ProjectAbstract

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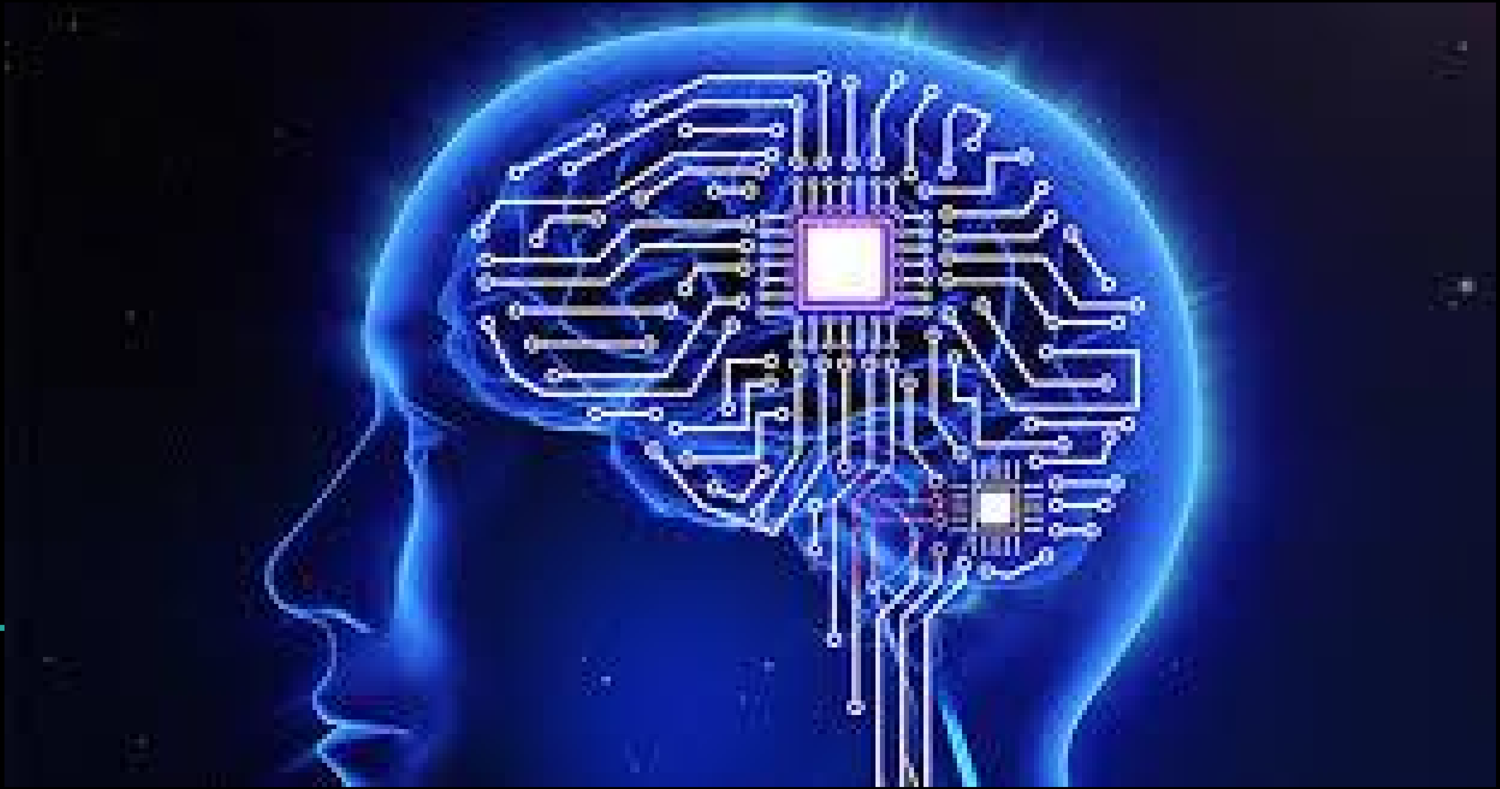

The core functionality of an FPGA in terms of parallelism and re-programmability using limited power make them in the present day, forerunner hardware candidates for improving Artificial Intelligence models in terms of energy and time efficiency.

The amount of data required to be processed for a meaningful insight to be derived from machine learning models is huge and this sort of computation is most generally realized today through the cloud. Consequently , firms providing computing-systems as a service- such as Amazon and Google have invested a lot in GPU and TPU based data centers.

But a year ago,, Apple introduced its iphone 7 model that used an FPGA to perform more of these operations “on the device” , instead of using the cloud for every data processing step.

Developing hardware to mimic neural networks in the brain is becoming more realizable as technology advances and improves. This project aims to construct an FPGA based model of a single intelligent learning unit (cell) . The various challenges in making a single cell “LEARN” from different trivial inputs are analysed.

Following the idea of mimicking the human brain in hardware as said by Elon Musk as what is going to determine the survival of humans in the long run, this project explores the design considerations of modeling a neuron in a piece of hardware that can be re-used.

This neuron can be modelled as a simple input-output device to begin with, which “learns” the logic after being trained with a set of instructions. The key to the training process lies in determining the logic that relates the inputs and the outputs,in this simplistic level.

The capability of reproducing a logic would reflect automation and unmanned data processing and decision making ; which is quite common.The goal would be to accelerate the process by implementing it on an FPGA in order to use its parallel processing resources to the maximum.

Once this is achieved, more complicated nerve-models can be explored based on the feasibility of mathematical models needed to implement them on hardware.Relative comparisons between these would provide great insights to the challenge of actually making a hardware based human-brain.

Finally , it is planned to have a visual demonstration of the neural activations , although the hardware requirements for it is not yet clear. The degree to which the portability and reusability of the project develops would determine its practical usefulness in low power devices such as mobile phones or home-automation bots.