

From Devices to Algorithms: Neuromorphic Computing for Energy-Efficient Autonomy

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Abstract:

As autonomous systems become increasingly capable, their growing computational demands create a fundamental challenge: how can we deliver intelligence at the edge while operating within severe energy and resource constraints? Neuromorphic computing offers a promising path by rethinking computation across the stack—from emerging devices and circuits to architectures and learning algorithms—drawing inspiration from the efficiency of biological neural systems. In this talk, I will discuss our efforts to develop such cross-layer neuromorphic systems, with an emphasis on exploiting device characteristics and brain-inspired architectures to reduce the energy and latency of computation. I will highlight how algorithm–hardware co-design can enable adaptive, event-driven intelligence while minimizing data movement and computation. Autonomous aerial platforms, such as drones, provide a compelling example where these advantages can translate directly into longer flight times, faster response, and greater onboard autonomy.