Development and Validation of a Deep Learning Algorithm for Detection of Diabetic Retinopathy in Retinal Fundus Photographs

Presentation by Aidan Fitzgerald

Paper Summary:

This research paper applies a deep learning algorithm for automated detection of diabetic retinopathy (an eye disease that can lead to partial or complete blindness). A convolutional neural network was trained using a data set of 128,175 retinal images that contained varying levels of diabetic retinopathy. Through this data, the algorithm was able to detect diabetic retinopathy with a high sensitivity and specificity.

Key Points:

- The algorithm was able to detect referable diabetic retinopathy with a sensitivity of 97.5% and a specificity of 93.4% on the first data set at a high sensitivity operating point. The algorithm was able to detect referable diabetic retinopathy with a sensitivity of 90.3% and a specificity of 98.1% on the first data set at a high specificity operating point.
- Previous studies were unable to achieve a high level of sensitivity and specificity. Most of the studies were able to achieve a high level of sensitivity but were unable to achieve a high level of specificity.
- Further research is needed to determine the viability of applying this algorithm in a clinical setting. The algorithm, however, did show a high level of sensitivity of specificity, which is necessary when it comes to screening diseased populations.

Questions:

- What other areas of ophthalmology are well suited to deep learning?
- Will the deployment of an automated grading system really improve patient outcomes?
- What does this paper show about the greater area of using convolutional neural networks for image recognition?

Key Definitions:

Sensitivity: The ability of the algorithm to detect disease when there is disease.

Specificity: The ability of the algorithm to detect that there is no disease when there is none.

Diabetic Retinopathy: High blood sugar levels can lead to damage to blood vessels that nourish the retina. These blood vessels can leak blood into the eye which can lead to partial or complete blindness.