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Unsupervised Particle Tracking with Neuromorphic Computing

We study the application of a neural network architecture for identifying charged particle trajectories via unsupervised learning of delays and synaptic weights using a spike-time-dependent plasticity rule. In the considered model the neurons receive time-encoded information on the position of particle hits in a tracking detector for a particle collider, modeled according to the geometry of the Compact Muon Solenoid Phase II detector. We show how a spiking neural network is capable of successfully identifying in a completely unsupervised way the signal left by charged particles in the presence of conspicuous noise from accidental or combinatorial hits, opening the way to applications
of neuromorphic computing to particle tracking. The presented results motivate further studies investigating neuromorphic computing as a potential solution for real-time, low-power particle tracking in future high-energy physics experiments.

AI keywords

neuromorphic computing, detector design, pattern recognition

Primary author: Dr CUFINO, Fabio (University of Bologna)

Co-authors: Dr PORCU, Eleonora (University of Bologna); Dr CORADIN, Emanuele (University of Padova); Prof. SANDIN, Fredrik (Lulea Techniska Universitet); Dr RAJ, Jinu (Central University of Tamilnadu); DORIGO, Tommaso (Istituto Nazionale di Fisica Nucleare)

Presenter: Dr CUFINO, Fabio (University of Bologna)

Track Classification: Hardware & Design