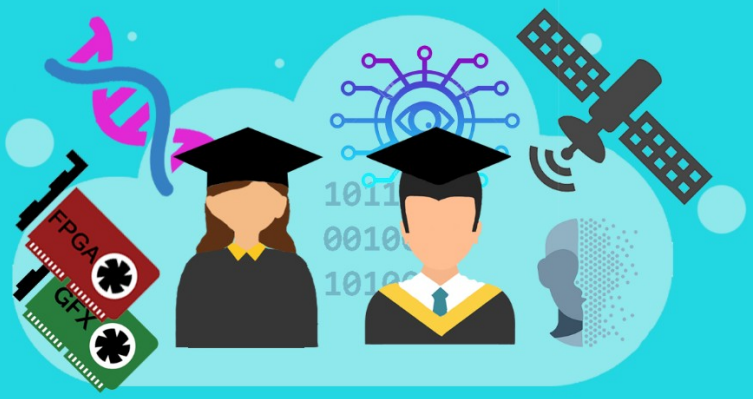
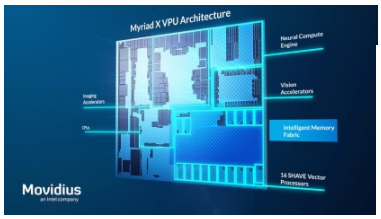
Diploma Thesis

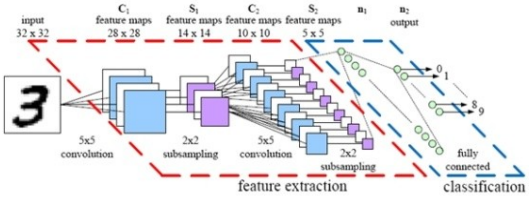
Microproccessors and Digital Systems Laboratory



EFFICIENT DEPLOYMENT OF CONVOLUTIONAL NEURAL NETWORKS IN LOW POWER EMBEDDED ARCHITECTURES

Convolutional Neural Networks (CNNs) offer improved machine vision, which is beneficial in numerous tasks, such as object detection/identification and stereoscopic vision. CNNs are critical components of modern applications in autonomous vehicles, in medical image analysis and many others. However, breathing improved machine vision capabilities into embedded platforms is a different challenge on its own. Myriad is a low power embedded processor by Movidius/Intel that provides a lot of features for efficient deployment of computer vision and artificial intelligence applications. Myriad has been integrated in battery-operated devices, such as DJI drones, to handle the execution of CNN-based applications.





This thesis will contribute to the development of a CNN engine for the Intel/Movidius Myriad embedded processor that provides low execution time and energy consumption for modern CNN-based applications, along with a user-friendly Caffe-like API. Myriad 2 exposes a lot of the challenges present in modern hardware, since it is a multiprocessor, VLIW, SIMD SoC with multiple memory hierarchies.

The contribution of the student in this project can be in one or more of the following areas:

Extending the CNN engine with new features (high-level API, support for complex CNNs, ...)

Development of a runtime system in Myriad that will improve resources utilization.

The use cases for evaluation include terrain classification and face emotion detection applications. The **Movidius Myriad evaluation board/MDK**, the **Intel Neural Compute Stick** and the **Caffe** framework will be heavily used during the whole duration of the thesis. Finally, this thesis will be conducted in close collaboration with Movidius/Intel, Ireland and with the University of Castilla, Spain. Information on Movidius Myriad can be found in: http://movidius.com/.

PREREQUISITES Excellent C/C++ and basic knowledge of multicore embedded systems is required. Basic background in neural networks is highly desirable. Familiarity with the Caffe framework is a strong plus.

KEYWORDS: Convolutional Neural Networks, resource management, low power embedded processors.

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