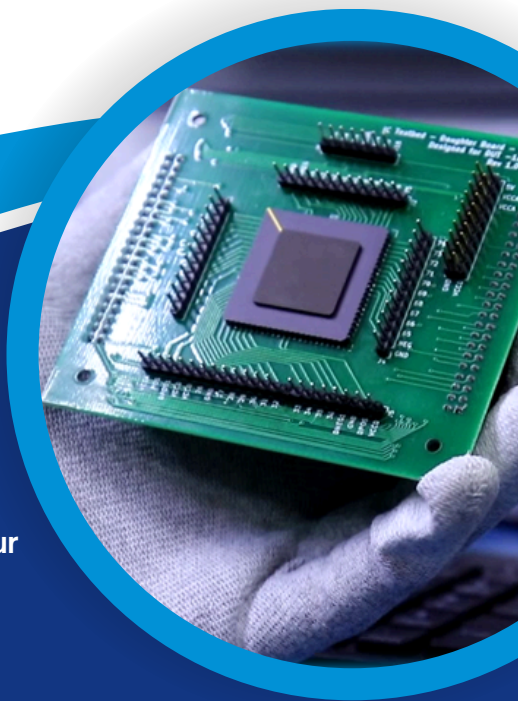# NeuRonICS Lab
Neurally - inspired **Re**configurable
Intelligent **C**ircuits & **S**ystems

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Analog Compute for Edge-AI:
Devices, Circuits & SoC

PhD Thesis by Pratik Kumar

Under the guidance of
Prof. Chetan Singh Thakur

Abstract

This research focuses on tackling the computational bottlenecks present in machine learning and edge computing by introducing a pioneering approach called Shape-based Analog Computing. By formulating a comprehensive mathematical framework and developing a complete analog AI computing ecosystem, the aim is to build machine learning systems that are not only more efficient but also highly resilient and scalable.

Furthermore, the research delves into hybrid computing architectures that combine traditional CMOS technology with emerging memory devices to address the limitations posed by current digital technologies. The ultimate objective of this work is to push the boundaries of machine learning performance and efficiency through cutting-edge innovations in analog computing, offering a transformative solution to the growing demands of data processing at the edge.

About the Author

Dr. Pratik Kumar, a researcher at the Indian Institute of Science, brings his expertise in both hardware and software to the field of Machine Learning. During his Ph.D., Dr. Kumar's research focused on the intersection of hardware-friendly algorithms, high-performance architectures, and emerging memory technologies. This work aimed to improve the efficiency of Machine Learning, particularly for edge computing tasks. Dr. Kumar's background includes a Master's degree in Microelectronics and VLSI, along with industry experience, which contributes to his well-rounded approach to bridging the gap between software and hardware in Machine Learning.