

Personal Information

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Education

- 23.06.2023 **Dr.rer.nat. in computer science**, Faculty of mathematics, computer science and natural sciences, RWTH Aachen,
Dissertation title: Gradient-Free Optimization of Artificial and Biological Networks using Learning to Learn,
1. Advisor: Prof. Dr. Abigail Morrison, 2. Advisor: Prof. Dr. Michael Herty
doi:10.18154/RWTH-2023-09115
- 2013 **Diploma in computer science (Dipl. Inf. = MSc.) with focus on artificial and computational intelligence**, Faculty of informatics, Chair of Computer graphics LS7, TU Dortmund,
Thesis title: Density based Extraction of Salient Regions in Radiological Data,
Advisor: Prof. Dr. Heinrich Müller

Career Summary

- 11.11.2018–
now **Doctoral Student/Research Member**, 1. Simulation and Data Lab Neuroscience (SDL), Institute for Advanced Simulation (IAS), Jülich Supercomputing Centre (JSC), JARA, in the group of Prof. Dr. Abigail Morrison, Forschungszentrum Jülich
2. Institute for Geometry and Applied Mathematics, in the group of Prof. Dr. Michael Herty, RWTH Aachen
 - Gradient free optimization methods applied on
 - Artificial and spiking neural networks (SNNs)
 - Emergent self-organization and self-coordination in multi-agent systems steered by SNNs
 - Meta-Learning and Multi-task learning with SNNs on high performance computing systems
- 23.04.2020–
23.06.2023 **HDS-LEE graduate training program**, offered at the Helmholtz School for Data Science in Life, Earth and Energy

- 02.12.2013– **Software-Coordinator/Research Member**, Institute of Neuroscience and Medicine (INM-6) & Institute for Advanced Simulation (IAS-6) & JARA Institute Brain Structure-Function Relationships (INM-10), in the group of Prof. Dr. Sonja Grün, Forschungszentrum Jülich
- 10.11.2018 Duties involved:
- Implementation of statistical analysis methods for electrophysiological and analog time series data
 - Maintaining the Electrophysiology Analysis Toolkit Analysis Toolkit (Elephant)
 - Helping out other scientists implementing additional analysis methods
- 2008 **Software-internship**, Faculty of informatics, Chair of Computer graphics LS7, TU Dortmund, TU Dortmund
- Detection and classification of nano-sized objects in fluids

Selected Publications

Yegenoglu, A., Subramoney, A., Hater, T., Jimenez-Romero, C., Klijn, W., Pérez Martín, A., van der Vlag, M., Herty, M., Morrison, A., & Diaz-Pier, S. (2022). Exploring parameter and hyper-parameter spaces of neuroscience models on high performance computers with learning to learn. *Frontiers in Computational Neuroscience*, 16. <https://doi.org/10.3389/fncom.2022.885207>

Romero, C. J., **Yegenoglu, A.**, Martín, A. P., Diaz-Pier, S., & Morrison, A. (2022). Emergent communication enhances foraging behaviour in evolved swarms controlled by spiking neural networks. *arXiv preprint arXiv:2212.08484 (submitted to Swarm Intelligence, Springer Nature)*.

Yegenoglu, A., Krajsek, K., Pier, S. D., & Herty, M. (2020). Ensemble kalman filter optimizing deep neural networks: An alternative approach to non-performing gradient descent. *International Conference on Machine Learning, Optimization, and Data Science*, 78–92. https://doi.org/10.1007/978-3-030-64580-9_7

Quaglio, P., **Yegenoglu, A.**, Torre, E., Endres, D. M., & Grün, S. (2017). Detection and evaluation of spatio-temporal spike patterns in massively parallel spike train data with SPADE. *Frontiers in Computational Neuroscience*, 11. <https://doi.org/10.3389/fncom.2017.00041>

Programming Languages

Python	Scientific stack, PyTorch, TensorFlow
C++	STL, Qt- Framework, OpenGL, OpenMP
Java	Android, JUnit, UML
Web	GIT, Html, CSS, Javascript
Math	Matlab, R, Rapid-Miner, \LaTeX , Haskell
Data bank	MySQL

Languages

German	native language
Turkish	native language

English	fluent
Japanese	good
Latin	latinum
French	basic
Tatar	basic

Teaching Experience

- 15.07.2023 **Vast parameter space exploration using Learning to Learn on EBRAINS**, Tutoring, Tutorial, OCNS 2023
<https://cns2023.sched.com/event/1NCef/t12-vast-parameter-space-exploration-using-l2l-on-ebrains>
- 12–14.04.2023 **Introduction to High Performance Computing**, Tutoring, PhD Life Sciences meeting, HBP Workshop, Medizinische Universität, Innsbruck, Austria
<https://biomed-phd.i-med.ac.at/life-science-phd-meeting/>
- 27.03.2023 **Vast parameter space exploration using Learning to Learn on EBRAINS**, Tutoring, Workshop, HBP summit 2023, Marseilles, France
<https://summit2023.humanbrainproject.eu/>
- 2022 & 2023 **Neuroinspired computing**, Tutoring, RWTH-Aachen, Aachen, Deutschland
- 01.-05.08.2022 **Simulation of Biological Neuronal Networks**, Lecture, Bernstein Center Freiburg, Freiburg, Germany
- 18.01.2022 **Introduction into the L2L framework**, Tutoring (online), Bernstein Workshop
<https://bernstein-network.de/wp-content/uploads/2022/01/schedule.pdf>
- 06.-07.10.2022 **Porting Code from Matlab To Python**, Lecture (online), Forschungszentrum Jülich
- 01.-04.02.2021 **Build on EBRAINS I– IV**, Tutoring (online), Workshop, 5th HBP Student Conference 2021
- 21.-22.01.2020 **Large-scale neural network simulations**, Tutoring, Workshop, 4th HBP Student Conference 2020, Pisa, Italy
<https://www.humanbrainproject.eu/en/education/participatecollaborate/student-conference/4th-student-conference/>
- 28.-29.01.2019 **Porting Code from Matlab To Python**, Lecture, Joint Research Centre, Ispra, Italien
- 12.10.2017–11.10.2018 **Python Introduction to Computational Neuroscience**, Tutoring, RWTH Aachen
- 03.2017, 03.2018 **G-Node Advanced Neural Data Analysis Course**, Tutor, Jülich-Barmen
<https://portal.g-node.org/advanced-course-2018/>
- 18.10.2017 **Analyzing neural activity data in the HBP framework using Elephant**, Tutoring, HBP Summit 2017, Glasgow, Scotland
- 15.09.2017 **Elephant Tutorial**, Tutor, HBP Code Jam 2017, Lausanne, Switzerland
<http://neuralensemble.org/meetings/CodeJam8/>
- 13.01.2016 **Data analysis with Elephant**, Tutoring, HBP CodeJam Workshop #7, Manchester, UK
<http://neuralensemble.org/meetings/CodeJam7/>
- 26.09.2015 **Nest and Elephant**, Tutoring, HBP Summit 2015, Madrid, Spain
- 24.–27.11.2014 **Advanced Data Analysis Class**, Tutor, Forschungszentrum Jülich
<https://github.com/SPP1665DataAnalysisCourse>

Scientific Outreach

Organization and program committee of the 4.-7. Human Brain Project Student Conference on Interdisciplinary Brain Research

<https://www.humanbrainproject.eu/en/education-training-career/HBPSC2023/>

Human Brain Project Student Ambassador SP7 & WP5, High Performance Computing & Analytics Platform

<https://www.humanbrainproject.eu/en/education-training-career/education-programme/student-community/student-ambassadors/>

- 26.07.2022 **Artificial and biological learning**, Lecture, JULAB Entdeckerwoche 2022, Forschungszentrum Jülich
- 18.-19.07.2022 **Young Researchers using EBRAINS for tomorrow's scientific challenges**, Lecture at HBP outreach event series (online)
https://www.humanbrainproject.eu/en/education-training-career/yr_workflows/
- 2019 **Gepulste Neuronale Netze lernen zu lernen**, Article, Bernstein Koordinationsstelle 2019, special issue: Bernstein Feature 2019
- 15.-18.10.2018 **HBP Summit Open Day SP5 Booth: Use (Elephant)**, Human Brain Project Summit 2018, Maastricht, Netherlands

Mentoring/Supervision

- 30.03.–30.10.2023 **Supervision BSc. thesis of Mr. Abdelrhman Farag**, Evolutionary Neural Architecture Search using NEST and L2L: Solving the Mountain Car Problem
- 05.02.–11.09.2023 **Co-supervision MSc. thesis of Ms. Yessica Yu**, Evolving Cooperative Drone Swarms for Aerial Firefighting: Spiking Neural Network-Based Control and Adaptive Strategies
- 28.11.2022–01.08.2023 **Supervision MSc. thesis of Mr. Walid Sabouni**, A Neural Network to learn the mapping from fitness to parameter space in the L2L framework
- 01.03.–30.09.2021 **Co-supervision BSc. thesis of Ms. Jessica Yu**, Evolving autonomous agents with simulated brains using L2L and NetLogo

Mentoring projects at the JSC:

- 01.12.2018 – 31.10.2023 Optimizing Current Imaging Pipelines by Whole-Brain Dynamical Models with The Virtual Brain Platform
- 01.11.2021 – 31.08.2023 Whole-brain network modelling, constrained by regional heterogeneities
- 01.10.2021 – 30.09.2023 Sparse and event-based models for deep learning
- 01.07.2022 – 31.12.2023 Biologically plausible reinforcement/imitation learning in spiking networks
- 01.05.2022 – 31.07.2023 Relating slow-wave activity patterns across scales and measurements using a modular analysis pipeline
- 01.10.2022 – 30.09.2023 Spiking neural network simulations reveal the role of place and grid cells in spatial learning

Awards

- 2016 **ICCS2016 Best Paper Award and AFIA price**
<https://www.irit.fr/ICCS2016/node/21.html>
- 2011 **1st place in the projectgroup-praxis-competition of the alumni informatics in Dortmund regarding outstanding projects in computer sciences**

Scientific Presentations

- 27.03.2023 **Gradient free optimization of neuroscience models at different scales with L2L**, HBP Summit 2023, Marseilles, France
- 19.01.2023 **Emergent self-coordination in simulated swarms steered by Spiking Neural Networks**, HBP Student Conference 2023, Madrid, Rey Juan Carlos University, Spain
- 08.12.2022 **Optimizing Spiking Neural Networks with L2L on HPC systems**, End of year colloquium, Forschungszentrum Jülich, Germany
- 13.10.2021 **Hyper-parameter space exploration of neuroscience models on high performance computers with the Learning to Learn framework**, HBP Summit 2021, Belgium (online)
- 10.06.2021 **Optimizing Spiking Neural Networks with Learning to Learn**, HDS-LEE retreat, Monschau, Germany
- 10.06.2021 **HBP Tea & Slides Session – Writing proposals for High Performance Computing (HPC), Cloud and storage resources**, HBP student event, Germany (online)
- 20.07.2020 **Ensemble Kalman Filter Optimizing Deep Neural Networks: An Alternative Approach to Non-performing Gradient Descent**, The Sixth International Conference on Machine Learning, Optimization, and Data Science, LOD2020, Siena, Italy
- 21.10.2019 **Learning to Learn on High Performance Computing**, Society for Neuroscience Meeting 2019, Chicago, USA
- 15.07.2019 **Learning to Learn on High Performance Computing**, OCNS 2019, Barcelona, Spain
- 20.06.2019 **Learning to Learn and Learning to Optimize for High-Throughput Hyperparameter Search using HPC**, Second Workshop on the Convergence of Large Scale Simulation/HPC and Artificial Intelligence, ISC 2019, Frankfurt, Germany
- 03.06.2019 **Using a Kalman filter as optimizer for L2L**, HBP L2L workshop, Fuerberg, Austria
- 15.10.2018 **Utilizing the Elephant and NetworkUnit frameworks within the Collaboratory for an HPC-enabled workflow**, HBP Summit, Maastricht, Netherlands
- 02.07.2018 **Collaborative HPC-enabled workflows on the HBP Collaboratory using the Elephant framework**, INM-ICS Retreat, Forschungszentrum Jülich, Germany
- 10.02.2017 **Spatio-Temporal Spike Pattern Recognition in Massively Parallel Spike Trains**, HBP Student Conference, Vienna, Austria
- 02.02.2017 **Elephant – Tools for the Analysis of Functional Data**, Brainhack 2017, Munich, Germany
- 13.10.2016 **Concrete example of utilizing the Collab to simplify a collaborative simulation-analysis workflow**, HBP Summit 2016, Florence, Italy
- 14.10.2016 **Embedding Elephant in a Simulation-Validation Workflow within the HBP Collaboratory**, HBP Summit 2016, Florence, Italy
- 04.10.2016 **Integrating HPC into a Collaborative Simulation-Analysis Workflow for Computational Neuroscience**, JARA-HPC Symposium, Aachen, Germany
- 13.07.2016 **Spatio Temporal Spike Pattern Detection in Massively Parallel Spike Trains using Formal Concept Analysis**, Young researchers retreat, Osaka, Japan
- 27.09.2016 **Elephant Open-Source Tool for the Analysis of Electrophysiological Data Sets**, HBP Summit 2015 , Madrid, Spain

Full Publication List

Pastorelli, E., **Yegenoglu, A.**, Kolodziej, N., Wybo, W., Simula, F., Diaz, S., Storm, J. F., & Paolucci, P. S. (2023). Two-compartment neuronal spiking model expressing brain-state specific apical-amplification, -isolation and -drive regimes. *arXiv preprint arXiv:2311.06074*.

Yegenoglu, A. (2023). *Gradient-free optimization of artificial and biological networks using learning to learn* [Dissertation]. RWTH Aachen University [Druckausgabe: 2023. - Onlineausgabe: 2023. RWTH Aachen University; Dissertation, RWTH Aachen University, 2023]. Jülich, Forschungszentrum Jülich GmbH, Zentralbibliothek, Verlag. <https://doi.org/10.18154/RWTH-2023-09115>

Yegenoglu, A., Subramoney, A., Hater, T., Jimenez-Romero, C., Klijn, W., Pérez Martín, A., van der Vlag, M., Herty, M., Morrison, A., & Diaz-Pier, S. (2022). Exploring parameter and hyper-parameter spaces of neuroscience models on high performance computers with learning to learn. *Frontiers in Computational Neuroscience*, 16. <https://doi.org/10.3389/fncom.2022.885207>

Romero, C. J., **Yegenoglu, A.**, Martín, A. P., Diaz-Pier, S., & Morrison, A. (2022). Emergent communication enhances foraging behaviour in evolved swarms controlled by spiking neural networks. *arXiv preprint arXiv:2212.08484 (submitted to Swarm Intelligence, Springer Nature)*.

Yegenoglu, A., Krajsek, K., Pier, S. D., & Herty, M. (2020). Ensemble kalman filter optimizing deep neural networks: An alternative approach to non-performing gradient descent. *International Conference on Machine Learning, Optimization, and Data Science*, 78–92. https://doi.org/10.1007/978-3-030-64580-9_7

Süzen, M., & **Yegenoglu, A.** (2019). Generalised learning of time-series: Ornstein-uhlenbeck processes. *arXiv preprint arXiv:1910.09394*.

Quaglio, P., **Yegenoglu, A.**, Torre, E., Endres, D. M., & Grün, S. (2017). Detection and evaluation of spatio-temporal spike patterns in massively parallel spike train data with SPADE. *Frontiers in Computational Neuroscience*, 11. <https://doi.org/10.3389/fncom.2017.00041>

Senk, J., **Yegenoglu, A.**, Amblet, O., Brukau, Y., Davison, A., Lester, D. R., Lührs, A., Quaglio, P., Rostami, V., Rowley, A., Schuller, B., Stokes, A. B., van Albada, S. J., Zielasko, D., Diesmann, M., Weyers, B., Denker, M., & Grün, S. (2017). A collaborative simulation-analysis workflow for computational neuroscience using HPC. In *Lecture notes in computer science* (pp. 243–256). Springer International Publishing. https://doi.org/10.1007/978-3-319-53862-4_21

Yegenoglu, A., Quaglio, P., Torre, E., Grün, S., & Endres, D. (2016). Exploring the usefulness of formal concept analysis for robust detection of spatio-temporal spike patterns in massively parallel spike trains. In *Graph-based representation and reasoning* (pp. 3–16). Springer International Publishing. https://doi.org/10.1007/978-3-319-40985-6_1

Yegenoglu, A., Holstein, D., Phan, L. D., Denker, M., Davison, A., & Grün, S. (2015). *Elephant–open-source tool for the analysis of electrophysiological data sets* (tech. rep.). Computational and Systems Neuroscience. G-Node. <https://doi.org/10.12751/nncn.bc2015.0126>

Yegenoglu, A. (2013). *Dichtebasierte extraktion salienter regionen aus radiologischen daten* [Master's thesis, Technical University of Dortmund] [Diplomarbeit].

Adrian, K., Bürger, F., Bürger, J., Fitzner, M., Jaspers, H., Kleemann, J., Norder, P., Tillmann, C., Winnekens, K., **Yegenoglu, A.**, & Zach, S. (2011). *Cool-IP*. <https://doi.org/10.17877/DE290R-3020>

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