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Two-Dimensional Optoelectronic Graphene Nanoprobes for Neural Network TU HONG, KRISTINA KITKO, RUI WANG, Vanderbilt University, QI ZHANG, Vanderbilt University Medical Center, YAQIONG XU, Vanderbilt University — Brain is the most complex network created by nature, with billions of neurons connected by trillions of synapses through sophisticated wiring patterns and countless modulatory mechanisms. Current methods to study the neuronal process, either by electrophysiology or optical imaging, have significant limitations on throughput and sensitivity. Here, we use graphene, a monolayer of carbon atoms, as a two-dimensional nanoprobes for neural network. Scanning photocurrent measurement is applied to detect the local integration of electrical and chemical signals in mammalian neurons. Such interface between nanoscale electronic device and biological system provides not only ultra-high sensitivity, but also sub-millisecond temporal resolution, owing to the high carrier mobility of graphene.

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