Uveal Melanoma detection from Fundus Images Using Deep Learning.

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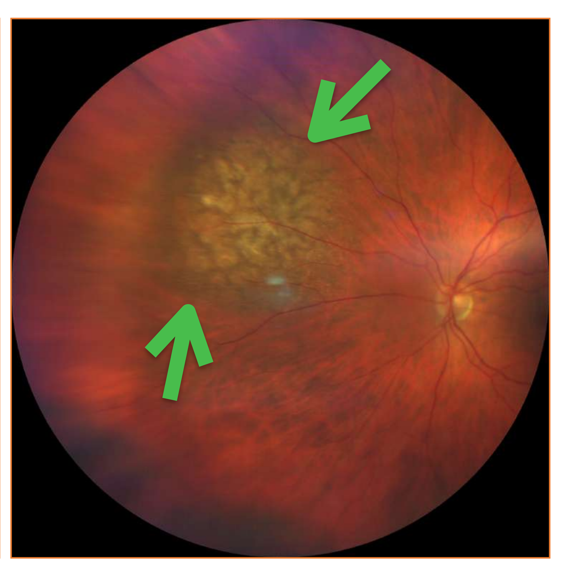
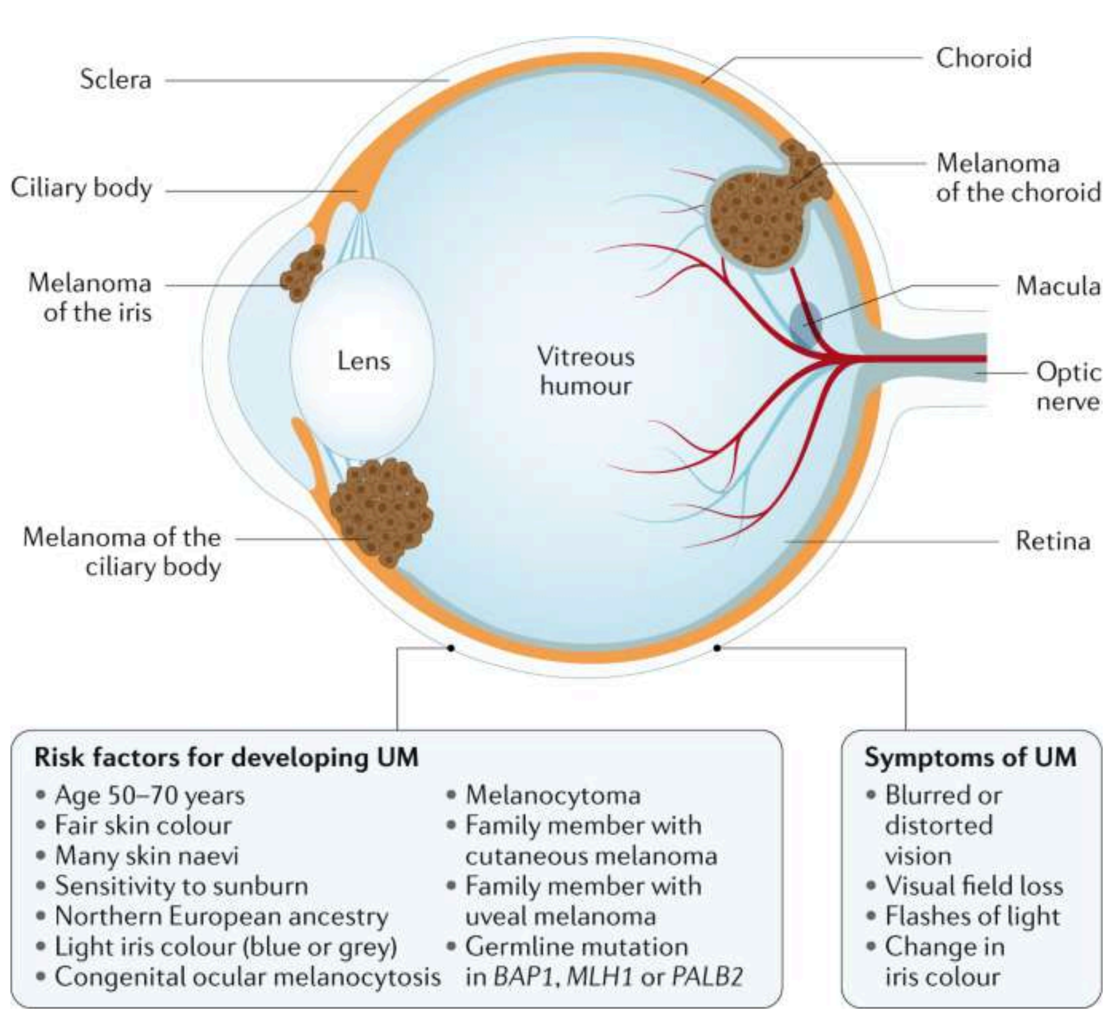
INTRODUCTION

- Uveal melanoma (UM) is considered a highly critical eye disease that affects adults. Choroidal nevus is the most prevalent type of tumor found in the eye and has the potential to transform into uveal melanoma.
- Uveal melanoma is a malignant form of eye cancer that can cause vision loss and has a high risk of spreading to other parts of the body.
- Early prediction of UM can help to reduce the risk of death caused by delays in diagnosis.

Choroidal Nevus



Choroidal Melanoma



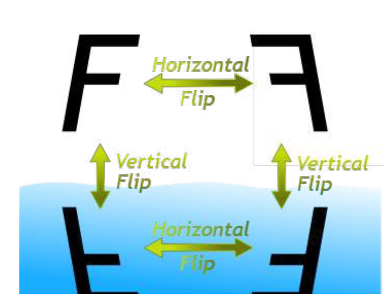
Uveal Melanoma (1)

OBJECTIVES

- Develop machine learning models to classify Choroidal nevus into two categories, and use an interpretable machine learning model to assess the outcomes.

Material & Methods

- We used various pre-trained machine learning models to classify Choroidal Nevus as either present or absent.
- In order to interpret our models, we applied SHAP analysis.
- We collected 854 fundus images in RGB format from two datasets - the Alberta Ocular Brachytherapy Program and the Philadelphia Group. Each eye was photographed, resulting in 427 images with lesions and 427 images without lesions.
- Prior to training and validating our classification results, we pre-processed the images by converting them to a suitable format, resizing them to a standard size, and utilizing data augmentation techniques to increase the size of our dataset. The pre-processing steps are depicted in the figure below.
- figure (2) show the original and RGB channel in fundus images.



Data Augmentation

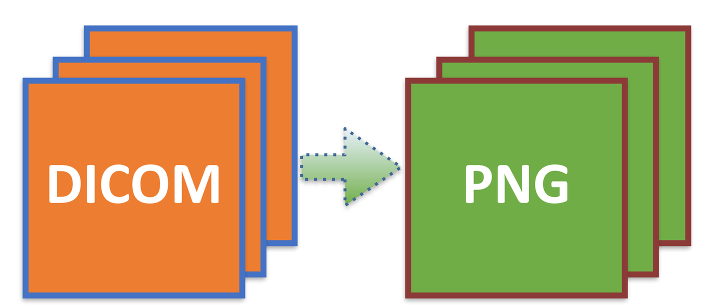


Image Conversion

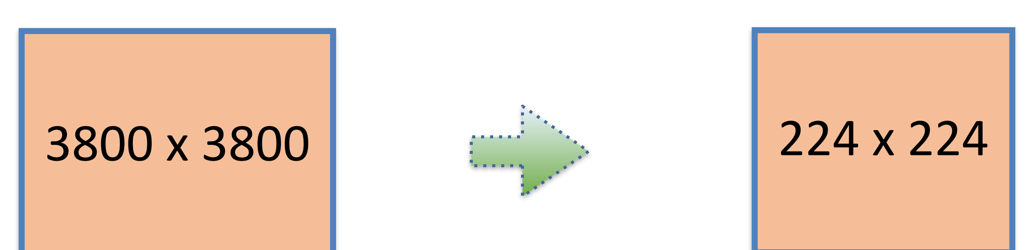
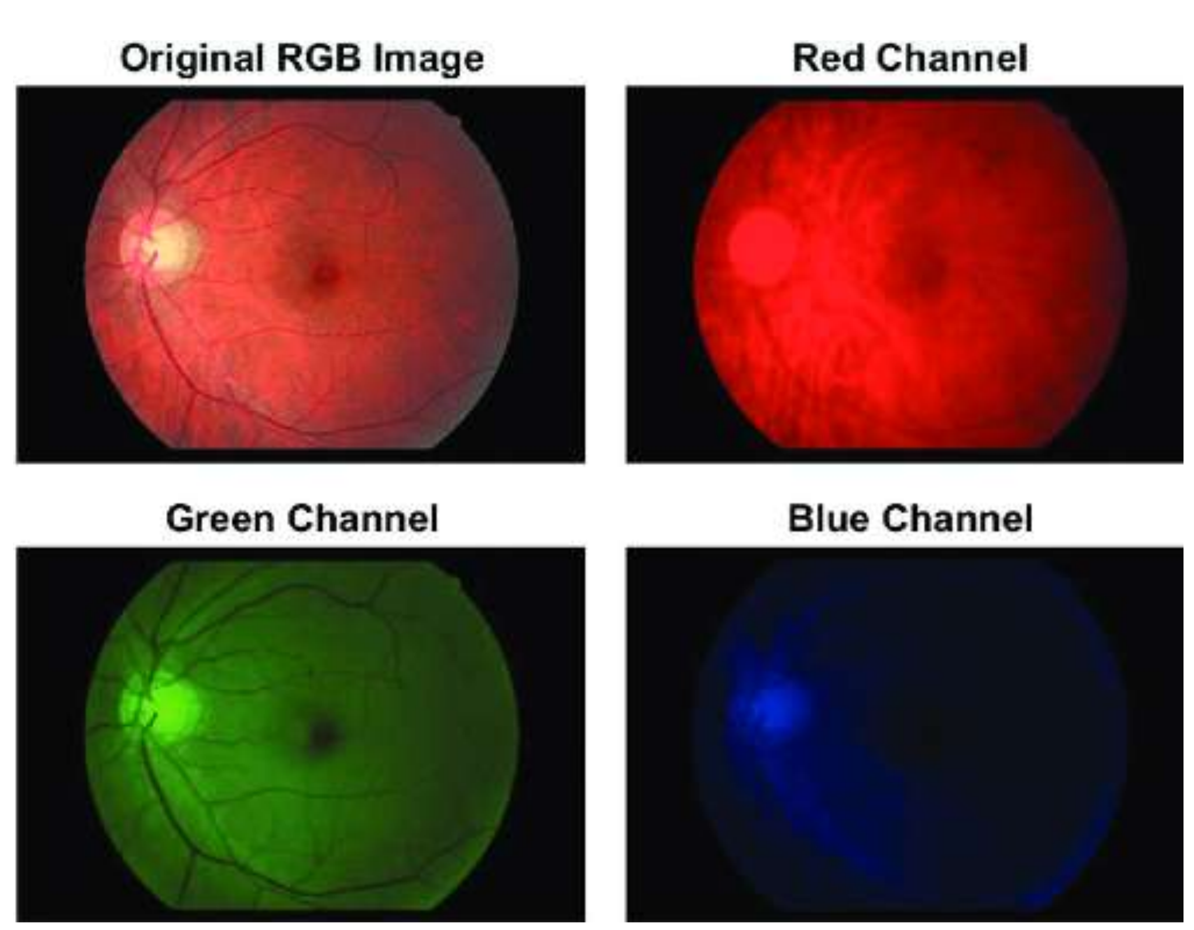


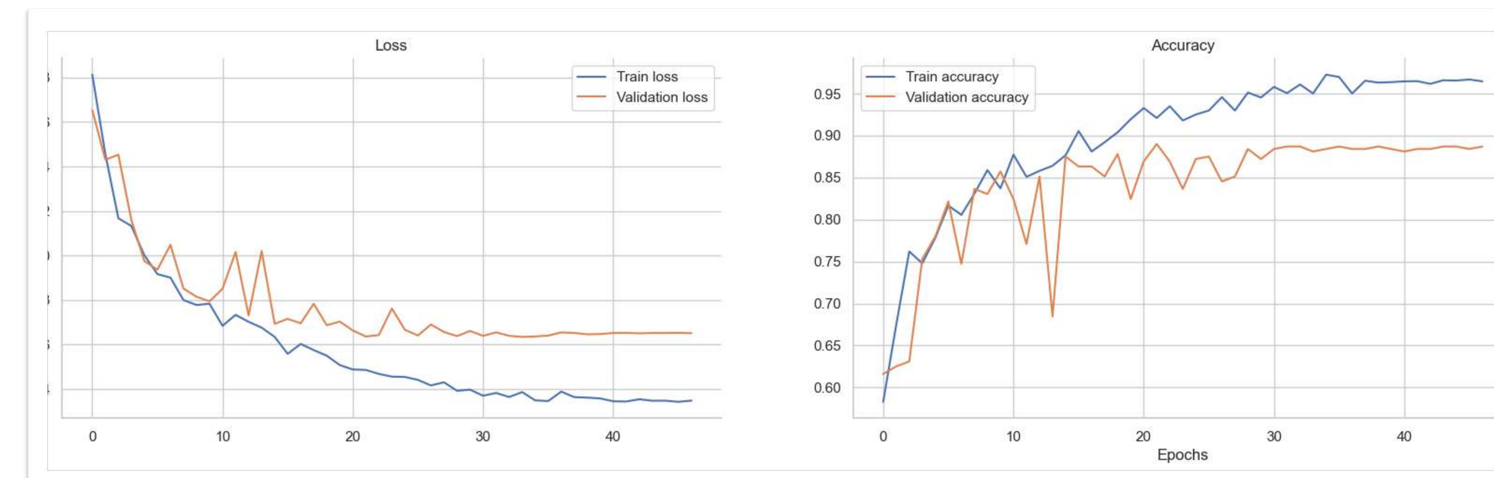
Image Resizing



RGB Channel Funds Image (2)

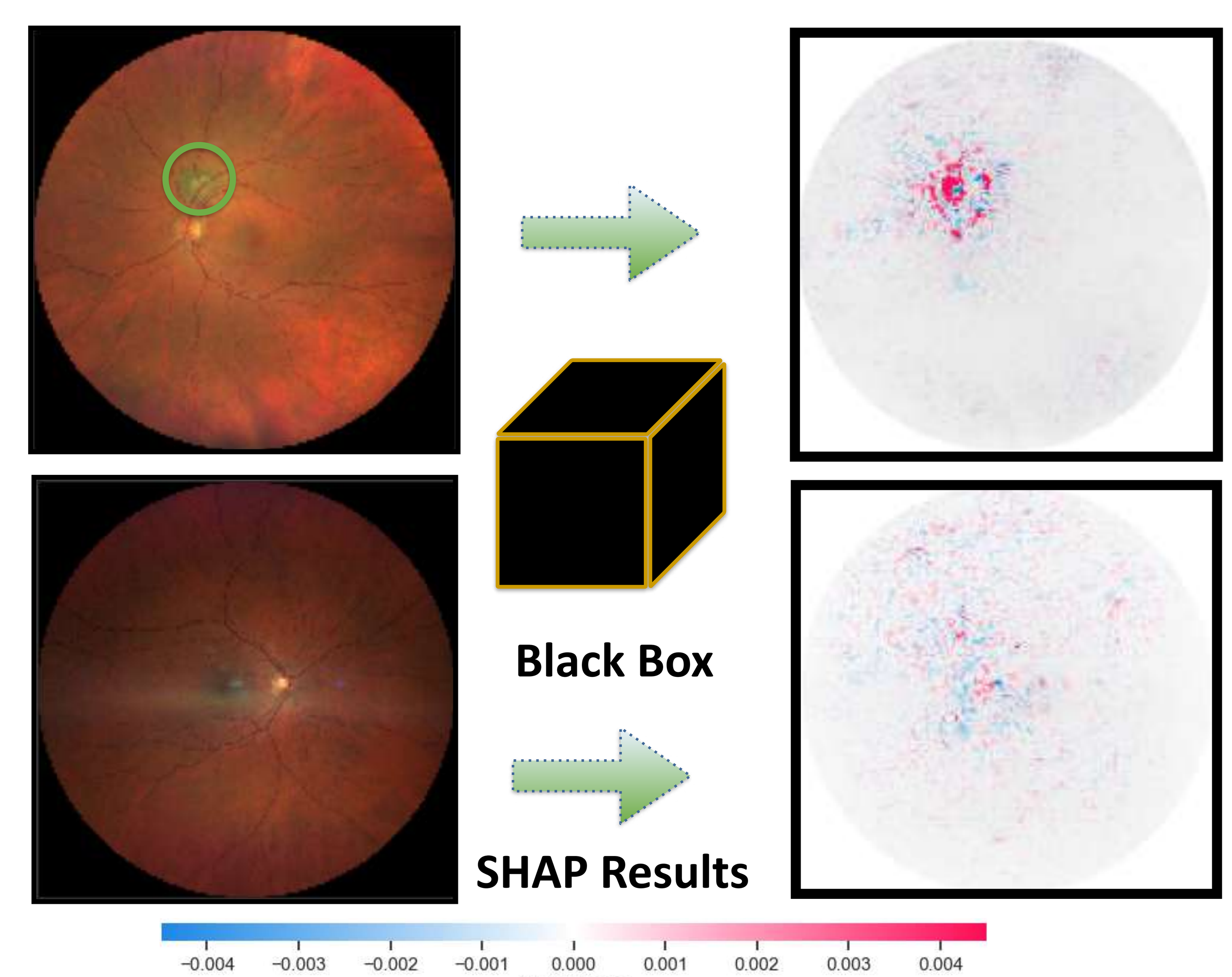
RESULTS

- The performance metric results indicate the validation and loss values for the binary classification task of Choroidal Nevus.
- The findings demonstrate that one of the pre-trained machine learning models was able to achieve a 90% validation accuracy and a 0.60 loss value, which suggests that it was effective in accurately detecting Choroidal Nevus.



Loss and Accuracy Result

- In the lower left portion of the display, there are two images of fundus: one displaying a non-lesion area and the other showing the presence of a lesion.
- On the lower right side, the SHAP results for both images are presented. The SHAP values are coloured red to indicate an increase in the prediction, while blue indicates a decrease in the prediction.



SHAP results

CONCLUSION

- The findings indicate that our machine learning algorithms were able to make accurate predictions for the binary classification of choroidal nevus.
- Additionally, the SHAP tool was effective in interpreting the classification results and identifying the key features that played a significant role in determining the final prediction of choroidal nevus.

REFERENCES

1. Jager, Martine J., et al. "Uveal melanoma." *Nature reviews Disease primers* 6.1 (2020): 24.
2. Bilal, Anas, et al. "A Transfer Learning and U-Net-based automatic detection of diabetic retinopathy from fundus images." *Computer Methods in Biomechanics and Biomedical Engineering: Imaging &*

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