World Academy of Science, Engineering and Technology
International Journal of Health and Medical Engineering
Vol:16, No:07, 2022

Optimization of a Convolutional Neural Network for the Automated Diagnosis of Melanoma

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Abstract : The incidence of melanoma has been increasing rapidly over the past two decades, making melanoma a current public health crisis. Unfortunately, even as screening efforts continue to expand in an effort to ameliorate the death rate from melanoma, there is a need to improve diagnostic accuracy to decrease misdiagnosis. Artificial intelligence (AI) a new frontier in patient care has the ability to improve the accuracy of melanoma diagnosis. Convolutional neural network (CNN) a form of deep neural network, most commonly applied to analyze visual imagery, has been shown to outperform the human brain in pattern recognition. However, there are noted limitations with the accuracy of the CNN models. Our aim in this study was the optimization of convolutional neural network algorithms for the automated diagnosis of melanoma. We hypothesized that Optimal selection of the momentum and batch hyperparameter increases model accuracy. Our most successful model developed during this study, showed that optimal selection of momentum of 0.25, batch size of 2, led to a superior performance and a faster model training time, with an accuracy of ~ 83% after nine hours of training. We did notice a lack of diversity in the dataset used, with a noted class imbalance favoring lighter vs. darker skin tone. Training set image transformations did not result in a superior model performance in our study.

Keywords : melanoma,convolutional neural network,momentum,batch hyperparameter
Conference Title : ICADSC 2022 : International Conference on Advanced Dermatology and Skin Cancer
Conference Location : Singapore, Singapore
Conference Dates : July 12-13, 2022