

Artificial intelligence techniques for subarachnoid hemorrhage detection and consequence classification

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Abstract

The space between the skull (actually, the arachnoid) and brain (i.e. the pia) is referred to as the subarachnoid space (SAS) which is filled with cerebrospinal fluid (CSF). CSF circulates through SAS to protect the brain and major cerebral blood vessels. Subarachnoid hemorrhage (SAH) is a life-threatening form of the case caused by bleeding in the SAS. It is a crucial medical emergency that needs proper diagnosis, prompt assessment, and careful treatment. Early detection and consequence classification are very much necessary in ensuring good prediction and reducing the risk of neurologic deficits.

Recently, several attempts have been made to apply artificial intelligence (AI) or machine learning (ML) techniques to identify SAH using diagnostic digital images. Previous studies using ML have shown diagnostic effectiveness in detecting SAH, however, with less than 90% accuracy and not for realistic clinical data. It is difficult to interpret the outcomes of those AI approaches into clinical settings as it contains a different combination of predictive features taken from several scales, including various scores or coefficients.

There is a need for a more understandable, simple, and trustworthy prognostic tool/method for SAH patients. In this survey, various medical brain images and relevant AI models, like ANN, CNN, and LSTM were considered. The survey was prepared looking for a possibility of significant improvement in terms of accuracy, simplicity, and reliability of the SAH detection, (even in the early stage) and for clarification of consequences using problematic clinical data.