

## ABSTRACT

Technology in biomedical is growing all the time. We can now estimate our health condition just by analyzing the brain activity using brain-imaging methods such as electroencephalography (EEG) and functional near-infrared spectroscopy (fNIRS). The kinds of signals obtained from this device usually contain unwanted information signals or noises from various sources which need to be removed to obtain the original signal. In this thesis, we are analyzing fNIRS data obtained from physionet. As mentioned before, fNIRS is one of the brain-imaging methods which detects the brain activity by looking at the changes of oxy-Hemoglobin (oxy-Hb) and deoxy-Hemoglobin (deoxy-Hb) levels.

This thesis proposes a method to detect and remove noise using fast independent component analysis (FastICA). FastICA is a popular algorithm of independent component analysis (ICA) which is one of the methods for blind source separation. We use this method since we are going to separate the noise from the noisy or contaminated signal, hence achieving the clean signal. The fNIRS data we have gathered contain the contaminated (noisy) signals and the clean signals from nine trials.

This thesis expects the accuracy of the FastICA method to detect and remove noise. To analyze the performances of the method, we are calculate the value of mean square error (MSE), peak to signal noise ratio (PSNR) and cross-correlation from the results of the denoised signals.

**Keywords:** *Motion artifact, fNIRS, ICA, FastICA.*