
Real-time smart self-mixing interferometry sensor with embedded neural network

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Résumé

Self-mixing interferometry is a nonlinear optical measurement technique in which a laser beam is re-injected into the emitting laser itself after reflection on a target. Information about the target can in principle be obtained by monitoring the voltage across the laser but analyzing this signal is notoriously difficult, which hinders broader use of self-mixing interferometry. In this contribution, we show that a neural network can accurately reconstruct the displacement of the target from the interferometric signal in widely varying experimental conditions. By optimizing a tiny network and thanks to the qualia neural networks embedding framework, we demonstrate real time operation of a smart and robust self-mixing sensor with embedded AI running on a low power microcontroller.

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