

# ANALYSIS OF EXTRACTED CARDIOTOCOGRAPHIC SIGNAL FEATURES TO IMPROVE AUTOMATED PREDICTION OF FETAL OUTCOME

Michał Jeżewski<sup>1</sup>, Robert Czabański<sup>1</sup>, Janusz Wróbel<sup>2</sup>, Krzysztof Horoba<sup>2</sup>

<sup>1</sup>*Division of Biomedical Electronics, Institute of Electronics, Silesian University of Technology, Gliwice, Poland*

<sup>2</sup>*Department of Biomedical Signal Processing, Institute of Medical Technology and Equipment, Zabrze, Poland*

## Abstract

Cardiotocographic monitoring based on automated analysis of the fetal heart rate (FHR) signal is widely used for fetal assessment. However, the conclusion generation system is still needed to improve the abnormal fetal outcome prediction. Classification of the signals according to the predicted fetal outcome by means of neural networks is presented in this paper. Multi-layer perceptron neural networks were learned through seventeen time-domain signal features extracted during computerized analysis of 749 traces from 103 patients. The analysis included estimation of the FHR baseline, detection of acceleration and deceleration patterns as well as measurement of the instantaneous FHR variability. All the traces were retrospectively verified by the real fetal outcome defined by newborn delivery data. Influence of numerical and categorical representation of the input signal features, different data sets during learning, and gestational age as additional information, were investigated. We achieved the best sensitivity and specificity for the neural networks fed with numerical input variables together with additional information on the gestational age in the categorical form.

**Keywords:** cardiotocography, fetal heart rate monitoring, fetal outcome prediction, pattern classification, signal analysis