High Accuracy Classification of Myopathy Electromyography Signals Using a ResNet50 Neural Network

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Myopathies are skeletal muscle disorders characterized by chronic muscle weakness, which are frequently diagnosed using electromyography (EMG) studies. Automating the diagnosis of myopathies from EMG signals would save valuable time and resources, as well as achieve accurate diagnostics, for doctors and health practitioners. Although time frequency representations have been used in medical research, their application in neural networks warrants further investigation. In this experiment, it was hypothesized that after a transfer neural network is trained on time frequency (spectrogram and scalogram) representations of EMG signals, the neural network will be able to accurately (90%+) classify between normal and myopathy EMG signals. A sample size that includes myopathy (n = 107) and normal (n = 106) EMG signals obtained from a study at the University of Copenhagen in 2001 was broken into several smaller samples that were converted into spectrogram and scalogram images, yielding normal (N = 3,710) and myopathy (N = 3,745) EMG images. These images were fed into a convolutional neural network, a VGG16 transfer learning model, and a ResNet50 transfer learning model, all of which used the binary cross-entropy loss function and Adam optimizer. The results support the hypothesis because after training neural networks on time frequency representations, the ResNet50 transfer model achieved a 96.57% accuracy when classifying between normal and myopathy spectrogram representations of EMG signals. Creating this neural network is leading to automated diagnosis of these signals, which will save time and money in the medical field.

Awards Won:

Third Award of $1,000