Non-Invasive AI-Based Retinal Inflammation Detection and Severity Estimation Using OCT B-Scans

Tech ID: 34520 / UC Case 2025-573-0

CONTACT

Andrew M. Van Court
amvancourt@ucdavis.edu
tel: .

ABSTRACT

Researchers at the University of California, Davis have developed a machine learning system that accurately detects and estimates retinal inflammation severity in uveitis patients using non-invasive OCT B-scan images.

FULL DESCRIPTION

This technology utilizes a deep learning model trained on OCT B-scan images aligned with fluorescein angiography (FA) to detect presence and severity of retinal inflammation related to uveitis. Leveraging a novel annotation pipeline and explainable AI techniques such as Grad-CAM, it offers a rapid, non-invasive, and cost-effective alternative to invasive FA procedures, providing clinician-level diagnostic support for improved and accessible patient care.

APPLICATIONS

▶ Clinical ophthalmology decision-support tools for uveitis diagnosis and monitoring.

▶ Integration in OCT imaging platforms and cloud-based diagnostic software.

▶ Telemedicine platforms enabling remote inflammation assessment.

▶ Pharmaceutical clinical trials requiring standardized inflammatory severity measures.

▶ Screening programs in low-resource and pediatric healthcare settings.

FEATURES/BENEFITS

▶ Detects retinal inflammation non-invasively without fluorescein dye injection.

▶ Provides rapid, automated analysis from standard OCT scans.

▶ Delivers high diagnostic accuracy, outperforming fellowship-trained clinicians.

▶ Quantifies severity with strong correlation to ground truth standards.

▶ Enhances trust and interpretability with explainable AI insights (e.g., Grad-CAM heatmaps).

▶ Enables scalable adoption in telemedicine and low-resource settings.

▶ Problems Solved Eliminates the invasiveness, cost, and limited accessibility of fluorescein angiography.

▶ Identifies subtle signs of retinal inflammation that are difficult to detect clinically.

▶ Standardizes and quantifies inflammation severity grading.

▶ Expands diagnostics where fluorescein angiography is contraindicated or unavailable, including for pediatric and remote care.

▶ Accelerates diagnosis and treatment decisions in uveitis management.

INVENTORS

▶ Emami-Naeini, Parisa

▶ Ghafourian-Momenzade, Amin

▶ Soltani Bozchalooi, Iman

OTHER INFORMATION

KEYWORDS

artificial intelligence, deep learning, fluorescein angiography, machine learning, optical coherence tomography, retinal inflammation, severity estimation, uveitis diagnosis, visual transformer, Grad-CAM

CATEGORIZED AS

▶ **Biotechnology**

  ▶ Health

▶ **Imaging**

PATENT STATUS

Patent Pending

RELATED CASES

2025-573-0

ADDITIONAL TECHNOLOGIES BY THESE INVENTORS

▶ A Multimodal Distributed Sensing Device

▶ Headset with Incorporated Optical Coherence Tomography (OCT) and Fundus Imaging Capabilities

▶ A High Degree of Freedom, Lightweight, Multi-Finger Robotic End-Effector

▶ Haptic Smart Phone-Cover: A Real-Time Navigation System for Individuals with Visual Impairment