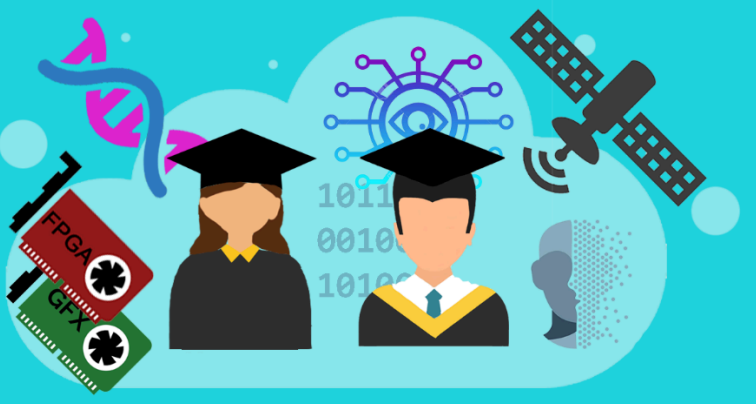
# Diploma Thesis

Microproccessors and Digital Systems Laboratory




## Intelligent Kernel Mapping in Heterogeneous GPUs

Graphics Processing Units (GPUs) have revolutionized computing by enabling high-performance acceleration for a wide range of general-purpose applications. Initially designed for rendering graphics, GPUs have become indispensable in accelerating compute-intensive tasks, especially in the field of Artificial Intelligence (AI), High Performance Computing (HPC) and Big Data.

As the range of application widens, heterogeneous GPU architectures have emerged, integrating different types of cores within a single GPU. These architectures offer specialized cores tailored for different workloads, allowing for more efficient processing. Maximizing performance in such environments requires intelligent techniques for mapping each computational kernel to the most suitable GPU core type. Without optimal mapping, applications may suffer from resource underutilization, increased execution time, or energy inefficiency.

This thesis aims to develop intelligent techniques for kernel mapping in heterogeneous GPU architectures. The research will explore various methods, including machine learning models, static code analysis, and dynamic runtime characterization. The goal is to create a mechanism that can automatically and efficiently map kernels to the optimal cores, improving overall performance and resource utilization in heterogeneous GPU systems. This work will pave the way for more intelligent and adaptive execution environments in modern computing platforms.

**Prerequisites:** C/C++, Python, Basic concepts of AI/ML, GPU architecture

**Desirable:** Familiarity with Linux, Bash scripting

**Related Material:**

https://doi.org/10.1109/MICRO.2003.1253185, https://doi.org/10.1109/VDAT50263.2020.9190559, https://dl.acm.org/doi/abs/10.1145/2400682.2400691

**Contact information:**

Asst. Prof. Sotirios Xydis (sxydis@microlab.ntua.gr)

Konstantinos Iliakis (kiliakis@microlab.ntua.gr)

Panagiotis Eleftherakis (pelef@microlab.ntua.gr)