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Can transfer learning and federated learning overcome deep learning obstacles and accelerate artificial intelligence adoption in retinopathy of prematurity diagnostics?

Carolyn Yu Tung Wong*, **Wilson Yip, MBChB** and **Henry Hing Wai Lau**
The Chinese University of Hong Kong, Hong Kong

Purpose of review: Artificial intelligence (AI), such as deep learning (DL), has emerged as a promising approach for addressing ROP specialist scarcity and ROP diagnostic subjectivity. Traditional DL applied to ROP tasks seemed to encounter great obstacles, given ROP's low prevalence, data paucity, and difficulty in multi-institutional data sharing to optimise training. Transfer learning (TL) and federated learning (FL) has evolved as advanced strategies for addressing DL issues. This review intends to highlight the TL and FL applications in various ROP tasks.

Recent findings: TL and FL were successful in achieving outstanding results for ROP screening, triaging, and monitoring, with certain algorithms exceeding the baseline DL models. To some extent, TL aided in the construction of generalizable ROP models in the face of little data. FL lays the groundwork for safe data exchange between institutions in TL. However, both TL and FL faced shortcomings with inadequate generalizability and data privacy attacks. Future research is also needed to address the unsolved interpretability and liability issues in the TL and FL models.

Summary: While TL and FL have great potential to overcome DL constraints and improve ROP's diagnostic robustness, more work to address application concerns like model interpretability and liability is needed.

Biography

Carolyn Yu Tung Wong has been passionate and dedicated to ophthalmology research, especially in artificial intelligence. She is the first author of more than 10 review and original articles focusing on the developments of artificial intelligence in ophthalmology, as guided by mentors at Moorfields Eye Hospitals, including Professor Pearse A. Keane, Dr Fares Antaki, and Dr Peter Woodward Court. Besides, Carolyn has also presented her research at different international conferences, including the APACRS and ARVRS, and will soon be presenting her latest research findings on artificial intelligence in ophthalmology at ARVO2024, APGC2024, and APACRS2024, both in poster and oral formats. Carolyn has also been an active research member of Professor Pearse A. Keane's ophthalmology AI research team and is currently working on multi-institutional based artificial intelligence model developments for retinopathy of prematurity screenings.

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