

Early Detection and Risk Stratification of Uterine Fibroid using Deep Learning-A Review

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Abstract

Uterine fibroids represent a significant global health burden, affecting a majority of women by age 50. Current diagnostic methods, primarily ultrasound and MRI, are effective for anatomical description but are subjective and lack predictive capability for individual risk stratification. This review synthesizes the emerging application of deep learning (DL) in transforming the management of uterine fibroids. We detail how convolutional neural networks (CNNs) and architectures like U-Net automate detection and segmentation with high accuracy, outperforming traditional methods. Crucially, we explore the potential of DL to integrate imaging radiomics with clinical and genetic data to predict future fibroid behavior, enabling a shift from reactive to proactive, personalized care. Despite promising results, challenges including data scarcity, algorithmic bias, and model explainability remain significant hurdles to clinical adoption. The review concludes that overcoming these barriers through interdisciplinary collaboration and robust validation is essential to realize the full potential of DL in improving early detection, risk stratification, and ultimately, patient outcomes for uterine fibroids.

Keywords: Uterine Fibroids, Deep Learning, Risk Stratification, Explainable AI, Medical Imaging.