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Using Machine Learning to Classify Human Fetal Health and Analyze Feature Importance

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Abstract : Reduction of child mortality is an ongoing struggle and a commonly used factor in determining progress in the medical field. The under-5 mortality number is around 5 million around the world, with many of the deaths being preventable. In light of this issue, Cardiotocograms (CTGs) have emerged as a leading tool to determine fetal health. By using ultrasound pulses and reading the responses, CTGs help healthcare professionals assess the overall health of the fetus to determine the risk of child mortality. However, interpreting the results of the CTGs is time-consuming and inefficient, especially in underdeveloped areas where an expert obstetrician is hard to come by. Using a support vector machine (SVM) and oversampling, this paper proposed a model that classifies fetal health with an accuracy of 99.59%. To further explain the CTG measurements, an algorithm based on Randomized Input Sampling for Explanation ((RISE) of Black-box Models was created, called Feature Alteration for explanation of Black Box Models (FAB), and compared the findings to Shapley Additive Explanations (SHAP) and Local Interpretable Model Agnostic Explanations (LIME). This allows doctors and medical professionals to classify fetal health with high accuracy and determine which features were most influential in the process.

Keywords : machine learning, fetal health, gradient boosting, support vector machine, Shapley values, local interpretable model agnostic explanations
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