

# An FPGA Implementation of a Deep Variational Autoencoder using hls4ml package

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## Abstract

## 1 Introduction

The hls4ml package was developed by members of High Energy Physics (HEP) community to translate machine learning (ML) algorithms into high level synthesis (HLS) code. In the project development, hls4ml was used as the tool to perform this transformation on a trained *Variational Autoencoder* model. A schematic workflow is shown in the figure 1 below.

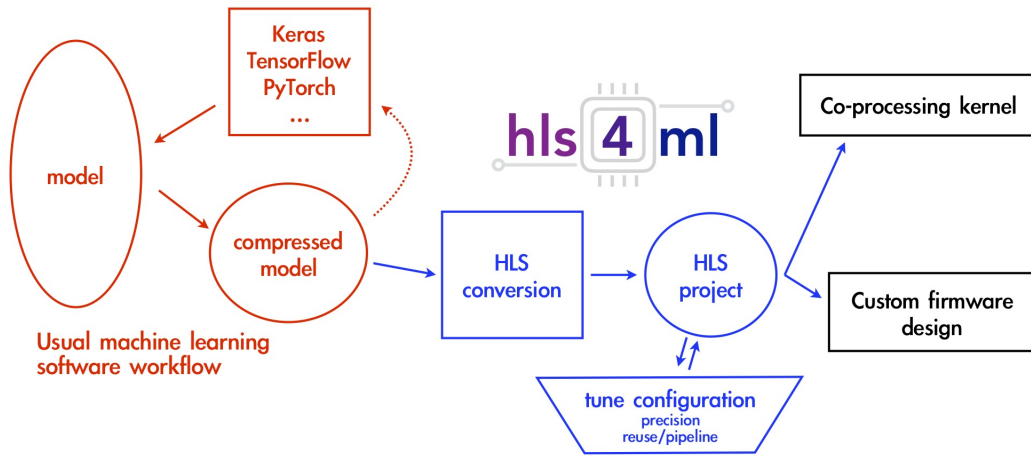


Figure 1: A typical workflow to translate a model into an FPGA implementation using hls4ml.

The goal of the hls4ml package is to empower a HEP physicist to accelerate ML algorithms using FPGAs, thanks to its tools for ML models conversion into HLS. Indeed, hls4ml makes the translation of Python objects into

HLS, and its synthesis automatic workflow, allowing fast deployment times also for those who know how to write software or are not yet experts on FPGAs.

## **2 Model Implementation**

## **3 Training and compression**

## **4 FPGA Implementation of the Model**

### **4.1 Laboratory Implementation**

## **5 Experimental Results and discussion**

## **6 Conclusions**