Michail **Sapkas**

PhD Researcher · Edge AI · Hardware Accelerators

Padova, Italy

(+39) 366-500-2145 | michail.sapkas@phd.unipd.it | msapkas.github.io | Msapkas | michail-sapkas-270006223

Education

University of Padova, National PhD Programme

Padova, Italy

Ph.D. in Technologies for Fundamental Research in Physics and Astrophysics — *Nov. 2024 – Present*

- Curriculum: Computing. Thesis (provisional): *Hardware Deep Learning Methods for Particle Detection*.
- Tutors: Prof. Marco Zanetti and Prof. Andrea Triossi. Cycle 40 (PNRR-funded scholarship).

University of Padova

Padova, Italy

M.Sc. in Physics of Data — *Oct. 2022 – Sep. 2024*

- Thesis: *Beam Control with Fast Reinforcement Learning Inference at the Edge*, carried out at KIT (Karlsruhe, Germany).

University of Crete

Heraklion, Greece

B.Sc. in Physics — *Sep. 2013 – Apr. 2022*

- Thesis: *Gaussian Beam Tracing in Underwater Acoustics* (grade 10/10), benchmarking BELLHOP against KRAKEN.

Experience

University of Padova & INFN Padova

Padova, Italy

Ph.D. Researcher – Edge AI and Hardware Accelerators — *Nov. 2024 – Present*

- Designed a latency-constrained Gated Recurrent Unit on the AMD Versal AI Engine (VCK190), with a hybrid AIE–PL dataflow; published in JINST (2026).
- Developed a 1D CNN hit-detection model for a CAEN digitizer, converted with HLS4ML, integrated as a Vivado IP, closing timing at 8 ns with 182-cycle latency.
- Working on the Mini Drift Tubes muon telescope: GRU and Transformer models for muon tracking and timing, and a TDC pipeline on an Artix UltraScale+ FPGA with XDMA/PCIe readout.
- Presented the GRU and RL work at TWEPP 2025 and RL4AA'26 (talk and poster).

SLAC National Accelerator Laboratory

Stanford, California, USA

Visiting Researcher – AI Engine Development — *Sep. 2026 – Mar. 2027*

- AI Engine development on the Versal VEK280 platform.

ThinkQuantum

Padova, Italy

AI Engine Developer (occasional contract) — *Jan. 2026 – May 2026*

- Secure boot and BBRAM key provisioning for the Versal VCK190, with boot-image signing and encryption flows.

CAEN S.p.A.

Viareggio, Italy

Research Project – Signal Processing on a Digitizer — *2025 – 2026*

- Six-month project delivering a real-time CNN for trigger and hit-time detection in the CAEN digitizer FPGA, with coincidence trigger logic and an IP wrapper.

Karlsruhe Institute of Technology (KIT), IPE

Karlsruhe, Germany

Visiting Researcher – Reinforcement Learning and Versal AI Engine — *Mar. 2024 – Aug. 2024*

- Built a hardware benchmark system for the Versal VCK190 AI Engines.
- Deployed a modified RL agent for beam control at the KARA synchrotron light source.
- Developed a GRU on the AI Engine for fast inference under latency constraints.

FORTH – Foundation for Research and Technology

Heraklion, Greece

Undergraduate Research Fellow — *Oct. 2021 – Apr. 2022*

- Benchmarked acoustic propagation models (RAMGeo, BELLHOP, KRAKEN) for ship-traffic noise simulation.
- Contributed to the EU QUIETSEAS project on continuous sound assessment in the Mediterranean and Black Seas.

Skills

Hardware	AMD Versal AI Engine, FPGAs (Zynq, Artix UltraScale+), VHDL, Vivado, Vitis, PCIe/XDMA, TDC, hardware benchmarking
Machine Learning	PyTorch, TensorFlow, HLS4ML, QKeras, CNNs, RNNs (GRU), Transformers, autoencoders, knowledge distillation, Reinforcement Learning (DQN, DDPG, PPO)
Programming	Python, C/C++, Fortran, Bash, Dask, Jupyter, LaTeX
Languages	Greek and Italian (native), English (C1)

Talks & Posters

4th Collaboration Workshop on RL for Autonomous Accelerators (RL4AA'26) — *Liverpool, UK*
Talk: Deploying Recurrent Neural Networks on AMD FPGAs – A GRU on the Versal AI Engine — *Apr. 2026*

RL4AA'26 — *Liverpool, UK*
Poster: Designing a Gated Recurrent Unit in the Versal AI Engines — *Mar. 2026*

TECH-FPA PhD Retreat — *Catania, Italy*
Poster: Deploying Inference Models at the Edge — *Feb. 2026*

2nd FPGA Developers' Forum (FDF) — *Italy*
Talk: A Low Latency Gated Recurrent Unit Implementation for the AMD Versal AI Engine — *2025*

TWEPP 2025 – Topical Workshop on Electronics for Particle Physics — *Rethymno, Crete, Greece*
Talk: A Latency-Constrained GRU Implementation in the Versal AI Engine — *Oct. 2025*

Workshop on Electronics for Physics Experiments and Applications (INFN) — *Italy*
Poster — *2025*

CERN Video Lectures — *Geneva, Switzerland*
Talk: CERN Lecture (video available on CERN Document Server) — *2026*

Publications

Journal of Instrumentation (JINST), vol. 21, C03015 — *2026*
M. Sapkas, A. Triossi, M. Zanetti – "A Latency-Constrained, Gated Recurrent Unit (GRU) Implementation in the Versal AIE" — *arXiv:2511.15626*

TWEPP 2025 Topical Workshop on Electronics for Particle Physics — *Rethymno, Greece*
M. Sapkas, A. Triossi, M. Zanetti – same work, conference proceedings — *2025*

TWEPP 2026; IEEE NSS MIC RTSD (Nuclear Science Symposium)
Abstracts accepted (presentations forthcoming) — *2026*

Honors & Awards

2024 **PhD Scholarship**, Ministry of University and Research, PNRR Mission 4 (Component 2) — *Italy*
2022 **Grade 10/10**, B.Sc. thesis, University of Crete — *Heraklion, Greece*

Courses & Schools

PhD course, University of Padova (Prof. Ester Pantaleo) — *Padova, Italy*
Big Data Modelling and Learning (passed) — *2025 – 2026*

PhD course, University of Padova (Prof. Giorgio Carlo Buttazzo) *Padova, Italy*

Deep Neural Networks (passed) *2026*

PhD course, University of Padova (Prof. Andrea Duggento) *Padova, Italy*

Introduction to Neuromorphic Computing (passed) *2025*

PhD course, University of Padova (Prof. Andrea Fabbri) *Padova, Italy*

Programmable SoC for Data Acquisition and Processing (passed) *2025*

School *Italy*

ISOTDAQ – International School of Trigger and Data Acquisition *2025*

Course *Italy*

Advanced course in FPGA programming *2025*

2nd AI-INFN Advanced Hackathon, Collegio Borromeo *Pavia, Italy*

AI-INFN Advanced Hackathon (HLS4ML on AMD FPGAs) *Nov. 2025*

Retreat, INFN Laboratori Nazionali del Sud *Catania, Italy*

TECH-FPA PhD Retreat *Feb. 2026*