

Recent advances in neuromorphic computing and artificial intelligence for calorimetry

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Neuromorphic computing is based on encoding information across a “time” component: the so-encoded information can be processed in a nontrivial way with spiking neural networks. We simulate hadrons impinging on a homogeneous lead-tungstate calorimeter and detect the resulting light via an array of light-sensitive sensors whose signals we process using a neuromorphic computing system. We show that the extracted primitives offer valuable topological information about the timestamped shower development in the material, without needing to increase the granularity of the medium itself (<https://arxiv.org/abs/2502.12693>).

Furthermore, I will show how hadrons identification at high energies can be improved using the topology of their energy depositions in dense matter, along with the time of the interactions. We focus on the impact of calorimeter granularity by progressively merging detector cells and extracting features like energy deposition patterns and timing information. Our results indicate that fine segmentation improves particle discrimination, with higher granularity yielding more detailed characterisation of energy showers (<https://arxiv.org/abs/2502.10817>).

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