FetA.I.: A Novel Fetal Health Classification Program Using Soft Voting With Deep and Ensemble Learning

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Fetal monitoring based on cardiotocography (CTG) is a non-invasive option for assessing fetal health. However, current methodologies of interpreting CTG consist of human eye inspection, resulting in a 60% false positive rate in classifying fetal conditions during pregnancy. This has led to unnecessary medical interventions, such as C-sections, for suspected pathological conditions like fetal hypoxia and fetal anemia. This study aimed to develop an automated CTG diagnosis system that can improve fetal health assessment, which could have a positive impact on healthcare in underdeveloped countries where access to trained medical professionals is limited. After CTG data was imported from the UCI ML repository, four AI base algorithms were used to create a novel soft voting classifier that combines the predictions made by individual machine learning models through a weighted majority vote, resulting in a more accurate and reliable fetal health classification program. The interdisciplinary approach, which brings together AI and medical science, helps address the current issues faced by human eye inspection of CTG. The computational software developed by our study can assist clinicians in real-time decision-making based on CTG data, potentially improving the outcomes of pregnancy and delivery. With a user-friendly graphical interface developed using Python Tkinter, this system can be easily integrated into clinical practice. The results demonstrate that the soft voting classifier effectively combines the predictions of the four base models and achieved higher accuracy (89.44%) compared to the individual models, with 96.1% precision for detecting fetal hypoxia and 93.3% for detecting fetal anemia.