Agnel Charities

Fr. C. Rodrigues Institute of Technology, Vashi, Navi-Mumbai

Department of Computer Engineering

Project Proposal

Group No	11	
Group Members	**Roll No**	**Name of Student**
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Project Proposal	**Domain – Embedded Systems and Machine Learning**	
	Title – Application of Embedded System for precision timing measurement and Machine Learning.	

Abstract:

The Compact Muon Solenoid (CMS) experiment is one of two large general-purpose particle physics detectors built on the Large Hadron Collider (LHC) at CERN in Switzerland and France.

The goal of CMS experiment is to investigate a wide range of physics, including the search for the Higgs boson, extra dimensions, and particles that could make up dark matter.

Our proposed system has two parts: the first part aims to make use of powerful parallel processing capabilities of the Field Programmable Gate Array device to program a Time to Digital Converter (TDC) for precision measurement of timing with an accuracy of sub-nanoseconds of collisions of particles. TDC being an important component of the CMS system is essential for accurate collision reconstruction and has great significance in collision detection. The second part deals with using the FPGA device to simulate the CMS detection system by identifying the significant collisions out of the collision data available to us- high energy jets, muon particles, missing energies etc. The use of FPGA is particularly significant due to the large amount of data as well as the rate at which that data is generated. Hence the calculation of identifying the significant collision must be optimized and performed as fast as possible

Machine Learning using neural networks involves generation of weights file which represents the machine learning model. Currently these weights file representing the neural network are run using CPUs or GPUs which have lower processing speeds in terms of Frames per Second. The aim of this project is to decompose the weight file of the machine

	learning models and implement this model in FPGA in order to speed up the processing. A field-programmable gate array (FPGA) is an integrated circuit (IC) that can be programmed in the field after manufacture. FPGAs are similar in principle to, but have vastly wider potential application than, programmable read-only memory (PROM) chips. Making use of FPGA improves the processing speed in terms of Frames per Second. We intend to maximize the processing speed in order to have optimum output by making use of parallel computing principles.
	Feasibility Study: Subject to TIFR.
	In house /Outhouse : Outhouse **Company Name - TIFR**
	Category : Research

APPROVAL AND AUTHORITY TO PROCEED

We approve the project as described above, and authorize the team to proceed.

Title	Remarks
Application of Embedded System for precision timing measurement and machine learning	Reviewed the topic It is accepted

Approved By	Date 4.8.19	Approved By	Date