CervNet: A Novel Multimodal Neural Network to Diagnose Cervical Spondylosis From X-ray Images

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CervNet represents a significant innovation in the automated diagnosis of Cervical Spondylosis, a degenerative condition affecting the cervical spine that impacts over 85% of individuals aged 60 and above along with nearly 25% of people under the age of 40. Despite being the most accessible imaging modality, manual interpretation of cervical spine X-rays achieves only 68.3% accuracy, often necessitating more expensive CT or MRI scans for reliable diagnosis. To address this limitation, I have developed CervNet, a novel multimodal deep learning model that integrates X-ray images along with quantitative spinal parameters to enhance diagnostic precision of Cervical Spondylosis. CervNet employs a Single Shot Detector (SSD) to identify vertebrae C2–C7 from cervical spine X-ray images and uses an algorithm to generate quantitative spinal parameters, such as intervertebral disc heights and cervical disc angles. The feature maps extracted by an Attention Block from the quantitative data captured features such as disc space narrowing. These were concatenated with those from EfficientNetB7, which identified visual markers such as bone spurs (osteophytes) and endplate sclerosis. All these features are key indicators of Cervical Spondylosis. The combined feature map was then passed into the fully connected layer for final classification. The model achieved an accuracy of 99.09%, surpassing previous AI-based methods. A mobile app prototype was also developed to showcase model efficacy. This multimodal approach mimics real-world radiological assessment of Cervical Spondylosis, improving diagnostic robustness especially in resource-limited settings where advanced imaging is not readily available.

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