Contribution ID: **139** Type: **Invited Poster**

A Photonic Smart Sensor Based on Quantum Memories and Machine Learning

We present a scheme based on the temporal control of single-photon sources and single-photon detectors to learn the parameters of an optical cavity with a nonlinear response. The scheme works by learning the temporal shape of a single-photon pulse reflected from the cavity. This can be achieved using a Raman single-photon detector, a simple quantum memory, with a controllable read-pulse to select particular temporal modes. As an example, we discuss an optomechanical cavity to illustrate how the mechanical frequency and optomechanical coupling rate can be estimated by machine learning.

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Track Classification: Precision and Quantum Metrology with Atoms, Photons and Phonons