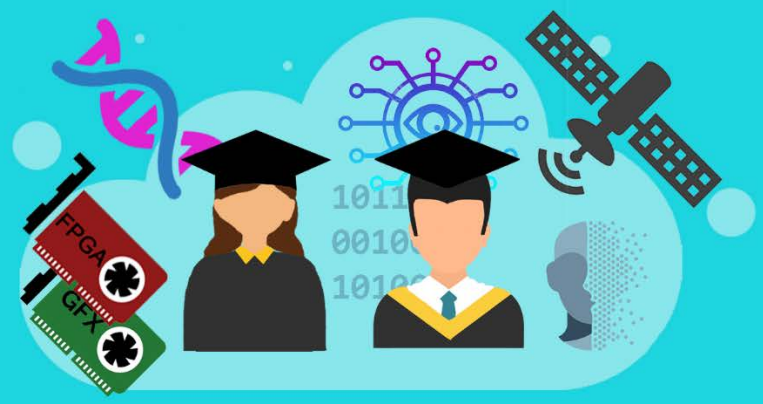
Diploma Thesis

Microproccessors and Digital Systems Laboratory



Neural Networks on Heterogeneous VPUs

The end of Dennard Scaling and miniaturization improvements has led the industry and research to explore new avenues to cope with the increasingly complex new algorithms and applications, like AI. One of the most prominent ways to achieve this is through the introduction of Heterogeneous Computing.

Vision Processing Units or **VPUs** is a new category of specialised and highly heterogeneous processors, both in computational units and in memory, that offer very high performance in a small power envelope. Intel/Movidius Myriad 2 & Myriad X VPUs are some of the best representatives of this category offering 50x increased performance/Watt improvement over traditional CPUs. Leveraging the capabilities of such devices is not an easy task though and requires significant effort from the developer's side as well as in depth knowledge of the underlying hardware.

In an effort to, smoothen the learning curve and increase programmability, microlab is developing a framework named **ParalOS**. The goal of this framework is to achieve the aforementioned features, while also maintaining high performance and allowing low level optimisations.

The **goal of this diploma thesis** is to create a neural network inference engine for the Myriad family of VPUs based on the ParalOS Framework. The engine shall be capable of executing state of the art networks like Resnets, and YOLO family of detectors. A basic neural network engine is already implemented and can be used as a foundation.

Keywords

VPU, Heterogeneous Computing, Neural Networks, Parallel Programming, Embedded Systems.

Prerequisites

- Good knowledge of C/C++
- Familiarity with Python Good Knowledge of Python
- Basic knowledge of Computer Architecture
- Basic knowledge of Neural Networks
- Experience with parallel programming and Operating Systems is a plus.

Academic Advisors:

- Evangelos Petrongonas (vpetrog@microlab.ntua.gr)
- Vasileios Leon, PhD (vleon@microlab.ntua.gr)
- George Lentaris, Dr (glentrar@microlab.ntua.gr)
- Prof. Dimitrios Soudris: (dsoudris@microlab.ntua.gr)