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Using Gradient-Boosted Trees, Waist Circumference Prediction for Epidemiological Studies

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Introduction

In clinical research, waist circumference is becoming recognized as a useful health risk predictor. However, self-reported values are frequently inaccurate and clinical datasets typically lack this measurement. When this information is lacking or to mitigate the impact of inaccurate self-reports, predicting waist circumference based on standard physical features may be a viable option. This study found that the advanced machine learning algorithm XGBoost could build models that can predict waist circumference based on height, weight, calculated BMI, age, race/ethnicity and sex. It also found that these models performed better than linear regression models that are currently in use and the relative importance of each feature in this prediction [1].

Description

Early cardiovascular dysfunction and an increased risk of cardiovascular morbidity and mortality in adulthood are linked to childhood obesity and overweight. The obese child exhibits the following cardiovascular dysfunction symptoms: a significantly higher arterial blood pressure, changes in the structure and function of the myocardium (left ventricular hypertrophy, left ventricular diastolic dysfunction and myocardial dysfunction) and the development of long-term epicardial fat. Cardiovascular disorders in childhood are serious because they can lead to heart failure, acute coronary syndrome and sudden, premature death in adulthood. Screening for early metabolic complications is regarded as being very important, but it isevaluating weight list or midriff outline as a cardio-metabolic gamble factor. The midsection periphery (WC) is a simple to-decide clinical boundary for surveying the wholesome status of the youngster, free of weight record (BMI). Concentrates in grown-ups have shown that people with focal corpulence are more powerless to cardio-metabolic gamble factors. Studies have demonstrated that central obesity is an independent risk factor for coronary artery disease, arterial hypertension and dyslipidemia. Furthermore, WC at the ages of 5 to 17 years was shown to be associated with abnormal concentrations of TG, LDL-C, HDL-C and insulin. WC correlates with visceral obesity, which is why obese children with elevated WC need to be carefully monitored to prevent long-term cardio-metabolic complications [2].

In biomedical research, machine learning (ML) methods are increasingly being used to predict disease outcomes. ML methods are powerful tools. We used boosted trees (XGboost) to predict disease outcomes and identify risk factors in this study. This machine learning strategy is capable of capturing complex and nonlinear interactions between variables, resulting in improved predictive power in numerous situations. Numerous ML models have been developed for diagnostic or prognostic purposes in light of the COVID-19 pandemic. For instance, based on the testing of 75,991 veterans for the virus, developed a prediction model for COVID-19 infection. Predictors included vital signs, hematology measurements and blood biochemistries. The prediction was based on boosted trees. Developed a model based on demographics, comorbidities, vital signs and blood test results to predict in-hospital mortality for COVID-19 patients. XGboost, the generalized additive model and LASSO were some of the tools used. based on basic patient information, comorbidities, vital signs, clinical symptoms and a complete blood count, utilized deep neural networks to predict the severity of COVID-19 infection. performed a systematic review of 169 studies describing 232 prediction models related to COVID-19 up until July 1, 2020. The utilization of ML techniques in the investigation of COVID-19 has also been the subject of a number of recent reviews [3].

Extreme Gradient Boosting, or XGBoost;A machine learning algorithm for building gradient-boosted decision trees (https://github. com/dmlc/xgboost) is well-suited for regression. In a nutshell, the algorithm creates a preliminary decision tree. After applying the initial tree, it constructs subsequent decision trees to predict residuals (errors). It then adds the scaled residual to the original prediction to produce a slightly improved prediction after scaling this residual by a pre-defined learning rate (lower learning rates favor less variance and overfitting). Until it reaches a predetermined number of trees, which is defined as the number of trees at which additional trees no longer improve performance, it continues to build additional trees in this manner. In XGBoost, extreme gradient-boosted trees are unique in that they determine branch splits by clustering residuals into leaves based on similarity scores. If the gain in the group's similarity to the parent leaf does not exceed a user-defined value (lambda), groups of leaves are pruned. reducing overfitting is the goal of this type of regularization. Based on our empirical findings, the optimal parameters were a learning rate of. 02, 80 percent subsampling and a maximum tree depth of 5, 1000 trees. Empirically, the number of trees was chosen by increasing them by a factor of ten until there was no more improvement in performance and then decreasing them until performance started to decline [4,5].

Conclusion

Early cardiovascular dysfunction is associated with childhood obesity and overweight. When compared to children, visceral obesity is a significant predictor of vascular impairment (pre-hypertension and hypertension), particularly in adolescents. WC over the 90th percentile is a prescient variable for expanded LVM file and concentric hypertrophy in the two kids and youths. Pediatric patients who are obese and have a high WC need to be closely watched to avoid long-term cardiovascular problems.

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Conflict of Interest

There are no conflicts of interest by author.

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