Revolutionizing Non-Invasive Skin Cancer Detection Through a Novel Vision Transformer Application

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Every year, more people in the U.S are diagnosed with skin cancer than all other cancers combined. Early detection of these cancers can tremendously increase the 5-year survival rate. Current methods involve self skin examination (SSE), leading to professional screening from dermatologists. However, SSE can miss important lesions, which can cause development of cancer. To help aid in SSE and professional screening, efforts have been made towards the use of AI through Convolutional Neural Networks (CNN). However, these networks struggle to achieve high enough precision and sensitivity preventing them from adequate use. This research proposes a Vision Transformer (ViT) model to increase these metrics of skin cancer detection and its applicability. Through the ViT model's multi-head attention layer, the model serves to be more suitable for skin cancer classification than the CNN's Conv2d layer. Our ViT model was trained and evaluated on a dataset gathered from the International Skin Imaging Collaboration (ISIC), which was then fine tuned and augmented to improve its training behavior. Our transformer model was then compared to a standard CNN model and further implemented into a Windows application. The resulting model shows an ability to detect skin cancers at a 95.4% accuracy, outperforming the standard CNN model by over 8%. These findings support the potential for the implementation of ViT models in a clinical setting due to the high accuracy shown combined with the accessibility of the model through the Windows application.

Awards Won:
Missouri University of Science and Technology: Summer Camp scholarships (camp tuition and travel expenses, valued at up to $1,500)
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