

Title of your presentation: Brain-like computing using emerging technologies.

Abstract:

The talk will discuss memristor-based synapse networks that are connected to CMOS neurons to perform several neuromorphic functions such as the winner-take all (WTA), logical exclusive OR (XOR), edge detection, Maze Search, and Virtual bug by utilizing the spike-timing-dependent plasticity (STDP) learning mechanism. Specific details of the implementation of a hybrid position detector chip using memristors and CMOS devices will be discussed. The ability of the metal-oxide-metal based memristor to modify its resistance continuously due to the Sinh current-voltage relationship can be leveraged to build extremely dense and large neuromorphic circuitry with several hundred thousand neurons as opposed to conventional all CMOS analog VLSI circuitry that comprises 20 FETs/synapse with limited number of neurons.

The talk will also discuss the design of memristor and resonant tunneling diode based cellular nonlinear networks (CNN) to implement analog voltage programmable basic image processor capable of contour or edge detection and horizontal/vertical line detection. The proposed implementation will be compared with other types of neuromorphic nano-circuits such resonant tunneling diode.