"Super" Neuromorphic Computing with Photonic and Superconducting Devices

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***Abstract*— We present a hardware platform combining integrated photonics with superconducting electronics for large-scale "super" neuromorphic computing. It is widely recognized that neural networks are effective at providing solutions to problems that are difficult to solve with conventional computational architectures and algorithms. Today, implementation of complex neural networks in dedicated hardware is an active field both in industry and academia. We believe a new approach is required to implement neuromorphic hardware roughly equivalent to the brain in numbers of neurons and level of interconnectivity. I will describe our progress towards building a superconducting optoelectronic network of devices that uses semiconductor devices and "photons" for communications and "superconducting electronics" for local computation to implement a spiking neural network that has the potential to be scaled to billions of neurons each directly connected to ~10,000 other neurons.**

***Keywords (Index Terms)* — Neuromorphic computing, photonic, superconducting devices.**

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