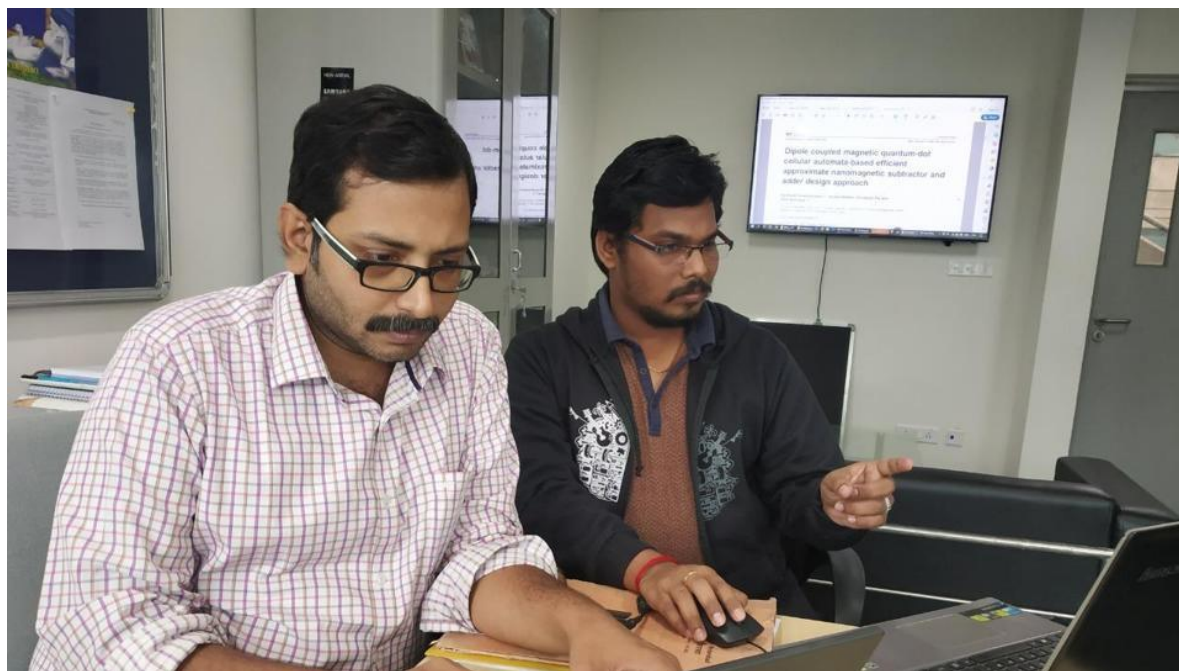# IIT Hyderabad team develops low power chips for Artificial Intelligence devices

The need for High Performance Computing data centers is rapidly growing in order to cater to the growing demand in processing and storing Big Data arising due to the Digital India and other initiatives

Dr Amit Acharyya (L), Associate Professor, IIT Hyderabad and Santhosh Sivasubramani (R), PhD Scholar, IIT Hyderabad.(HT Photo)

Indian Institute of Technology, Hyderabad researchers have developed low power chips that can be used in Artificial Intelligence-powered devices. They have developed magnetic quantum-dot cellular automata (MQCA) based nanomagnetic logic architectural design methodology of approximate arithmetic circuits.

The researchers are working towards a vision of realising resource constrained magnetic chips for ultra low power portable artificial intelligent applications.

Many modern systems such as speech and face recognition systems and IoT enabled devices for remote health monitoring require highly computationally and energy-intensive neural networks. Hence, it is not practically affordable to perform these computations in the portable hand-held devices. With these major limitations, all the machine learning algorithms used in these Artificial Intelligent applications runs on remote systems.

These factors put forth a clear demand for low power chip design in the area of Artificial Intelligence. To address these issues, highly intensive convolutions should be performed using ultra low power, least energy consuming, and area efficient devices, thus motivated us to explore the MQCA based nanomagnetic architecture designs for next generation rebooting computing platform.

The IIT Hyderabad Researchers from the Advanced Embedded Systems and IC Design Laboratory, Department of Electrical Engineering, have conducted extensive research in this area and as a proof of concept demonstration, they have shown 'Dipole coupled MQCA based efficient approximate nanomagnetic subtractor and adder design approach.'

The research was undertaken by a team comprising Mr. Santhosh Sivasubramani, PhD Scholar, Advanced Embedded Systems and IC Design Laboratory, Department of Electrical Engineering, IIT Hyderabad, Dr. Amit Acharyya, Associate Professor, Department of Electrical Engineering, IIT Hyderabad, and Dr. Chandrajit Pal, Post-Doctoral Research Fellow, IIT Hyderabad. The Research has been published in the reputed peer-reviewed journal by Nanotechnology (Prestigious journal of Institute of Physics).

Speaking about the outcomes and benefits of this Research, Dr. Amit Acharyya said, "We have computationally modelled, designed and implemented an arithmetic adder, subtractor and add/sub using nanomagnets which are the basic building blocks of performing AI computing. We are aware that the emerging edge computing devices are handy in size as well as requiring low-power computation and are also tolerant to feeble decrease in precision. The reported work of ours' targets such devices, where there is a significant investment in the research towards making it low power without compromising on accuracy too much. Performing AI computing on edge with approximate nanomagnetic logic deployed on the magnetic ICs is an attempt towards the futuristic computations. I hope this work paves the way towards achieving such a vision."

Source: Hindustan Times
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