Near-Perfect Melanoma Diagnosis with Optimized Feature Learning and Classification

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As the most dangerous type of skin cancer, melanomas are often misdiagnosed by dermatologists for nevi. Early detection of melanomas is crucial for improving the five-year survival rate. Nine networks were constructed from concatenations of three possible feature extractors (GoogLeNet [G], ResNet-50 [R], and Inceptionv3 [I]) and three possible classifiers (k-Nearest-Neighbor [kNN], Naive Bayes [NB], and Support Vector Machine [SVM]). A bag of features algorithm was used as the control. Using images of melanomas and nevi from the HAM10000 database, the nine networks and the control were first trained and then tested to calculate the correct classification rate (CCR). It was hypothesized that R-SVM would yield the highest CCR. The results showed that R-SVM and G-SVM had the highest CCR. The results also showed that the classifier part of a network has a larger impact on the accuracy than the feature extractor part. In addition, G-kNN, G-SVM, R-kNN, R-SVM, I-kNN, and I-SVM achieved results that surpass dermatologist performance, with G-SVM and R-SVM also achieving state-of-the-art 99.991% accuracy in detecting melanoma.

Awards Won: