**6th Sem Major Project Research Report**

**Topic: EMG Signals**

**Aim:** EMG Signal Classification for Finger Movement Detection and Disease Detection.

**Basics about EMG:**

Electromyography (EMG) signals can be used for clinical/biomedical applications, Evolvable Hardware Chip (EHW) development, and modern human computer interaction. EMG signals acquired from muscles require advanced methods for detection, decomposition, processing, and classification.

**EMG Decomposition:**

Decompose the EMG signal to reveal the mechanisms pertaining to muscle and nerve control.

Traditional methods for decomposition of EMG Signals we read from the past literatures were:

**The Fourier Transform**

• The Fourier Transform provides frequency information of a signal that

represents frequencies and their magnitude.

• It does not tell us when in time the frequencies exist. The transform is

therefore, ideal for stationary signals.

**The Short-Time Fourier Transform (STFT)**

• The STFT was developed to overcome the poor time resolution of the

Fourier Transform. It gives us a time-frequency representation of the

signal.

• With STFT we can assume some portion of the non-stationary signal is

stationary.

• We then take a Fourier Transform of each stationary portion along the

signal and add them up.

**Wavelet Transform Method**

As the main advantages of wavelets is that -

* They offer a simultaneous localization in time and frequency domain.
* The second main advantage of wavelets is that, using fast wavelet transform, it is computationally very fast. Wavelets have the great advantage of being able to separate the fine details in a signal.

Then after analyzing all these two methods, we found Wavelet Transform Method to be the best suitable method.

**Now we know how to fetch EMG Signals from the Human Body by using above methods, so we are now focusing on Finger Movement Detection and Neuro-Muscular Disease Detection.**

1. **Finger Movement Detection Using SVM:**

**Aim** for this classification using SVM was to use this Learning Model and get a data set which helps in Narcotic Tests. Since we know there are unwanted Hand movements in the case of person defected with Drug Addictions. So we can induce this Model along with other methods used by Narcotic Department to detect Person using Drugs.

We used various SVM Models for this Classification like XGB, Random Forrest etc. and after analyzing we figured out that accuracy of XVG was around 90% and of Random Forest was 94%.

So, we opted Random Forest Method for the Learning Model.

1. **Neuro-Muscular Disease Detection.**

**Aim** is to making a SVM Model to detect Neuron-Muscular Diseases with better accuracy than previous algorithms. Since EMG is used for diagnostics of various Neuron-Muscular Diseases by Doctors. Also EMG Signal Analysis by Doctors is Time Consuming and Sometimes also inaccurate.

**Current State of Research Project:**

* Right now, we’ve trained SVM and classified Hand Movements EMG Signals.
* We are searching Data Sets of Neuron-Muscular Diseases. Since such data is highly classified and Research institutes don’t easily share such data. Therefor we lagged behind in achieving this Aim to making a SVM Model to detect Neuron-Muscular Diseases with better accuracy than previous algorithms.