

Journal launch: Welcome to *Intelligent Opto-Electronics*

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Optics and electronics, two core pillars of modern science, have long shaped humanity's understanding of the physical world and driven revolutions in opto-electronic science, technology, and applications. From Maxwell's unification of light and electromagnetism to the invention of lasers, opto-electronics have redefined boundaries across energy, communication, medicine, and computing. Today, as artificial intelligence (AI) emerges as a transformative force, the convergence of optics, electronics, and intelligent systems heralds a new era of discovery. The core architecture of AI systems—neural networks—depends on the high-speed, parallel data transmission enabled by photons and the intricate logical computations carried out by electrons. Together, these complementary physical processes form the essential hardware backbone that underpins intelligent information processing. *Intelligent Opto-Electronics* (IOE) is born at this pivotal juncture, dedicated to exploring the symbiotic relationship between photonics, electronics, and AI, and fostering innovations that transcend traditional disciplinary divides.

The manipulation of photons and electrons—the fundamental capability to control light and charge carriers with high precision—has long served as the foundation for progress in optoelectronic materials, devices, and systems. In recent years, this foundational science has become increasingly intertwined with intelligent computing paradigms, from neuromorphic photonic chips to AI-optimized photonic circuits. Simultaneously, artificial intelligence has emerged as a powerful catalyst, accelerating innovation in optical-electronic system design, optimization, and real-time control.

Einstein's elucidation of the photoelectric effect laid the foundation for quantum mechanics, while the invention of fiber optics revolutionized the global communication. More recently, quantum computing has leveraged photonic principles to redefine computational limits. Similarly, AI has revolutionized data analyses, autonomous systems, and predictive modeling. Yet, their integration remains nascent. *Intelligent Opto-Electronics* seeks to bridge this gap by focusing on two new research paradigms: "AI for Opto-

Electronics" and "Opto-Electronics for AI".

Recent advances exemplify this fusion. Neural networks now design metasurfaces with unprecedented optical properties, while photonic neuromorphic systems mimic biological cognition. Quantum machine learning algorithms, powered by entangled photons, promise exponential gains in computational power. Conversely, opto-electronic technologies enable AI to "see" and "interpret" the world with unparalleled precision—autonomous vehicles rely on LiDAR, and AI-driven microscopy deciphers cellular dynamics. Such cross-pollination highlights the importance of having a dedicated platform to nurture this growing field.

Despite rapid progress, critical challenges persist. The integration of AI with opto-electronics demands novel frameworks to manage the complexity of hybrid systems. For instance, optimizing photonic circuits via deep learning requires overcoming the "black box" nature of neural networks. Similarly, the energy efficiency of AI-hardware interfaces remains a bottleneck, necessitating breakthroughs in materials, device architectures, and algorithms. Addressing these challenges requires interdisciplinary collaboration, uniting experts in photonics, electronics, computer science, and materials engineering. *Intelligent Opto-Electronics* will serve as the nexus for such collaborations, promoting dialogue between theory and applications.

As an open-access journal, *Intelligent Opto-Electronics* will publish high-impact research Articles, Reviews, and Letters, etc.

Intelligent Opto-Electronics is guided by a distinguished Editorial Board comprising pioneers in photonics, opto-electronics, and AI. IOE benefits from the strong support of the excellent editorial team from its sister journals, *Opto-Electronic Advances* (OEA) and *Opto-Electronic Science* (OES).

We invite researchers worldwide to contribute to *Intelligent Opto-Electronics*—a platform where optics, opto-electronics, and intelligence converge. Let us collectively pioneer solutions to humanity's most pressing challenges and illuminate the path toward a smarter, and brighter future.



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