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A method for compact and low-cost vibrational spectroscopy platforms

Vibrational spectroscopy, including infrared and Raman optical spectroscopy, is an instrumental technique for fingerprinting molecular structures and the chemical compositions of different materials. Despite its great promise, the wide adoption of vibrational spectroscopy in in-field applications has been hindered by the demanding instrumentation requirements, i.e. costly and bulky tools with large footprints.

Stanford researchers have combined advances in imaging technologies and data analysis to build an accurate low-cost vibrational spectroscopy platform. The relevant features and the important spectral bands that are necessary for accurate identification are pre-determined and weighted through machine learning. By specifying these bands of interest, it becomes possible to reduce the spectral resolution of the measured spectrum and consequently use a compact cost-effective spectrometer design without compromising the identification accuracy. The reduction of the spectral resolution requirements enables compact and low-cost spectrometer designs.

Stage of development
Proof of concept

Applications

- Low-cost, small footprint vibrational spectroscopy platforms for applications that involve detection and identification of certain objects or substances

Advantages

- The approach enables the use of point-of-care diagnostics systems and inline quality control for food, pharmaceutical, or security applications

Publications

- Ho, Chi-Sing, et al. "Rapid identification of pathogenic bacteria using Raman spectroscopy and deep learning." *Nature communications* 10.1 (2019): 1-8.

Patents

- Published Application: WO2022213092

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