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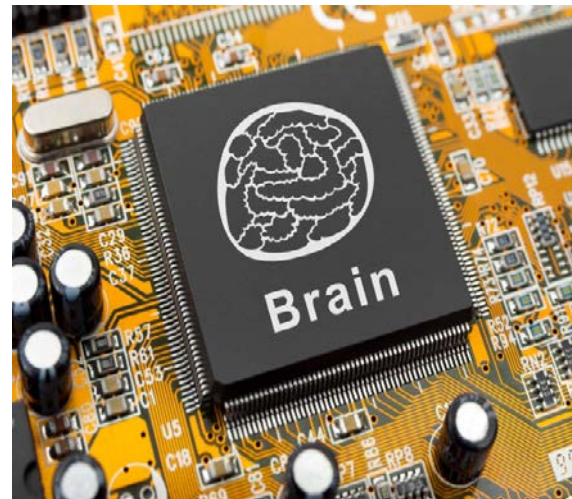
# ASIC<sup>2</sup> Project: Sigma-Delta Neurons for Memristor Learning

**Background:** The artificial intelligent era has begun! From autonomous cognitive cars to brain-inspired neuromorphic integrated circuits that adaptively interact and precisely trained using the transmitted data. Huge efforts are invested to develop artificial neurons that mimic the functionality of neuro-processing and learning elements.

Biological neurons exchange information by transceiving spikes or pulse trains with other neurons. We show that sigma-delta modulators can be used to model the neural activation. A sigma-delta modulator is an efficient method for encoding analog signals into digital signals as found on high-precision analog to digital converters. While the memristor is used to model the synapse which represents the connection strength between neurons and the firing rate between them.

## **Project Description:**

In this project students are required to design and implement artificial neural network by using sigma-delta modulators and memristors, that learned online by machine learning algorithm. show the advantages of using sigma-delta on the learning precision. The option to implement a specific application using the integrated artificial neural network.



**Perquisites:** linear electric circuits

**Recommended:** Introduction to biological signals & systems, Mixed-signals circuits

**Contacts Details :** Loai Danial

sloaidan@tx

VLSI Lab