*Neural Network approaches for prediction of Neonatal Diseases*

# Introduction

The last decade has seen exponential growth in the field of Machine Learning and Artificial Intelligence, primarily since the introduction of Deep Neural Networks [1] that have drastically improved the ability of machines to solve problems that rely on intuitive decisions learnt from experience rather than pre-determined rules. Artificial Neural Networks are inspired by the neural connections of the Human brain; Neurons optimize their mutual-connections through synapses and therefore learn over time, through reinforcement and experience [2]. The artificial neurons in an artificial neural network are much like the neurons in the brain, they are mutually connected to other neurons, ordered in layers where each neuron outputs a function of its summed inputs, equivalent to a neuron-synapse [2].

Neural networks are a form of supervised learning; They are trained by back-propagating the error between the required output and that of the network output, to the layers between the input and the output layers, called the hidden layers. The neurons “learn” by optimizing weights between their connections with other neurons, corresponding to the back-propagated error.

<<Introduction to Neural Network>>

# Applications

As Machine Learning has matured, new opportunities have emerged for various applications in the Medical domain. Neural networks have been established at the forefront of applications in these domains, for medical disease diagnosis.

A decision-reference system was proposed by Vanisree K et al for diagnosis of Congenital Heart Diseases[5] where a Multi layer feedforward network (a type of neural network) was trained on a benchmarked dataset. Various physiological features of a patient were considered in this work, including signs, symptoms and medical test parameters. This system managed to achieve an accuracy of 90% in providing an accurate measure whether the patient was diseased or not.

In another work by C.S Dangare et al [7], a Heart Disease Prediction System was developed based on neural networks. The system predicts the probability of a patient developing a heart disease based on 13 continuous medical parameters like blood pressure, cholesterol and discrete features such as obesity and health habits such as smoking. The study manages to diagnose heart disease with 99.25% accuracy by training a relatively simple neural network with 1 hidden layer on 570 training examples. This study is a good example of how effectively neural networks even in their nascent form, can assist in diagnosis of medical diseases.

An automated speech recognition (ASR) system was developed by Krzysztof Wołk et. al [8], inspired by EU-BRIDGE project, intended to automate transcription and translation technology, and cross the language-barrier between medical communities worldwide, promoting sharing of medical research. Further, access to translations of a foreign patient’s medical data could save their lives.

This work utilized a sophisticated recurrent neural network with 750 hidden layers trained on sentences of Polish-to-English and vice-versa ,composed of 50 words or fewer with 500,000 iterations and manages to achieve a working accuracy under strict hardware constraints.

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