Hey Computer, Am I Sick? Finding Disease Patterns Using Computer Vision

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The hypothesis of the project was that machine learning can be used to identify disease patterns in medical imaging. Machine learning functions were used to identify patterns in chest X-rays of young patients infected by viral or bacterial pneumonia, and in rear-eye photographs of patients with diabetic retinopathy (DR). Online images available for research purposes were used in this project. Neural network functions were defined to take as input an image (X-ray or rear-eye photograph) and output a classification (normal, virus, or bacteria for the chest X-rays, and the DR level for rear-eye photographs). The accuracy of the functions was close to 90%. Correctly classified images were analyzed to identify patterns. For example, normal X-rays show clear lungs; viral pneumonia X-rays show smoke-like patters in the lungs; bacterial pneumonia X-rays show cloud-shape patterns in the lungs. Accurate diagnosis of pneumonia is important for young patients, because pneumonia can be fatal if not treated. The DR level is related to the number of defects in the eye (the defects look like luminous spots in the pictures). The machine learning technique can help to train medical professionals to identify the infection extent of DR and treat DR, which if untreated can lead to blindness. Machine learning can greatly help patients by expanding the range of information available that is not limited by the experience of the medical professionals. This study demonstrated that machine learning is an effective tool to discover patterns in medical imaging that can help in the diagnostic of disease.