3D Point Cloud Data with Deep Learning Algorithm for Melanoma Detection: An Inclusive Review

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Abstract: *Melanoma is a severe and potentially life-threatening form of skin cancer that originates in the pigment-producing melanocytes. Early detection is critical for improving survival rates, yet traditional diagnostic methods such as visual inspection and dermoscopic analysis can be subjective and limited in accuracy. In recent years, deep learning techniques have gained prominence in melanoma detection, particularly through the use of 2D dermoscopic image analysis with convolutional neural networks (CNNs) like AlexNet, VGGNet, and ResNet.. To overcome these limitations, recent trends have shifted toward 3D imaging and point cloud-based analysis, which allow for the inclusion of geometric and spatial information. Advanced models such as PointNet and DGCNN have shown promise in directly analyzing 3D point clouds, offering more robust and structure-aware classification. These advancements signal a transformation in melanoma detection, combining automation with spatial understanding for improved diagnostic accuracy. This paper represents recent advancements in melanoma detection, shifting from 2D image analysis to 3D point cloud methods. Models like PointNet and DGCNN enhance accuracy by capturing lesion depth and structure.*

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