Using Automated Infant Posture Recognition to Reduce SIDS Risk

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According to the CDC, approximately 3500 infants die annually in the United States from sleep-related infant deaths, such as Sudden Infant Death Syndrome (SIDS). My project aims to reduce the extrinsic risk factors of SIDS by initiating an automatic alert when an infant's posture is high-risk (as considered by the American Academy of Pediatrics). I downloaded pictures of infants in various lying positions and produced about 50,000 video frames. On each frame, I ran PoseNet: a model that generates coordinates and a confidence score for different body parts. I used it to recognize each infant's nose, eyes, ears, shoulders, elbows, and wrists. Then, I progressively added more features, such as angles and distances between certain body parts. Using this dataset, I built a geometric algorithm and a machine learning (ML) model. I modified the geometric algorithm to include threshold values for all measurements. Then, I imported the CSV data file into WEKA (an ML software) and experimented with different algorithms. The ML models with the lowest and highest accuracy were generated by Decision Tables (64.78%) and Random Forests (91.07%) respectively. After refining the Random Forests (RF) model by optimizing hyperparameters (objective functions and number of trees), the accuracy improved to 96.67% with a root mean square error of 0.072 when using 10-fold cross-validation. I incorporated this RF model into my "SIDS Pose Recognition" application. With my user-friendly app, caregivers would immediately receive an alert when an infant's position is unsafe or high-risk for SIDS.

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