

YURF-BANGASH-YOUSAFZAI AUGUR : PROPOSAL OF CAROTID PLAQUE FORMATION PREDICTOR AMONG GENERAL POPULATION BY EXPLORATION OF STATE-OF-THE-ART FOR AUTOMATED MACHINE LEARNING

Our novel approach to developing a predictive risk model for CP formation by exploring SOTA for automated machine learning provides optimised predictions which, when incorporated into the respective risk stratification protocols, shall translate into a decrease in the morbidity and mortality associated with cardiovascular atherosclerotic events by assisting in risk stratification and subsequent complication triaging among general population.

INTRODUCTION: Carotid plaque, recognized as a predictor of adverse cardiovascular and cerebrovascular complications¹, has been explored via machine learning.²

METHODOLOGY: The study population comprised 122 entrants—variables including subjective measures such as weight, height and smoking history as well as serum levels of HbA1c and HDL-C.³ The current state of the art (SOTA) for automated Machine Learning (aML)⁴ was adopted with superimposition of ensemble approach and macro-weighted average area under the receiver operating curve (mWA-AUROC), along with other parameters, was adopted to gauge the discriminative ability of the developed models.

RESULTS: A Decision Tree algorithmic model predicted CP formation with a perfect mWA-AUROC of 1.00 and an accuracy of 100% on the training partition (40% of the original dataset) along with an mWA-AUROC of 0.99 and an accuracy of 98.6% on the testing partition (60% of the original dataset). (Figure 1) A precision of 100% and a recall of 98.5%— such that an F1 score of 99.2%— was achieved on the testing partition by the respective algorithmic model— to be heretofore termed as the “Yurf-Bangash-Yousafzai augur”. The Yurf-Bangash-Yousafzai augur thus outsmarts the CP predictive model (having AUROC, accuracy and an F1 score each of 0.86) developed by Wu D et al.²

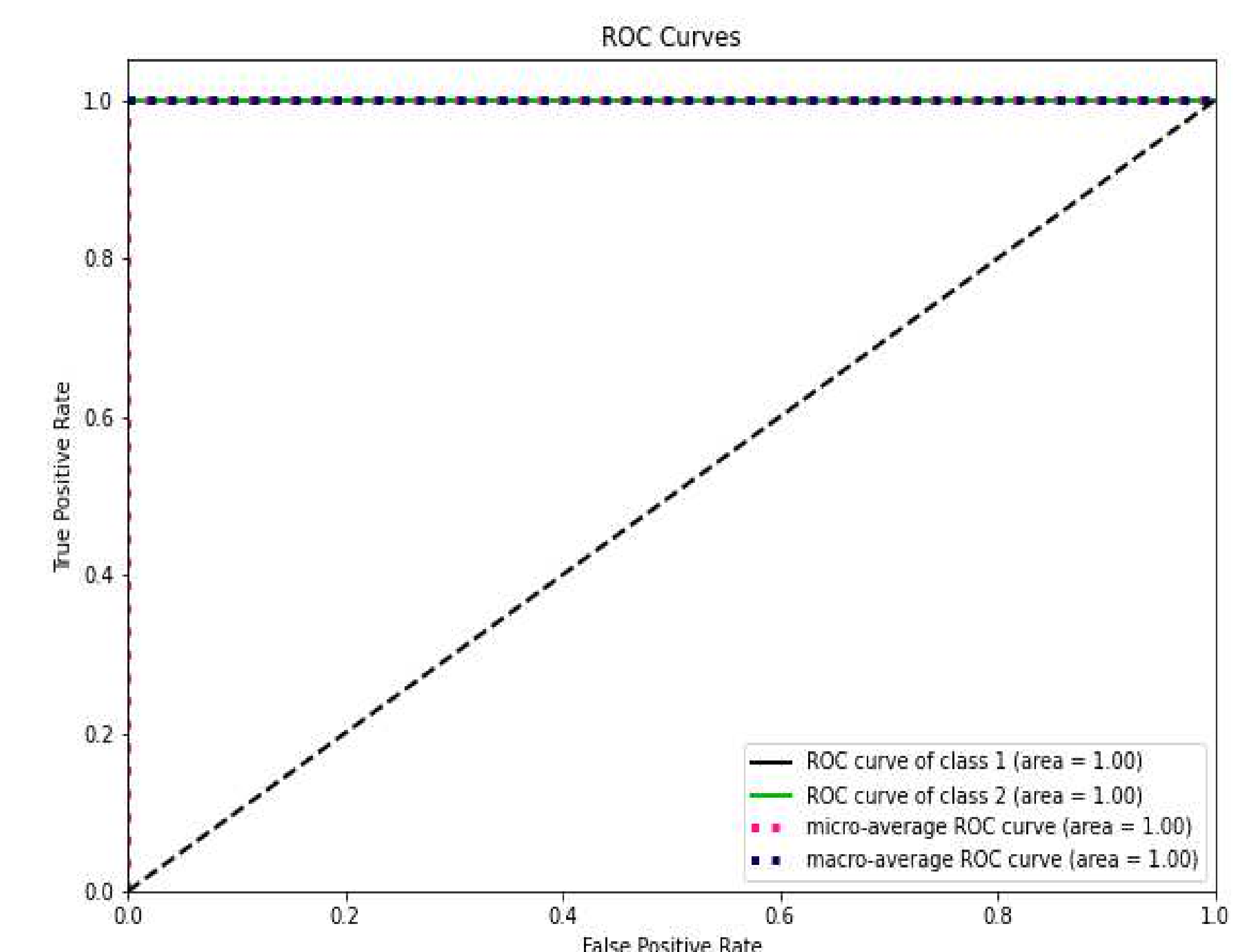


Figure 1: The AUROC curve of Yurf-Bangash-Yousafzai augur indicative of its discriminative classification ability

References

1. van der Toorn JE, Bos D, Ikram MK, et al. Carotid Plaque Composition and Prediction of Incident Atherosclerotic Cardiovascular Disease. *Circ Cardiovasc Imaging*. 2022;15(3):e013602. doi:10.1161/CIRCIMAGING.121.013602
2. Wu D, Cui G, Huang X, et al. An accurate and explainable ensemble learning method for carotid plaque prediction in an asymptomatic population [published online ahead of print, 2022 Apr 28]. *Comput Methods Programs Biomed*. 2022;221:106842. doi:10.1016/j.cmpb.2022.106842
3. Ukweh ON, Ekpo EU. Carotid Intima-Media Thickness and Carotid Plaque: A Pilot Study of Risk Factors in an Indigenous Nigerian Population. *J Stroke Cerebrovasc Dis*. 2019;28(5):1346-1352. doi:10.1016/j.jstrokecerebrovasdis.2019.01.035
4. AutoML Compare. *MLJAR Automated Machine Learning*. <https://mljar.com/automl-compare/>. Published 2021. Accessed June 19, 2022.