

ALEXANDRU VASILACHE

Research Scientist, Efficient Machine Learning & Neuromorphic Computing

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SUMMARY

Ph.D. researcher on efficient AI through Neuromorphic Computing, developing low-power ML for time-series processing and hardware-aware applications. Award-winning publications and state-of-the-art results.

My goal is to develop energy-efficient embodied agents with human-like intelligence, curiosity and self-awareness.

EDUCATION

Ph.D. in AI & Neuromorphic Computing

11/2022 – 11/2025

Karlsruhe Institute of Technology (KIT), Germany

Supervisors: Juergen Becker, Yulia Sandamirskaya

Grade: 1.0 (magna cum laude)

B.Sc. and M.Sc. in Computer Science (AI & Robotics)

11/2017 – 10/2022

Karlsruhe Institute of Technology (KIT), Germany

EXPERIENCE

Research Scientist: Embedded Machine Learning

(3 years) 11/2022 – now

FZI Research Center for Information Technology, Karlsruhe, Germany

- Researching, prototyping and shipping efficient ML models, co-designed with specialized hardware for various applications from control to neural decoding, in projects with industry partners (e.g., Siemens, NXP).
- Mentored 16 students, providing technical guidance, delegating tasks, and supporting their research.

SELECTED PROJECTS

Efficient ML for Real-Time Neural Decoding  **2nd Place Winner, Grand Challenge, BioCAS 2024**

- Hybrid DL neuromorphic model for real-time neural decoding of primate motor commands. SOTA performance.

Efficient ML for Sleep Analysis 

Best Paper Award, IECBES 2024

- Hybrid DL neuromorphic model for sleep stage classification from single-lead ECG signal. SOTA performance.

Efficient ML for Vibration-Based Predictive Maintenance 

ICONS 2025

- Neuromorphic ML with vibration signals for predictive maintenance in factories. 3500× energy reduction.

Open-Source Spike Encoding Toolkit 

Best Paper Award, ICONS 2025

- Converting numerical data into sparse signals for energy-efficient ML.

Sparse Neural Architectures for Robotic Control 

Best Student Paper Award, ICANN 2025

- An evolutionary reinforcement learning framework to optimize sparse SNNs for continuous control: competitive performance with a fraction of the parameters of SOTA models (e.g., 66% of SOTA with 0.06% of the weights).

- Sim-to-real transfer by deploying the controllers on a physical inverted pendulum for swing-up and balancing.

Efficient Model-Based RL for Control 

Project Leader, Telluride Workshop 2025

- (WIP) Neuromorphic Model-based RL inspired by Dreamer for sample- and energy-efficient learning.

Deep RL for Efficient Socially-Aware Robot Navigation

Thesis Supervisor

- Hybrid Neuromorphic-Deep RL model for energy-efficient motion planning in dynamic environments.

Achievements and Awards

- Finished PhD with magna cum laude in 3 years at the age of 26.
- Telluride Neuromorphic Workshop 2025: Best New Neuromorph (BNN) Nominee.
- Capo Caccia Neuromorphic Workshop 2024 participant.
- In 1 year of publications: 7 first-author, 3 best paper awards and 2nd place winner in Neural Decoding Challenge.

PUBLICATIONS

- Evolving Spatially Embedded Recurrent Spiking Neural Networks for Control Tasks** ICANN 2025
A Vasilache, J Scholz, Y Sandamirskaya, J Becker
- Efficacy of Spiking Neural Networks for Intrusion Detection Systems** Cyber-AI 2025
L Knapp, M Borsig, I Baumgart, S Nitzsche, A Vasilache, J Becker
- Spiking Neural Networks for Low-Power Vibration-Based Predictive Maintenance** ICONS 2025
A Vasilache, S Nitzsche, C Kneidl, M Tekneyan, M Neher, J Becker
- Training Neural Networks by Optimizing Neuron Positions** LIVING MACHINES 2025
L Erb, T Boccato, A Vasilache, J Becker, N Toschi
- A PyTorch-Compatible Spike Encoding Framework for Energy-Efficient Neuromorphic Applications** ICONS 2025
A Vasilache, J Scholz, V Schilling, S Nitzsche, F Kaelber, J Korsch, J Becker
- Realtime-Capable Hybrid Spiking Neural Networks for Neural Decoding of Cortical Activity** NICE 2025
J Krausse, A Vasilache*, K Knobloch, J Becker*
- Sleep Stage and Apnea Classification from Single-Lead ECG Using Artificial and Spiking Neural Networks** IECBES 2024
G Biri, A Vasilache*, T Hu, M Themistocli, S Nitzsche, J Juhl, C Erler, S Fuhrhop, W Stork, J Becker*
- Hybrid Spiking Neural Networks for Low-Power Intra-Cortical Brain-Machine Interfaces** BioCAS 2024
A Vasilache, J Krausse*, K Knobloch, J Becker*
- Low-Power Vibration-Based Predictive Maintenance for Industry 4.0 using Neural Networks: A Survey** ECMLPKDD 2024
A Vasilache, S Nitzsche, D Floegel, T Schuermann, T Bierweiler, M Mussler, F Kaelber, S Hohmann, J Becker