ALEXANDRU VASILACHE

Research Scientist, Neuromorphic Computing & Efficient Artificial Intelligence

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SUMMARY

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

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

EDUCATION

Ph.D. in AI & Neuromorphic Computing **11/2022 – defense on 20 Nov 2025**
Karlsruhe Institute of Technology (KIT), Germany: Supervisors: Juergen Becker, Yulia Sandamirskaya

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 aplications from control to healthcare, in projects with industry partners (e.g., Siemens, NXP).
- Mentored 16 students, providing technical guidance, delegating tasks, and supporting their research.

SELECTED PROJECTS

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.

Robot Recognition and Localization System for Spot® **Univerity Project**

- Visual detection and localization system for Boston Dynamics Spot® for a hide and seek challenge.

Efficient ML for 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. SOTA performance.

Open-Source Spike Encoding Toolkit **Best Paper Award, ICONS 2025**

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

Achievements and Awards

- Soon to finish PhD 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