Title: Enhancing Cervical Cancer Diagnosis Through Explainable AI and Deep Learning Techniques

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Abstract: Cervical cancer is a leading cause of cancer related deaths among women, and early detection is crucial for improving patient prognosis. Traditional diagnostic methods, while effective, are often time-consuming and prone to subjectivity. This paper explores the use of deep learning techniques for automating cervical cancer diagnosis, employing five distinct models MobileNetV2, VGG19, Xception, ConvNeXtBase, and InceptionV3 along with a tuned version of MobileNetV2. A secondary dataset with five classes of cervical cell images were utilized to build the models and the performance of each model was evaluated with precision, recall and F1-score. The tuned MobileNetV2 model achieved the highest accuracy and robustness in classification. Tuned MobileNetV2 provided an accuracy of 0.99, with precision and recall values of 0.99. To address the "blackbox" nature of deep learning models, Explainable AI (XAI) techniques were incorporated, including LIME and Saliency Maps, to improve model interpretability. The use of XAI in the tuned MobileNetV2 model enhances transparency, allowing for visual interpretation of model predictions. Findings of the research suggests that deep learning, coupled with XAI, offers a promising and more explainable approach to cervical cancer diagnosis, advancing both accuracy and interpretability in automated clinical decision-making.

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