**ABSTRACT**

Speech is the most important and indispensable mode of communication between humans. In communication, the continuous flow of speech gets affected due to the interruption of emotional, panic and psychological factors that cause syllable or word repetition, prolongation and interjection. Speech dysfluency is a primary challenge for speech pathologist to isolate the normal speech from the stuttered speech. The primary objective of this paper is to propose a novel approach through optimized cepstral features selection that improves the classifiers accuracy. In this paper, Particle Swarm Optimization (PSO) and Synergistic Fibroblast Optimization (SFO) were introduced to select optimal features from conventional MFCC (Mel-Frequency Cepstrum Coefficients). The optimized cepstral features from PSO and SFO of pre-processed Tamil speech data is used to discriminate among different categories of speech signals like Normal, Moderate and Sever stutter through machine learning classification methods such as Support Vector Machine (SVM) and Naive Bayes (NB). From the experimental results, the optimal selection of cepstral features using SFO algorithm has achieved high accuracy of 96.08% employed with NB which outperforms well to the feature selection of PSO and classical MFCC. The evaluation of the proposed methodology is done by using performance metrics like sensitivity, specificity, precision, f-score and accuracy.