Dr. Johanne Hizanidis

Research Interests

- Superconducting oscillators and metamaterials: Theoretical study in collaboration with experimentalists
- Nonlinear dynamics in semiconductor nanostructures, photonic systems, and lasers
- Neuromorphic dynamics and Physical Reservoir Computing
- Complexity, synchronization phenomena, and collective behavior in condensed matter physics

Career Metrics & Achievements

- **Publications**: 46 peer-reviewed articles, 7 conference proceedings, 2 book chapters
- **Citations**: 2233, **h-index**:24 (according to Google Scholar)
- **PhD co-supervision**: 2 completed
- **MSc co-supervision**: 5 completed
- **Research funding**: €239K total (as PI)
- **Conference invitations**: 1 plenary talk, 8 invited talks
- **Awards**: 2025 NSC V. Afraimovich Award for outstanding young scholar in Nonlinear Physical Science

Education

2008 **PhD, Physics**, *Technische Universität Berlin, Germany*
Thesis title: Control of noise-induced spatio-temporal dynamics in superlattices
Supervisor: Prof. Dr. Eckehard Schöll, PhD
Degree: Dr. rer. nat.

2002 **BSc, Physics**, *University of Athens, Greece*
Thesis title: Ring dark solitons
Specialization: Electronics and Telecommunications
Supervisor: Prof. Dimitrios Frantzeskakis
Degree: Ptychion

Professional Experience

Since 2023 **Senior Researcher**
Institute of Electronic Structure and Laser
Foundation for Research and Technology-Hellas (IESL-FORTH)

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2018–2022 **Principal Investigator**
Physics Department, University of Crete
Main research field: **Chimera states and spatio-temporal dynamics in SQUID metamaterials**

2015–2017 **Postdoctoral Researcher**
"Center for Quantum Complexity and Nanotechnology (QCN)", Physics Department, University of Crete
Main research field: **Chimera states: from superconducting oscillators to biological neurons.**

07/2014–12/2014 **Postdoctoral Researcher**
KRIPIS Project "Advanced Materials for Energy", National Center for Scientific Research "Demokritos".
Main research field: **Synchronization phenomena in population dynamics systems.**

07/2012–06/2014 **Postdoctoral Researcher**
Thales Project "Mathematical Modeling of Complex Systems with Applications in Biomedicine, Physics and the Technology of Materials".
Main research field: **Synchronization and collective behavior in complex networks of biological neurons.**

10/2012–02/2014 **Adjunct Professor**
School of Pedagogical and Technological Education (ASPETE), Electronics Department

10/2010–02/2014 **Adjunct Professor**
Technological Educational Institute of Kalamata, Branch of Sparta, Department of Information Technology and Telecommunications

01/2009–06/2010 **Postdoctoral Researcher**
Optical Communications Laboratory, Informatics and Telecommunications Department, University of Athens (Group of Prof. Dimitris Syvridis).
Main research field: **Nonlinear dynamics in lasers and chaotic optical communication.**

10/2002–12/2007 **Research Assistant**
Technische Universität Berlin (Group of Prof. Dr. Eckehard Schöll).
Project title: Sonderforschungsbereich 555 (Complex Nonlinear Processes)
Main research field: **Nonlinear dynamics and control in semiconductor superlattices.**

Research Funding

2018-2022 **Hellenic Foundation for Research and Innovation Grant**
Project title: SQUID Metamaterials: Chimera states and Spatio-temporal dynamics
Host Institute: Department of Physics, University of Crete, Greece.
Principal Investigator: J. Hizanidis.
Budget: 200,000 Euros.

2017-2019 **Program to increase the Competitiveness of NUST "MISiS" among the World**
Project title: Pattern formation in locally coupled SQUID oscillators
Collaborating institutes: Department of Theoretical Physics and Quantum Technologies, MISIS. Moscow, Russia & Department of Physics, University of Crete, Greece.
Leading Scientist: J. Hizanidis.
Budget: 12,000 Euros.

2014 **Scientific Projects 2014, John S. Latsis Public Benefit Foundation**
Project title : Collective behavior in networks of biological neurons: mathematical modelling and software development
Collaborating institutes: NCSR "Demokritos", University of Barcelona, University of Aberdeen, University of Patras, Universiteit van Amsterdam.
Coordinator: J. Hizanidis.
Budget: 12,000 Euros.

2013–2015 **IKYDA**
Supported by the Greek State Scholarship Foundation (IKY) and the German Academic Exchange Service (DAAD).
Project title: Chimera states in dynamical networks of nonlinear systems
Coordinators: J. Hizanidis & A. Provata (Greece), P. Hövel & E. Schöll (Germany)
Budget: 15,000 Euros.

Participation in Major Projects

Currently **Consolidator Grant, European Research Council**
Project title: Beyond Anderson
Principal Investigator: Prof. Konstantinos Makris, University of Crete, Greece

2015-2017 **FP7-REGPOT, European Commission**
Project title: Crete Center for Quantum Complexity and Nanotechnology
Director: Prof. Giorgos Tsironis, University of Crete, Greece

2012-2014 **THALES Program, Greek Ministry of Education**
Project title: Mathematical Modeling of Complex Systems with Applications to Biomedicine, Physics and the Technology of Materials
Principal Investigator: Prof. Tassos Bountis, University of Patras, Greece

2009-2010 **STREP FP-6, European Commission**
Project title: Photonic Integrated Components Applied to Secure chaoS encoded Optical communications systems
Principal Investigator: Prof. Dimitrs Syvridis, National Kapodistrian University of Athens, Greece

2002-2007 **Collaborative Research Center SFB 555, German Research Foundation (DFG)**
Project title: Complex Nonlinear Processes
Principal Investigator: Prof. Eckehard Schöll, Technische Universität Berlin, Germany

Awards and Scholarships

2025 **NSC V. AFRAIMOVICH MEMORIAL AWARD**
for outstanding young scholars in Nonlinear Physical Science

2008 **STIBET Scholarship**
DAAD "Research Assistantship" Program

Participation in Evaluation Panels

- Member of the Panel of the 2025 FNRS Quinquennial Prize in Basic Exact Sciences, Belgium
- Evaluator of Research Proposals for the National Science Center, Poland

Editorial roles

- **Editor for Journal of Computational Science, Elsevier B.V.** (2022).
- **Review Editor for Frontiers in Network Physiology** in the Networks of Dynamical Systems specialty section (2021).
- **Editorial Board Member for Scientific Reports, Nature Publishing Group** in the Mathematical Physics, Thermodynamics and Nonlinear Dynamics Category (2018).

Teaching

Spring Semester 2025 & 2026	**General & Applied Physics II** Undergraduate laboratory and theoretical course, Hellenic Naval Academy
Spring Semester 2023–2025	**Physics for Preparatory Students** Undergraduate theoretical course, Hellenic Military Academy
Winter Semesters 2021 & 2023	**Computational Neuroscience** Graduate course, M.Sc. Program in Cognitive Systems, Open University Cyprus
Spring Semesters 2019 & 2020	**Nonlinear Dynamics & Chaos** Graduate course, Physics Department, University of Crete
Spring Semesters 2017 & 2019	**Abstract Neuron Models** Lecture at the Interdisciplinary Graduate Programme "BRAIN and MIND sciences", University of Crete
Winter Semesters 2013/2014 & 2012/2013	**Physics I: Electrostatics & Electronics** Undergraduate theoretical course, Technological Educational Institute of Sparta, Department of Information Technology and Telecommunications
Winter Semesters 2013/2014 & 2012/2013	**Automatic Control Systems I** Undergraduate laboratory course, School of Pedagogical and Technological Education (ASPETE), Electronics Department
Spring Semester 2011	**Digital Circuits** Undergraduate laboratory course, Technological Educational Institute of Sparta, Department of Information Technology and Telecommunications

Winter Semester 2010/2011	**Analog Electronics** Undergraduate laboratory course, Technological Educational Institute of Sparta, Department of Information Technology and Telecommunications

Student supervision & co-supervision

MSc thesis 2025	"Physical Reservoir Computing with Josephson Junctions", Giorgos Baxevanis, Aristotle University of Thessaloniki, Greece (completed)
Internship 2024	"Nonlinear dynamics of coupled neuromorphic Josephson junctions", Giorgos Baxevanis, Aristotle University of Thessaloniki, Greece
MSc rotation project 2021	"Oscillator model for beat perception", Christos Paschalidis, Brain and Mind Sciences Graduate Program, University of Crete, Greece
BSc thesis 2021	"Neuromorphic computing with Josephson junctions", Dimitris Chalkiadakis, University of Crete, Greece
MSc thesis 2019	"Modelling dynamics using Machine Learning", Maria-Myrto Villia, University of Crete, Greece
MSc rotation project 2018	"Modeling chaotic dynamical systems with recurrent neural networks", Lazaros Mitskopoulos, Brain and Mind Sciences Graduate Program, University of Crete, Greece
BSc thesis 2018	"Chimera states in modular networks: the C.elegans paradigm", Maria-Myrto Villia, University of Crete, Greece
PhD thesis 2018	"Control of collective behavior in laser arrays", Joniald Shena, University of Crete, Greece
PhD thesis 2015	"Synchronization phenomena in lattices of coupled oscillators", Evangelia Panagakou, University of Athens, Greece
MSc thesis 2015	"Study and analysis of MRI data for modelling of neural networks in the brain", Nefeli Tsigkri-De Smedt, University of Athens, Greece
BSc thesis 2014	"Nonlinear Dynamics and Chaos: Simulation of the Lorenz attractor with Easy Java Simulation open software", Anastassia Trompouki, Technological Educational Institute of Kalamata, Greece
BSc thesis 2012	"Study of linear Automatic Control Systems using MATLAB (Simulink), Panagiotis Aleiferis, Technological Educational Institute of Kalamata, Greece
MSc thesis 2007	"Multiple time-delayed feedback control of the coherence resonance in a model showing a global bifurcation", Roland Aust, Technische Universität Berlin, Germany

Talks & Posters in International Conferences

Invited Talk	"Symmetry Transitions and Chaotic Hysteresis in a Non-Hermitian Optical Trimer", *South African-German WE-Heraeus Seminar: Nonlinear dynamics and anomalous transport in low dimension* , February 2026, Cape Town, South Africa
Plenary Talk	"Superconducting oscillators: From collective dynamics to neuromorphic computing", *Nonlinear Science and Complexity*, August 2025, Rio Claro, Brazil

Talk T. Christopoulos, J. Hizanidis, G. Nousios, E. E. Kriezis, and O. Tsilipakos: "Assessing passive Q-switching in nanophotonic laser cavities enhanced with 2D materials", *25th International Conference on Transparent Optical Networks (ICTON 2025)*, July 2025, Barcelona, Spain

Talk "Nonlinear Dynamics and Collective Behavior in Dissipative Optical Arrays with Complex Couplings", *XLV Dynamics Days Europe*, June 2025, Thessaloniki, Greece

Talk "Chaotic dynamics in optical waveguide trimers: from active coupling to PT-symmetry", *XLIV Dynamics Days Europe*, July 2024, Bremen, Germany

Invited Talk "Complex dynamics of superconducting neurons", *XLIV Dynamics Days Europe*, July 2024, Bremen, Germany

Talk "Dynamical properties of neuromorphic Josephson junctions", *XLIII Dynamics Days Europe*, September 2023, Naples, Italy

Poster "Nonlinear dynamics around higher-order exceptional points", *XLIII Dynamics Days Europe*, September 2023, Naples, Italy

Invited Talk "Multi-branched resonances, chaos through quasiperiodicity, and asymmetric states in a superconducting dimer", *SIAM Conference on Applications of Dynamical Systems*, May 2021, Virtual Cinference, Originally scheduled in Portland, Oregon, U.S.

Talk "Pattern formation and chimeras in SQUID metamaterials", *Symposium in Honor of the 60th Birthday of Giorgos P. Tsironis*, June 2019, Chania, Greece.

Invited Talk "Pattern formation and chimeras in SQUID metamaterials", *School and Workshop on Patterns of Synchrony, Chimera States and Beyond*, May 2019, ICTP, Trieste, Italy.

Poster L. Mitskopoulos, J. Hizanidis & G. P. Tsironis: "Modelling the Hindmarsh-Rose Chaotic Dynamics with Recurrent Neural Networks", *Symposium on Machine Learning and Dynamical Systems, Imperial College London*, February 2019, London, UK.

Talk "Flux bias-controlled spatio-temporal dynamics in SQUID lattices", *Nonlinear Localization in Lattices – NLL 2018*, June 2018, Spetses, Greece.

Talk "Robust chimera states in superconducting metamaterials", *PhysCon*, July 2017, Florence, Italy.

Talk P. Hövel, A. Schmidt, T. Kasimatis, J. Hizanidis & A. Provata: "Chimera patterns as complex systems: Examples from two-dimensional networks of coupled neurons", *Crossroads in Complex Systems*, IFISC, June 2017, Mallorca, Spain.

Talk P. Hövel, J. Hizanidis, T. Isele & A. Provata: "Controlling chimera states by a block of excitable units", *Patterns of Dynamics 2016*, July 2016, Berlin, Germany.

Talk "Chimeras in locally coupled SQUIDs: Lions, goats and snakes ", *Quantum metamaterials and Quantum Technology*, June 2016, Spetses, Greece.

Invited Talk "Chimeras in SQUIDs: lions, goats and snakes", *XXXVI Dynamics Days Europe*, June 2016, Corfu, Greece.

Talk E. Panagakou, J. Hizanidis, P. Hövel, I. Omelchenko, E. Schöll & A. Provata: "Chimera states in population dynamics: networks with fragmented and hierarchical connectivities", *Conference in Complex Systems (CCS'15)*, September 2015, Arizona, USA.

Talk "Chimera-like dynamics and metastability in the C.elegans brain network", *PhysCon*, August 2015, Istanbul, Turkey.

Invited Talk "Chimera-like states in modular neural networks", *MACOMSYS Thales Workshop*, July 2015, Patras, Greece.

Talk P. Hövel, A. Vüllings, I. Omelchenko & J. Hizanidis: "Clustered Chimera States in Systems of Type-I Excitability", *WIAS Workshop: Collective dynamics in coupled oscillator systems*, November 2014, Berlin, Germany.

Talk P. Hövel, A. Vüllings, I. Omelchenko & J. Hizanidis: "Chimera states in neuronal systems", *ECCS'14 European Conference on Complex Systems*, September 2014, Lucca, Italy.

Poster I. Omelchenko, A. Provata, J. Hizanidis, E. Schöll & P. Hövel: "Robustness of chimera states", *International Conference on Control of Self-Organizing Nonlinear Systems*, August 2014, Warnemünde, Germany.

Invited Talk "Chimera states in networks of nonlocally coupled neural oscillators", *Greek-Turkish Conference on Statistical Mechanics and Dynamical Systems*, July 2014, Athens, Greece.

Invited Talk "Chimera states in networks of nonlocally coupled neural oscillators", *10th AIMS Conference on Dynamical Systems, Differential Equations, and Applications*, July 2014, Madrid, Spain.

Talk "Clustered Chimera States in Systems of Type-I Excitability", *DPG Spring meeting 2014*, Dresden, Germany.

Invited Talk "Chimera states in networks of biological neurons and coupled damped pendulums", *MACOMSYS Thales Workshop*, July 2013, Heraklion, Greece.

Poster "Chimera states in networks of excitable elements", *XXXIII Dynamics Days Europe*, June 2013, Madrid, Spain.

Poster A. Bezerianos, V. G. Kanas, J. Hizanidis & T. Bountis: "Advanced techniques to model bi-directional communication of neural ensembles: theoretical considerations and obstacles, *AREADNE Research in Encoding and Decoding of Neural Ensembles*, June 2012, Santorini, Greece.

Poster "Nonlinear analysis of Diffusion Tensor Imaging (DTI) data of human brain neuron tracts", *DPG Spring meeting 2012*, Berlin, Germany.

Talk "Control of coherence resonance in semiconductor superlattices", *Chaotic Modeling and Simulation International Conference*, June 2008, Chania, Greece.

Talk "Effect of noise and delay near a global bifurcation in superlattices", *DPG Spring meeting 2008*, Berlin, Germany.

Talk "Delay-induced multistability in a generic model for excitable dynamics", *ASME International Design Engineering Technical Conferences (IDETC)*, September 2007, Las Vegas, USA.

Poster "Delay- and noise-induced dynamics near a global bifurcation", *Dynamics Days Europe*, September 2006, Heraklion, Crete, Greece.

Poster "Noise induced front motion: signature of a global bifurcation", *Constructive Role of Noise in Complex Systems*, July 2006, MPIPKS Dresden, Germany.

Talk "Noise induced fronts in superlattices", *ICFN 2005, 18th International Conference on Noise and Fluctuations*, September 2005, Salamanca, Spain.

Talk "Noise induced moving fronts in semiconductor superlattices", *Dynamic Days Europe 2005*, July 2005, Berlin, Germany.

Talk "Control of noise induced oscillations in semiconductor superlattices", *DPG Spring meeting 2005*, Berlin, Germany.

Talk "Control of noise induced oscillations in semiconductor superlattices", *Dresdner Herbstseminar des Arbeitskreises Nichtlineare Physik*, November 2004, Dresden, Germany.

Poster "Deterministic and stochastic dynamics in semiconductor superlattices", *International Conference and Spring School on Complexity in Science and Society*, July 2004, Patras and Ancient Olympia, Greece.

Poster "Noise induced pattern formation in semiconductor nanostructures", *Workshop on Stochastic Systems with Delay and Memory*, February 2004, Martin-Luther-Universität, Leucorea, Wittenberg, Germany.

Poster E. Schöll & J. Hizanidis: "Control of noise-induced spatiotemporal patterns in superlattices", *15th International Conference on Nonequilibrium Carrier Dynamics in Semiconductors*, July 2007, Tokyo, Japan.

Poster E. Schöll & J. Hizanidis: "Noise-induced current oscillations in superlattices: from stationary to moving domains", *International Conference on the Physics of Semiconductors (ICPS)*, July 2006, Vienna, Austria.

Organization of Workshops & Conferences

- Minisymposium: "Advances in the Theoretical Understanding and Hardware Implementations of Reservoir Computers", Dynamics Days Europe, June 2025, Thessaloniki, Greece.
- Symposium in Honor of the 60th Birthday of Giorgos P. Tsironis, June 2019, Chania, Greece.
- Self-organized patterns on complex networks (SOP), Satellite Workshop of the 8th International Scientific Conference on Physics and Control (PhysCon 2017), July 2017, Florence, Italy.
- Self-organized patterns on complex networks (SOP), Satellite Workshop of the 2016 Conference on Complex Systems (CCS'16), September 2016, Amsterdam, Netherlands.
- 5th Ph.D. Spring School & Workshop on Mathematical Modeling of Complex Systems, July 2015, Patras, Greece.
- 4th Ph.D. Spring School & Workshop on Mathematical Modeling of Complex Systems, July 2014, Athens, Greece.

- Chaos Applications in Telecommunications and Sensors, June 2009, Chania, Greece.
- Dynamic Days Europe, July 2005, Berlin, Germany.

International Collaborations

- Prof. S. Anlage, University of Maryland, USA
- Prof. K. Lüdge, Technische Universität Ilmenau, Germany
- Dr. O. Omelchenko, University of Potsdam, Germany
- Prof. N. Lazarides, Abu Dhabi Polytechnic, United Arab Emirates
- Dr. A. Provata, National Center for Scientific Research "Demokritos", Greece
- Prof. K. Makris, University of Crete, Greece
- Dr. O. Tsilipakos, The National Hellenic Research Foundation, Greece
- Prof. M. Kriezis, Aristotle University of Thessaloniki, Greece

Computer skills

Programming Languages	C++, C, Python, Perl, HTML, bash
Typeset	LaTeX
Software Packages	Mathematica, Matlab
Office Packages	OpenOffice, Microsoft Office
Operating Systems	Linux, Windows

Languages

Greek	Mother tongue
English	Fluent
German	Very good
Russian	Beginner