Zachary P. Kilpatrick

http://www.colorado.edu/amath/zpkilpat

University of Colorado Boulder, Assistant Professor, Applied Mathematics   (zpkilpat@colorado.edu)

EDUCATION
2007 – 2010   **University of Utah**: PhD in Mathematics
2005 – 2007   **University of Utah**: M.S. in Mathematics
2001 – 2005   **Rice University**: B.A. in Computational and Applied Mathematics; B.A. in History

ACADEMIC APPOINTMENTS
2016 –   **University of Colorado Boulder**, Assistant Professor, Applied Mathematics
2018 –   **University of Colorado Boulder**, Affiliate Faculty, Institute for Cognitive Science
2016 –   **University of Colorado School of Medicine**, Affiliate Faculty, Physiology & Biophysics
2016 – 2019   **University of Houston**, Research Assistant Professor, Mathematics
2012 – 2016   **University of Houston**, Assistant Professor, Mathematics
2010 – 2012   **University of Pittsburgh**, NSF Mathematical Sciences Postdoctoral Research Fellow

CURRENT RESEARCH GRANTS   amount to Kilpatrick in **bold**
2019 – 2022   NSF DMS – Mathematical Biology (sole PI: **$249,999**)
    Spatiotemporal neural dynamics of visual decisions

2017 – 2021   NIH – National Institute of Mental Health (co-PI with J. Gold & K. Josić: **$532,732**)
    CRCNS: Decision making in changing environments

COMPLETED RESEARCH GRANTS   amount to Kilpatrick in **bold**
2016 – 2019   NSF DMS – Mathematical Biology (sole PI: **$234,000**)
    Robust spatiotemporal dynamics in multi-layer neuronal networks

2015 – 2019   NSF DMS – Mathematical Biology (co-PI with K. Josić: **$164,722**)
    The ever-changing network: How changes in architecture shape neural computations

2013 – 2017   NSF DMS – Mathematical Biology (sole PI: **$184,937**)
    Architecture for robust spatiotemporal dynamics in neuronal networks

2010 – 2012   NSF DMS Postdoctoral Research Fellowship (sole PI: **$135,000**)

PENDING RESEARCH GRANTS   amount requested in **bold**
2020 – 2023   NIH BRAIN – Theories, Models and Methods for Analysis of Complex Data from the Brain
    (sole PI: **$788,135**)
    Connecting neural circuit architecture and experience-driven probabilistic computations

CONFERENCE GRANTS AND INTERNAL GRANTS
2016 – 2017   NSF DMS – Conference Proposal (PI with J. Gjorgjieva & R. Rosenbaum: **$20,000**)
2016 – 2017   Burroughs Wellcome Fund – Conference Proposal (co-PI with J. Gjorgjieva: **$5,000**)
2016 – 2017   SIAM – Conference Proposal (PI with J. Gjorgjieva & R. Rosenbaum: **$5,000**)
2016 – 2017   CU Boulder Faculty Conference Award: **$3,000**
    International Conference on Mathematical Neuroscience

2013 – 2014   University of Houston, GEAR (co-PI with K. Josić: **$30,000**)
    Forecasting in biological networks: How organisms see the future

2013   University of Houston, New Faculty Research Grant (sole PI: **$6,000**)
    Robust neural field models for decision making with multiple alternatives

MANUSCRIPTS UNDER REVIEW   undergrads*; grad students‡; postdocs†; co-first$^\oplus$; co-last$^\bullet$

1. B. Karamched, S. Stolarczyk, Z.P. Kilpatrick$^\bullet$, & K. Josić$^\bullet$, *Optimal evidence accumulation on social networks*, **SIAM J Appl. Dyn. Syst.** in review. **arXiv:** https://arxiv.org/abs/1810.05909

REFEREED JOURNAL PUBLICATIONS   undergrads*; grad students‡; postdocs†; co-first$^\oplus$; co-last$^\bullet$

1. Y. Wang, Z.P. Kilpatrick$^\bullet$, & K. Josić$^\bullet$, *A hierarchical model of perceptual multistability involving interocular grouping*, **J Comput. Neurosci.** (2020) in press.

2. S. Bidari‡, O. Peleg, & Z.P. Kilpatrick, *Social inhibition maintains adaptivity and consensus of foraging honey bees in dynamic environments*, **R. Soc. Open Sci.** 6 (2019) 191681.

3. N.W. Barendregt‡, K. Josić$^\bullet$, & Z.P. Kilpatrick$^\bullet$, *Analyzing dynamic decision-making models using Chapman-Kolmogorov equations*, **J Comput. Neurosci.** 47 (2019) pp. 205-222.

4. A.E. Radillo$^\oplus$, A. Veliz-Cuba$^\oplus$, K. Josić$^\bullet$, & Z.P. Kilpatrick$^\bullet$, *Performance of normative and approximate evidence accumulation on the dynamic clicks task*, **Neurons, Behavior, Data Analysis, & Theory** (2019) 10226.

5. Z.P. Kilpatrick, W.R. Holmes, T.L. Eissa†, & K. Josić, *Optimal models of decision-making in dynamic environments*, **Curr. Opin. Neurobiol.** 58 (2019) pp. 54-60.

6. K.P. Nguyen‡, K. Josić$^\bullet$, & Z.P. Kilpatrick$^\bullet$, *Optimizing sequential decisions in the drift-diffusion model*, **J Math. Psychol.** 88 (2019) pp. 32-47.

7. N. Krishnan* & Z.P. Kilpatrick, *Optimizing a jump-diffusion model of a starving forager*, **Phys. Rev. E** 98 (2018) 052406.

8. G. Faye & Z.P. Kilpatrick, *Threshold of front propagation in neural fields: An interface dynamics approach*, **SIAM J Appl. Math.** 78 (2018), pp. 2575-2596.

9. Z.P. Kilpatrick, *Synaptic mechanisms of interference in working memory*, **Sci. Rep.** 8 (2018) 7879.

10. N. Krishnan*, D.B. Poll‡, & Z.P. Kilpatrick, *Synaptic efficacy shapes resource limitations in working memory*, **J. Comput. Neurosci.** 44 (2018), pp. 273-295.

11. Z.P. Kilpatrick & D.B. Poll‡, *Neural field model of memory-guided search*, **Phys. Rev. E** 96 (2017), 062411.

12. D.B. Poll‡ & Z.P. Kilpatrick, *Velocity integration in a multilayer neural field model of spatial working memory*, **SIAM J Appl. Dyn. Syst.** 16 (2017), pp. 1197-1234.

13. A.E. Radillo, A. Veliz-Cuba, K. Josić$^\bullet$, & Z.P. Kilpatrick$^\bullet$, *Evidence accumulation and change rate inference in dynamic environments*, **Neural Comput.** 29 (2017), pp. 1561-1610.

14. A. Jacot-Guillarmod$^\bullet$, Y. Wang$^\bullet$, C. Pedroza, H. Öğmen, Z.P. Kilpatrick$^\bullet$, & K. Josić$^\bullet$, *Extending Levelt's Propositions to perceptual multistability involving interocular grouping*, **Vision Res.** 133 (2017), pp. 37-46.

15. Z.P. Kilpatrick, *Ghosts of bump attractors in stochastic neural fields: Bottlenecks and extinction*, **Discrete Contin. Dynam. Syst. Ser. B** 21 (2016), pp. 2211-2231.

16. Z.T. McCleney* & Z.P. Kilpatrick, *Entrainment in up and down states of neural populations: non-smooth and stochastic models*, **J. Math. Biol.** 73 (2016), pp. 1131-1160..

17. D.B. Poll‡ & Z.P. Kilpatrick, *Persistent search in confined domains: a velocity-jump process model*, **J. Stat. Mech.** (2016), 053201.

18. D.B. Poll‡, K. Nguyen*, & Z.P. Kilpatrick, *Sensory feedback in a bump attractor model of path integration*, **J. Comput. Neurosci.** 40 (2016), pp. 137-155.

19. A. Veliz-Cuba†, Z.P. Kilpatrick$^\bullet$, & K. Josić$^\bullet$, *Stochastic models of evidence accumulation in changing environments*, **SIAM Rev.** 58 (2016), pp. 264-289.

20. A. Veliz-Cuba†, H.Z. Shouval, K. Josić❂, & Z.P. Kilpatrick❂, *Networks that learn the precise timing of event sequences*, **J Comput. Neurosci.** 39 (2015), pp. 235-254.

21. D.B. Poll‡ & Z.P. Kilpatrick, *Stochastic motion of bumps in planar neural fields*, **SIAM J Appl. Math.** 75 (2015) pp. 1553-1577.

22. Z.P. Kilpatrick, *Stochastic synchronization of neural activity waves*, **Phys. Rev. E** 91 (2015), 040701(R).

23. P.C. Bressloff & Z.P. Kilpatrick, *Nonlinear Langevin equations for wandering patterns in stochastic neural fields*, **SIAM J Appl. Dyn. Syst.** 14 (2015), pp. 305-334.

24. Z.P. Kilpatrick, *Delay stabilizes stochastic motion of bumps in layered neural fields*, **Physica D** 295 (2015), pp. 30-45.

25. Z.P. Kilpatrick & G. Faye, *Pulse bifurcations in stochastic neural fields*, **SIAM J Appl. Dyn. Syst.** 13 (2014), pp. 830-860.

26. J.K. Kim†, Z.P. Kilpatrick, M.R. Bennett, & K. Josić, *Molecular mechanisms that regulate the coupled period of the mammalian circadian clock*, **Biophys. J** 106 (2014), pp. 2071-2081.

27. Z.P. Kilpatrick, *Coupling layers regularizes wave propagation in stochastic neural fields*, **Phys. Rev. E** 89 (2014), 022706.

28. S. Carroll*, K. Josić, & Z.P. Kilpatrick, *Encoding certainty in bump attractors*, **J Comput. Neurosci.** 37 (2014), pp. 29-48.

29. Z.P. Kilpatrick, B. Ermentrout, & B. Doiron, *Optimizing working memory with heterogeneity of recurrent cortical excitation*, **J Neurosci.** 33 (2013), pp. 18999-19011.

30. Z.P. Kilpatrick, *Interareal coupling reduces encoding variability in multi-area models of spatial working memory*, **Front. Comput. Neurosci.** 7 (2013), 82.

31. Z.P. Kilpatrick & B. Ermentrout, *Wandering bumps in stochastic neural fields*, **SIAM J Appl. Dyn. Syst.** 12 (2013), pp. 61-94.

32. Z.P. Kilpatrick, *Short term synaptic depression improves information transfer in perceptual multistability*, **Front. Comput. Neurosci.** 7 (2013), 85.

33. S.M. Jayasuriya* & Z.P. Kilpatrick, *Effects of time-dependent stimuli on a competitive neural network model of perceptual rivalry*, **Bull. Math. Biol.** 6 (2012), pp. 1396-1426.

34. Z.P. Kilpatrick & B. Ermentrout, *Response of traveling waves to transient inputs in neural fields*, **Phys. Rev. E** 85 (2012), 021910.

35. Z.P. Kilpatrick & G.B. Ermentrout, *Hallucinogen persisting perception disorder in neuronal networks with adaptation*, **J Comput. Neurosci.** 32 (2012), pp. 25-53.

36. Z.P. Kilpatrick & G.B. Ermentrout, *Sparse gamma rhythms arising through clustering in adapting neuronal networks*, **PLoS Comput. Biol.** 7 (2011), e1002281.

37. P.C. Bressloff & Z.P. Kilpatrick, *Two–dimensional bumps in piecewise smooth neural fields with synaptic depression*, **SIAM J Appl. Math.** 71 (2011), pp. 379-408.

38. Z.P. Kilpatrick & P.C. Bressloff, *Binocular rivalry in a competitive neural network model with synaptic depression*, **SIAM J Appl. Dyn. Syst.** 9 (2010), pp. 1303-1347.

39. Z.P. Kilpatrick & P.C. Bressloff, *Stability of bumps in piecewise smooth neural networks with nonlinear adaptation*, **Physica D** 239 (2010), pp. 1048-1060.

40. Z.P. Kilpatrick & P.C. Bressloff, *Spatially structured oscillations in a two-dimensional excitatory neuronal network with synaptic depression*, **J Comput. Neurosci.** 28 (2010), pp. 193-209.

41. Z.P. Kilpatrick & P.C. Bressloff, *Effects of synaptic depression and adaptation on spatiotemporal dynamics of an excitatory neuronal network*, **Physica D** 239 (2010), pp. 547-560.

42. P.C. Bressloff & Z.P. Kilpatrick, *Nonlocal Ginzburg-Landau equation for cortical pattern formation*, **Phys. Rev. E** 78 (2008), 041916.

43. Z.P. Kilpatrick, S.E. Folias, & P.C. Bressloff, *Traveling pulses and wave propagation failure in inhomogeneous neural media*, **SIAM J Appl. Dyn. Syst.** 7 (2008), pp. 161-185.

Editorials, Book Chapters, and Book Reviews (All Refereed)

B1. Z.P. Kilpatrick, J Gjorgjieva, & R. Rosenbaum, *Special Issue from the 2017 International Conference on Mathematical Neuroscience*, **J. Math. Neurosci.** 9 (2019) 1.

B2. Z.P. Kilpatrick, *Book Review: Methods and Models in Mathematical Biology (Johannes Muller and Christina Kuttler)*, **SIAM Rev.** 59 (2017) pp. 211-214.

B3. Z.P. Kilpatrick, *Wilson-Cowan model*, **Encyclopedia of Computational Neuroscience** (2014), Ed. D. Jaeger and R. Jung, Springer Verlag.

B4. G.B. Ermentrout, S.E. Folias, & Z.P. Kilpatrick, *Spatiotemporal pattern formation in neural fields with linear adaptation*, **Neural Field Theory** (2014), Ed. S. Coombes, P. beim Graben, R. Potthast and J.J. Wright, Springer Verlag.

Press

P1. CU Boulder Today, Daniel Strain, *Study sheds light on how people make Super Tuesday or other tough choices*, March 2, 2020

P2. AAAS, *On eve of Super Tuesday, study sheds light on how people make choices*, March 2, 2020

P3. SIAM News, Lina Sorg, *Collective decision-making and optimal foraging techniques in honeybees*, August 8, 2018

Invited Conference Plenary Talks

1. "Accumulating evidence across multiple timescales" at **Collaborative Research in Computational Neuroscience Principal Investigators Meeting**, Austin, Texas, 9/2019.

2. "Evidence accumulation within and across trials" at **Neuroethology of Movement and Motor Control: Banff International Research Station Workshop**, Banff, Alberta, Canada, 5/2019.

3. "Synaptic mechanisms of repetition bias in working memory" at **International Neural Coding Workshop**, Torino, Italy, 9/2018

4. "Wave initiation thresholds in neural fields: An interface dynamics approach" at **International Conference on Mathematical Neuroscience**, Juan-les-Pins, France, 6/2018

5. "Interacting activity patterns in neural field models of working memory" at **Winter School on Stochastic Models in Neuroscience**, Toulouse, France, 12/2017

6. "Evidence accumulation in dynamic environments: Neurons, organisms, and groups" at **Undergradaute Capstone Conference at the Mathematical Biosciences Institute**, Columbus, Ohio, 8/2017

7. "Maintenance of spatial working memory across time: bump models" at **Brain Dynamics and Statistics: Simulation and Data: Banff International Research Station Workshop**, Banff, Alberta, Canada, 2/2017

8. "Networks that learn the change-rate of a dynamic environment" at **Bernstein Sparks Workshop on Recurrent Network Theory**, Göttingen, Germany, 5/2016

9. "Learning the volatility of a dynamic environment" at **Connecting Network Architecture and Computation: Banff International Research Station Workshop**, Banff, Alberta, Canada, 12/2015

10. "Evidence accumulation in changing enviroments" at **University of Texas Conference on Learning and Memory**, Austin, Texas, 4/2015

11. "Getting the most out of bumps" at **Conference on Nonlinear Dynamics and Stochastic Methods**, Pittsburgh, Pennsylvania, 3/2014

12. "Networks that learn the precise timing of sequences" at **Gulf Coast Consortium Conference on Theoretical and Computational Neuroscience**, Houston, Texas, 1/2014

13. "Spatial architecture that reduces error of spatial working memory in neural field models" at **Stochastic Modeling of Biological Processes: Institute of Mathematics and its Applications Workshop**, Minneapolis, Minnesota, 5/2013

14. "Optimizing memory using synaptic heterogeneity" at **Conference on Progress in Neural Field Theory**, Reading, United Kingdom, 4/2012

15. "Stimulus-induced transitions of traveling waves in neural fields" at **Conference on the Spatio-temporal Evolution Equations and Neural Fields: Centre International de Rencontres Mathématiques**, Luminy, France, 10/2011

DEPARTMENT COLLOQUIA AND SEMINAR TALKS

1. "Analyzing decision making in dynamic environments with Chapman-Kolmogorov equations" at **Colorado State University, Applied Mathematics Seminar**, Fort Collins Colorado, 2/2019

2. "Tuning evidence-integration across multiple timescales" at **Princeton Neuroscience Institute Seminar**, Princeton, New Jersey, 10/2018

3. "Optimizing and identifying evidence-integration across multiple timescales" at **Computational Neuroscience Seminar at Institut d'Investigacions Biomèdiques August Pi i Sunyer**, Barcelona, Spain, 6/2018

4. "Neural field models of working memory: Laminar structure and delays" at **Partial Differential Equations Seminar at Institut de Mathèmatiques de Toulouse**, Toulouse, France, 12/2017

5. "Neuromechanics of working memory errors: a neural field approach" at **Institut national de recherche en informatique et en automatique, MathNeuro Seminar**, Sophia Antipolis, France, 11/2017

6. "Evidence accumulation in dynamic environments: The price of optimality" at **Ecole Normale Supèrieure, Neural Theory Seminar**, Paris, France, 11/2017

7. "Synaptic mechanisms of interference in working memory" at **University of Pennsylvania, Computational Neuroscience Seminar**, Philadelphia, Pennsylvania, 10/2017

8. "Evidence accumulation in dynamic environments: Neurons, organisms, and groups" at **Colorado School of Mines, Applied Mathematics Colloquium**, Golden, Colorado, 8/2017

9. "Evidence accumulation in dynamic environments" at **University of Colorado School of Medicine, Physiology and Biophysics Colloquium**, Aurora, Colorado, 11/2016

10. "Stochastic neural dynamics of working memory" at **Colorado State University, Applied Mathematics Seminar**, Fort Collins, Colorado, 9/2016

11. "Evidence accumulation in dynamic environments" at **University of Colorado, Applied Mathematics Colloquium**, Boulder, Colorado, 9/2016

12. "Stochastic neural dynamics of working memory" at **University of Arkansas, Physics Colloquium**, Fayetteville, Arkansas, 3/2016

13. "Perceptual switching in changing and static environments" at **Louisiana State University School of Medicine, Cell Biology and Anatomy Colloquium**, New Orleans, Louisiana, 9/2015

14. "Stochastic dynamics of nonlinear waves in neuronal networks" at **University of Colorado, Applied Mathematics Colloquium**, Boulder, Colorado, 11/2014

15. "Stochastic motion of activity patterns in multistable neuronal networks" at **University of Minnesota, Mathematical Biology Seminar**, Minneapolis, Minnesota, 11/2013

16. "Waves, transients, and wandering in continuum neural field equations" at **University of Houston, Mathematics Colloquium**, Houston, Texas, 2/2012

17. "Processing of inputs by neural fields" at **Hungarian Academy of Sciences, Neural Computing Seminar**, Budapest, Hungary, 11/2011

18. "Waves and oscillations in neural field models of visual cortex" at **Rice University, Computational and Applied Mathematics Colloquium**, Houston, Texas, 1/2011

19. "Dynamics in a spatially extended neuronal network with synaptic depression" at **University of Nottingham, Mathematical Neuroscience Seminar**, Nottingham, United Kingdom, 11/2009

20. "Spatiotemporal dynamics in a neuronal network with synaptic depression" at **Institut national de recherche en informatique et en automatique, NeuroMathComp Seminar**, Sophia Antipolis, France, 10/2009

21. "Short term synaptic plasticity in spatially extended neuronal networks" at **National Institutes of Health − National Institute for Diabetes and Diseases of the Kidney, Laboratory of Biological Modeling Seminar**, Bethesda, Maryland, 9/2009

22. "Short term synaptic plasticity in spatially extended neuronal networks" at **University of Pittsburgh, Mathematical Biology Seminar**, Pittsburgh, Pennsylvania, 9/2009

OUTREACH, TUTORIAL, AND PRESS TALKS

1. "Keeping up with the Jones's opinions: Bayesian evidence accumulation on social networks" at **American Physical Society March Meeting (online)**, Denver, Colorado, 3/2020

2. "Stochastic and dynamical models of evidence integration and storage" at **International Conference on Mathematical Neuroscience: Tutorial Talks (2)**, Copenhagen, Denmark, 6/2019

3. "Dynamical models of decision making and working memory" at **Colorado School of Mines, Tutorial at Math Biology Summer School**, Golden, Colorado, 5/2018

4. "Now you see it, Now you don't: The mathematics of perception" at **Houston Museum of Natural Science: Public Science Outreach Talk**, Sugar Land, Texas, 10/2014

INVITED MINISYMPOSIUM AND SMALL WORKSHOP TALKS

1. "Stochastic dynamics of foraging under normative patch-leaving decisions" at **Conference on Frontiers in Applied and Computational Mathematics**, Newark, New Jersey, 5/2020

2. "Neural and synaptic mechanisms of interference in working memory" at **SIAM Pacific Sectional Meeting: Special Session on Theoretical Neuroscience**, Seattle, Washington, 10/2019

3. "Training vs. designing continuous attractors in recurrent neural networks" at **Organization for Computational Neuroscience (Workshop): How does learning reshape the dimensionality of collective network activity?**, Seattle, Washington, 7/2018

4. "Neural field model of memory guided search" at **SIAM Central States Sectional Conference (Minisymposium): Applied Dynamical Systems**, Fort Collins, Colorado, 9/2017

5. "Evidence accumulation in dynamic environments" at **SIAM Applications of Dynamical Systems (Minisymposium): Excitability, Feedback, and Collective Decision-Making Dynamics**, Snowbird, Utah, 5/2017

6. "Maintaining spatial working memory across time in bump attractor models" at **AMS Sectional Meeting: Special Session on Mathematical Neuroscience and Physiology**, Pullman, Washington, 4/2017

7. "Phase dynamics of multilayer neural networks" at **SIAM Life Sciences (Minisymposium): PRCs and Phase Models in Neuroscience**, Boston, Massachusetts, 7/2016

8. "Stochastic effects in neural activity waves: synchrony and stabilization via delays" at **AMS Sectional Meeting: Special Session on Nonlinear Waves of Differential Equations**, New Brunswick, New Jersey, 11/2015

9. "Pulse bifurcations in stochastic neural fields" at **SIAM Applications of Dynamical Systems (Minisymposium): Analysis of Network Dynamical Systems**, Snowbird, Utah, 5/2015

10. "Stochastic synchronization of neural activity waves" at **IMACS International Conference on Nonlinear Evolution Equations and Waves: Special Session on Mechanisms for Computations in Neuronal Networks**, Athens, Georgia, 4/2015

11. "Networks That Learn the Timing of Event Sequences" at **SIAM Life Sciences (Minisymposium): Dynamics of Multistable Perception and Decision Making**, Charlotte, North Carolina, 8/2014

12. "Pulse bifurcations in stochastic neural fields" **AIMS Conference on Dynamical Systems: Special Session on Random Dynamical Systems in the Life Sciences**, Madrid, Spain, 7/2014

13. "Networks that learn to precisely encode the timing of sequences" **AIMS Conference on Dynamical Systems: Special Session on Modeling and Dynamic Analysis of Complex Patterns in Biological Systems and Data**, Madrid, Spain, 7/2014

14. "Slowing bump diffusion with network heterogeneity in stochastic neural fields" at **Conference on Frontiers in Applied and Computational Mathematics**, Newark, New Jersey, 6/2013

15. "Noise-induced phenomena in continuum neural field equations" at **IMACS International Conference on Nonlinear Evolution Equations and Waves: Special Session on Dynamics of Neuronal Networks**, Athens Georgia, 3/2013

16. "Stochastic and adaptive switching in competitive neural network models of perceptual rivalry" at **SIAM Life Sciences (Minisymposium): Perceptual Rivalry and Mathematical Modeling**, San Diego, California, 8/2012

17. "Wandering and transitions of pulses in stochastic neural fields" at **Canadian Applied and Industrial Mathematical Society Meeting (Minisymposium): Applied Analysis (with Dynamical Systems)**, Toronto, Ontario, Canada 6/2012

CONFERENCE ORGANIZATION

- **The dynamics and limitations of working memory**, (with Albert Compte) Workshop at Annual Conference on Computational Neuroscience (11 speakers), Barcelona, Spain, 7/2019

- **International Conference on Mathematical Neuroscience**,
  Advisory Committee (5 invited/47 contributed talks; 112 attendees), Copenhagen Denmark, 6/2019
  Advisory Committee (14 invited/34 contributed talks; 107 attendees), Juan-les-Pins, France, 6/2018
  Conference Chair (11 invited/45 contributed talks; 131 attendees), Boulder, Colorado, 6/2017
  Conference Co-Chair (12 invited/39 contributed talks; 124 attendees), Juan-les-Pins, France, 6/2016

- **Dynamical models of individual and collective decision-making**, (with Krešimir Josić and Bhargav Karamched) Minisymposium at SIAM Life Sciences (8 speakers), Minneapolis, Minnesota, 8/2018

- **Gulf Coast Consortium Annual Conference on Theoretical and Computational Neuroscience**, (co-organizer), (7 invited speakers), Rice University, Houston, Texas, 2/2015

- **Nonlinear and stochastic dynamics in large neuronal networks**, (with Jonathan Touboul) Minisymposium at SIAM Applications of Dynamical Systems (8 speakers), Snowbird UT, 5/2015

- **Neural mechanisms of working memory limits**, (with Albert Compte)
  Workshop at Annual Conference on Computational Neuroscience (13 speakers), Paris FR, 7/2013

- **Stochasticity in large networks of the brain**, (with Jonathan Touboul)
  Minisymposium at SIAM Applications of Dynamical Systems (8 speakers), Snowbird, Utah, 5/2013

- **Spatiotemporal dynamics in networks of the brain**, (with Stefanos Folias)
  Minisymposium at SIAM Life Sciences (8 speakers), San Diego, California, 8/2012

- **Criticality, threshold phenomena, and network dynamics**, (co-organizer)
  Conference at Complex Biological Systems Group Theme Days (6 speakers), University of Pittsburgh, Pittsburgh, Pennsylvania, 5/2012

- **SIAM/MAA Mid-Atlantic Regional Applied Mathematics**, (co-organizer), Student Conference at Shippensburg University (3 invited/43 contributed talks; 77 attendees), Shippensburg, Pennsylvania, 4/2012

- **Sensorimotor processes reflected in spatiotemporal dynamics of neuronal activity**, (with Jian-Young Wu) Workshop at Computational Systems Neuroscience (Cosyne) Conference (9 speakers), Snowbird, Utah, 2/2012

- **The role of adaptation and depression in neuronal network dynamics** (with Rodica Curtu), Minisymposium at SIAM Life Sciences (8 speakers), Pittsburgh, Pennsylvania, 7/2010

- **Cortical network dynamics** (with Steve Coombes), Minisymposium at SIAM Life Sciences (4 speakers), Montreal, Quebec, Canada, 8/2008

- **IGERT Annual Student Workshop** (co-organizer), Workshop at University of Utah (5 lectures by invited speaker Bard Ermentrout), Salt Lake City, Utah, 5/2008

Teaching Experience

University of Colorado Boulder	Term	Units	Undergrads	Grads	Rating
APPM 4370/5370: Computational Neuroscience	S20	3	–	–	–/6.00
APPM 5470: Partial Differential and Integral Equations	F19	3	–	15	5.57/6.00
APPM 8400: Mathematical Biology Seminar	F19	1	–	8	5.50/6.00
APPM 2360: Differential Equations w/ Linear Algebra	S19	4	143	–	4.83/6.00
(Also Course Coordinator: 8 sections ≈ 625 students)					
APPM 5470: Partial Differential and Integral Equations	F18	3	1	10	5.64/6.00
APPM 3570: Applied Probability	S18	3	15	–	5.18/6.00
APPM 3570: Applied Probability	S18	3	19	–	5.47/6.00
APPM 8400: Mathematical Biology Seminar	S17	1	–	10	5.90/6.00
APPM 3570: Applied Probability	S17	3	59	–	5.06/6.00
APPM 4350: Fourier Series & Boundary Value Problems	F16	3	26	2	5.54/6.00

University of Houston					
MATH/BIOL 4309: Mathematical Biology	S16	3	37	–	–
MATH 4377: Advanced Linear Algebra	F15	3	60	–	–
MATH 3321: Honors Engineering Mathematics	F15	3	72	–	–
MATH/BIOL 4309: Mathematical Biology	S15	3	22	–	4.1/5.0
MATH/BIOL 4309: Mathematical Biology	S14	3	25	–	4.67/5.00
MATH 4377: Advanced Linear Algebra	F13	3	51	6	4.2/5.0
MATH/BIOL 4309: Mathematical Biology	S13	3	21	–	4.0/5.0
MATH 3321: Honors Engineering Mathematics	F12	3	24	–	4.6/5.0

University of Pittsburgh

MATH 230: Analytic Geometry & Calculus II	S11	3	94	–	4.02/5.00
MATH 220: Analytic Geometry & Calculus I	F10	3	83	–	3.27/5.00

University of Utah

MATH 1180: Calculus for Biologists II	S08	3	29	–	–
MATH 1170: Calculus for Biologists I	F07	3	46	–	–

Graduate Students Supervised

- Timothy Thorn, **PhD** (CU Boulder), 2nd year
  Project: *Low-dimensional dynamics of recurrent neural networks trained for working memory*

- Nicholas Barendregt, **PhD** (CU Boulder), 2nd year
  Project: *Stochastic and ensemble dynamics of evidence accumulation in changing environments*

- Subekshya Bidari, **PhD** (CU Boulder), 3rd year
  Project: *Adaptive models of collective decisions for swarms in dynamic environments*

- Patrick Talley, **M.P.S.** (CU Boulder), 2021
  Project: *Nonlinear analysis of cortical activity waves representing spatially-extended visual objects*

- Kate Nguyen, **PhD (coadvisor)** (U Houston), exp 2020
  Project: *Optimizing evidence-accumulation across sequences of binary decisions*

- Nikhil Krishnan, **M.S.** (CU Boulder), May 2019
  Thesis: *Foraging in stochastic environments*
  Now: PhD Student at Princeton University in Operations Research & Financial Engineering

- Adrian Radillo, **PhD (coadvisor)** (U Houston), August 2018
  Dissertation: *Optimal decision-making models in changing environments*
  Now: AI Data Scientist at Chubb; Previously: Postdoc at U Penn Neuroscience

- Daniel Poll, **PhD** (U Houston), May 2017
  Dissertation: *Stochastic dynamics in bump attractor models of spatial working memory*;
  Now: Assistant Professor of Mathematics, College of Charleston
  Previously: Postdoc at Northwestern Engineering Sciences & Applied Mathematics

Postdoctoral Fellows Supervised

- Tahra Eissa (CU Boulder), 2018–; One Refereed Publication (Curr. Op. Neurobiol.), Two Refereed Conference Abstracts (CoSyNe Poster and SfN Talk)

- Alan Veliz-Cuba (coadvisor) (UH), 2013–2015; Four Refereed Publications (SIAM Rev.; J. Comput. Neurosci.; Neural Comput.; Neurons, Behavior, Data Analysis, and Theory)
  Faculty Position: Assistant Professor of Mathematics, University of Dayton

Other Trainees Supervised

- Emily Webb, **undergraduate**, 2019–

- Nikhil Krishnan, **undergraduate**, 2017–2018

- Elliott Saslow, **undergraduate**, 2017
  (with Zoe Donaldson, MCDB)

- Matthew Hansen, **undergraduate**, 2016–2017

- Jacob Parelman, **postbac**, 2017
  (with R. McKell Carter, Psychology)

- Courtney Van Den Elzen, **grad rotation**
  (IQ Bio Program), 2017

- Six undergrads at UH: two women; one

Goldwater Scholar; and three publications.

- Two undergrads at U Pittburgh: one publication.

Dissertation Committees

- Sabina Altus, Applied Mathematics (CU Boulder), exp 2021
- Jaqueline Wentz, Applied Mathematics (CU Boulder), exp 2020
- Harry Dudley, Applied Mathematics (CU Boulder), exp 2020
- Shelly Jones, Neuroscience (CU School of Medicine), exp 2020
- Elijah Christensen, Neuroscience (CU School of Medicine), 2020
- Joshua Aurand, Applied Mathematics (CU Boulder), 2020
- Callie Federer, Computational Biosciences

- (CU School of Medicine), 2019
- Sama Shretha, Applied Mathematics (CU Boulder) 2019
- Jay Stotsky, Applied Mathematics (CU Boulder), 2018
- John Nardini, Applied Mathematics (CU Boulder), 2018
- Wei-Ting Li, Biology (UH), 2017
- Inomzhon Mirzaev, Applied Mathematics (CU Boulder), 2017
- Changan Liu, Mathematics (UH), 2017
- Jose Manuel Lopez, Mathematics (UH), 2014

Masters Thesis Committees

- Jamie Voros, Aerospace Engineering (CU Boulder), 2020

- Kadambari Suri, Aerospace Engineering (CU Boulder), 2019

Reviewing and Editing

- **Editor:** *Journal of Mathematical Neuroscience*
- **Grant Reviewer:** *NSF/NIH Collaborative Research in Computational Neuroscience (2018, 2019, 2020), Agence Nationale de la Recherche (France), Wellcome Trust Fellowships (UK), NSF – MathBioSys*, and *NSF DMS – Math Biology*
- **Book Reviewer:** *SIAM* and *Taylor & Francis*
- **Conference Abstract Reviewer:** *Cosyne (2014, 2017, 2018, 2019, 2020)* and *International Conference on Mathematical Neuroscience (2016, 2017, 2018, 2019)*
- **Journal Referee:** *Biological Cybernetics*; *Chaos*; *Discrete and Continuous Dynamical Systems Series B*; *European Journal of Applied Mathematics*; *Frontiers in Computational Neuroscience*; *Frontiers in Systems Neuroscience*; *Journal of Computational Neuroscience*; *Journal of Mathematical Biology*; *Journal of Mathematical Neuroscience*; *Journal of Neurophysiology*; *Journal of Neuroscience*; *Nature Communications*; *Neural Computation*; *Neural Networks*; *Neurocomputing*; *Nonlinearity*; *Physica D*; *Physical Review E*; *Physical Review Letters*; *PLoS Computational Biology*; *PLoS One*; *Scientific Reports*; *SIAM Journal of Applied Dynamical Systems*; *SIAM Journal of Applied Mathematics*; and *SIAM Journal on Mathematical Analysis*

Affiliations and Memberships

- **Affiliate Faculty, Interdisciplinary Quantitative Biology Program, BioFrontiers Institute, University of Colorado Boulder**
- **Affiliate Faculty, Center for Neuroscience, University of Colorado Boulder**

- **Member, Society for Industrial and Applied Mathematics**

COMMITTEES
- **IQ Biology Academic Advising Committee**, CU Boulder, BioFrontiers Institute, 2018–
- **Graduate Studies Committee**, CU Boulder, Department of Applied Mathematics, 2017–
- **Graduate Partial Diff Eqn Exam Committee**, CU Boulder: 1/2017; 1/2018; 1/2019
- **APPM 30th Anniversary Celebration Committee**, CU Boulder, 2019
- **College of Engineering/Applied Mathematics Partnership Committee**, CU Boulder, 2017–2018
- **Colloquium Chair**, CU Boulder, Department of Applied Mathematics, 2017–2018
- **Awards Committee**, CU Boulder, Department of Applied Mathematics, 2016–2017
- **Graduate Studies Committee**, UH, Department of Mathematics, 2014–2015
- **Gulf Coast Consortium for Theoretical and Computational Neuroscience**, UH/Rice University/Texas Medical Center, 2012–2016
- **Colloquium Committee**, UH, Department of Mathematics, 2012-2016
- **NETWORKS Seminar Committee**, UH, 2012–2016

OUTREACH
- **National Alliance for Doctoral Studies in the Mathematical Sciences**, mentor, 2014–
- **Association for Women in Math**, U Utah, alumnus mentor, 2016–2017
- **Summer Undergraduate Research Fellowship**, UH, professional development panelist, 2015
- **SIAM/AMS Student Chapter**, UH, professional development panelist, 2013–2016
- **Cougar and Houston Area Mathematics Program (CHAMP)**, UH, facilitating high school mathematics outreach program, 2013–2016

INDUSTRY CONSULTING

2019–20	Corporate Data Science Instructor, **Data Society**, Washington DC
2018	Scientific & Technical Consultant, **FullContact**, Denver CO