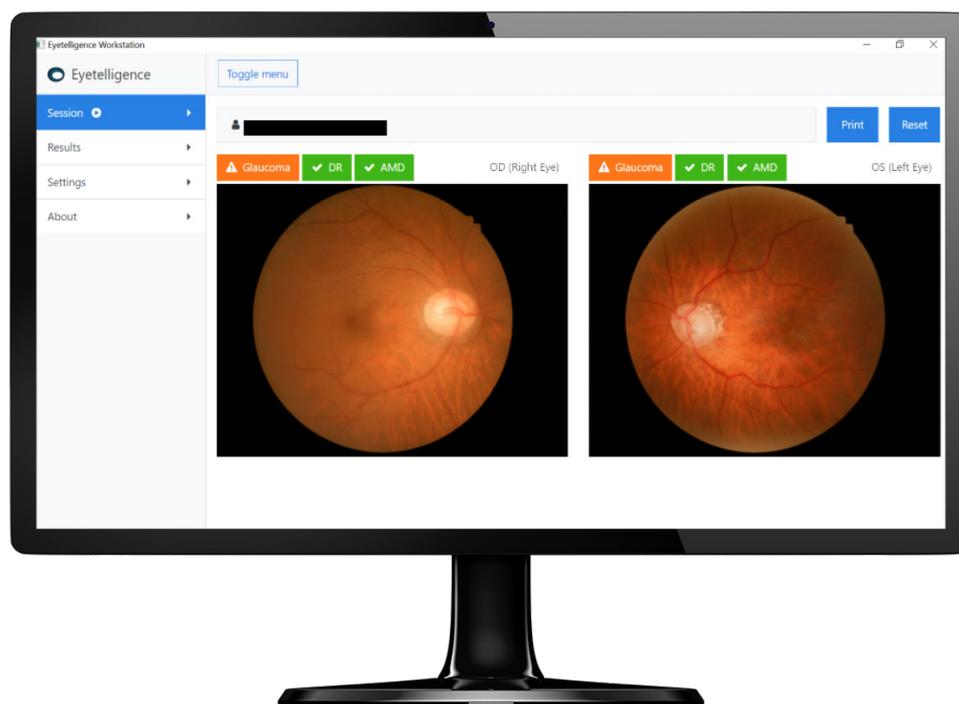The MACULAR DISEASE ISSUE

Eyetelligence
Equipping Optometry for Disease Detection

WRITER **Melanie Kell**

Using standard fundus images, artificial intelligence (AI) can enhance optometrists' ability to detect ophthalmic and systemic disease and provide more standardised, efficient, accurate and accessible care. Eyetelligence Workstation, the product of more than 10 years of work by Prof Ming He, Chief Medical Officer at privately-owned Australian company Eyetelligence, is an affordable platform that optometrists can use in practice to augment their detection and management of the three most common sight-threatening eye diseases.

Speed, efficiency, accuracy and standardisation are the key benefits of Eyetelligence Workstation, a new software platform that assists optometrists in the detection and grading of diabetic retinopathy (DR), glaucoma and age-related macular degeneration (AMD). The software takes just 15 seconds to interpret a pair of fundus images.

The innovative AI platform was developed by ophthalmologist Ming He, who is also

Professor of Ophthalmic Epidemiology at the University of Melbourne and Centre for Eye Research Australia (CERA).

Launched in mid-2020, Eyetelligence Workstation has now been approved as a Class One Medical Device by the Therapeutic Goods Administration, European Medicines Agency, the Medicines and Healthcare products Regulatory Agency (United Kingdom) and the New Zealand Medicines and Medical Devices Safety Authority. The platform

is available for use by optometrists in Australia and New Zealand.

DECISION MAKING MADE SIMPLE
Development of Eyetelligence Workstation was driven by a desire to find an affordable solution that would enable optometrists to quickly and accurately detect referrable eye diseases, as Prof He recently explained to *mivision*.

"It is estimated that 80% of vision loss is avoidable through early detection,

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prevention and treatment strategies. Despite this, up to 50% of cases of major eye diseases remain undiagnosed in Australia, primarily because many of these conditions are asymptomatic in their early stages – meaning patients are less likely to make contact with health services until vision loss occurs. To identify these asymptomatic cases, an active screening program is required, however, such a program is not currently available in Australia, even for people residing in urban areas," said Prof He.

"Retinal photography is a ubiquitous and cost-effective investigation that can be used to detect changes associated with DR, glaucoma and AMD, and a range of systemic pathology. However, optimal assessment of retinal photographs requires interpretation by professional graders. This considerably limits the accessibility, affordability and efficiency of screening programs," he added.

In an attempt to overcome these challenges, Eyetelligence Workstation software is being offered to optometrists at a price point that Prof He says is "inexpensive and really exciting" when compared to other in-house decision-making support tools marketed by international competitors.

EXPANDING CAPACITY

Professor Zongyuan Ge, who heads Eyetelligence's technical development (and also heads Monash Medical AI Group, the largest AI health research group in Victoria), explained that the company's machine-learning software was developed using some 200,000 retinal images.

"A panel of sub-specialist ophthalmologists assessed each image to define the 'ground truth' with respect to whether the image was taken from a patient with glaucoma, AMD or DR," he explained. "The software was subsequently validated on an 'internal' set of images before undergoing external validation on various ethnicities such as Singaporean, Chinese, Caucasian and

Indigenous Australians. Across these populations, the software maintained high levels of accuracy, detecting around 95% of cases."

The Eyetelligence Workstation software can be used with existing hardware and, unlike other overseas products, it can process the images using personal computers, and does not require uploading patient sensitive information or images onto the cloud. Compatible with any camera from launch, automation is now possible using a range of Topcon, Nidek, Centrevue, Zeiss and other devices.

"We are working independently and with instrument manufacturers to automate the fundus image acquisition and screening process," said Prof Ge.

Since its initial launch, Prof Ge and his team have worked to achieve more accurate glaucoma detection features, including a traffic light system that stratifies each patient's level of risk, and a diabetic retinopathy grading scale.

Professor Harrison Weisinger, Chief Commercial Officer for Eyetelligence, said the accuracy of the platform is impressive.

"While the original accuracy rate of Eyetelligence's AI was 95%, Dr Ge has been able to increase sensitivity without sacrificing specificity, consequently reducing false negatives by a further 50%," he said.

"This translates to even better disease detection without triggering false alarms. They did this through a combination of techniques, including the use of more difficult cases, such as isolated retinal nerve fibre layer defects and disc haemorrhages.

"Also, by identifying and relabelling positive cases within our 200,000 plus image database that had previously been 'missed' by our software, they were able to re-train the AI with higher quality data."

Prof Ge said the next step is to expand the workstation's capability.

"We are preparing to expand the number of conditions we can detect – both eye-related and those relating to general health. For instance, we are developing software to detect signs of microvascular diseases, predict cardiovascular disease risk and assess biological age."

GO FAST, GO SAFE

Prof Weisinger says Eyetelligence is a cost-effective, decision-making support tool that can help optometrists across all areas of Australia – whether metropolitan, regional, rural or remote – to meet the increasing demands for eye care services of an ageing population.

Summarising the key benefits of this Australian innovation he said:

"We believe this tool enables optometrists in their practices to provide the very best in patient care by offering them in-house support, standardisation and efficiency:

• Optimised patient-care: well-equipped optometrists are very good at detecting glaucoma but with Eyetelligence working in the background, missed glaucoma cases should be more-or-less eliminated. Patient care will be optimised through appropriate referral to further investigations (such as visual field testing) or referral to ophthalmology. An optional patient-friendly report can also be generated from Eyetelligence to provide tangible information and help optometrists to build practice loyalty.

• Support: it's difficult to diagnose glaucoma, particularly for optometrists that may not have all of the latest equipment at their disposal. This software can provide them with an extra layer of support and confidence, which is particularly important to less experienced practitioners.

• Standardisation: we know that optometrists have varied ability to diagnose eye diseases. Eyetelligence can reassure practice owners who employ many optometrists, including locums, of their team members' clinical diagnoses,

• Efficiency: our software gives results in 15 seconds, allowing the optometrists to devote their time to other aspects of patient care within the appointment, and

• Finally, it provides a level of comfort to optometrists that enables them to 'go fast and go safe'."

To find out more about Eyetelligence, or request a free trial, visit eyetelligence.com.au. mi

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