

Towards a Unified Interface for Spike-Based Learning in PyNN Across Simulators, Frameworks and Hardware

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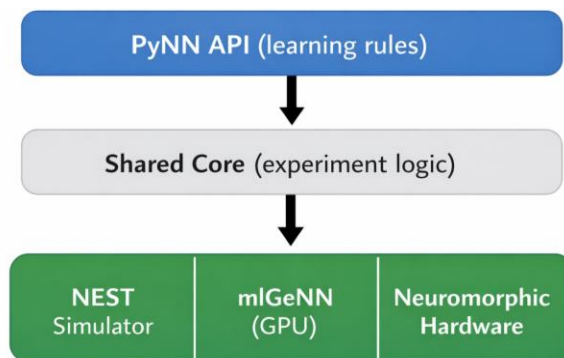
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Spiking neural networks (SNNs) offer a promising approach to energy-efficient and event-driven computation. However, recent discussions in the neuromorphic community highlight a key challenge: training methods are fragmented across simulators, compilers, and hardware platforms, and there is a lack of shared software abstractions.

Learning algorithms such as e-prop (Bellec et al., 2020) and EventProp (Wunderlich & Pehle, 2021) are implemented in a system-specific way, making it difficult to reuse models, compare results, or move between platforms. In addition, the field currently explores multiple learning approaches without a clear standard, further complicating development and evaluation.

In this work, we explore how the PyNN framework (Davison et al., 2009) can support portable training of SNNs across different systems. Our approach separates general experiment logic from simulator-specific code, allowing learning rules to be defined once and applied across multiple backends. We also discuss how this approach can extend toward deployment on neuromorphic hardware platforms (Shoesmith et al., 2025), including emerging approaches to on-chip learning (Rostami et al., 2022).

Figure 1: Modular architecture enabling portable training of spiking neural networks



This work represents a step toward unifying training workflows for SNNs and enabling models to be defined once and executed across multiple systems.

References

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- Davison et al., Front. Neuroinform., 2, 11, 2009
- Rostami et al., Front. Neurosci., 16, 1018006, 2022