AI unmasks failures in medical personal protective equipment

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Medical personal protective equipment (PPE) is essential to infectious disease control, something that has, in pandemic times, become very apparent. Governments and organizations in affected areas generally

recommend the wearing of PPE by medical personnel, including surgical masks, gloves, and face shields, especially in crowded environments. However, ensuring that medical personnel in severely affected areas comply with the recommendations requires a means to monitor in real-time whether PPE is being used.

Writing in the *International Journal of Sensor Networks*, a team from China has developed a system based on machine learning that can detect whether personnel are wearing the requisite PPE. The approach uses deep neural networks (DNNs) to carry out object detection in real scenarios.

Jianlou Lou, Xiangyu Li, Guang Huo, Feng Liang, Zhaoyang Qu, and Ndagijimana Kwihangano Soleil of the Northeast Electric Power University in Jilin and Tianrui Lou of Guangzhou University have used two novel modules, the Deformable and Attention Residual with 50 layers (DAR50) feature extraction module, and the Criss-Cross Feature Pyramid Network (CCFPN) feature fusion module, in order to address the two key problems that have so far limited performance in PPE detection. They have thus overcome the issues of interference from background information and detection target scales that vary in size.

By combining the two modules, the researchers were able to create an object detection network, Attention and Multi-Scale Fusion-based Regions with Convolution Neural Network (AMS R-CNN). Their tests with medical PPE and The Visual Object Classes Challenge 2007 (VOC 2007) datasets, showed their system to work better than various state-of-the-art methods.

The development of AMS R-CNN could benefit those managing medical professionals and help ensure that the PPE rules are being adhered to with a view to minimizing the risk of infectious disease transmission. The medical staff who work in high-risk environments,

such as hospitals and laboratories, will themselves benefit from increased protection from colleagues and so improve overall safety and also reduce risk to patients.

The work highlights the potential of deep neural networks to revolutionize the way we detect objects. Accuracy can only be improved with further advances in this technology.

More information: Tianrui Lou et al, Medical Personal Protective Equipment Detection based on Attention Mechanism and Multi-scale Fusion, *International Journal of Sensor Networks* (2022). DOI: 10.1504/IJSNET.2022.10052844

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