# Spyridon Liaskonis

sliaskonis | Spyridon Liaskonis | Personal Website | spirosliaskonis@gmail.com | +306984713711

## Education

2020 - Present Diploma (5 years) in Electrical and Computer Engineering
**University of Thessaly**, Volos, Greece

## Research Interests

Computer Architecture, Hardware Accelerators, High-Performance Computing, Embedded Systems, Operating Systems, Deep Learning.

## Skills

- **Programming Languages , Libraries:** C, C++, Python, CUDA, OpenMP, OpenMPI, Verilog, HLS C/C++, MATLAB, NumPy, Matplotlib
- **Tools:** git, make, PyTorch, TensorFlow, Xilinx Vitis HLS, Xilinx Vivado, Intel Vtune Profiler, Intel PIN, Intel Advisor, LaTeX, Linux, Bash, ONNX

## Thesis

**Automatic Quantization and Pruning of Convolutional Neural Networks for FPGA Deployment (Ongoing)**

Developing the framework **rl4finn**, which automates the optimization and deployment of neural networks on FPGA platforms. The framework integrates reinforcement learning (RL) to explore and optimize quantization strategies, enabling efficient hardware deployment. Key contributions include:

- Designed RL reward functions to optimize neural network quantization for FPGAs.
- Automated pruning of CNNs using Vitis AI to reduce model complexity.
- Trained an RL agent to explore the vast space of quantization strategies and applied the optimal strategy to the network.
- Expanding framework support for various FPGA platforms and validating it on multiple network architectures.

*Technologies/Tools:* FINN, ONNX, PyTorch, Brevitas, Gymnasium, Vitis-AI

## Selected Academic Courses - Projects

**ECE 338: Parallel Computer Architecture (Ongoing) — Based on** Computer Architecture: A Quantitative Approach **by Patterson & Hennessy** *Technologies:* Intel Pin, ChampSim

- Implementing machine learning-based branch prediction for hard-to-predict branches.
- Developing a neural network trained specifically on hard-to-predict (H2P) branches, inspired by the works of BranchNet and Tarsa et al.
- Testing and evaluating the network on SPEC 2017 benchmarks using the ChampSim simulator.

**ECE 340: Embedded Systems (Grade 9.75/10)** *Technologies:* C, OpenCL, Verilog, Vivado, Vitis HLS, PetaLinux

- Hardware acceleration of the Smith-Waterman Local Sequence Alignment algorithm for Genomics using the Vitis High-Level Synthesis toolset, on a low-power FPGA MPSoC.
- Performance measurement of bare-metal embedded software on an ARM processor.
- IEEE 754 compatible Floating-Point Adder in Verilog on an FPGA. Project Repository

**ECE 415: High-Performance Computing (Grade: 9.5/10)** *Technologies:* C, CUDA, OpenMP, AVX

- Parallel implementation of a Sobel Filter with OpenMP.
- GPU acceleration of a separable convolution kernel with CUDA.
- GPU acceleration of a histogram equalization algorithm with CUDA.
- CPU/GPU acceleration of an N-body simulation with OpenMP/CUDA. Project Repository

**ECE 333: Digital Systems Lab** *Technologies:* Verilog, Xilinx Vivado

- A 7-Segment Display Driver to display a scrolling message.
- A UART serial communication system.
- A VGA driver used to drive a conventional monitor and depict a variety of images. Project Repository

**ECE 445: Parallel & Distributed Computing (Grade 9/10)** *Technologies:* C, OpenMP, OpenMPI

- Designed and implemented parallel algorithms for matrix multiplication and the Jacobi method using OpenMP, focusing on thread distribution, scheduling, and performance optimization.
- Designed and implemented parallel algorithms for calculating communication costs in a distributed system, using MPI to measure point-to-point and broadcast communication times, and optimizing performance for matrix-vector multiplication and sorting algorithms. Project Repository

**ECE 447: Neuro-Fuzzy Computing (Grade 8.84/10)** *Technologies:* PyTorch, NLTK

- Fine-tuned the BERT architecture for news classification
- Applied data preprocessing using NLTK.
- Trained and evaluated the model using PyTorch, optimizing performance through hyperparameter tuning.

**ECE494: Processor Design (Grade 10/10)** *Technologies:* FINN, PyTorch, Brevitas, ONNX

- Hardware acceleration of Quantized Deep Neural Networks on FPGAs using the FINN compiler by Xilinx
- Evaluation of several levels of quantization and the effects on accuracy, performance, and resource utilization.

**ECE 513: Circuit Simulation Algorithms (Grade 10/10)** *Technologies:* C++, FLEX, Bison, Eigen, CMAKE

- Developed a complete circuit simulation program like SPICE in C++.
- Implemented parsing, equation formulation, and solution techniques (direct and iterative methods) for linear circuits.
- Utilized sparse matrix techniques and external libraries (Eigen) for efficient computation.
- Performed transient analysis to simulate circuit behavior over time. Project Repository

**ECE 318: Operating Systems (Grade 7/10)** *Technologies:* Linux

- Benchmarking alternatives of Shortest-Job First (SJF) on a VM that emulates the API of the Linux scheduler.
- Implementation of a user-space file system based on FUSE with support for basic file operations.
- Modifying the SLOB memory allocator to use the First-fit algorithm for both page and block allocation.

**ECE 340: Concurrent Programming (Grade 8.5/10)** *Technologies:* C, PThreads

- Implemented a coroutine-based system for concurrent code execution with explicit switching, using functions to manage execution contexts. Extended the implementation to support concurrent execution with threads using automatic switching via an alarm/timer and a round-robin scheduling policy.
- Implementation of many concurrent algorithms in C/Java using Semaphores/Monitors. Project Repository

## Voluntary Work/Extra Curriculars

- Teaching Assistant for ECE219: Computer Organization and Design (September 2024- Present)
  Examination of laboratory assignments on MIPs assembly programming, Verilog implementation of a MIPs CPU, and performance analysis and optimization of computationally intensive algorithms on x86 CPUs.
  Reference: Prof. Nikolaos Bellas

- Teaching Assistant for ECE220: Numerical Analysis (February 2025 - Present)
  Assisted students in teaching lab sessions for a course covering key topics in numerical analysis and the application of numerical methods using MATLAB.
  Reference: Prof. Panagiota Tsompanopoulou

## Languages

**English:** Professional Working Proficiency (ECCE Certification)
**Greek:** Native Speaker