Researchers propose automated detection method for unruptured cerebral aneurysms

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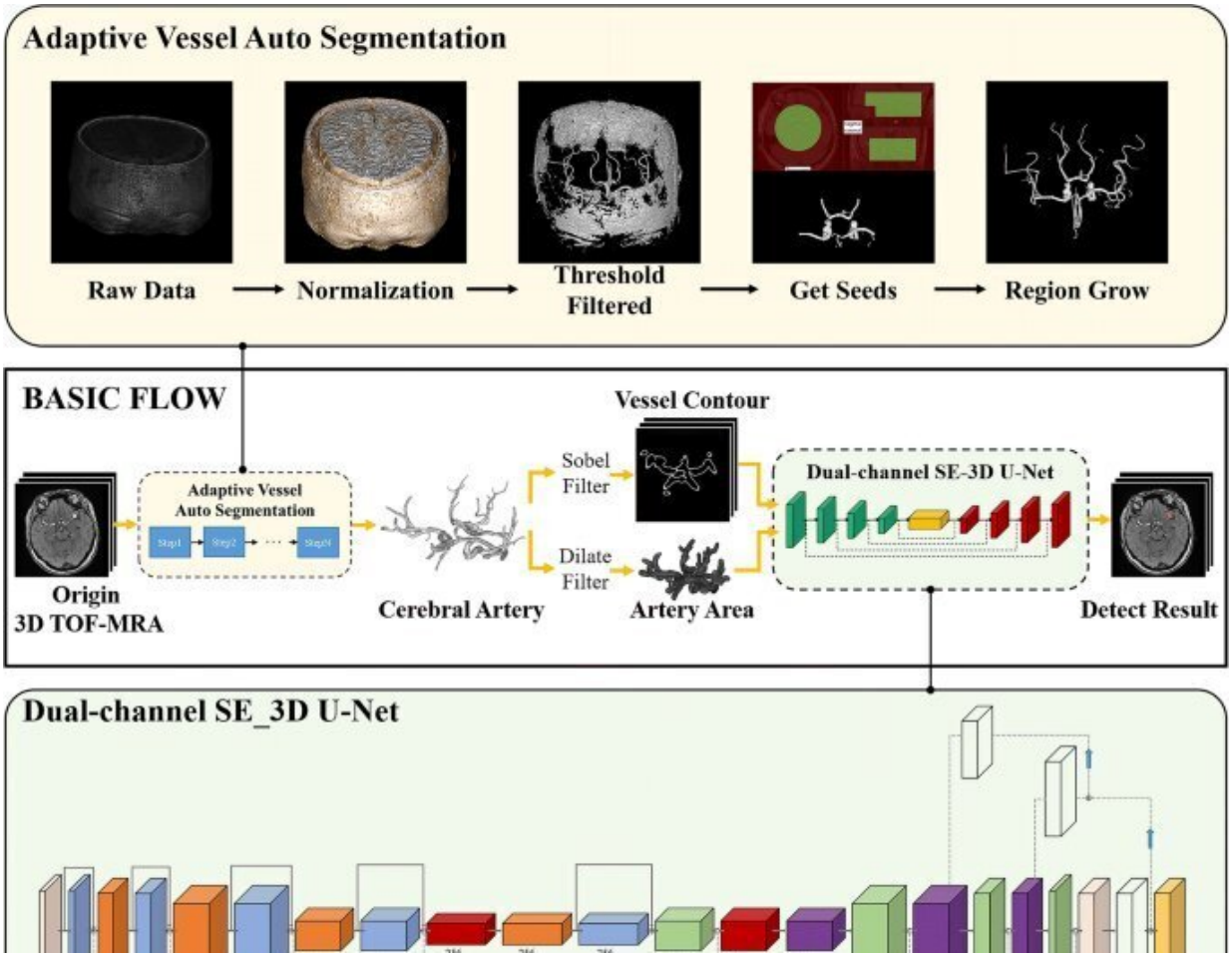

Credit: *European Radiology* (2023). DOI: 10.1007/s00330-022-09385-z

Cerebral aneurysms are high-incidence, high-risk and have an insidious

onset. Timely detection and intervention can help prevent aneurysm rupture. Geng Chen from Dai Yakang's group at Suzhou Institute of Biomedical Engineering Technology (SIBET) of the Chinese Academy of Sciences, in collaboration with the Department of Radiology at Huashan Hospital, Fudan University, recently proposed an equalized augmentation strategy based on aneurysm location and constructed a detection model based on dual channel SE-3D UNet. The study was published in *European Radiology*.

Time of flight magnetic resonance angiography (TOF-MRA) is the primary non-invasive screening method for intracranial aneurysms. However, manual screening can result in missed diagnoses and low efficiency. Existing deep learning–based automated detection algorithms have a high average number of false positives per case. This can lead to risk and unnecessary digital subtraction angiography (DSA) examinations, making it difficult to apply these methods in clinical practice.

To enhance the detection performance, Geng and his team utilized an equalized augmentation strategy based on the location of the aneurysm lesion, which aimed to mitigate the issue of biased detection results arising from data imbalance in the neural network model.

The proposed detection method involves preprocessing the entire TOF-MRA data using an adaptive thresholding intracranial vessel extraction algorithm. The resulting images, which depict the contour and entirety of the vascular tree, were then utilized as inputs for the dual-channel SE-3D UNet model. This model incorporates a channel attention mechanism for adaptive feature selection, allowing for automatic processing of raw TOF-MRA images to detect aneurysms and generate output that includes annotations of their locations.

The method was validated on a multicenter dataset. Experimental results

indicated that the sensitivity of detection at case level (TRP) was 82.46% and the average number of false positives per case (FPs/case) was 0.88. There was no significant difference between the detection performance of each grouping after statistical analysis.

"This method demonstrates that an aneurysm detection algorithm with both high sensitivity and low false positive rate is possible," said Geng.

More information: Geng Chen et al, Automated unruptured cerebral aneurysms detection in TOF MR angiography images using dual-channel SE-3D UNet: a multi-center research, *European Radiology* (2023). DOI: 10.1007/s00330-022-09385-z

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