P15 - Skin Cancer Diagnosis through Machine Learning: An Educational Tool for Improved Detection

14. Medicinteknisk utbildning / Biomedical engineering education
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Abstract text*:
Skin cancer is a rapidly growing and potentially deadly form of cancer, making early detection crucial for improved patient outcomes. This study introduces a machine learning-based educational system designed to aid early detection of skin cancer. The system leverages machine learning techniques to analyse skin lesion images from the ISIC-ISBI 2016 and 2017 datasets providing a non-invasive and cost-effective alternative to traditional biopsies. The primary objective of this dataset collection was to generate an automated prediction of lesion segmentation boundaries using dermoscopy images, where each image has a manual tracing of lesion boundaries done by an expert. To accommodate the diverse images acquired using many different devices, pre-processing and segmentation using OTSU thresholding isolate the region of interest, followed by extraction of detailed features such as texture, shape, and color. Principal component analysis (PCA) refines these features. An SVM ensemble classifier, trained on labeled images and evaluated on the ISIC-ISBI datasets, distinguishes cancerous from non-cancerous lesions. The system achieves an impressive 95.73% accuracy, a 95.51% average similarity rate in segmentation, and a low mean squared error (MSE), demonstrating its effectiveness. This system operates in real-time as a user-friendly application executable on any desktop computer, tablet, or laptop. The application takes an image as input, pre-processes it, and extracts relevant features. Using this feature matrix, the classifier determines whether the input image indicates a malignant or benign melanoma. The output provides a clear label of 'cancerous melanoma' or 'benign melanoma' for each analyzed image. This system offers significant educational value for dermatology students and doctors. It can be used for hands-on learning and classroom training, enabling accurate diagnosis without the need for invasive biopsies. The system's potential portability makes it a valuable tool for resource-limited settings and large-scale educational initiatives focused on skin cancer detection.