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Automated Triaging of MRIs Rules Out Cancer in Dense Breasts

Mammography provides early detection when breast cancer treatments are more successful. Unfortunately, mammography is less sensitive in women with dense than with fatty breast tissue. This is unfortunate because the breast cancer risk is three- to six times higher in dense rather than fatty breast tissue and two times higher than that of the average woman. To compensate, cancer detection sensitivity for women with extremely dense breasts may be improved with supplemental screening.

The results of the multisite clinical trial, Dense Tissue and Early Breast Neoplasm Screening (DENSE) Trial, in the Netherlands support a supplemental MRI screening strategy. However, routine MRI screening for breast cancer will substantially increase the radiology workload. Since normal anatomical and physiological variations do not require review, an automated way to triage resulting MRIs was developed using a deep learning algorithm. Data from seven hospitals were used to train the algorithm, which was tested on data from an eighth hospital. A total of 4581 MRI examinations of dense breasts were included. Of the breasts, 838 had at least one lesion, of which 77 were malignant; 8,324 had no lesions.

The algorithm dismissed 39.7% of MRI examinations without cancer without missing any malignant disease. Of the MRIs with lesions, the algorithm considered 90.7% as abnormal and triaged them for radiological review. In general, for MRI examinations without lesions, the algorithm more frequently dismissed those with minimal background parenchymal enhancement than those with high. Using transverse, sagittal, and coronal combinations achieved faster interpretations but adding more convolutional layers, additional dense layers, or additional input channels did not improve performance.

Since nearly 82,000 women in just the Netherlands may be eligible for biennial MRI breast screening based on breast density, this automatic triaging system has great potential to reduce radiologist workload.

The study's lead author, Erik Verburg, added: 'The approach can first be used to assist radiologists to reduce overall reading time… Consequently, more time could become available to focus on the really complex breast MRI examinations.'

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