Faculty of Electrical Engineering & Computer Science
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City University of Applied Sciences

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Homero Muñoz Ruiz

Energy Efficient Convolutional Neural Network Architectures for Embedded Applications.

ABSTRACT - Masterthesis

Convolutional Neural Network algorithms have developed an exceptional performance in computer vision areas. Nowadays, there is more talk about technological advances where CNNs play an important role, such as self-driving cars in the automotive industry, monitoring in the smart industry or image-based disease in the medical area. However, the use of these technologies is also distinguished by the high computational cost and the high memory they require. This condition restricts them from using high-performance computers equipped with processor modules that are power-hungry units. This condition is a disadvantage to implementing these technologies in devices with more limited resources. That is why the interest in this topic has grown in recent years.

This project is focused on CNNs for analytics in embedded systems. Since using these methods has a high computational cost, which requires high-performance hardware (GPUs, TPUs), this project focuses on employing design methodologies suitable for low-power resource-limited embedded systems (Low-power FPGA). This methodology consists of a machine learning pipeline from data ingestion through training and deployment and is applied for sensor analytics for health structural analysis.

This project aims to research and design exploration of CNN-based algorithms with reduced resource utilization and energy consumption by employing CNNs in Field Programmable Gate Arrays for applications that require acceleration and energy efficiency. Implementation of CNN-based algorithms will be on the processing unit of the Xilinx Zynq-7000 board.