Emergent Spatiotemporal Order in Growing Microbial Colonies**
 Conference on Mathematical Approaches to Cell-Cell Communication and Collective Behaviours,
 July 9-13, 2018
 Banff International Research Station, Banff, Alberta, Canada
21. **Evidence Accumulation and Decision-Making on Networks**
 Mathematical Neuroscience Workshop, February 28 - March 1, 2018
 University of Colorado-Boulder, Boulder, CO, USA
22. **Frequency Dependent Gene Expression for Axonal Length Sensing**
 Mathematical Neuroscience Workshop, September 8, 2017
 University of Colorado-Boulder, Boulder, CO, USA
23. **Doubly Stochastic Poisson Model of Flagellar Length Control**
 Annual Meeting of the Society for Mathematical Biology, July 17-21, 2017
 University of Utah, Salt Lake City, UT, USA
24. **Effects of Cell Geometry on Reversible Vesicular Delivery**
 SIAM Conference on Applications of Dynamical Systems, May 21-25, 2017
 Snowbird Ski and Summer Resort, Snowbird, UT, USA
25. **Mathematical Models of Motor-Based Intracellular Transport**
 Networks Group Meeting, April 12, 2017
 University of Houston, Houston, TX, USA
26. **The Princess Problem**
 Undergraduate Mathematics Colloquium, March 29, 2017
 University of Utah, Salt Lake City, UT, USA

27. **Motor-Based Delivery of Vesicles to Localized Cellular Targets**
Tim Elston Lab Seminar, November 30, 2016
University of North Carolina, Chapel Hill, NC, USA
28. **Modeling Hard-Core Repulsion in Transport Processes**
Applied Math Group, November 3, 2016
University of Utah, Salt Lake City, UT, USA

POSTERS

1. **Boundary-Driven Emergent Spatiotemporal Order in Growing Microbial Colonies**
University of Houston Postdoc Symposium, July 20-21, 2018
UH Hilton Hotel, Houston, TX, USA
 - Winner! Best Poster
2. **Boundary-Driven Emergent Spatiotemporal Order in Growing Microbial Colonies**
Conference on Quantitative Biology, June 26-29, 2018
BioScience Research Collaborative, Houston, TX, USA
3. **Evidence Accumulation and Decision-Making on Networks**
COSYNE 2018, March 1-4, 2018
Downtown Hilton Hotel, Denver, CO, USA
4. **Evidence Accumulation and Decision-Making on Networks**
Gulf Coast Consortium for Theoretical and Computational Neuroscience, January 26, 2018
BioScience Research Collaborative, Houston, TX, USA
5. **Science Day**
University of Utah, November 12, 2016
Salt Lake City, UT, USA
Gave poster presentation to middle and high school students and encouraged them to pursue a career in science and mathematics.
6. **A Model of Reversible Vesicular Transport with Exclusion**
Spatially Distributed Stochastic Dynamical Systems in Biology Conference, June 20-24, 2016
Isaac Newton Institute for Mathematical Sciences, Cambridge, UK
7. **Science Day**
University of Utah, November 17, 2015
Salt Lake City, UT, USA
Gave poster presentation to high school students and encouraged them to pursue a career in science and mathematics.
8. **A Frequency-Dependent Decoding Mechanism for Axonal Length Sensing**
SIAM Conference on Applications of Dynamical Systems, May 17-21, 2015
Snowbird Ski and Summer Resort, Snowbird, UT, USA
9. **Delayed Feedback Model of Axonal Length Control**
MBI Axonal Transport and Neuronal Mechanics Conference, November 3-7, 2014
The Ohio State University, Columbus, OH, USA

PROFESSIONAL
SERVICE

- Book Reviews
 1. Goriely, Alain. *The Mathematics and Mechanics of Biological Growth*. Vol. 45. Springer, 2017.
- Reviewer for
 1. *Journal of Mathematical Biology*
 2. *Physica D: Nonlinear Phenomena*
 3. *ACS Synthetic Biology*

4. *Physical Review E*
5. *Mathematical Biosciences*
6. *Mathematics and Computers in Simulation*

MEMBERSHIPS

1. Society for Industrial and Applied Mathematics (SIAM) (2015-Present)
2. Society for Mathematical Biology (SMB) (2017-Present)
3. American Physical Society (APS) (2019-Present)
4. American Mathematical Society (AMS) (2021 -Present)

COMPUTER SKILLS

- *Languages:* Java, C++, Python, Matlab, Maple, Mathematica
- *Tools and Applications:* L^AT_EX, MS Office tools or equivalent
- *Operating Systems:* Windows, OS X, Linux