IBM Research is training Watson to identify eye retina abnormalities

Melbourne, Australia - 21 Feb 2017: IBM (NYSE: IBM) Research has today announced new research developments in IBM Watson's ability to detect abnormalities of the eye's retina. The Melbourne based IBM researchers have trained a research version of Watson to recognise abnormalities in retina images, which could in the future offer doctors greater insights and speed in their early identification of patients who may be at risk of eye diseases – such as glaucoma, a leading cause of blindness in the developed world.

The research began in 2015 and the latest work has focused on streamlining some of the manual processes experienced by doctors today. This includes distinguishing between left and right eye images[1], evaluating the quality of retina scans[2], as well as ranking possible indicators of glaucoma[3]. Glaucoma has been named "the silent thief of sight" as many patients remain undiagnosed until irreversible vision loss occurs. Glaucoma can be treated but early detection is critical, with doctors currently relying on regular eye examination screening programs.

The researchers applied deep learning techniques and image analytics technology to 88,000 de-identified retina images accessed through EyePACS®, to analyse key anomalies of the eye. The research results demonstrate Watson's ability to accurately measure the ratio of the optic cup to disc – which is a key sign of glaucoma – with statistical performance as high as 95 percent. The technology has also been trained to distinguish between left and right eye images (with up to 94 percent confidence), which are important for downstream analysis and for the development effective treatment programs.

"It is estimated that at least 150,000 Australians have undiagnosed glaucoma, with numbers expected to rise due to our rapidly ageing population. It is critical that every Australian has access to regular eye examinations throughout their life so that diseases like glaucoma and diabetic retinopathy can be detected and treated as early as possible," Dr. Peter van Wijngaarden, Principal Investigator at Centre for Eye Research Australia, Department of Ophthalmology, University of Melbourne.

"There is a real need for resources that allow all Australians to access regular eye examinations and the development of image analytics and deep learning technology will provide great promise in this area."

The research is expected to continue to improve over time as the research technology expands to detect features of other eye diseases such as diabetic retinopathy and age-related macular degeneration.

"Medical image analysis with cognitive technology has the capacity to fundamentally change the delivery of healthcare services," said Dr. Joanna Batstone, Vice President and Lab Director at IBM Research Australia. "Medical images represent a rich source of data for clinicians to make early diagnosis and treatment of disease, from assessing the risk of melanomas to identifying eye diseases through the analysis of retinas. Cognitive technology holds immense promise for confirming the accuracy, reproducibility and efficiency of clinicians' analyses during the diagnostic workflow."

IBM Research globally continues to advance research combining cognitive technology with medical images. Through its 12 collaborative labs worldwide, IBM Research is focused on research projects involving medical imaging analysis for diseases such as melanoma, breast cancer, lung cancer and eye disease.

About IBM Research

For more than seven decades, IBM Research has defined the future of information technology with more than 3,000 researchers in 12 labs located across six continents. Scientists from IBM Research have produced six Nobel Laureates, 10 U.S. National Medals of Technology, five U.S. National Medals of Science, six Turing Awards, 19 inductees in the U.S. National Academy of Sciences and 20 inductees into the U.S. National Inventors Hall of Fame. For more information about IBM Research, visit www.ibm.com/research.

The research results were presented at the 38th IEEE Annual International Conference of the Engineering in Medicine and Biology Society (EMBC), 19th International Conference on Medical Image Computing and Computer Assisted Intervention (MICCAI) and the Digital Image Computing: Techniques and Applications (DICTA) in Australia.

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[1] *P. Roy, et al. "Automatic Eye Type Detection in Retinal Fundus Image Using Fusion of Transfer Learning and Anatomical Features." International Conference on Digital Image Computing: Techniques and Applications (DICTA), 2016.. http://ieeexplore.ieee.org/abstract/document/7797012/*

[2] *D. Mahapatra et al. "Retinal Image Quality Classification Using Saliency Maps and CNNs."Machine Learning in Medical Imaging, Volume 10019 of the series Lecture Notes in Computer Science, pp 172-179. http://link.springer.com/chapter/10.1007/978-3-319-47157-0_21.*

[3] *S. Sedai, et al. "Segmentation of Optic Disc and Optic Cup in Retinal Fundus Images Using Coupled Shape Regression." , Proceedings of the Ophthalmic Medical Image Analysis Third International Workshop (OMIA 2016) Held in Conjunction with MICCAI 2016, pp 1-8. http://ir.uiowa.edu/omia/2016_Proceedings/2016/1/*

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