



Assessment of accuracy and cost matrix of a deep learning algorithm to detect melanoma in Brazil

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Abstract:

INTRODUCTION

Artificial intelligence has been frequently used to classify pigmented lesions in order to promote earlier detection of melanoma, the most deadly skin cancer. Most articles evaluate algorithms accuracy to classify pigmented lesions. However, highest accuracy are not always related to the lowest health system costs. One melanoma false negative (FN) can lead to later stages disease resulting in high direct and indirect costs.

METHODS

We worked with a dataset of 8000 dermoscopy images from ISIC dataset (4000 melanomas). 80% of them were used for training, 10% for validation and 10% for testing. We transferred learning from a pre-trained imagenet to EfficientNet and trained it with 20 epoches. We built a cost matrix based on values spent by the Health Public System in Brazil for the diagnosis and treatment of melanoma in different stages and measured how the algorithm would perform in a real world set of patients.

RESULTS

EfficientNetB4 achieved total cost of R\$ 648.122,00 with 0.84 accuracy, 0.84 sensitivity (62 FN, 69 FP). EfficientNetB6 achieved a total cost of R\$625.532,00 with 0.82 accuracy, 0.88 sensitivity in the test (47 FN, 89 FP). FN were more common in amelanotic melanomas.

DISCUSSION

A 4,2% increase in sensitivity besides 2,4% reduction in accuracy resulted in a R\$32.418,00 saving. If we could



reduce FN to 30 cases, for example, maintaining 0.82 accuracy, sensitivity would increase to 0.92 and cost would be R\$599.080. This states the importance of the cost matrix to find the best algorithm weights. Higher sensitivity, even with lower accuracies, could justify reduction of false negatives and costs.

Biography:

Aline Okita has graduated in medicine and post-graduated in dermatology in one of the most important university in Brazil, University of São Paulo, and now works with a multidisciplinary team at Hospital Israelita Albert Einstein in a research for the Ministry of Health to develop an algorithm to help detecting melanoma in order to reduce costs related to its treatment in Brazil. She is CEO of Axonn Health Tech responsible for the development of CoronaBr.com.br, a website with a virtual nurse to triage patients that viralized in Brazil and had more than 20 million access in 2 weeks.

Publication of speakers:

1. Treatment of Male-Pattern Alopecia with Platelet-Rich Plasma;
2. Treatment of psoriasis vulgaris with cyclosporine and methotrexate injections using the MMP® technique