

SPECTRAL KERNEL MACHINES WITH ELECTRICALLY TUNABLE PHOTODETECTORS

Tech ID: 33969 / UC Case 2025-064-0

PATENT STATUS

Patent Pending

BRIEF DESCRIPTION

Spectral machine vision collects both the spectral and spatial dependence (x,y, λ) of incident light, containing potentially useful information such as chemical composition or micro/nanoscale structure. However, analyzing the dense 3D hypercubes of information produced by hyperspectral and multispectral imaging causes a data bottleneck and demands tradeoffs in spatial/spectral information, frame rate, and power efficiency. Furthermore, real-time applications like precision agriculture, rescue operations, and battlefields have shifting, unpredictable environments that are challenging for spectroscopy. A spectral imaging detector that can analyze raw data and learn tasks in-situ, rather than sending data out for post-processing, would overcome challenges. No intelligent device that can automatically learn complex spectral recognition tasks has been realized.

UC Berkeley researchers have met this opportunity by developing a novel photodetector capable of learning to perform machine learning analysis and provide ultimate answers in the readout photocurrent. The photodetector automatically learns from example objects to identify new samples. Devices have been experimentally built in both visible and mid-infrared (MIR) bands to perform intelligent tasks from semiconductor wafer metrology to chemometrics. Further calculations indicate 1,000x lower power consumption and 100x higher speed than existing solutions when implemented for hyperspectral imaging analysis, defining a new intelligent photodetection paradigm with intriguing possibilities.

SUGGESTED USES

- » Waste recycling, agriculture, quality control in food manufacturing, pharmaceuticals, wafer metrology, chemometrics, and more
- » Smartphone, robotics, and/or satellite applications
- » Spectral machine vision applications demanding low power, high speed, and high resolution

ADVANTAGES

- » Complex spectral recognition by a single photodetector, surpassing recent neuromorphic photodetectors

CONTACT

Sabrina N. David
sabrina.david@berkeley.edu
tel: .



INVENTORS

- » Javey, Ali

OTHER INFORMATION

CATEGORIZED AS

- » **Engineering**
 - » Engineering
 - » Other
 - » Robotics and Automation
- » **Agriculture & Animal Science**
 - » Chemicals
 - » Devices
 - » Other
 - » Plant Varieties
 - » Processing and Packaging
- » **Biotechnology**
 - » Food
 - » Health
 - » Industrial/ Energy
 - » Other
- » **Communications**
 - » Optical
 - » Other
- » **Computer**
 - » Hardware

- » 1,000x lower power consumption and 100x higher speed than existing solutions for hyperspectral imaging analysis
- » Alleviates data barrier and unpredictability in spectral machine vision

RELATED MATERIALS

» [Other](#)

» **Energy**

» [Bioenergy](#)

» [Other](#)

» [Solar](#)

» [Storage/Battery](#)

» **Environment**

» [Sensing](#)

» **Imaging**

» [3D/Immersive](#)

» [Molecular](#)

» [Other](#)

» [Remote Sensing](#)

» **Materials & Chemicals**

» [Agricultural](#)

» [Biological](#)

» [Chemicals](#)

» [Electronics Packaging](#)

» [Nanomaterials](#)

» [Other](#)

RELATED CASES

2025-064-0

ADDITIONAL TECHNOLOGIES BY THESE INVENTORS

- [Enhancing Photoluminescence Quantum Yield for High Performance Optoelectrics](#)
- [Permeable Micro-Lace Electrodes For Electrodermal Activity](#)
- [Chemical-Sensitive Field-Effect Transistor](#)



University of California, Berkeley Office of Technology Licensing

2150 Shattuck Avenue, Suite 510, Berkeley, CA 94704

Tel: 510.643.7201 | Fax: 510.642.4566

<https://ipira.berkeley.edu/> | otl-feedback@lists.berkeley.edu

© 2025, The Regents of the University of California

[Terms of use](#) | [Privacy Notice](#)