

## PROFILE

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- **PhD student at the IMPRS for Intelligent Systems**
- **Research Interests:** Dynamics of spiking neural networks, models of neuronal plasticity, neuromorphic & reservoir computing, reinforcement learning and evolutionary dynamics

## EDUCATION

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| <b>PhD Computer Science/Theoretical Neuroscience</b><br>International Max Planck Research School for Intelligent Systems | Tübingen, Germany<br>2020 - 2025 |
| <b>MSc Artificial Intelligence</b><br>University of Edinburgh                                                            | Edinburgh, UK<br>2018 - 2019     |
| <b>BSc Mathematics</b><br>University of Athens                                                                           | Athens, Greece<br>2014 - 2018    |

## EXPERIENCE

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| <b>Max Planck Institute for Biological Cybernetics</b><br>Doctoral researcher in the group of Anna Levina                                                                                                                         | Tübingen, Germany<br>2020 - 2024 |
| <ul style="list-style-type: none"><li>– Research focusing on the interaction between network structure and synaptic plasticity</li><li>– Participation in smaller projects on neural data analysis and network dynamics</li></ul> |                                  |
| <b>Ocado Technology</b><br>Software Engineer - Simulation team                                                                                                                                                                    | London, UK<br>2019 - 2020        |
| <ul style="list-style-type: none"><li>– Development and maintenance of the supply chain simulation code used by Ocado</li><li>– Data analysis and optimization of supply chain and warehouse automation processes</li></ul>       |                                  |
| <b>Newcastle University</b><br>Research internship at the ICOS group, supervised by Marcus Kaiser                                                                                                                                 | Newcastle, UK<br>Summer 2018     |
| <ul style="list-style-type: none"><li>– Worked on a novel brain simulation framework aimed at investigating the long-term effects of transcranial stimulation on the brain connectivity of epileptic patients.</li></ul>          |                                  |

## PUBLICATIONS

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### Preprints

1. Fardet T, **Giannakakis E**, Paulun L, and Levina A. Revising clustering and small-worldness in brain networks. 2024.
2. **Giannakakis E**, Khajehabdollahi S, and Levina A. Network bottlenecks and task structure control the evolution of interpretable learning rules in a foraging agent. 2024.
3. Vinogradov O, **Giannakakis E**, Buendia V, Uysal B, Ron S, Weinreb E, Schwarz N, Lerche H, Moses E, and Levina A. Effective excitability captures network dynamics across development and phenotypes. 2024.

4. **Giannakakis E**, Vinogradov O, Buendia V, and Levina A. The topology of E/I recurrent networks regulates the effects of synaptic plasticity. 2023.

## Peer-reviewed Papers

1. Hamidi M, Khajehabdollahi S, **Giannakakis E**, Schäfer TJ, Levina A, and Wu CM. Modular Growth of Hierarchical Networks: Efficient, General, and Robust Curriculum Learning. In: *ALIFE 2024: Proceedings of the 2024 Artificial Life Conference*. MIT Press. 2024.
2. Khajehabdollahi S, Zeraati R, **Giannakakis E**, Schäfer TJ, Martius G, and Levina A. Emergent mechanisms for long timescales depend on training curriculum and affect performance in memory tasks. In: *The Twelfth International Conference on Learning Representations*. 2024.
3. **Giannakakis E**, Khajehabdollahi S, and Levina A. Environmental variability and network structure determine the optimal plasticity mechanisms in embodied agents. In: vol. *ALIFE 2023: Proceedings of the 2023 Artificial Life Conference*. 2023.
4. Khajehabdollahi S, **Giannakakis E**, Buendía V, Martius G, and Levina A. Locally adaptive cellular automata for goal-oriented self-organization. In: vol. *ALIFE 2023: Proceedings of the 2023 Artificial Life Conference*. 2023.
5. Khajehabdollahi S, Prosi J, **Giannakakis E**, Martius G, and Levina A. When to Be Critical? Performance and Evolvability in Different Regimes of Neural Ising Agents. *Artificial Life* 2022:1–21.
6. Khajehabdollahi S, **Giannakakis E**, Prosi J, and Levina A. Reservoir computing with self-organizing neural oscillators. In: vol. *ALIFE 2021: The 2021 Conference on Artificial Life*. 2021.
7. Prosi J, Khajehabdollahi S, **Giannakakis E**, Martius G, and Levina A. The dynamical regime and its importance for evolvability, task performance and generalization. In: vol. *ALIFE 2021: The 2021 Conference on Artificial Life*. 2021.
8. **Giannakakis E**, Han CE, Weber B, Hutchings F, and Kaiser M. Towards simulations of long-term behavior of neural networks: Modeling synaptic plasticity of connections within and between human brain regions. *Neurocomputing* 2020;416:38–44.
9. **Giannakakis E**, Hutchings F, Papasavvas CA, Han CE, Weber B, Zhang C, and Kaiser M. Computational modelling of the long-term effects of brain stimulation on the local and global structural connectivity of epileptic patients. *PLOS ONE* 2020;15:1–21.

## CONFERENCE PRESENTATIONS

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### Contributed Talks

- **Artificial Life Conference 2023** Sapporo, Japan  
*Environmental variability and network structure determine the optimal plasticity mechanisms in embodied agents* July 2023
- **32nd Annual Computational Neuroscience Meeting (CNS 2023)** Leipzig, Germany  
*Local excitation and lateral inhibition enable the simultaneous processing of multiple signals in recurrent neural networks* June 2023
- **Artificial Life Conference 2021** Online  
*Reservoir computing with self-organizing neural oscillators* July 2021

### Posters

- **Bernstein Conference 2024** Frankfurt, Germany

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| <i>Dendritic nonlinearities and synapse-type specific input clustering enable the development of input selectivity in diverse settings.</i>                                                                                                                              | September 2024                    |
| <ul style="list-style-type: none"> <li>• <b>AREADNE 2024</b><br/><i>Overlapping E/I Neuronal Assemblies generate rich network dynamics and enable complex computations.</i></li> </ul>                                                                                   | Milos, Greece<br>June 2024        |
| <ul style="list-style-type: none"> <li>• <b>International Conference on Neuromorphic Computing and Engineering</b><br/><i>Network bottlenecks and task structure control the evolution of interpretable learning rules.</i></li> </ul>                                   | Aachen, Germany<br>June 2024      |
| <ul style="list-style-type: none"> <li>• <b>Computational and Systems Neuroscience Meeting (COSYNE 2024)</b><br/><i>Distinct excitatory and inhibitory connectivity structures control the dynamics and computational capabilities of recurrent networks.</i></li> </ul> | Lisbon, Portugal<br>February 2024 |
| <ul style="list-style-type: none"> <li>• <b>Bernstein Conference 2023</b><br/><i>Inhomogeneous connectivity structures in E/I networks enable the processing of multiple chaotic time series.</i></li> </ul>                                                             | Berlin, Germany<br>September 2023 |
| <ul style="list-style-type: none"> <li>• <b>Computational and Systems Neuroscience Meeting (COSYNE 2023)</b><br/><i>Synaptic-type-specific clustering optimizes the computational capabilities of balanced recurrent networks.</i></li> </ul>                            | Montreal, Canada<br>March 2023    |
| <ul style="list-style-type: none"> <li>• <b>Bernstein Conference 2022</b><br/><i>The topology of E/I recurrent networks regulates their ability to learn the dynamics of chaotic attractors.</i></li> </ul>                                                              | Berlin, Germany<br>September 2022 |
| <ul style="list-style-type: none"> <li>• <b>Computational and Systems Neuroscience Meeting (COSYNE 2022)</b><br/><i>Clustered recurrent connectivity promotes the development of E/I co-tuning via synaptic plasticity</i></li> </ul>                                    | Lisbon, Portugal<br>March 2022    |
| <ul style="list-style-type: none"> <li>• <b>30th Annual Computational Neuroscience Meeting (CNS 2021)</b><br/><i>Recurrent connectivity controls the ability of inhibitory synaptic plasticity to produce E/I co-tuning</i></li> </ul>                                   | Online<br>June 2021               |
| <ul style="list-style-type: none"> <li>• <b>Bernstein Conference 2019</b><br/><i>Local Inhibitory Plasticity boosts the storage capacity and robustness of attractor networks</i></li> </ul>                                                                             | Berlin, Germany<br>September 2019 |

## TEACHING

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| <ul style="list-style-type: none"> <li>• <b>Teaching Assistant</b> at the University of Tübingen<br/><i>Neural Coding (For Neural Information Processing MSc students)</i></li> </ul>                           | 2021 - 2022 |
| <ul style="list-style-type: none"> <li>• <b>Teaching Assistant</b> at the University of Athens<br/><i>Computer Science I (Introduction to Programming for 1st year Mathematics Undergraduates)</i></li> </ul>   | 2017 - 2018 |
| <ul style="list-style-type: none"> <li>• <b>Mathematics Tutor</b> in Athens<br/><i>Tutoring Students preparing for the Panhellenic exam (University Entrance) in Mathematics Physics and Biology</i></li> </ul> | 2014 - 2018 |

## STUDENT PROJECT SUPERVISION

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- **Miriam Bautista Salinero:** Master Thesis
- **Joao Barretto-Bittar:** Master Thesis (co-supervised with Roxana Zeraati)
- **Nicolas Patzlaff:** Master Thesis (co-supervised with Oleg Vinogradov)
- **Akif Erdem Sağtekin:** Student assistant (MSc Student)
- **Margaux Asclipe:** Lab Rotation (MSc Student)

- **Andrej Ilić:** Lab Rotation (MSc Student)
- **Thomas Zenkel:** Essay Rotation (MSc Student)
- **Dana Rapp:** Bachelor Thesis

## ORGANIZING

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- **Co-organizer of the Bernstein PhD Symposium**

September 2023

*A scientific gathering of PhD students taking place during the yearly Bernstein conference*

## SKILLS

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- **Programming:** **Python** (Proficient), **Java** (proficient), **Matlab** (Proficient), **C++** (Some Experience)
- **Libraries:** **PyTorch** (Proficient), **Numpy** (Proficient), **Brian 2** (Proficient), **JAX** (Some Experience), **NEST** (Some Experience)
- **OS:** Linux, Windows

## LANGUAGES

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- **Greek:** Native Speaker
- **English:** Proficient (C2)
- **French:** Upper-Intermediate (B2)
- **German:** Intermediate (B1)
- **Russian:** Intermediate (B1)
- **Persian:** Conversational

## FUNDING, SCHOLARSHIPS AND AWARDS

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|-----------------------------------------------------------------|------|
| • Tübingen AI center PhD funding                                | 2024 |
| • CNS 2023 travel award                                         | 2023 |
| • Eurobank Ergasias Graduate Award                              | 2019 |
| • General Michael Arnaoutis Foundation Scholarship              | 2018 |
| • University of Edinburgh Informatics UK/EU Masters Scholarship | 2018 |
| • Eurobank Ergasias Undergraduate Award                         | 2014 |