Curriculum Vitae of Dr. Tobias Kühn, born 13.04.1989 in Oberhausen, Germany

2008	Abitur at the Ricarda-Huch-Gymnasium Krefeld
2008 -2013	Bachelor-Studies of Physics and Mathematics at RWTH Aachen and UPJV Amiens
2011	**BSc in Physics** (thesis title: Edge Magnetism in Mean-Field theory, supervised by Carsten Honerkamp)
2011 - 2014	Master Studies in Physics at the RWTH Aachen with courses mainly in solid state and statistical physics
2013	**BSc in Mathematics** (thesis title: A Solving Method for the Landau-Lifshitz-Slonczewski Equation, supervised by Christof Melcher)
2014	**MSc in Physics** (thesis title: Vertex Parameterization for the 2d-Hubbard Model, supervised by Carsten Honerkamp) Grade for Master thesis / Master colloqium: 1.3/1.0 Grade for Master in total[1]: 1.4
9/2014 - 12/2019	PhD student at the Institut of Computational and Systems Neuroscience (INM-6) of Forschungszentrum Jülich and RWTH Aachen, supervised by Moritz Helias
16/12/2019	Defense of **doctoral thesis** „Path integral methods for correlated activity in neuronal networks“
1/2019 - 3/2019	Internship in the editorial department of the newspaper „Süddeutsche Zeitung“, department „Wissen“ (Science)
9/2014 -12/2018 and 4/2019 - 9/2019	Employee at INM-6, Forschungszentrum Jülich
10/2019 - 8/2020	Postdoc with R. Monasson at Laboratoire de Physique de l‘ENS
9/2020 - 8/2021	Postdoc (ATER) with F. van Wijland at Laboratoire Matière et Systèmes Complexes, Université de Paris
9/2021 - 3/2022	Postdoc with R. Monasson, funded by a fellowship of the German Academic Exchange Service (DAAD)
Since 4/2022	Postdoc with U. Ferrari at Institut de la Vision, Sorbonne Université, INSERM, CNRS

Peer-reviewed publications

2017	**TK**, M. Helias: „Locking of Correlated Neural Activity to Ongoing Oscillations“, PloS Computational Biology, https://doi.org/10.1371/journal.pcbi.1005534
2018	**TK**, M. Helias: „Expansion of the Effective Action around Non-Gaussian Theories“, Journal of Physics A, https://iopscience.iop.org/article/10.1088/1751-8121/aad52e/meta

1 Given in the german system: 1.0 is the best grade, 4.0 satisfactory. Exams graded worse than 4.0 are considered as not passed.

2020	J. Stapmanns[2], **TK**[2], D. Dahmen, T. Luu. C. Honerkamp, M. Helias: „Self-consistent formulations for stochastic nonlinear neuronal dynamics“, Physical Review E, https://journals.aps.org/pre/abstract/10.1103/PhysRevE.101.042124
2021	C. Keup[2], **TK**[2], D. Dahmen, M. Helias: „Transient chaotic dimensionality expansion by recurrent networks“, Physical Review X, https://journals.aps.org/prx/abstract/10.1103/PhysRevX.11.021064
2021	A. van Meegen, **TK**, M. Helias: „Large-Deviation Approach to Random Recurrent Neuronal Networks: Parameter Inference and Fluctuation- Induced Transitions“, Physical Review Letters, https://journals.aps.org/prl/abstract/10.1103/PhysRevLett.127.158302
2022	L. Tiberi[2], J. Stapmanns[2], **TK**, T. Luu, D. Dahmen, H. Helias: „Gell-Mann-Low criticality in neural networks“, Physical Review Letters, https://journals.aps.org/prl/abstract/10.1103/PhysRevLett.128.168301, Editor‘s Suggestion and featured in „Physics“
2023	**TK**, F. van Wijland: „Diagrammatics for the inverse problem in spin systems and simple liquids“, Journal of Physics A, https://iopscience.iop.org/article/10.1088/1751-8121/acb7b4/meta

Preprint

2023	**TK**, R. Monasson: „Information content in attractor networks with variable background connectivity“, arxiv, in preparation

Thesis

2019/2020	**TK**: „Path integral methods for correlated activity in neuronal networks“, http://publications.rwth-aachen.de/record/782370

Reviewer activity

Since 2016	Support of M. Helias for PloS Comput Biology, SIAM Journal of Applied Mathematics, Journal of Statistical Mechanics: Theory and Experiment, Journal of Physics A: Mathematical and Theoretical
Since 2019	Reviewer for Journal of Physics A: Mathematical and Theoretical, Physical Review E

Conference and Workshop Contributions

2015

- Poster at the Retreat of the Institute for Neuroscience and Medicine (INM) of the Research Centre Jülich: „Theory of Phase-locked Correlated Activity to Local Oscillations“

2 Equally contributing authors.

2016

- Talk at the Spring Meeting of the Deutsche Physikalische Gesellschaft (DPG), Regensburg: „Correlated Activity of Periodically Driven Binary Networks“
- Poster at the 9th Bernstein Sparks Workshop: Recent Advances in Recurrent Network Theory: Fluctuating Correlated Dynamics Across Scales, Göttingen: „How does an Oscillatory Drive Shape the Correlations in Binary Networks?“
- Poster at the Bernstein Conference, Berlin: Same title as for the Sparks Workshop
- Poster at the CRCNS Conference, Paris: „Correlations in Binary Networks with Time-dependent Input“

2017

- Poster at the CNS Conference, Antwerp: „Temporal Structure of Synchrony and Unitary Events in Periodically-driven Balanced Networks“
- Poster at the Bernstein Conference, Göttingen: „A Diagrammatic Derivation of the TAP-Approximation“

2018

- Talk at the Spring Meeting of the DPG, Berlin: „Expanding the Effective Action around Non-Gaussian Theories“
- Poster at the Workshop InSpire – New Insights on Complex Neural Dynamics:, Cergy-Pontoise: „TAP-Approximation and beyond with Feynman Diagrams“
- Poster at the Retreat of the Institute of Neuroscience (INM) and the Institute of Complex Systems (ICS) of the Research Centre Jülich (equally contributing second author): „Field Theory for Stochastic Nonlinear Rate Neurons“, awarded with the prize for the „Best Theoretical Poster“
- Poster at Bernstein Conference, Berlin (equally contributing second author): Same title as at INM-Retreat in Jülich

2019

- Talk at the Spring Meething of the DPG, Regensburg: „Functional Renormalization Group for Stochastic Rate Neurons“
- Co-author of posters at the Bernstein Conference, Berlin: „A bridge from large deviation theory to statistical field theory“, „Renormalization Group for Spatially Extended Neuronal Networks“ and „Synopsis of Statistics and Dynamics of Binary and Rate Neuronal Networks“

2020

- „Flash presentation“ at the Journées de Physique Statistique of l‘ENS, Paris: „Diagrammatic expansion of the effective action around non-Gaussian theories“
- Co-author of poster at „Cosyne“ Conference, „Transient chaotic dimensionality expansion by recurrent networks“ (first author C. Keup)

2021

- Talk at Spring Meeting of the DPG, (sections Biological Physics, Chemical and Polymer Physics, Dynamics and Statistical Physics, Physics of Socio-economic Systems): „Dynamics, Statistics and Coding in Random Rate and Binary Networks“
- Poster at Annual Meeting of the DPG: „Diagrammatic expansion of the second Legendre transform around non-Gaussian theories“

2022

- „Flash presentation“ at the Journées de Physique Statistique of l‘ENS, Paris: „Diagrammatic solution to the inverse problem in simple liquids and spin systems“
- Poster at workshop „Building population models for large-scale neural recordings“, Informatics Forum, University of Edinburgh: „Network inference revisited with Feynman diagrams“, joint work with Ulisse Ferrari
- Poster at Bernstein conference, Berlin: „Network inference for spike-count neurons“, joint work with Ulisse Ferrari

2023

- „Flash presentation“ at the Journées de Physique Statistique of l‘ENS, Paris: „Computing the Fisher information in continuous attractor networks“
- Presentations at Spring Meeting of the DPG, Dresden:
  „Quantifying information content in continuous attractor networks“ (talk, joint work with Rémi Monasson)
  „How not to lose spikes: inference methods for spike-count neurons“ (poster, joint work with Ulisse Ferrari)

Invited Talks

2016	PhD-seminar of the Theoretical Physics Department of the University of Heidelberg, „Cold Quantum Coffee“: „Field Theory and (Functional) Renormalisation Group in Theoretical Neuroscience“
2020	At CENTURI, Marseille: „Statistical Physics and Neuroscience“
2022	QBio Seminar, Centre de biologie quantitative de l’ENS-PSL, Paris: „Diagrammatics for the Inverse Problem of the Spike-Count Neuron (and many of its friends)“
2023	Mathematical Biology Seminar at Charles University, Prague: „How harmful is disorder for the representation of space in attractor networks?“

Summer Schools

2015	Participant of the first „Advanced Computational Neuroscience School“, Göttingen
2016	Tutor at the second „Advanced Computational Neuroscience School“, Göttingen
2017	Participant of the Beg Rohu Summer School „Out of Equilibrium Dynamics, Evolution and Genetics“, St. Pierre-Quiberon (only partly attended due to sickness)
2022	Participant of „Mathematical Methods in Computational Neuroscience“ at Fred Kavli Center, Eresfjord, Norway

Teaching and Supervision

2010 - 2014	Tutor for diverse lectures at RWTH Aachen, in Mathematics for non-Mathematicians, including physicists, and Introduction to Theoretical Physics
2016 - 2018	Tutor for exercises of the lectures (RWTH) „Theoretical Neuroscience: Correlation structure of neuronal networks“ (summer terms 2016, 2017 and 2018), „Statistical Mechanics of Neuronal Networks“ (winter terms 2016/17 and 2017/18), „Statistical Physics“ (summer term 2018) and „Computational Neuroscience“ (winter terms 2015/16, 2016/17 and 2017/18)

Oct. 2016 - Dec. 2017	Co-Supervision (together with M. Helias) of the Master thesis of Christian Keup (thesis title: A Neuron Model Independent Path Integral Explored via Binary Assemblies)
2017	As substitute: Two lectures in the course „Theoretical Neuroscience: Correlation structure of neuronal networks“ (at RWTH)
Apr. 2019 - Aug. 2019	Co-Supervision (together with M. Helias) of the Bachelor thesis of Jan Bauer (thesis title: Learning effective data representations with restricted Boltzmann machines)
09/2020 - 06/2021	Teaching at diverse courses at Université de Paris (physics for physicians, mathematical tools for physics (during two semesters), signal treatment with Matlab) and for the Master 2 **ICFP** of the Université de Paris, Sorbonne University, University Paris-Saclay, Ecole Normale Supérieure, Ecole Polytechnique (Tutorials for the Lecture „Statistical Physics“)

Fellowships and Grants

2016 and 2017	Support of M. Helias and C. Honerkamp in writing proposals („Facing the multi-scale problem in neuroscience by the functional renormalization group“ and „Dynamic phase transitions in cortical networks“) for the acquisition of „Exploratory Research Space“-seed funds of RWTH Aachen
2021/2022	Postdoc Fellowship of the German Academic Exchange Service (DAAD, 6 months)