Title (tentative): Development and validation of a decision support tool for detection of congenital heart defects in neonates using heartbeat sounds from digital stethoscopes

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Description

Motivation and application domain

The aim of this project is to develop an algorithm which will provide an objective support in clinical decision making for congenital heart defect detection. Heart sounds, captured by means of electronic stethoscopes soon after birth, will be analyzed and classified to assist with diagnosis. This solution will have to provide fast and accurate diagnosis of congenital heart defect cases, resulting in timely treatment and a reduction in child mortality rate in the developing world.

General objectives and main activities

This thesis consists of the development of a recognition system for congenital heart defects in newborns using artificial intelligence, involving the latest techniques in machine learning to support clinicians' diagnoses. The focus is on processing and analyzing phonocardiogram signals using Deep Convolutional Neural Networks to classify heart sound recordings into normal (no CHD) or abnormal (CHD). The work will include engineering and analysis of discriminative characteristics of audio signals, the development and testing of a classification algorithm.

This work is being carried out in conjunction with the INFANT Research Centre at the University College Cork. The audio database is provided by Ukrainian partners via a collaborative project funded by Grand Challenges Canada, Start in Global Health scheme.

Training Objectives (technical/analytical tools, experimental methodologies)

Study and understanding of the state-of-the-art in this area. Develop skills in signal processing, data analysis and in understanding of feature engineering. Involvement in the analysis of high quality real-life data of substantial size, data preparation, basics of big data analytics and efficient data management. Practical experience in developing and using deep convolutional neural network models. MATLAB and Python programming skills.

Place(s) where the thesis work will be carried out: University College Cork, INFANT Centre

Additional information

Maximum number of students: 1

Financial support/scholarship: Erasmus+ traineeship