1 Introduction

The goal of this project is to implement a convolutional neural network (CNN) in the C++ language and use High Level Synthesis (HLS) to synthesise it into a Field Programmable Gate Array (FPGA) compatible hardware description.

A pre-trained CNN is provided in this project. It has been trained on the CIFAR-10 dataset which consists of 32x32 colored images in 10 classes. A good implementation making good use of the coeficients needs to be implemented before working on the hardware part of this project.

In fact, the first step is a python model of the CNN without using convolution specific libraries. The CNN should be tested using a user-friendly language such as python before using the CNN in environment that are harder to debug. The pyhton model is also used in the embedded systems project to build a software, C language CNN.

The model can then be converted to C++ while taking precautions to ensure that the written code is synthesisable and somewhat optimised when going through the HLS flow.

Finally, the code can then be flashed on chip and tested using a VGA controller to visualise the results of the completed CNN on screen.

2 Work distribution