Dominik Dold, Dr. rer. nat.

🎓 neuromorphic computing, machine & deep learning, neuroscience, AI
✉ dodo.science@web.de
🌐 https://dodo47.github.io/
🔗 https://www.linkedin.com/in/dominik-dold/

Work experience

2021 – · · · ·	**Internal Research Fellow in AI.** ESA ESTEC, Advanced Concepts Team, Noordwijk.
2020 – 2021	**AI Residency Researcher.** Siemens AI Lab Residency, Siemens AG, Munich.
2017 – 2018	**Visiting Researcher.** Senn group for computational neuroscience, University of Bern.
2016 – 2020	**Doctoral Researcher.** Petrovici group for neuro-inspired AI, Heidelberg University.
2014 – 2015	**Research Assistant.** Evers group for theoretical quantum dynamics, MPIK Heidelberg.

Education

2016 – 2020	**Dr. rer. nat.**, Heidelberg University, Germany. Thesis title: *Harnessing function from form: towards bio-inspired AI in neuronal substrates.*
2014 – 2016	**M.Sc. in Physics**, Heidelberg University, Germany. Thesis title: *Stochastic Computation in Spiking Neural Networks Without Noise.*
2010 – 2014	**B.Sc. in Physics**, Heidelberg University, Germany. Thesis title: *Energy Conservation in Fano Spectral Line Shape Control.*

Awards

2019	**First prize** in the finals of the 2019 **International Collegiate Competition for Brain-Inspired Computing** (ICCBC 2019) at Tsinghua University in Beijing, China.

General skills

Languages	very good writing, reading and communication skills in English
Coding	PYTHON, PyTorch, TensorFlow, Mathematica, Matlab, C(++), HTML
Software	familiar with Linux bash shell and Windows systems, version control (git), integrated testing (jenkins), job scheduler (slurm, moab), SPARQL, AWS
Design	LaTeX, Microsoft Office, Microsoft Powerpoint, Inkscape, TikZ, Gimp
Teaching	co-supervised two Master's theses and supervised lecture tutorials, physics experiments for students and soft skill courses for first-year students
Social	organized the Journal Club of my research group during my PhD, reviewed for the ICANN 2021 conference, chaired the session "Graph Based Methods" at the ICMLA 2021 conference, currently co-organizing the Science Coffee at ESA's ACT.

Communication skills

Selected talks

2022	**International Conference on Neuromorphic Systems (ICONS)**, hybrid. Selected from submitted publications (upcoming).
	International Joint Conference on Neural Networks (IJCNN), Padua, Italy. Selected from submitted publications (upcoming).

Communication skills (continued)

■ **Invited talk at the Observatory of the University of Vienna**, Vienna, Austria.
Invited to the PhD Seminar by Alice Zocchi.

■ **Invited talk at the Max Planck Institute for Astronomy**, Heidelberg, Germany.
Invited to the Galaxy Coffee Seminar by Nadine Neumayer.

2021 ■ **International Conference on Machine Learning and Applications (ICMLA)**, virtual.
Selected from submitted publications.

■ **Spiking Neural Networks as Universal Function Approximators (SNUFA)**, virtual.
Selected from submitted abstracts. Virtual workshop organised by Chiara Bartolozzi, Sander Bohté,
Dan Goodman, and Friedemann Zenke.

■ **International Conference on Neuromorphic Computing (ICNC)**, virtual.
Selected from submitted publications.

■ **International Joint Conference on Neural Networks (IJCNN)**, virtual.
Selected from submitted publications.

2019 ■ **Perception and attention mechanisms in the primate brain**, Paris, France.
Workshop. Invited as part of the Human Brain Project.

■ **Invited talk at Huawei research center**, Hangzhou, China.
Invited by Liao Jianxing & Yansong Chua.

■ **Selected talk at the Cosyne conference 2019**, Lisbon, Portugal.
Selected from submitted abstracts.

2018 ■ **Invited talk at the ETH Institute of Neuroinformatics**, Zurich, Switzerland.
Invited by João Sacramento and Benjamin Grewe.

■ **Intel Neuromorphic Research Community (INRC) workshop**, Reykjavik, Iceland.
Invited by Mike Davies as INRC project representative.

■ **Neuroplasticity: From Bench to Machine Learning**, Guildford, England.
Selected from abstracts. Workshop at the Institute of Advanced Studies, University of Surrey.

■ **From Neuroscience to Machine Learning**, Paris, France.
Invited to workshop at the European Institute for Theoretical Neuroscience.

Poster presentations

2019 ■ **Bernstein conference 2019** in Berlin, Germany.

■ **CNS conference 2019** in Barcelona, Spain.

■ **DS^3 data science summer school** in Paris, France.

■ **IRCN course in neuro-inspired computation** in Tokyo, Japan.

2018 ■ **Bernstein conference 2018** in Berlin, Germany.

■ **EMBO dendrites workshop 2018** in Heraklion, Greece.

2017 ■ **Bernstein conference 2017** in Göttingen, Germany.

■ **CNS conference 2017** in Antwerp, Belgium.

Additional training and experience

June 2020 ■ **AI@Sustainability 72h Hackathon** organized by the Siemens AI Lab.

August 2019 ■ **Team communication – key roles and intercultural contexts workshop.**[†]

June 2019 ■ **DS^3 data science summer school.**
Five-day school co-organized by the École polytechnique & the DATAIA Institute.

March 2019 ■ **IRCN course in neuro-inspired computation.**
Four-day course offered by the University of Tokyo.

■ **University leadership and management (Epigeum).**[†]

Additional training and experience (continued)

February 2019   ◪ **Business management course "Grundlagenwissen BWL".**[†]

October 2018   ◪ **Computational physics with GPUs.**[†]

April 2017   ◪ **Machine learning in science and industry.**[†]
     [†] Courses offered by the Heidelberg graduate academy and graduate school for physics.

Publications

Patent applications

2022   ◪ **D. Dold**, Y. Liu, M. Joblin, M. Hildebrandt. Method and system for anomaly detection in a network.

◪ **D. Dold** & M. Hildebrandt & S. Mogoreanu. A more efficient approach for training graph-based recommender systems that allows for end customer hardware deployment.

2021   ◪ **D. Dold** & J. Soler Garrido. Industrial device and method for building and/or processing a knowledge graph.

◪ **D. Dold** & J. Soler Garrido. Neuromorphic hardware for processing a knowledge graph represented by observed triple statements and method for training a learning component.

◪ **D. Dold** & J. Soler Garrido. Neuromorphic hardware and method for storing and/or processing a knowledge graph.

Peer-reviewed articles & preprints

in prep.   ◪ W. Senn* & **D. Dold*** et al. Lagrangian dynamics of dendritic microcircuits enables real-time error backpropagation across cortical areas.

subm.   ◪ A. Himmelhuber, **D. Dold**, S. Grimm, S. Zillner & T. Runkler. XAI for cybersecurity through combining symbolic and sub-symbolic methods.

in print   ◪ **D. Dold**, J. Soler Garrido, V. Caceres Chian, M. Hildebrandt & T. Runkler. Neuro-symbolic computing with spiking neural networks. *International Conference on Neuromorphic Systems (ICONS)*.

◪ **D. Dold**. Relational representation learning with spike trains. *International Joint Conference on Neural Networks (IJCNN)*.

◪ **D. Dold*** & K. Fahrion*. Evaluating the feasibility of interpretable machine learning for globular cluster detection. *Astronomy & Astrophysics*.

2021   ◪ **D. Dold** & J. Soler Garrido. An energy-based model for neuro-symbolic reasoning on knowledge graphs. *20th IEEE International Conference on Machine Learning and Applications (IEEE ICMLA)*

◪ V. Caceres Chian*, M. Hildebrandt*, T. Runkler & **D. Dold***. Learning through structure: towards deep neuromorphic knowledge graph embeddings. *International Conference on Neuromorphic Computing (ICNC 2021)*.

◪ J. Göltz & L. Kriener et al. Fast and energy-efficient neuromorphic deep learning with first-spike times. *Nature Machine Intelligence, Volume 3*.

◪ J. Soler Garrido*, **D. Dold*** & J. Frank. Machine learning on knowledge graphs for context-aware security monitoring. *IEEE International Conference on Cyber Security and Resilience (IEEE-CSR)*.

◪ **D. Dold** & J. Soler Garrido. SpikE: spike-based embeddings for multi-relational graph data. *International Joint Conference on Neural Networks (IJCNN)*.

Publications (continued)

2020   ■ S. Billaudelle* ... **D. Dold*** et al. Versatile emulation of spiking neural networks on an accelerated neuromorphic substrate. *IEEE International Symposium on Circuits and Systems (ISCAS).*

2019   ■ A. Kungl et al. Accelerated physical emulation of bayesian inference in spiking neural networks. *Frontiers in Neuroscience, 13, 1201.*

      ■ **D. Dold***, I. Bytschok* & M. Petrovici* et al. Stochasticity from function – why the bayesian brain may need no noise. *Neural Networks, 119, 200–213.*

2017   ■ I. Bytschok*, **D. Dold*** & M. Petrovici* et al. Spike-based probabilistic inference with correlated noise. *arXiv:1707.01746.*

<div align="right">* marks equal contributions</div>

Supervised theses

2021   ■ V. Caceres. Towards the integration of graph neural networks into neuromorphic architectures. *Master's thesis, Technical University Munich.*

2018   ■ M. Zenk. Spatio-temporal predictions with spiking neural networks. *Master's thesis, Heidelberg University.*

Research proposals

2021   ■ **D. Dold**. Energy efficient and explainable learning systems for space missions. *ESA Research Fellowship.*

2019   ■ J. Jordan, L. Kriener, **D. Dold**, M. Petrovici & W. Senn. Real-time error-backpropagation for deep cortical microcircuits in spiking neuromorphic systems. *Intel INRC grant (cont.).*

2018   ■ J. Jordan, **D. Dold**, M. Petrovici & W. Senn. Real-time error-backpropagation for deep cortical microcircuits in spiking neuromorphic systems. *Intel INRC grant.*