Automated assessment of multiple datasets using artificial intelligence accurately diagnoses common cause of blindness

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Pathological myopia is a condition characterized by severe, progressive nearsightedness caused by the protrusion of pigmented tissue from the

back of the eye. The disease is one of the leading causes of blindness worldwide and the leading cause in Asian countries. Early diagnosis is essential for preventing permanent loss of vision but heavily relies on manual screening and involves a complete eye exam, which can take up to an hour.

Zhuo Zhang of the A*STAR Institute for Infocomm Research in Singapore and her colleagues have now developed an automated, computer-assisted informatics method that uses artificial intelligence to diagnose the condition accurately.

In earlier work, Zhang and her colleagues developed an algorithm that could extract information about tissue texture from biomedical images of the back of the eye, or fundus, and use it to detect pathological myopia with an accuracy of 87.5%. They then showed that combining the images with demographic data such as age, sex and ethnicity, improved the accuracy further.

The latest automated method—Pathological Myopia diagnosis through Biomedical and Image Informatics (PM-BMII)—takes the process one step further; it uses an artificial intelligence approach known as multiple kernel learning to fuse the demographic data and clinical fundus images with genomic information and then analyze the combined datasets (see image).

Zhang and her colleagues tested the method on data collected from 2,258 patients, 58 of whom had already been diagnosed with pathological myopia. They found that the method could detect the condition with a high degree of accuracy and that the combination of all three datasets was more accurate than any one alone or any two combined.

Combining the three datasets probably produced the best results because each set contains different information that complements the other sets,

therefore providing a holistic assessment of the disease.

The researchers suggest that the method could also be applied to the detection of other eye diseases, "including age-related macular degeneration and glaucoma. These diseases have common characteristics," says Zhang. "They result from both environmental and genetic risk factors, and can be observed from fundus images."

Zhang adds that it is still unclear whether adding additional types of data to the analyses would improve the accuracy of the diagnoses. "More types of data may introduce complexity into the computational model, so we cannot draw the conclusion that accuracy would be improved without further investigation."

More information: Zhang, Z., et al. Automatic diagnosis of pathological myopia from heterogeneous biomedical data, *PLoS ONE* 8, e65736 (2013).
www.plosone.org/article/info%3Adoi%2F10.1371%2Fjournal.pone.0065736

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