NeuroResponse: A Low-Cost Wearable Glove for Quantitative Assessment of Peripheral Nerve Response Latency and Strength

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This project seeks to address the global need for affordable, early screening tools for diabetic peripheral neuropathy (DPN) by engineering a low-cost, self-contained wearable glove that quantitatively measures peripheral nerve response latency. Inspired by the lack of accessible diagnostic technologies in under-resourced communities, I designed and built a compact system integrating a vibration motor, force-sensing resistor (FSR), DRV2605 haptic driver, and OLED display into a single portable unit powered by an Arduino microcontroller. The prototype automatically calibrates baseline force values at startup, converts real-time FSR signals into approximate Newtons, and delivers consistent haptic stimuli while simultaneously recording the user's reaction latency with millisecond precision. During pilot testing, the system generated repeatable force outputs ranging from 4.85–8.89 N and captured physiologically plausible latency measurements (˜309–1347 ms), demonstrating reliable performance in real-use conditions. With a materials cost under $70 and no external lab equipment required, the device provides a scalable alternative to expensive nerve conduction studies and makes quantitative nerve assessment more accessible for communities lacking advanced clinical tools. Future work aims to expand the system's functionality through a Bluetooth-enabled smartphone app that automates testing, logs data, computes latency metrics, and supports remote clinician review. Another planned extension is the development of a complementary foot-based module for assessing sural nerve response near the ankle, enabling broader screening coverage for DPN. These advancements position the device as a promising, equitable solution for early neuropathy detection and patient self-monitoring.

Awards Won: