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Bias Prevention in Automated Diagnosis of Melanoma: Augmentation of a Convolutional Neural Network Classifier

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Abstract : Melanoma remains a public health crisis, with incidence rates increasing rapidly in the past decades. Improving diagnostic accuracy to decrease misdiagnosis using Artificial intelligence (AI) continues to be documented. Unfortunately, unintended racially biased outcomes, a product of lack of diversity in the dataset used, with a noted class imbalance favoring lighter vs. darker skin tone, have increasingly been recognized as a problem.Resulting in noted limitations of the accuracy of the Convolutional neural network (CNN)models. CNN models are prone to biased output due to biases in the dataset used to train them. Our aim in this study was the optimization of convolutional neural network algorithms to mitigate bias in the automated diagnosis of melanoma. We hypothesized that our proposed training algorithms based on a data augmentation method to optimize the diagnostic accuracy of a CNN classifier by generating new training samples from the original ones will reduce bias in the automated diagnosis of melanoma. We applied geometric transformation, including; rotations, translations, scale change, flipping, and shearing. Resulting in a CNN model that provided a modifiedinput data making for a model that could learn subtle racial features. Optimal selection of the momentum and batch hyperparameter increased our model accuracy. We show that our augmented model reduces bias while maintaining accuracy in the automated diagnosis of melanoma.

Keywords : bias, augmentation, melanoma, convolutional neural network
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