Curriculum Vitae

Richard Sebastian Eydam

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Neural Circuits and Computations Unit
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Positions

Postdoctoral Researcher Neural Circuits and Computations Unit 2021–
RIKEN Center for Brain Science, Wako, Japan

Researcher Laser Dynamics Research Group 2015–2019
Weierstrass Institute for Applied Analysis and Stochastics, Berlin, Germany
Project: CRC-910 „Control of self-organizing nonlinear systems“, A3: „Self-organization and control in coupled networks and time-delayed systems“

Research Interests

My research focuses on nonlinear dynamical systems, in particular coupled oscillators and excitable systems, with applications to neuroscience. I use numerical and analytical methods, with a focus on the study of bifurcations and phase transitions. My goal is to develop detailed models in neuroscience that address neurological disorders, such as epilepsy.

Education

PhD Department of Mathematics and Natural Sciences 2019
Technical University of Berlin, Germany
Thesis: *Mode-locking in Systems of Globally-Coupled Phase Oscillators*

M. Sc. Department of Physics, Free University of Berlin 2011–2014
Student exchange, Department of Physics Uppsala University, Sweden 2012–2013
Master thesis, Free University Berlin, Nonlinear Dynamics Group:
Thesis: *Chaos in Cosmological Models with Scalar Fields*

B. Sc. Department of Physics, Free University of Berlin 2007–2011
Thesis: *Influence of capping-potentials on the electronic structure of double bonds*

Publications

Franović, Igor; Eydam, Sebastian; Deniz, Eroglu
Regime switching in coupled nonlinear systems: Sources, prediction, and control—Minireview and perspective on the Focus Issue. Appeared in: Chaos 34, 120401 (2024); https://doi.org/10.1063/5.0247498.

Eydam, Sebastian; Franović, Igor; Louis, Kang
Control of seizure-like dynamics in neuronal populations with excitability adaptation related to ketogenic diet. Appeared in: Chaos 34, 053128 (2024); https://doi.org/10.1063/5.0180954.

Franović, Igor; Eydam, Sebastian
Patched patterns and emergence of chaotic interfaces in arrays of nonlocally coupled excitable systems. Appeared in: Chaos 32, 091102 (2022); https://doi.org/10.1063/5.0111507.

Franović, Igor; Eydam, Sebastian; Yanchuck, Serhiy; Rico Berner
Collective Activity Bursting in a Population of Excitable Units Adaptively Coupled to a Pool of Resources. Appeared in: Frontiers in Network Physiology, Sec. Networks of Dynamical Systems, Volume 2 (2022); https://doi.org/10.3389/fnetp.2022.841829.

Franović, Igor; Eydam, Sebastian; Semenova, Nadezhda; Zakharova, Anna
Unbalanced clustering and solitary states in coupled excitable systems. Appeared in: Chaos 32, 011104 (2022); https://doi.org/10.1063/5.0077022.

Franović, Igor; Yanchuck, Serhiy; Eydam, Sebastian; Wolfrum, Matthias; Iva Bačić
Dynamics of a stochastic excitable system with slowly adapting feedback. Appeared in: Chaos 30, 083109 (2020); https://doi.org/10.1063/1.5145176

Eydam, Sebastian
Mode locking in systems of globally-coupled phase oscillators.
Dissertation (2019): http://dx.doi.org/10.14279/depositonce-8576

Eydam, Sebastian; Franović, Igor; Wolfrum, Matthias
Leap-frog patterns in systems of two coupled FitzHugh–Nagumo units. Appeared in: Phys. Rev. E, 99 (2019), pp. 042207/1–042207/9; DOI 10.1103/PhysRevE.99.042207

Eydam, Sebastian; Wolfrum, Matthias
The link between coherence echoes and mode locking. Appeared in: Chaos 29, 103114 (2019); DOI 10.1063/1.5114699

Eydam, Sebastian; Wolfrum, Matthias
Mode locking in systems of globally-coupled phase oscillators. Appeared in: Phys. Rev. E, 96 (2017), pp. 052205/1–052205/8; DOI 10.1103/PhysRevE.96.052205

Chapters and Books

Eydam, Sebastian; Louis, Kang
Neural oscillations in the entorhinal grid network from function to pathology. In progress: Springer Nature - Forefronts of Neural Oscillations Research (2025);

Projects

CRC-910 Member: collaborative research center funded by the DFG
Projects: *Control of self-organizing nonlinear systems, A3: Activity patterns in delay-coupled systems, Self-organization and control in coupled networks and time-delayed systems*

Scientific exchange: Belgrade institute of Physics, Serbia, funded by the DAAD
Project: *Emergent Dynamics in Systems of Coupled Excitable Units*

Unpublished Works and Preprints

Eydam, Sebastian
Chaos in Cosmological Models with Scalar Fields, Free University Berlin thesis (2015)

Editorial work and reviews

Guest editor in "Chaos: An interdisciplinary Journal of Nonlinear Science"
Focus Issue: *Regime switching in coupled nonlinear systems: sources, prediction, and control* 2022-2024
Review editor in "Frontiers in Network Physiology" in the section "Networks of Dynamical Systems" 2023-
Reviewer for: Nonlinear Dynamics; SIAM J. on Applied Dynamical Systems; Chaos

Conferences

Bernstein Conference (Germany, Frankfurt) 2025
AP-CCN (Wako, Japan) 2025
Annual Meeting of the JNS (Japan, Niigata) 2025

AP-CCN (Daejeon, Korea) 2024
NEURO2024 (Japan, Fukuoka) 2024
FENS Forum (Vienna, Austria) 2024
COSYNE (Portugal, Lisbon) 2024

2nd RIKEN CBS Co-Creation International Conference (Japan, Wako) 2023
Bernstein Conference (Germany, Berlin) 2023
IBRO (Spain, Granada) 2023
Dynamics Days Europe (Italy, Naples) 2023
Annual Meeting of the JNS (Japan, Sendai) 2023
COSYNE (Canada, Montreal) 2023

Society for Neuroscience (USA, San-Diego) 2022
Bernstein Conference (Germany, Berlin) 2022
COSYNE (Portugal, Lisbon) 2022

Society for Neuroscience (online) 2021
Bernstein Conference (online) 2021

Dynamics Days Europe, (Germany, Rostock) 2019
Control of Self-Organizing Nonlinear Systems, (Germany, Warnemünde) 2018

Dynamics Days Europe, (UK, Loughborough) 2018
Control of Complex Systems and Networks, (Germany, Usedom) 2016
Patterns of Dynamic, (Germany, Berlin) 2016

Selected oral presentations

"The onset of glutamate-induced calcium waves in a Li-Rinzel astrocyte network"
Young Investigators Seminar, (RIKEN, Wako) (2025)

"Metabolic feedback and its potential role in epilepsy"
Oberseminar Nichtlineare Dynamik, (FU/WIAS, Berlin) (2023),
AP-CCN (KAIST, Daejeon) (2024)

"Seizure-like states in firing-rate and spiking neuronal networks"
Young Investigators Seminar, (RIKEN, online) (2021)

"Mode-locked solutions in systems of globally-coupled phase oscillators"
Dynamics Days Europe, (University Rostock, Germany) (2019),
Optical Solitons and Frequency Combs, (WIAS, Berlin) (2019),
Advanced seminar in nonlinear Dynamics (WIAS, Berlin) (2019),
Doctoral thesis defense (TU, Berlin) (2019)

"Leap-frog patterns in systems of two coupled FitzHugh-Nagumo units"
CRC 910 – Symposium, (TU-Berlin, Berlin) (2018)

"Phase Oscillator Mode-Locking"
Photonics Seminar, (WIAS, Berlin) (2017),
Scientific Computing Laboratory Seminar (IPB, Belgrade) (2017),
Applied Dynamical Systems Seminar (TU, Berlin) (2017)

"Chaos in Cosmological Models with Scalar Fields"
Nonlinear Dynamics Research Seminar, (FU, Berlin) (2015)

Selected poster presentations

"Glutamate-Induced Calcium Signaling in Astrocyte Filaments"
JNS, (Niigata) (2025); BC, (Frankfurt) (2025)

"Metabolic dynamics shapes neural activity: a framework for control of epilepsy"
COSYNE, (Lisbon) (2024); NEURO2024, (Fukuoka) (2024); FENS Forum, (Vienna) (2024)

"Metabolic dynamics in systems of quadratic integrate and fire neurons and the connection to epilepsy"
Bernstein Conference (Berlin) (2023)

"Patched patterns and emergence of chaotic interfaces in arrays of non-locally coupled excitable systems"
Dynamics Days Europe, (Napoli) (2023)

"Initiating Seizures in Attractor Networks: Routes to Seizure Activity"
JNS, (Sendai) (2023); IBRO, (Granada) (2023)

"Collective Activity Bursting in a Population of Excitable Units Adaptively Coupled to a Pool of Resources"
Bernstein Conference, (TU, Berlin) (2022); Adaptivity in nonlinear dynamical systems, (PIK, Potsdam) (2022)

"Stochastic excitable system with slowly adapting feedback"
Bernstein Conference, (online) (2021)

"Mode-locking in systems of globally coupled phase oscillators"
Control of Self-Organizing Nonlinear Systems, (Warnemuende, Germany) (2018); Dynamics Days Europe, (UL, Loughborough) (2018)

"Mode-locking in systems of phase oscillators with higher harmonic interaction"
Synchronization and oscillators with generalized coupling, (UE, Exeter) (2016); Control of Complex Systems and Networks, (Usedom, Germany) (2016)

Workshops

Adaptivity in nonlinear dynamical systems, (PIK, Potsdam, Germany)	2022
Optical Solitons and Frequency Combs, (WIAS, Berlin)	2019
Nonlinear Waves and Turbulence in Optics and Hydrodynamics, (WIAS, Berlin)	2017
Control of Self-Organizing Nonlinear Systems, (Wittenberg, Germany)	2017
Dynamics of Delay Equations, (WIAS, Berlin)	2016
Nonlinear Dynamics in Semiconductor Lasers, (WIAS, Berlin)	2016
Synchronization and oscillators with generalized coupling, (University of Exceter)	2016
Control of Self-Organizing Nonlinear Systems, (Wittenberg, Germany)	2015
Waves, Solitons and Turbulence in Optical Systems, (WIAS, Berlin)	2015

Teaching

Lab instructor: Department of Physics, Free University Berlin 2010-2011, 2014
Instructing and supervising experiments in optics, electronics, mechanics, and mathematics introductions

Private tutor: 2015, 2019-2020
Topics: linear algebra, physics, and calculus and stochastics (for economists and construction engineers)

Mentoring:

RIKEN CBS Summer Program: student Cory Wu	2025
RIKEN CBS Summer Program: student Amith Hariharasudhan	2024
RIKEN CBS Summer Program: student Ignacio Taguas Garzón	2023

Lectures & seminars:
RIKEN - Center for Brain Science 2023
Guided reading seminar: *A First Course In Probability* (ISBN-10: 0-321-79477-X)

References

Dr. Louis Kang
Neural Circuits and Computations Unit (unit leader)
RIKEN - Center for Brain Science
louis.kang@riken.jp

Prof. Dr. Igor Franović
Collaborator and mentor
Institute of Physics Belgrade
franovic@ipb.ac.rs

Dr. Matthias Wolfrum
PhD adviser, vice group leader
Weierstrass Institute for Applied Analysis and Stochastics
matthias.wolfrum@wias-berlin.de